

Contribution to the knowledge of the *Ranunculus auricomus* complex (Ranunculaceae) in Spain

FRANZ G. DUNKEL *

Abstract: In this article, 17 species of the *Ranunculus auricomus* complex of Spain are presented. The only diploid sexual species of Spain is *Ranunculus envalirensis* GRAU. Those being described and illustrated for the first time are *R. aragonensis* DUNKEL, *R. camerinus*, *R. pelendonorum*, *R. cantabricus*, *R. montserratioides*, *R. obtusitectus*, and the following taxa of a *R. carlittensis* group: *R. alejandrei*, *R. besandinus*, *R. guadarramensis*, *R. guaraensis*, *R. rotundifolius*, *R. sennenianus*, and *R. vasconicus*. The taxonomy and vulnerability of the above-mentioned taxa are discussed.

Zusammenfassung: In einer vorläufigen Übersicht des *Ranunculus auricomus*-Komplexes in Spanien werden 17 Arten vorgestellt. *Ranunculus envalirensis* GRAU stellt die einzige diploide sexuelle Art dar. Neu beschrieben und abgebildet werden *R. aragonensis* DUNKEL, *R. camerinus*, *R. pelendonorum*, *R. cantabricus*, *R. montserratioides*, *R. obtusitectus* und folgende Taxa einer *R. carlittensis* Gruppe: *R. alejandrei*, *R. besandinus*, *R. guadarramensis*, *R. guaraensis*, *R. rotundifolius*, *R. sennenianus*, und *R. vasconicus*. Ihre Taxonomie und unterschiedliche Gefährdung wird diskutiert.

Resumen: Una visión preliminar del complejo *Ranunculus auricomus* en España presenta 17 especies. *Ranunculus envalirensis* GRAU es la única especie sexual diploide. Nuevamente descritos y representados son *R. aragonensis* DUNKEL, *R. camerinus*, *R. pelendonorum*, *R. cantabricus*, *R. montserratioides*, *R. obtusitectus*, y los siguientes taxones de un grupo *R. carlittensis*: *R. alejandrei*, *R. besandinus*, *R. guadarramensis*, *R. guaraensis*, *R. rotundifolius*, *R. sennenianus* y *R. vasconicus*. Se discute su taxonomía y los diferentes peligros.

Key words: *Ranunculus auricomus*, Spain, new species, taxonomy.

*Correspondence to: f.g.dunkel@t-online.de
Am Saupurzel 1, D-97753 Karlstadt, Germany

1 INTRODUCTION

The *Ranunculus auricomus* complex harbours more than 800 species of apomictic or facultative apomictic character and only very few sexual species (DUNKEL & AL. 2018, DUNKEL 2019; KARBSTEIN & AL. 2020). Its distribution consists of a large area from Western Europe, Central Europe and Scandinavia, far eastward to Asia (China) and Feodoritsch Island. At the edge of

the distribution area, the diversity decreases and there exist only few or one species per country, e.g. *R. islandicus* (FAGERSTR. & G. KVIST) ERICSSON in Iceland, *R. pindicola* DUNKEL in Greece (DUNKEL 2015), and probably only *R. monophyllus* OVCZ. in China (WANG & GILBERT 2001). Species of this complex are completely lacking in Portugal and Turkey. On the contrary, a hot spot of diversity seems to be in Southern Scandinavia. The best examined areas, the provinces Uusima (Nylandia) around Hel-

sinki, Finland, and Södermanland, Suede, harbours 93 and 239 species, respectively (ERICSSON 1992, 2001; JULIN 1965, 1980; MARKLUND 1961, 1965).

The knowledge of the *Ranunculus auricomus* complex in Spain is based on the monography by J. Grau in 1984 (GRAU 1984). He reported five species for Spain, four of which were newly described by him: *R. carlittensis* (SENNEN) GRAU, *R. envalirensis* GRAU, *R. montserratii* GRAU, and *R. valdesii* GRAU (VALDES-BERMEJO & LOPEZ 1977). The fifth taxon in Spain determined by Grau is *R. alnetorum* W. KOCH. These plants were collected by E. Bourgeau at the Puerto de Leitariégos as early as in 1864. This pass links the provinces of Asturia and León in Northwestern Spain. Specimens of this collection were seen in diverse herbaria (M, MA, ZT) and populations found nearby – the pass itself was covered with snow at the end of May – demonstrated that these plants are different from those of the type locality of *R. alnetorum* close to Basel, Switzerland.

During the last 25 years, several new findings of *Ranunculus auricomus* populations were published (e.g., only selection: ALEJANDRE & AL. 2009; FABREGAT & AL. 2008; GARCÍA & SÁNCHEZ MELGAR 2007; MATEO & AL. 1995, 2004, MATEO & PISCO 1997; MONTSERRAT I MARTÍ 1986; VALDES-BERMEJO & LOPEZ 1977). All plants were determined by the authors either as *R. carlittensis* or *R. valdesii*, rarely as *R. montserratii* (SEGURA & MATEO 1995), mostly at the level of a subspecies.

Despite the new indications, taxa of the *Ranunculus auricomus* complex remain rare species in Spain. Since 2006, I have found only 35 populations during three weeks of excursions dedicated to the investigation of this complex. Unfortunately, due to the Covid 19 virus and travel restrictions it was not possible to continue my investigations in 2020. Considering the specimens of the Pyrenees or Prepyrenees, it would be worthwhile to look at the populations there (SÁEZ & AL. 2008). Although the robust species of the *R. cassubicus* group are absent in Spain (JALAS & SUOMINEN 1989), the found taxa present a wide spectrum of leaf diversity. Whereas the lateral lobe of *R. valdesii* is often undivided (Fig. 1), *R. aragonensis* is a taxon with an extensively divided blade and four to five lateral incisions (Fig. 3). The only diploid sexual species of the *Ranunculus auricomus* complex is *R. envalirensis* of the Eastern Pyrenees (DIOSDADO & PASTOR 1996; DUNKEL & AL. 2018). All other taxa present an amount of DNA by flow cytometry typical for tetraploid species. This is confirmed by three chromosome counts of Spanish taxa of this complex (DIOSDADO & PASTOR 1996). With the only exception of autopolyploid *R. cassubicifolius* W. KOCH, tetraploidy is linked with apomixis (HÖRANDL & GREILHUBER 2002). In contrast to the findings in the French Massif Central and Slovenia, no hybrids of triploid origin were detected. In contrast to the morphologically variable sexual *R. envalirensis*, the taxa of different regions described here remain morphologically specific. Even in garden culture under Central European conditions, they have kept their morphology. Therefore, it can be assumed that all new species are tetraploid and apomictic.

Most of the new species are restricted to single mountains (Fig. 33, 34): For example, *R. carlittensis* seems to be a species of the Eastern Pyrenees, the distribution area of *R. guadarra-mensis* is confined to the Sierra de Guadarrama, *R. obtusitectus*

grows in the Montaña Palentina, *R. cantabricus* is restricted to the Cordillera Cantábrica. Only *R. rotundifrons* covers a distribution area from the Picos de Europa to the Sierra de Albarracín, a distance of more than 350 km.

2 MATERIAL AND METHODS

During almost four weeks of field studies, 500 specimens have been collected since 2006. The material was studied now. The results concerning the diploid sexual taxa *R. envalirensis* had been previously published (DUNKEL & al. 2018).

Additionally, specimens from the following herbaria could be examined: Jaca (JACA), Madrid (MA), Munich (M), Valencia (VAL) and Zurich (Z, ZT), and the private herbarium of J.A. Alejandro. Used abbreviations are added in brackets (THIERS 2020).

In the text, the following abbreviations are used: Dept. = Département, Hb. = herbarium, herbarium Dunkel = Du, Prov. = Province (of), p.p. = pro parte, s.n. = sine numero, vs. = versus, n = north of, s = south of, sw = southwest of etc..

The species concept, definition of characters and depiction follow widely HÖRANDL & GUTERMANN (1998) and DUNKEL (2005, 2010).

All data sheets (Fig. 1, 3, 5, 7, 9, 11, 13, 15, 17, 19, 21, 23, 25, 27, 29, 31) present the most important characters of a species: the basal leaf sequence from the initial leaves (normally no. 1 and 2), the spring leaves evolving during flower period (no. 3–5), and the final leaves developing during the period of fructification (no. 6–7). The cycle is illustrated in vertical rows, from top to bottom. Small letters indicate an individual plant of a population. The small Arabic letters next to each basal leaf term the individuum of a population. Furthermore, the lowermost cauline or stem leaf with its specific number and form of segments is characteristic. Values of the largest segment are indicated in the description. Finally, the form and hairiness of the receptacle is illustrated at the bottom of the right column of the data sheet. Since the characters have been explained several times (HÖRANDL & GUTERMANN 1998a; DUNKEL 2005, 2010, 2014), a description can be omitted. The text requires a familiarity with the special terminology and definitions (cataphyll, length of basal leaf, main, first, second and so forth lateral incision, degree of incision: lobed, cleft, divided, dissected, receptacle, carpellophore) (see DUNKEL 2019: Fig. 1).

Pollen quality has been determined by carmine acetic staining according to HÖRANDL & al. (1997). About two hundred pollen grains per specimen were investigated.

All specimens of holotypes are deposited in MA; isotypes and further specimens are found in public herbaria as well as in the private herbarium of F. G. Dunkel (Du; collection number and herbarium number are identical). All specimens illustrated are of Spanish origin (Fig. 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32).

The geographical reference was given by coordinates or UTM (WGS84) system.

Fresh leaves from cultivated plants of some of the newly described species were used for flow cytometric ploidy esti-

mation using the standard two-step Otto protocol (OTTO 1990; DOLEŽEL & al. 2007) and *Pisum sativum* L. cv. Ctirad (DOLEŽEL & al. 1998) as the internal standard (PAULE & al. 2018). Flow cytometric ploidy estimations (DNA-ploidy; SUDA & al. 2006) were calibrated using a chromosome count of an individual Du-30442. The chromosome count was carried out as described in PAULE & al. (2018).

For demonstration of the altitudinal distribution of the Spanish species of the *R. auricomus* complex, indications of the sea level were divided into steps of 100 m (\pm 50 m) (Fig. 35).

3 PROSPECT OF THE SPECIES

The genus *Ranunculus*, especially the *Ranunculus auricomus* complex, still lacks a generally accepted subgeneric classification (TAMURA 1995). For more recent information and literature see HOJSGAARD & HÖRANDL 2019; KARBSTEIN & AL. 2020. Although a uniform procedure in all apomictic complexes is desirable, the *Ranunculus auricomus* complex is still classi-

fied by means of informal groups (BORCHERS-KOLB 1983, 1985; HÖRANDL & GUTERMANN 1998a, DUNKEL 2014). The grouping is still based only on morphological criteria.

R. envalirensis represents the only sexual diploid species. It resembles *R. cebennensis* DUNKEL and *R. marsicus* GUSS. & TEN., the latter being a rather widespread species of the Apennines (DUNKEL 2011, 2018). All species grow in meadows at highly montaneous to subalpine or even alpine level (*R. envalirensis*). As they share morphology and ecology, all are positioned into a *R. marsicus* group.

The *boreoapenninus* group is characterized by a heterophyllous leaf cycle with a rather divided blade of the spring leaves and almost entire final leaves (DUNKEL 2010). The entire morphological spectrum of the *Ranunculus auricomus* collective group is reflected on the one hand by *R. valdesii* (mostly undivided lobes: *R. valdesii* group), and on the other hand by *R. aragonensis* DUNKEL, sp. nov. (strongly divided blades with deeply incised leaf edge: *R. aragonensis* group).

Half of the new taxa demonstrate similarity to *R. carlittensis* and are categorized in a *R. carlittensis* group.

3.1. <i>Ranunculus auricomus</i> collective group	3.1.c <i>Ranunculus aragonensis</i> group	3.1.e <i>Ranunculus carlittensis</i> group
3.1.a <i>Ranunculus marsicus</i> group	3.1.3 <i>Ranunculus aragonensis</i>	3.1.10 <i>Ranunculus alejandrei</i>
3.1.1. <i>Ranunculus envalirensis</i> (diploid sexual species)	3.1.4 <i>Ranunculus camerinus</i>	3.1.11 <i>Ranunculus besandinus</i>
3.1.b <i>Ranunculus valdesii</i> group	3.1.5 <i>Ranunculus pelendonorum</i>	3.1.12 <i>Ranunculus carlittensis</i>
3.1.2 <i>Ranunculus valdesii</i>	3.1.d <i>Ranunculus boreoapenninus</i> group	3.1.13 <i>Ranunculus guarramensis</i>
	3.1.6 <i>Ranunculus cantabricus</i>	3.1.14 <i>Ranunculus guaraensis</i>
	3.1.7 <i>Ranunculus montserratii</i>	3.1.15 <i>Ranunculus rotundifrons</i>
	3.1.8 <i>Ranunculus montserratoides</i>	3.1.16 <i>Ranunculus sennenianus</i>
	3.1.9 <i>Ranunculus obtusitectus</i>	3.1.17 <i>Ranunculus vasconicus</i>

3.1.a *Ranunculus marsicus* group

3.1. *Ranunculus envalirensis* GRAU

Mitt. Bot. Staatssamml. München 20: 14, 1984. – Holotype: Andorra, Alpine Matten zwischen Soldeu und dem Puerto de Envalira, ca. 1900 m, 23 May 1970, Merxmüller & Gleisner, M-0025864. — DUNKEL 2018: Fig. 1, 8, 9; fig. 33.

Pollen quality — excellent; 98.2% well developed (Du-29988-3, Tab. 1).

Chromosome number — $2n = 16$ (Gerona, SEV-128349; DIOSDADO & PASTOR 1996).

DNA-ploidy — $2x$ (Soldeu, Du-29983; Eyne, Du-29988; PAULE & AL. 2018).

Eponymy — refers to the type locality at Puerto de Envalira.

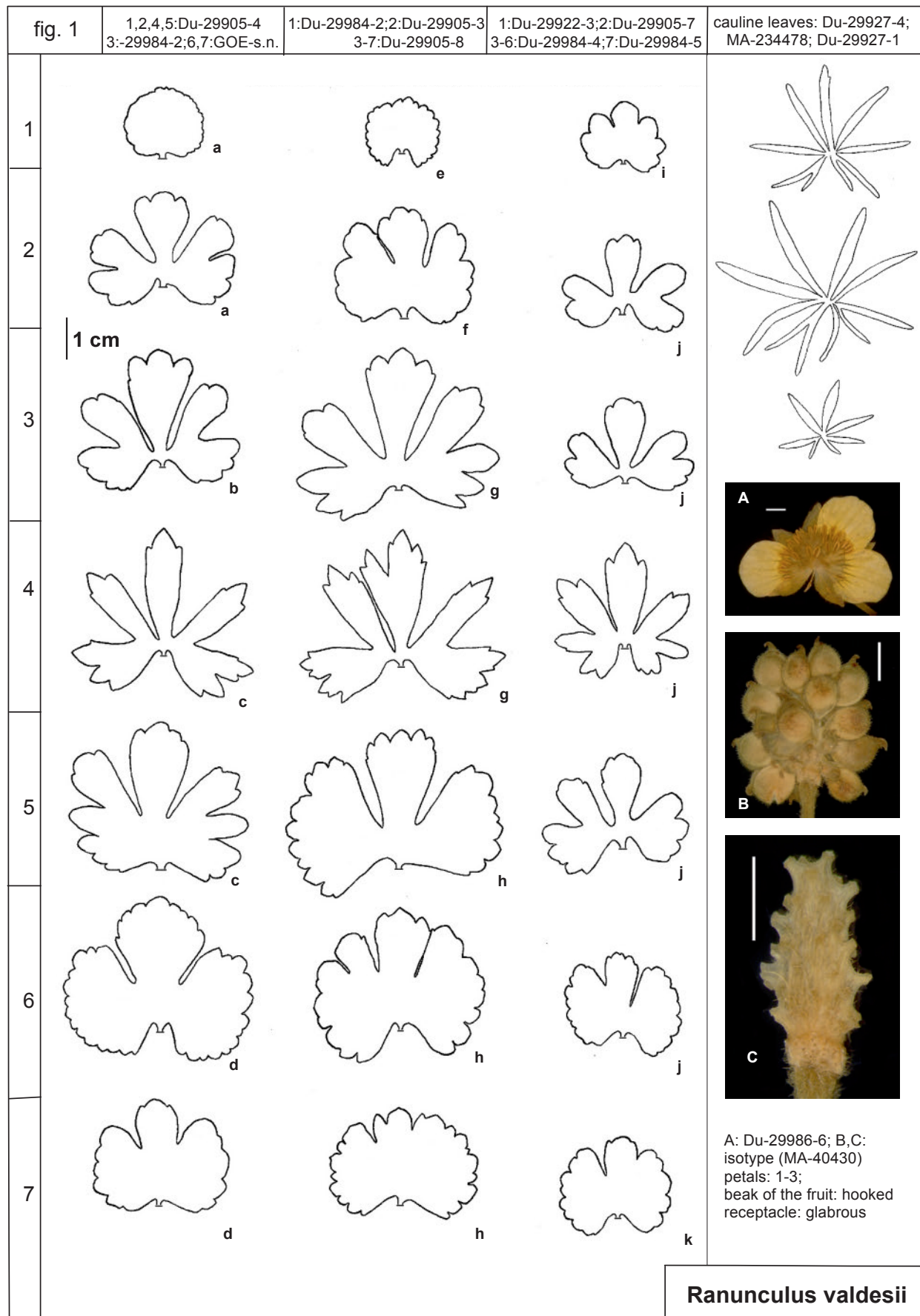
Ecology — subalpine to alpine meadows, 1600–2450 m.

Distribution — the geographic area of *R. envalirensis* seems to be restricted to the Pyrenees (DIOSDADO & PASTOR 1996:169). Possibly, *R. cebennensis* of the Cévennes is conspecific and belongs to *R. envalirensis* (DUNKEL 2018; KARBSTEIN & al. 2020). In this case, the geographic area of *R. envalirensis* is extended further north to southern parts of the Massif Central.

Vulnerability — not threatened.

Taxonomy — *R. envalirensis* represents the only sexual species of the *Ranunculus auricomus* complex. This is reflected in a greater morphological variation with more or less divided blades of the basal leaves. Furthermore, *R. envalirensis* has a tendency

►
Fig. 1: Data sheet (basal leaf cycle, stem leaves, flowers, fruits, receptacle) of *Ranunculus valdesii*. (Length of bars in figures of details = 2 mm)



Ranunculus valdesii



Fig. 2: Specimen of *R. valdesii* (Du-29992-2).

to develop more than two enrichment shoots with intermediate leaves presenting deep incisions of middle and lateral lobes (see DUNKEL & AL. 2018: fig. 8).

Specimens seen — France, Languedoc-Roussillon, Pyrénées-Orientales (66), Eyne, Val d'Eyne, Weide 2000 m, 07 Jun 1974, G. Wagenitz 2542, det. F.G. Dunkel 2011, GOE-10/2011/99; ibidem, Eyne, Val d'Eyne, Weide 2000 m, 07 Jun 1974, G. Wagenitz 2542, det. F.G. Dunkel 2012, G-00303160 (II/32 1); Eyne, marais du torrent d'Eyne en amont du village, marais, 1600 m, 30 May 2003, J.-M. Tison, Hb. Tison 03/97; ibidem, Eyne, Vallée d'Eyne, 1680–2180 m, 09 Jul 1986, H. Kalheber-86-1369, M-0008124; Eyne, SSW Eyne am Bach, W D33 (Voie Communale Carretera d'Eina), Feuchtwiese, Bachbett, 1580–1610 m, 42°27'50"N 02°04'29"E, 23 May 2013, F.G. Dunkel, Du-29987;

Andorra, Eastern Pyrenees, Envalira, Orillas del rio Valira, por debajo de Grau Roig, Bordas de Envalira, prados nitrificados junto al rio, 2050 m, 31TCH9212, 03 Jul 1992, G. Nieto Feliner-2991 & al., det. G. Nieto Feliner, MA-514086-2, Iter Andorrano-Aranense, VII-1992; ibidem, Soldeu, W Soldeu, in der großen Schleife der CG-2, W Callissa de l'Asó, subalpine Wiesen, 1750 m, 42°34'53"N 01°39'46"E, 23 May 2013, F.G. Dunkel, Du-29984; ibidem, Soldeu, an der Cami Pont d'Incles, am Riu d'Incles, Stichstraße, Wiese, 1755 m, 42°35'02"N 01°39'49"E, May 2013, F.G. Dunkel, Du-29985; Els Colells, Encamp, pelouse humide, 2450 m, 20 Jul 1979, J. Bouharmont no. 12741, det. F.G. Dunkel 2011, BR-109;

Spain, Prov. Gerona, Nuria, pastorales, abundante, Jun 1946, leg. Losa, det. J. Grau 1984, M-008125; ibidem: Nuria, 2400 m, 14 Jul 1988, J.C. Diosdado & M. Cacao, SEV-128349; Pyrenees, Katalonia, Prov. Lleida, Sant Joan de l'Erm, Coll de Leix, prats humits, sol esquisto, 1700 m, 24 May 1981, J. Carreras, det. F.G. Dunkel 2.2019, BCN-140961.

3.1.b *Ranunculus valdesii* group

3.1.2 *Ranunculus valdesii* GRAU

Mitt. Bot. Staatssamml. München 20: 16 (1984). – Holotype: Spain, Madrid, Sierra de Guadarrama, Rascafría, subida al Puerto del Reventón, robleal, 04 Jun 1974, G. Lopez & E. Valdés Bermejo, MA-233877; isotypes: Puerto del Reventón, en melojares de *Luzulo-Quercetum pyrenaicae*, 04 Jun 1974, G. Lopez & E. Valdés Bermejo, M-0099539, GDA.

syn. *Ranunculus auricomus* L. subsp. *valdesii* (GRAU) MATEO, FABREGAT & LÓPEZ UDIAS. An. Biol. Fac. Biol. Univ. Murcia 20: 107 (1995). — Fig. 1, 2, 33.

Pollen quality — mediocre, 55.5% well developed pollen (locotype Du-29927-4).

DNA-ploidy — 4x (Rascafría, locotypes Du-15637, Du-29927; Paule & al. 2018).

Chromosome number — $2n = 32$ (Madrid, SEV-128350; DIOSDADO & PASTOR 1996).

Distribution — Sierra de Guadarrama, Prov. Madrid, close to Rascafría, and Prov. Segovia, close to Navafria.

Ecology — humid sites in oak forests of *Quercus pyrenaica* Willd., along brooks (arroyos) in pine forests, 1130–1450 (1950) m.

Eponymy — refers to the Spanish botanist Enrique Valdés Bermejo (1945–1999), the discoverer of the species (together with G. Lopez).

Vulnerability — due to the small number of populations, *R. valdesii* is regarded as vulnerable.

Taxonomy — *R. valdesii* is an endemic species of the Sierra de Guadarrama. It is easily recognizable by its rounded teeth and

lobes and its almost undivided initial and final leaves. Therefore, it is quite different from all the other Spanish species, and it is deemed appropriate to put the species into its own monospecific group.

Specimens seen — Spain, Comunidad de Madrid (Prov. Madrid), Sierra de Guadarrama, Rascafría, de Rascafría al Puerto del Reventón, en melojares adarades, 1380 m, 40°54'50"N 03°53'40"W, 06 Jun 1974, G. Lopez & E. Valdés Bermejo, det. J. Grau, MA-234478; ibidem, Rascafría, Schotterstraße Richtung Reventón, oberhalb Tennisplatz, noch vor der Schranke, feuchter Pyrenäen-Eichen-Wald, rechts der Straße, beweidet, 1210 m, 40°54'30.2"N 03°53'21.6"W, 13 Apr 2006, F.G. Dunkel, Du-15637; ibidem, cultivated, 12 May 2006, F.G. Dunkel, Du-16272, Du-16760; ibidem, 20 May 2013, F.G. Dunkel, Du-29927; ibidem, Rascafría, feuchter Eichen-Hainbuchen-Wald, bachbegleitend, 200 m n M-604, o Rascafría, feuchter Eichen-Hainbuchen-Wald, bachbegleitend, 1135 m, 40°54'36.6"N 03°52'16.8"W, 20 May 2013, F.G. Dunkel, Du-29922; ibidem, Du-29923;

Castilla y León, Prov. Segovia, Sierra de Guadarrama, Navafria, “Los Bañaderos”, arroyo de Las Truchas, en pinar silíceo con arroyo sombreado, zonas húmedas y roquedo, 1450 m, 41°02'14" 03°51'20"W (30TVL2843), 30 May 1986, G. López & R. García-2094, det. G. López, MA-648975; ibidem, zonas húmedas de escorrentía, arroyo sombreado y bordes terrosos de camino, 1450 m, 30 May 1986, R. García-2343, det. G. López, MA-648973;

Material not sufficient for a secure determination:

Prov. Madrid, Navafria, pista forestal que llega hasta lo alto del puerto de Navafria, en borde del arroyo del Chorro, zonas húmedas rezumantes bajo pinar y cunetas, 1650 m, 40°59'48"N 03°48'58"W, (30TVL3040), 26 Jun 1986, R. García Adá-2626, R. García, MA-648976; Prov. Segovia, Sierra de Guadarrama, Aldealengua de Pedraza, ladera norte del pico del Nevero en roquedos, zonas higróturbos despejadas y bordes de arroyo dentro del pinar, 1950 m, 40°59'32"N 03°49'57"W, (30TVL3038), 24 Jun 1986, P. Egido & R. García-2956, R. García, MA-648974.

3.1.c *Ranunculus aragonensis* group

3.1.3 *Ranunculus aragonensis* DUNKEL spec. nova

Holotype: Spain, Prov. de Teruel, Sierra de Gúdar: 4,2 km SW Fortanete, próxima arroyo de Peñacerrada, 100 m E Masía de Peñacerrada, lichter Kiefernwald, Quellbach, [bright pine forest, fountain brook], 1680 m, 40°28'43"N 00°33'32"W, 27 May 2015, F.G. Dunkel 32850, MA; isotypes JACA, M, Du-32850. *Paratype*: Fortanete, arroyo de Peñacerrada, 30TYK0784, 02 Jun 1993, leg. G. Mateo-7730, Mercadal, Fabregat, López, det. G. Mateo sub *R. auricomus* L. subsp. *carlittensis* (SENNEN) MOLERO, PUJADAS & ROMO, rev. F.G. Dunkel 10.2020 sub *R. aragonensis*, VAL-80348. — Fig. 3, 4, 33.

Description — *Flowering shoot* (gracile) slim, 18–34 cm, stalk (0.8)1,2–3.5 mm in diameter, suberect to moderately divergent, angle between the main and secondary axis 10–50°, flowers 2–6, enrichment shoots 0–2; basal leaves (2)3–5(8) per rosette.

Basal leaf cycle: rather homophyllous, all basal leaves with closed or narrow-angled base ((-5)0–20°) and divided or dissected by main incisions (94–100%); leaf edge irregularly and coarsely crenate-serrated. Middle segment occasionally spatulate with 7–9 rounded teeth in leaf no. 1–3 and 7, in general broadly deltoid, and trileft by incisions from 20–50%, with 7–11 broad teeth, lateral edge concave.

First basal leaf 14–24 mm long; lateral segment undivided or cleft by first and second lateral incision (up to 50% and 42%, respectively).

Second basal leaf 22–28 mm long; lateral segment cleft to divided by first lateral incision (60–80%), cleft by second lateral incision 40–55%.

Third basal leaf 22–28 mm long; lateral segment cleft to divided by first lateral incision (50–75%), cleft by second lateral incision (35–50%), third lateral incision absent or up to 27%.

Fourth basal leaf 22–35 mm long; middle segment stalked up to 2 mm; lateral segment divided by first lateral incision (75–92%), cleft by second lateral incision (50–65%), lobed or cleft by third and fourth lateral incision (26–50%), fifth lateral incision absent or up to 40%.

Fifth basal leaf 22–34 mm long; middle segment stalked up to 2 mm; lateral segment divided by first lateral incision (60–80%), cleft by second lateral incision (42–65%), lobed or cleft by third and fourth lateral incision (26–45%), fifth lateral incision absent or up to 28%.

Sixth basal leaf 22–30 mm long; lateral segment cleft to divided by first lateral incision (60–85%), cleft by second lateral incision (35–50%), lobed or cleft by third lateral incision (25–35%).

Seventh basal leaf 20–28 mm long; lateral segment cleft to divided by first lateral incision (35–75%), second lateral incision absent or up to 36%.

Lowermost stem leaf divided into 7–11 segments, largest segment 20–45 mm long, 4–8 mm wide, lanceolate to narrowly deltoid, with (0)2–4 small to big, up to 10 mm long patent teeth.

Petals 2–5, 9–12 mm long, 7–10 mm wide; *androclinium* 0.6–0.8 mm, filaments up to 2 mm long; *receptacle* globose, 2.0–4.0 mm long, 1.2–2.6 mm wide, sparsely pilose (+), intervallum absent, carpellophores 0.3–0.7 mm; *fruits* 0.8–1.8 mm long, beak 0.4–0.7 mm long, uncinuate to involuted.

Pollen quality — mediocre, 68.2% well developed pollen (isotype Du-32850-6).

DNA-ploidy — 4x (Fortanete, locotype Du-33978).

Distribution — Iberian System: Sierra de Gúdar (Prov. de Teruel); Western Pyrenees: Monte Oturia, Yebra de Basa (Prov. Huesca).

Ecology — brushes, bright pine forests with humid ground or along brooks, beech forests, (500)1550–1900 m.

Eponymy — refers to the hitherto known main distribution in the region of Aragón.

Vulnerability — due to the small number of populations *R. aragonensis* is regarded as vulnerable.

Taxonomy — *R. aragonensis* is a very conspicuous taxon. It is characterized by almost closed or even overlapping basal aperture of the basal leaves combined with a high number of incisions and rounded teeth of the leaf edge. The middle segment of the spring leaves carries often more than ten teeth. On a morphological scale *R. valdesii* possesses the less divided blade, *R. aragonensis* the most divided one. It belongs to the few species with a (scarcely) pilose receptacle. As far as known so far, most populations occur in Aragón.

Specimens seen — Spain, Aragón, Montes Pirineos, Prov. Huesca: Yebra de Basa, Monte Oturia, sobre el hayedo-abetal, 1750(–1830) m, 30TYN2413, 24 May 1980, P. Montserrat & F. Fillat, det. J. Grau 1984 sub *R. carlittensis?*, rev. F.G. Dunkel Dec 2018 sub *Ranunculus aragonensis*, JACA-63880; ibidem: Javierre del Obispo, Monte Oturia, La Lera, bajo cantil W cerca majada, 1600 m, 30TYN2312, 27 May 1989, P. Montserrat, det. F.G. Dunkel Dec 2018, JACA-100889;

Aragón, Prov. Teruel, Sierra de Gúdar: Cantavieja, Puerto de la Tarayuela, 1650 m, 30TYK18, 22 May 1993, C. Fabregat et al., det. F.G. Dunkel, JACA-357495, VAL-80878; ibidem: Valdelinares, 5 km NNE Valdelinares, Gebüsch, 1740 m, 40°25'56"N 00°35'03"W, 27 May 2015, F.G. Dunkel, Du-32855; ibidem: Valdelinares, Claros de pinar moro, 1900 m, 40°22'25"N 00°37'15"E, 15 Apr 1995, D. Gomez et al., det. F.G. Dunkel, JACA-18895, Du-35794; ibidem: Valdelinares, por la Cerrada de la Balsa, in der Umgebung der Mas de la Balsa, Gebüsch, 1560 m, 40°21'43"N 00°34'32"W, 27 May 2015, F.G. Dunkel, Du-32856; ibidem: Fortanete, 4.2 km SW Fortanete, próxima arroyo de Peñacerradam, 100 m E Masía de Peñacerradam, lichter Kiefernwald, Quellbach (loc. typicus), 1680 m, 40°28'43.8"N 00°33'32.2"W, cultivated, 10 May 2017, F.G. Dunkel, Du-33978.

Material not sufficient for a secure determination:

Rioja (Logroño), Sistema Ibérico: Gallinero en Cameros, vaguada de umbría del monte Horquín bajo el collado de Peña Hincada, hayedo explotado, silíceo, 1200–1300 m, 30TWM3267, 17 Apr 1997, J.A. Alejandro 348/97, det. F.G. Dunkel Dec 2018, MA-616681, Du-37095;

País vasco (Euskadi), Prov. de Álava: Vitoria, Estarrona, en restos de robledales con encharcamento, 500 m, 30TWN2046, 22 Apr 1981, J.A. Alejandro-384.81, det. F.G. Dunkel, MA-286300.

3.1.4 *R. camerinus* DUNKEL spec. nova

H o l o t y p e : Spain, Sistema Ibérico, Castilla y León, Prov. Soria, Montenegro de Cameros, Puerto de Santa Inés, Arroyo del Puerto, unterhalb der SO-830, nahe am Bach, unter Buchen [underneath route SO-830, near to the brook, under beeches], 1495 m, 42°03'00"N 02°46'44"W, 22 May 2019, F.G. Dunkel-37109, F.G. Dunkel, MA; isotypes JACA, Du-37109. – Fig. 5, 6, 33.

Description — *Flowering shoot* gracile to slim (robust), 18–35 cm, stalk 0.8–2.5 mm in diameter, suberect to moderately divergent, angle between the main and secondary axis 10–40°, flowers 1–4, enrichment shoots 0(-1); basal leaves 2–5 per rosette.

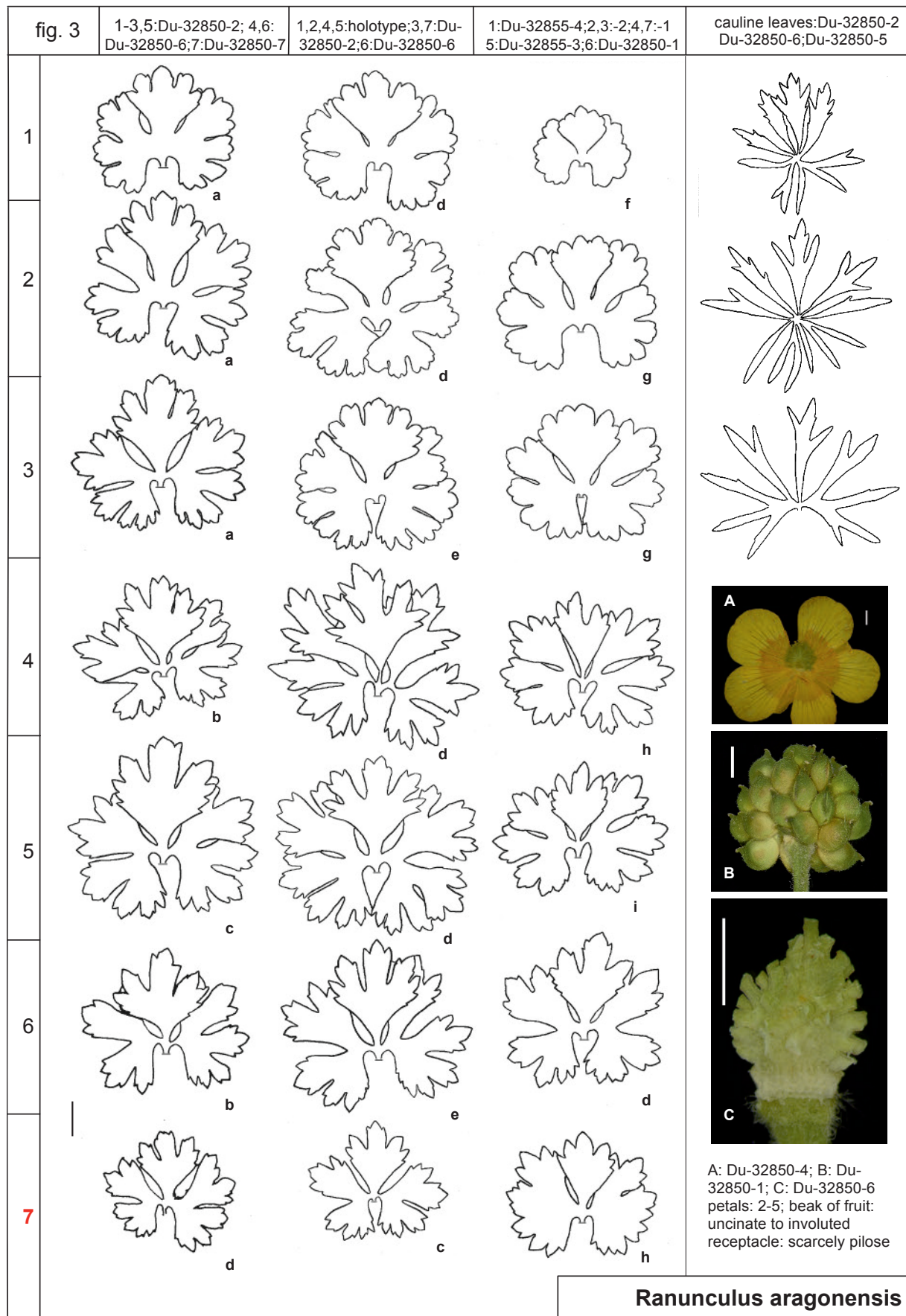
Basal leaf cycle: Leaf edge of the first basal leaf crenated, of the second to fifth one irregularly and deeply crenate-serrated, of the sixth and seventh basal leaf irregularly, occasionally finely crenate-serrated to serrated. Aperture at the base of the first to the fifth basal leaf narrowly angled (10–50(80)°), rarely closed (0°), at the sixth and seventh basal leaf narrowly angled to V-formed, rarely widely angled (60–100(110)°).

First basal leaf 12–18 mm long; cleft to divided by the main incision (50–75%), middle segment deltoid to spatulate with 4–9 rounded teeth; lateral segment undivided.

Second basal leaf 15–25 mm long; cleft to divided by the main

►
Fig. 3: Data sheet (basal leaf cycle, stem leaves, flowers, fruits, receptacle) of *Ranunculus aragonensis*. (Length of bars in figures of details = 2 mm)

►►►
Fig. 5: Data sheet (basal leaf cycle, stem leaves, flowers, fruits, receptacle) of *Ranunculus camerinus*. (Length of bars in figures of details = 2 mm)



Ranunculus aragonensis



Fig. 4: Holotype of *R. aragonensis* (MA).

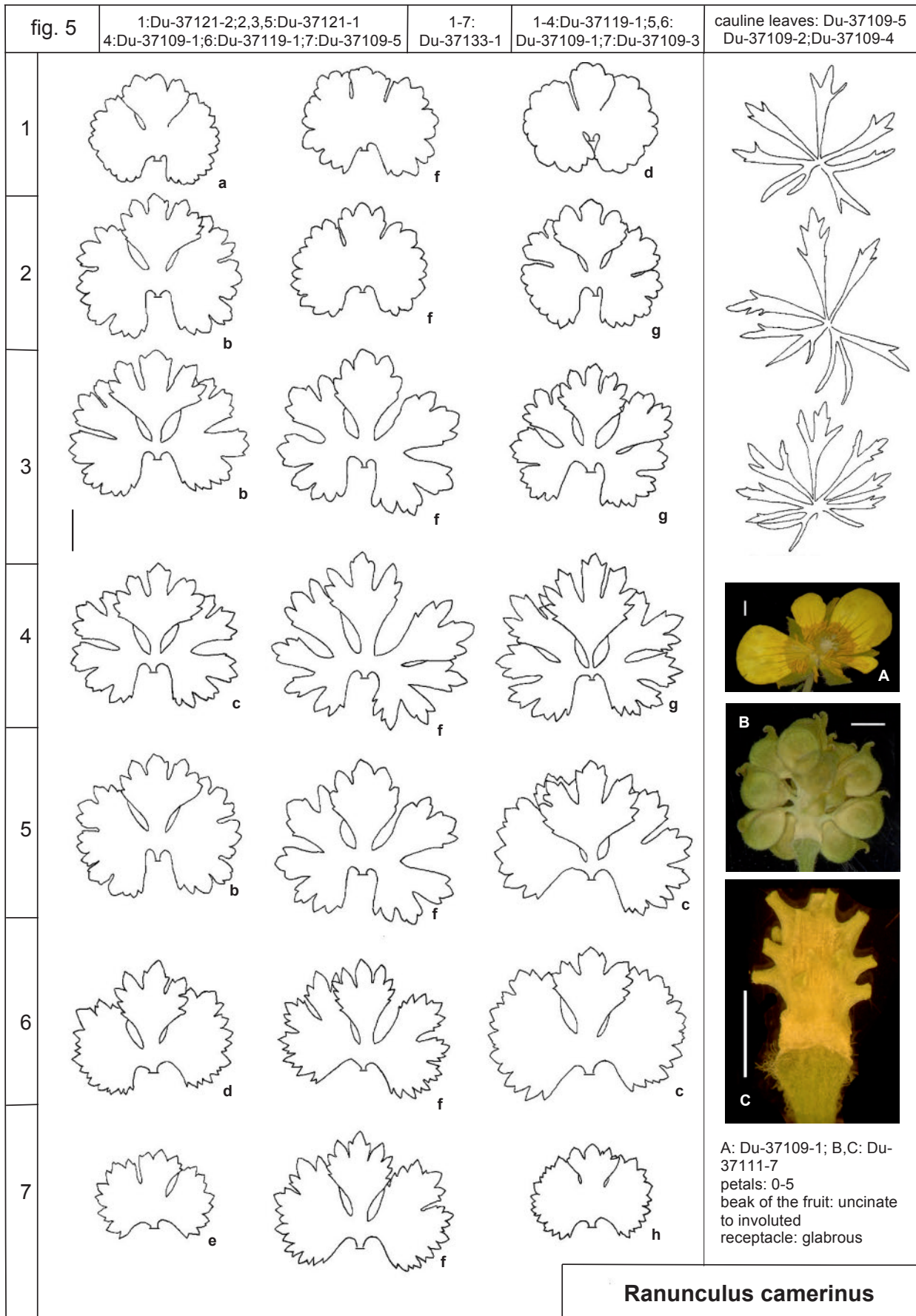




Fig. 6: Holotype of *R. camerinus* (MA).

incision (50–90%), middle segment spatulate to broadly deltoid with 5–11 teeth, occasionally trilobed with incisions up to 35%; lateral segment undivided or lobed to cleft by the first lateral incision (26–40%), second lateral incision absent or up to 30%.

Third basal leaf 20–28 mm long; divided by main incision (75–92%), middle lobe spatulate to broadly deltoid, trileft or quinquepartite with incisions up to 50%, with 7–11 teeth, lateral edge concave; lateral segment cleft to divided by first lateral incision (45–75%), cleft by second lateral incision (30–45%), third lateral incision absent or up to 30%.

Fourth basal leaf 23–30 mm long; divided to dissected by main incision (85–100%), middle lobe spatulate to broadly deltoid, trileft or quinquepartite with incisions up to 50%, with 9–13 teeth, lateral edge (slightly) concave; lateral segment cleft to divided by first lateral incision (60–75%), cleft by second lateral incision (32–55%), lobed to cleft by third and fourth lateral incision (30–45%, and 26–35%, respectively).

Fifth basal leaf 18–28 mm long; divided by main incision (85–95%), middle lobe spatulate to broadly deltoid, occasionally trileft with incisions up to 45%, with 9–13 teeth, lateral edge concave to slightly convex; lateral segment lobed to divided by first lateral incision (26–70%), lobed to cleft by second lateral incision (26–45%), third lateral incision absent or up to 35%.

Sixth basal leaf 22–30 mm long; divided the main incision (75–92%), middle lobe spatulate to broadly deltoid, occasionally trilobed with incisions up to 35%, with 9–11(13), partly small, teeth, lateral edge concave; lateral segment undivided or lobed to cleft by first and second lateral incision (26–50%, and 26–30%, respectively).

Seventh leaf 16–26 mm long; cleft to divided by main incision (60–90%), middle lobe trapezoid, spatulate or deltoid, with 5–11, partly small, teeth, lateral edge slightly concave to slightly convex; the lateral segment is undivided, or lobed by first lateral incision (26–32%).

Lowermost stem leaf divided into (5)7–9 segments, largest segment 20–42 mm long, 2–8 mm wide, (broadly linear to) narrowly deltoid, occasionally undivided, normally with 2(–4) teeth, (slightly) patent and up to 10 mm long.

Petals 0.5–, 9–12 mm long, 7–10 mm wide, conspicuous; *androclinium* 0.6–0.9 mm; *receptacle* globose to ellipsoidal, 2.0–3.0 mm long, 1.7–2.5 mm wide, glabrous, intervallum absent, rarely short (up to 15%), carpelophores 0.3–0.6 mm long; *fruits* 2.0–3.2 mm long, beak 0.5–1.0 mm long, uncinatate to involuted.

Pollen quality — mediocre, 44.8% well developed (holotype Du-37109-1).

DNA-ploidy — 4x (Montenegro de Cameros, isotype Du-37109).

Distribution — Sistema Ibérico: Sierra de Cameros, Sierra de la Demanda, Sierra de la Ballenera, and probably Velilla de Río Carrión.

Ecology — bright beech forests, clearings in beech forests, downy oak forests, 1000–1520 m.

Etymology — refers to the name of the Sierra de Cameros, site of the type locality and main distribution area of the species.

Vulnerability — not endangered.

Taxonomy — *R. camerinus* is similar to *R. aragonensis* with broadly deltoid middle segments of the spring leaves with more than ten teeth, but then the lateral lobes of the final leaves are un-

divided or lobed by the first lateral incision. *R. camerinus* occurs scatteredly in a restricted area of the Iberian System, especially in the name-giving Sierra de Cameros.

Specimens seen — Castilla y León, Prov. Soria, Sistema Ibérico, Sierra de la Camero Nuevo: Montenegro de Cameros, barranco del arroyo del Puerto, claros forestales, hayedos, sustrato ácido, 1500 m, 30TWM1855, 16 May 1992, J.A. Alejandro 79-92, det. F.G. Dunkel, MA-533537; ibidem: Montenegro de Cameros, barranco del arroyo del Puerto, en el fondo del barranco, hayedos, sustrato ácido, 1520 m, 42°02'54"N 02°46'48"W, 16 May 1992, J.A. Alejandro-82/92, Du-37121; ibidem: Montenegro de Cameros, barranco del arroyo del Puerto, claros forestales, hayedos, sustrato ácido, 1500 m, 16 May 1992, J.A. Alejandro 79/92, MA-533537; ibidem: Montenegro de Cameros, Puerto de Santa Inés, Arroyo del Puerto, unterhalb SO-830, am bzw. nahe Bach unter Buchen, 1495 m, 42°03'00"N 02°46'44"W, 22 May 2019, F.G. Dunkel, Du-37109; ibidem: Muro en Cameros, en la umbría de La Rasa, hayedos, sustrato meradamente ácido, 1370–1390 m, 42°14'10"N 02°33'48"W, 17 Apr 1997, J.A. Alejandro-341/97, Du-37139; ibidem: Muro en Cameros, puerto de La Rasa, hayedos de la umbría, hayedos adhesado y bordes con matorral spioso, vaguadas y rellanos con humedad edáfica, 1370–1380 m, 42°14'10"N 02°33'48"W, 27 Mar 1997, J.A. Alejandro-280/97, Du-37140-1; ibidem: Pico del Urbión: San Pedro Manrique, Matas-ejún, La Dehesilla, marojal con acebo y espinales en ladera al NE, sustrato ácido, 1270–1300, 41°58'54"N 02°15'05"W, 18 Apr 1994, J.A. Alejandro-118/94, Du-37134; ibidem: Pico del Urbión: San Pedro Manrique, Palacio de San Pedro, en una umbría del monte Lutero, marojal con hayas sobre sustrato ácido, 1330 m, 42°00'30"N 02°17'W, 17 May 1994, J.A. Alejandro-213/94, Du-37131;

La Rioja (Prov. Logroño), Sierra de la Camero Nuevo, Viniegra de Arriba, subiendo hacia el Puerto de Montenegro, hayedos y espinales sobre calizas, 1340 m, 42°05'30"N 02°48'W, (30TWM1660), 09 May 1992, M.L.G. Zúñiga & J.A. Alejandro-55/92, Du-37119, MA-533491, Hb. Alejandro-55/92; ibidem: Viniegra de Arriba, am Picknickplatz an der LR-333, 2,1 km e Viniegra de Arriba, im schattigen Buchenwald, nahe Bach, 1322 m, 42°05'42"N 02°48'28"W, 22 May 2019, F.G. Dunkel, Du-37111; ibidem: Ajamil de Cameros, la Dehesa de Torremuña, en hayedo residual, localizado en umbría, sustrato moderadamente ácido, 1230–1300 m, 42°11'20"N 02°24'30"W, 17 May 1996, M.L.Gil Zúñiga & J.A. Alejandro-617/96, Du-37142; ibidem: Ajamil de Cameros, la Dehesa de Torremuña, hayedos residuales, con algunos viejos marojos (downy oaks), umbría, sustrato moderadamente ácido, 1230–1300 m, 42°11'30"N 02°24' W, 23 May 1996, J.A. Alejandro-679/96, det. F.G. Dunkel, Du-37113, Hb. Alejandro-679/96; ibidem, 1320–1350 m, 42°11'N 02°23'W, 17 May 1996, leg. J.A. Alejandro-625/96, det. F.G. Dunkel, Du-37113; ibidem: Estollo, mazo de la Demanda, umbría de la sierra de Pradilla, vaguada en hayedo sobre sustrato de transición entre carbonatos y materiales ácidos, 1050–1100 m, 42°18'30"N 02°51'15"W, 03 May 1997, J.A. Alejandro-453/97, Du-37141, Alejandro-453/97; ibidem, Sierra de la Demanda: San Millán de la Cogolla, hayedo en ladera de umbría, sustrato carbonatado, 1020–1050 m, 30TWM1184, 42°18'30"N 02°52'00"W, 01 May 1997, J.A. Alejandro-426/97, Hb. Alejandro-426/97; ibidem: San Millán de la Cogolla, hayedo en ladera de umbría, sustrato carbonatado, 1020–1050 m, 30TWM1184, 01 May 1997, B.Fz. de Betoño & J.A. Alejandro-226/97, MA-616655, Du-37089; ibidem: Poyales, Sierra de Bellenera, en hayedos muy localizados en vaguadas de la umbría sobre sustrato ácido, 1300–1400 m, 42°05'55"N 02°15'01"W, (30TWM6261), 20 Apr 1994, J.A. Alejandro-124/94, F.G. Dunkel, Hb. Alejandro-124/94; ibidem: Hornillos de Cameros, la Dehesa, hayedo residual, hayedo, localizado en umbría sobre un sustrato moderadamente ácido, 1430–1440 m, 42°12'30"N 02°23'27"E, (30TWM5073), 17 May 1996, J.A. Alejandro-606/96 & M.L.Gil Zúñiga, F.G. Dunkel, Hb. Alejandro-606/96;

Prov. Burgos, Sistema Ibérico, Sierra de la Demanda, Monterrubio de la Demanda, in der Umgebung des Picknickplatzes «La Pradera», relativ feuchter Eichen-Buchen-Wald, Gebüsch, 1165 m, 42°08'05"N «03°07'24"W, 22 May 2019, F.G. Dunkel, Du-37118; ibidem: Neila, Morro de San Cristobal, 2–3 km sso Neila, vaguadas en ambiente de Hayedos de la umbría, sustrato de transición de calizas a sílices, 1450 m, 42°02'30"N 02°59' W, 30 May 1992, J.A. Alejandro-145/92, Du-37128, MA-533612, J.A. Alejandro-145/92.

Probably belonging to *R. camerinus*, material not sufficient for a secure determination:

Prov. Soria, Sierra de Cameros, Diustes, hayedo siliceo, 42°06'N 02°24'W, 10 May 1961, A. Segura Zubizarreta, det. N.N. 1990 sub *R. valdesii* Grau, rev. F.G. Dunkel Mar 2020 sub *R. cf. camerinus* Dunkel, MA-451318;

La Rioja (Prov. Logroño), Villoslada de Cameros: zwischen Villaneva de Cameros und Puerto de Santa Inés, Bachaue, 1000 m, 30 Apr 1999, M. Nydegger, det. T. Brodtbeck 1999 sub *Ranunculus carlittensis* (Senn.) Grau, Société pour l'Échange des plantes vasculaires de l'Europe et du Bassin Méditerranéen, Fascicule 28, n° 18961 *Ranunculus carlittensis* (Senn.) Grau; M-0099619, MA-692213; ibidem: Villoslada de Cameros, zwischen Villanueva de Cameros und Puerto de Santa Inés, unterhalb des Parkplatzes an der N-111, nahe Abzweigung, Bachaue, 997 m, 42°07'32.1"N 02°39'10.1"W, 21 May 2013, F.G. Dunkel, Du-29946;

ibidem: Poyales, sierra de Bellenera, muy localizados en vaguadas de la umbría, sobre substrato ácido, 1400 m, 42°05'55"N 02°15'00"W, 20 Apr 1994, J.A. Alejandro-127/94, Du-37133; ibidem: Viguera, al N-NE de Cerroyera, zona alta de los hayedos, en ambiente de ecotono entre el hayedo y el borde de arbustos espinosos, 1270–1290 m, 42°17'N 02°31'25"W, 20 Mar 1997, J.A. Alejandro-233/97, F.G. Dunkel, Du-37137;

Castilla y León, Prov. Palencia, Velilla de Río Carrión: Cardaños de Arriba, en zona basal del valle, prados, taludes herbosos, sustrato variado, entre piedras de viejas tapias derrumbadas, 1340–1360 m, 30TUN5657, 24 May 1990, M.L. Gil Zuñiga & J.A. Alejandro, F.G. Dunkel, MA-493483.

3.1.5 *R. pelendonorum* DUNKEL *spec. nova*

Holotype: Spain, Prov. Burgos, 30TVM, Sierra de la Demanda, Monterrubio de la Demanda, in der Umgebung des Picknickplatzes „La Pradera“, relativ feuchter Eichen-Buchen-Wald, Gebüsch, [in the surroundings of the picnic area „La Pradera“, rather humid oak-beech forest, brushes], 1165 m, 42°08'05"N 03°07'24"W, F.G. Dunkel-37115, 22 May 2019, MA; isotypes M, Du-37115. – Fig. 7, 8, 33.

Description — *Flowering shoot* gracile to robust, 20–48 cm, stalk 0.5–3.5 mm in diameter, suberect to moderately divergent, angle between the main and secondary axis 10–40°, flowers 1–4, enrichment shoots 0(–1); basal leaves (1)2–4(5) per rosette.

Basal leaf cycle: rather homophyllous, all basal leaves with narrow-angled, occasionally V-formed base 10–60(100)°. First basal leaf less divided by main incision (66–85%), all other basal leaves divided to dissected by main incision (88–100%); leaf edge irregularly and deeply crenate-serrated.

Lateral edge of the middle segment concave, occasionally straight in the first and seventh basal leaf.

First basal leaf 13–22 mm long; middle lobe deltoid with 5–9 teeth, lateral segment cleft by first incision (33–60%), second lateral incision absent or up to 30%.

Second basal leaf 18–26 mm long; middle lobe deltoid to spatulate with 11–13, partly small teeth, tricleft with incisions up to 40%; lateral segment cleft to divided by first lateral incision (50–75%), cleft by second lateral incision (33–50%), third and fourth lateral incision absent or up to 35%.

Third basal leaf 20–26 mm long; middle lobe deltoid to spatulate with 7–15, partly small teeth, tricleft with incisions up to 50%; lateral segment cleft to divided by first lateral incision (60–80%), cleft by second lateral incision (35–60%), cleft by third and fourth lateral incision (33–40%).

Fourth basal leaf 26–35 mm long; middle lobe deltoid to spatu-

late, stalked up to 5 mm, with 13–21, partly small teeth, tricleft with incisions up to 55%; lateral segment divided by first lateral incision (70–80%), cleft by second, third and fourth lateral incision (50–60%, 40–50%, and 35–50%, respectively), lobed to cleft by fifth lateral incision (26–35%).

Fifth basal leaf 24–32 mm long; middle lobe deltoid (to spatulate), with 9–17, partly small teeth, tricleft with incisions up to 50%; lateral segment divided by first lateral incision (70–85%), cleft to divided by second lateral incision (45–70%), cleft by third lateral incision (35–50%), lobed to cleft by fourth lateral incision (26–40%), lobed by fifth lateral incision (26–32%).

Sixth basal leaf 22–28 mm long; middle lobe deltoid to spatulate, with 13–17, partly small teeth, tricleft with incisions up to 50%; lateral segment cleft to divided by first lateral incision (60–70%), cleft by second lateral incision (33–55%), lobed to cleft by third lateral incision (26–50%), fourth lateral incision absent or up to 35%.

Seventh basal leaf 16–26 mm long; middle lobe deltoid, with 13–17, partly small teeth, tricleft with incisions up to 50%; lateral segment with multiple laciniae, cleft to divided by first lateral incision (50–75%), cleft by second lateral incision (40–60%), third, fourth and fifth lateral incision absent or up to 50%, 40% and 38%, respectively.

Lowermost stem leaf divided into 7–11 segments, largest segment 23–53 mm long, 1.8–6 mm wide, linear to narrowly deltoid, with 2–6 up to 10 mm long patent teeth.

Petals 0–5, 6–11 mm long, 5–7 mm wide; *androclinium* 0.7–0.9 mm; *receptacle* ellipsoidal to cylindrical, 3.2–4.5 mm long, 1.3–1.7 mm wide, glabrous, invervallum up to 20%, carpellophores 0.2–0.4 mm long; *fruits* 2.2–3.2 mm long, beak 0.5–1.0 mm long, uncinata.

Pollen quality — mediocre, 54.8% well developed (isotype Du-37115-8).

DNA-ploidy — 4x (Monterrubio de la Demanda, isotype Du-37115).

Distribution — at present only known from the type locality in the Sierra de la Demanda.

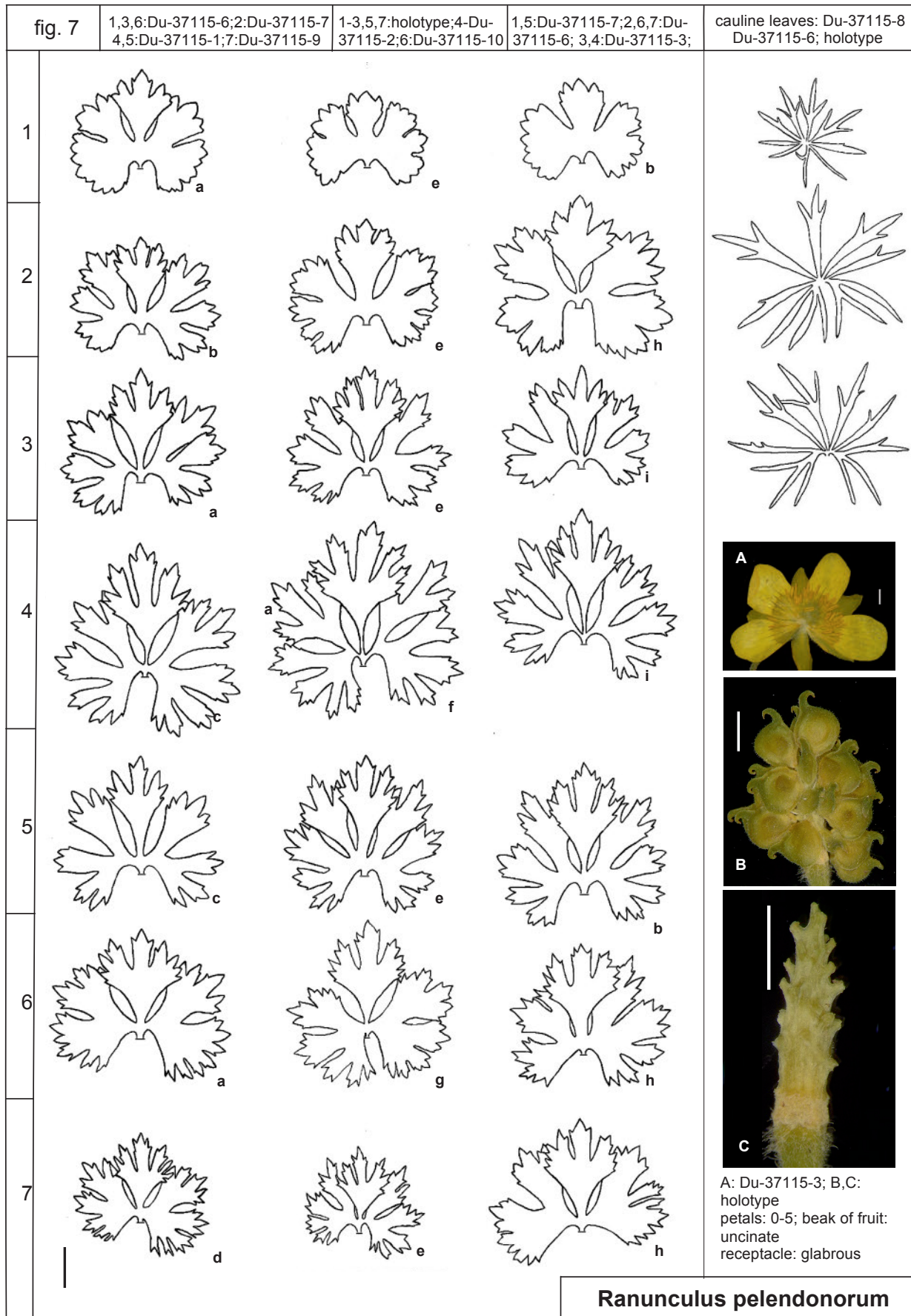
Ecology — humid oak-beech forests, 1150–1200 m.

Etymology — refers to the name of the ancient pre-Roman celtiberic tribe of the Pelendones, living in the area of the fountains of the Duero: the north of Soria, the southeast of Burgos and the southwest of La Rioja.

Vulnerability — endangered by rarity and drainage of humid forests.

Taxonomy — *R. pelendonorum* presents a homophyllous leaf cycle. The final leaves differ from other species of the *R. aragonensis* group and all the other taxa by the second and third lateral incision and multiple laciniae. Although it grows together with *R. camarinus* at the type locality, it is readily recognized by the multiple incisions of the lateral segments. It possesses the longest teeth of the middle segment of the lowermost cauline leaves

►
Fig. 7: Data sheet (basal leaf cycle, stem leaves, flowers, fruits, receptacle) of *Ranunculus pelendonorum*. (Length of bars in figures of details = 2 mm)



Ranunculus pelendonorum

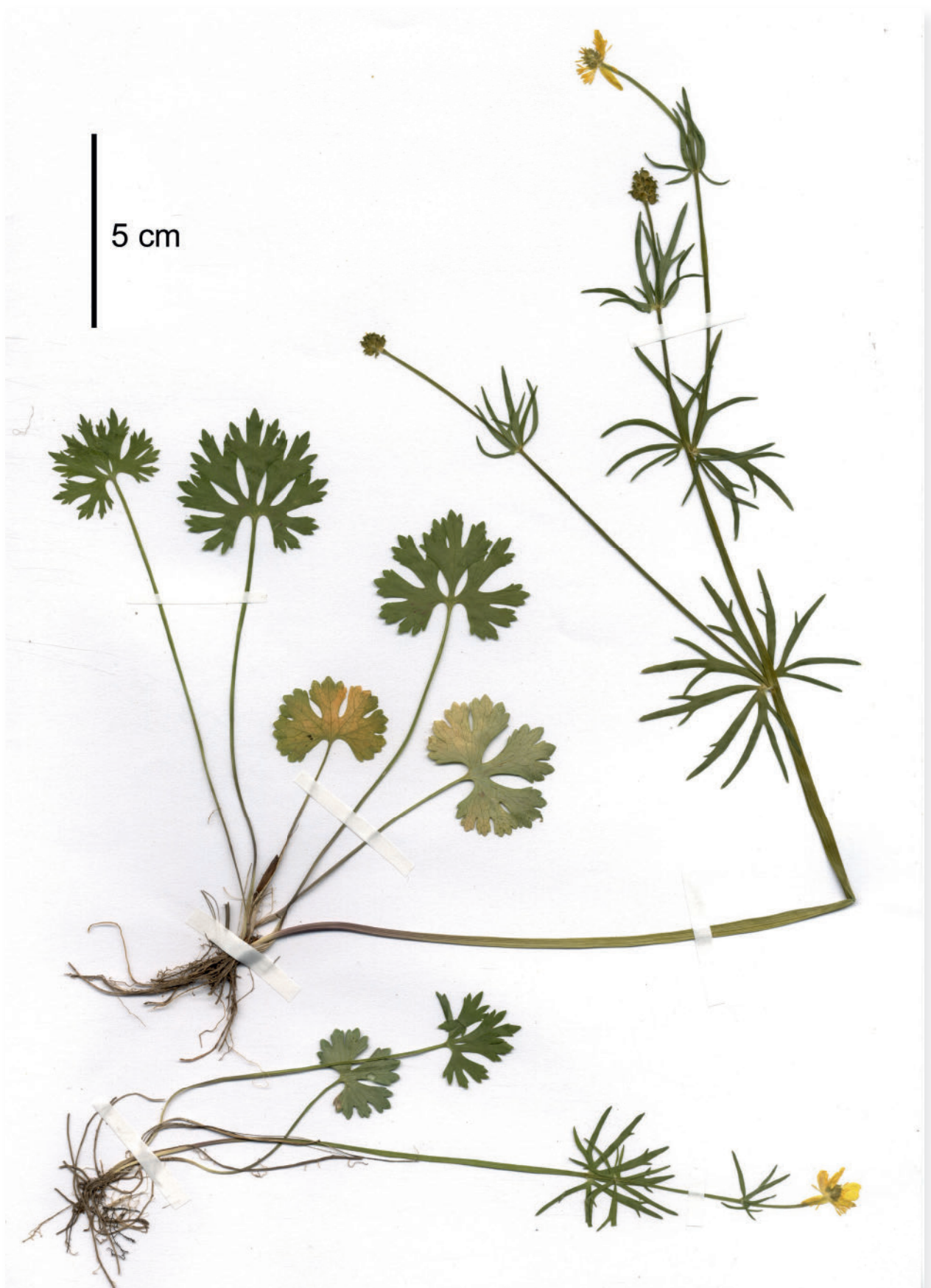


Fig. 8: Holotype of *Ranunculus pelendonorum* (MA)

and the receptacle presents an intervallum up to 20%.

Specimens seen — Spain, Castilla y León, Prov. Burgos, Sistema Ibérico, Sierra de la Demanda, Monterrubio de la Demanda, in der Umgebung des Picknickplatzes «La Pradera», relativ feuchter Eichen-Buchen-Wald, Gebüsch, 1165 m, 42°08'05"N 03°07'24"W, 22 May 2019, F.G. Dunkel-37115, Du-37115 (isotypes); ibidem, 30TVM, Monterrubio de la Demanda, paraje de «La Pradera», dentro del cercado del merendero, zona deprimida con humedad edáfica, en el herbazal entre zarzas, bajo haya, zona de bosque mixto adhesionado, 1155–1160 m, 42°08'13.3"N 03°07'20.0"W, 08 May 2011, Hb. Alejandro-164/11; ibidem, Hb. Du-37116.

3.1.d *Ranunculus boreoapenninus* group

3.1.6 *Ranunculus cantabricus* DUNKEL spec. nova

Holotype: Spain, Castilla y León, Cordillera Cantábrica, Villablino, Zufahrt zum [access road to] Puerto de Leitariegos, feuchte Wirtschaftswiese [humid meadow], 1165 m, 42°57'50"N 06°23'02"W, 16 May 2013, F.G. Dunkel 29905, MA; isotypes JACA, Du-29905. – Fig. 9, 10, 33.

Description — *Flowering shoot* gracile to slim, 15–33 cm, stalk 0.8–2.5(3.0) mm in diameter, suberect to moderately divergent (patent), angle between the main and secondary axis 10–50(70)°, flowers 1–5, enrichment shoots 0–1(2); basal leaves 3–5 per rosette.

Basal leaf cycle: Leaf edge irregularly and coarsely crenate-serrated.

First and second basal leaf 8–14 mm, and 10–20 mm long, respectively, with V-shaped to wide-angled base (80–120°), divided by the main incision (70–90%); middle segment deltoid with 3–5 rounded or crenated teeth; lateral segment undivided in the first basal leaf or lobed to cleft by the first lateral incision (26–42%).

Third basal leaf 12–24 mm long, with narrow-angled base (10–60°), divided by main incision (85–98%), middle lobe deltoid to spatulate, tricleft with incisions up to 60%, with 5–7 crenated teeth, lateral edge concave (to convex); lateral segment cleft by first and second lateral incision (50–66%, and 40–55%, respectively), lobed or cleft by third lateral incision (26–43%).

Fourth basal leaf 18–30 mm long, with narrow-angled base (10–60°), divided by main incision (85–95%), middle lobe deltoid, often tricleft with incisions up to 50%, with 5–9 crenated teeth, lateral edge concave to convex; lateral segment cleft by first lateral incision (33–60%), cleft to divided by second lateral incision (50–75%), cleft by third lateral incision (35–45%), fourth lateral incision absent or up to 30%.

Fifth basal leaf 17–24 mm long, narrow-angled to V-shaped base (20–100°), divided by the main incision (90–98%), middle lobe deltoid, occasionally trilobed with incisions up to 60%, with 5–7 crenated teeth, lateral edge concave (to convex); lateral segment cleft by first lateral incision (50–66%), second lateral incision absent or up to 50%.

Sixth to seventh leaf 14–20, and 16–22 mm long, respectively, with wide-angled base (110–170°); main incision 30–70% in the sixth, and absent or up to 50% in the seventh basal leaf; if middle lobe is present, it is deltoid to trapezoid; the lateral segment is undivided (or rarely cleft by first lateral incision up to 40%).

Lowermost stem leaf divided into 5–7 segments, largest segment

20–45 mm long, 2.0–7 mm wide, form variable: linear, lanceolate or narrowly deltoide, undivided or with up to four small teeth or with 1–2 patent, up to 10 mm long teeth.

Petals (1)3–5, 9–11 mm long, 6–9 mm wide; *androclinium* 0.2–0.6 mm, filaments up to 2 mm long; *receptacle* globose, 2.0–2.5 mm long, 1.8–2.2 mm wide, sparsely pilose (+), intervallum absent, carpelophores 0.2–0.5 mm; *fruits* 0.8–1.8 mm long, beak 0.4–0.7 mm long, uncinatate to involuted.

Pollen quality — 47.8% well developed pollen (isotype Du-29905-4)

DNA-ploidy — 4x (Du-29905, isotype; Murias de Paredes, Du-29894; Paule et al. 2018).

Chromosome number — $2n = 32$ (León, SEV-128348 sub *R. alnetorum*; DIOSDADO & PASTOR 1996).

Distribution — Cordillero Cantábrica: Puerto de Leitariegos (Asturias and Castilla y León), and Pico Tresmares (Cantabria).

Ecology — subalpine and alpine meadows, at lower altitudes occasionally in brushes, 1100–1950 m.

Eponymy — refers to the occurrence in the Cordillera Cantábrica.

Taxonomy — as early as in 1864, Eugène Bourgeau detected this species at the Puerto de Leitariegos. However, he collected it in the middle of June, gathering only plants with fruits and with the final basal leaves. The spring leaves were already withered. Indeed, these final leaves are similar to those of *R. alnetorum* W. KOCH, a rare endemic plant of humid meadows and alder brooks in the surroundings of Bale and neighbouring Germany.

Morphologically *R. cantabricus* is similar to *R. boreoapenninus* Pignatti with a heterophyllous leaf cycle (PIGNATTI 1976, DUNKEL 2010). Unlike *R. alnetorum*, but together with the following species, the new one possesses spring leaves with one to three lateral incisions and undivided lateral segments (*R. boreoapenninus* group). *R. cantabricus* differs from *R. carlittensis* by rounded teeth and a scarcely pilose receptacle. Geographically, *R. cantabricus* occurs at the most northwestern part of Spain and the distribution area reaches the province of Asturias.

Specimens seen — Spain, Asturias, Puerto de Leitariegos: Cangas del Narcea, prairies, 14 Jun 1864, E. Bourgeau, GOE-1151; ibidem, 14 Jun 1864, E. Bourgeau, MA-40419, det. J. Grau 1984 sub *R. alnetorum* W. Koch, rev F.G. Dunkel Dec 2018 sub *R. cantabricus* Dunkel;

Castilla y León, Cordillera Cantábrica, Prov. León: Villablino, Zufahrt zum Puerto de Leitariegos, feuchte Wirtschaftswiese, 1165 m, 42°57'50"N 06°23'02"W, 16 May 2013, F.G. Dunkel, Du-29905; ibidem: Murias de Paredes, ca. 300 m O des Ortes, am Fluss, Niederterrasse, Wirtschaftswiese, 1233 m, 42°50'55"N 06°11'05"W, 16 May 2013, F.G. Dunkel, Du-29894;

Cantabria, Cordillera Cantábrica, Prov. Santander: Pico Tresmares, en la ladera W de Cuetos Negros, pastos muy pendientes y repisas, conglomerados y areniscas, 1950 m, 30TUN8666, 13 Jul 1984, G. Morante & J.A. Alejandro-1119/84, MA-399058;

Probably belonging to *R. cantabricus*, material not sufficient for a secure determination:

Castilla y León, Cordillera Cantábrica, Prov. León: Villadangos, en Villadangos, Aug c. 1820, M. Lagasca (MA [MA-40418]), det. J. Grau 1984 sub *R. cf. carlittensis* Grau, rev. F.G. Dunkel Dec 2018 sub *R. cf. cantabricus* Dunkel; Prov. Palencia: Velilla de río Carrión, Cardaños de Arriba, prados, taludes herbosos, 1340–1360 m, 30TUN5657, 24 May 1990, J.A. Alejandro & M.L. Gil (JACA JACA-524392).

3.1.7. *Ranunculus montserratii* GRAU

Mitt. Bot. Staatssamml. München **20**: 15 (1984).

syn. *Ranunculus auricomus* subsp. *montserratii* (GRAU) SEGURA & MATEO, Stud. Bot. (Salamanca) **14**: 198 (1996). – **H o l o t y p e**: Spain, Prov. León, Puerto Montevejo, hayedo muy viejo, 1400 m, 30TUN4352, 16 Jun 1975, P. Montserrat & O. Bolos, det. J. Grau 1984, JACA-217275(=JACA-R80764); isotype M-0008122. – Fig. 11, 12, 33.

Pollen quality — mediocre, 48.8% well developed (Puerto de Montevejo, Du-36968-4).

DNA-ploidy — 4x (Puerto de Montevejo, Du-29911; Paule & al. 2018).

Distribution — only known from the area of the Puerto de Montevejo (León). Eventually, it also occurs at the province of Burgos (Montes Obarenes, Monte Tortijona and close to Condado de Treviño).

Ecology — (old) beech forests and its edges, (800)1250–1400 m.

Eponymy — refers to the Spanish botanist Pedro Montserrat Recoder (1918–2017) who collected the species at the type locality.

Vulnerability — endangered by rarity.

Taxonomy — *R. montserratii* is characterized by a wide aperture of the base, petiolated middle segment of the most divided spring leaf and rather undivided leaves with a width of up to 6 cm. Actually, the species is solely known from the surroundings of the Puerto de Montevejo at the province of León. Similar populations occur at different sites of the province of Burgos, they also may be attributed to *R. montserratii*.

Specimens seen — Spain, Castilla y León, Prov. León, Puerto Montevejo, hayedo muy viejo, 1400 m, 42°54' N 04°54'53" W (30TUN4352), 16 Jun 1975, P. Montserrat & O. Bolos, J. Grau 1984, JACA-217275(=JACA-R80764); ibidem, M-0008122 (isotype); Auffahrt zum Puerto de Montevejo von Norden, zwischen Prioro und Besande, bds. der CL-615, Ginsterheide, Straßenböschung, 1273 m, 42°55'37,9" N 05°04'33,5" W, 19 May 2013, F.G. Dunkel, Du-29911; ibidem, cultivated, 03 May 2017, F.G. Dunkel, Du-34345; Puerto Montevejo, Hang-Buchenwald, cf. locus typicus, 1385 m, 42°54'45" N 04°54'48" W, 24 May 2019, F.G. Dunkel, Du-36968; ibidem, Puerto Montevejo, Zufahrt zum Puerto Montevejo von Norden, an der LE-233, Buchenwaldrand, Ginsterheide, 1355 m, 42°55'17" N 04°54'39" W, 24 May 2019, F.G. Dunkel, Du-37007.

Similar to *R. montserratii* (and *R. montserratoides* spec. nova), but further material and studies are needed:

Castilla y León, Prov. Burgos, Condado de Treviño, Bajauri, monte Tortijona, cabecera de la vaguada de Valdebelarra, zona con humedad edáfica, hayedo-robledal, 809 m, 42°39'31.6" N 02°33'11.9" W (30TWN366230 Datum ED-50), 02 Jun 2013, J.A. Alejandre-113/13, Hb. Alejandre-113/13; ibidem, pequeña posuelos con alta hidromorfia edáfica, linde de hayedo-robledalblación muy localizada en un rellado del fondo del barranco en el contacto ente el hayedo y robledal 810 m, 42°39'32" N 02°33'08" W (30TWN3667023028), 15 Jun 2013, J.A. Alejandre-244/13, Hb. Alejandre-244/13; ibidem, Condado de Treviño, Obecuri, barranco Morizabal, pequeña población muy localizada en un rellado del fondo del barranco en el contacto ente el hayedo y robledal, 795 m,

42°39'29.7" N 02°31'23.4" W (30TWN3907422962), 19 May 2013, J.A. Alejandre-59/13, Hb. Alejandre-59/13; ibidem, Miraveche, Montes Obarenes, en la vertiente Norte, hayedos, 1150 m, 42°41'22" N 03°11'36" W (30TVN8426), 31 May 1983, J.A. Alejandre-1290/83, Hb. Alejandre-1290/83, Du-37091.

3.1.8 *Ranunculus montserratoides* DUNKEL spec. nova

H o l o t y p e: Spain, Castilla y León, Prov. León, Cordillera Cantábrica, Prioro, Auffahrt zum [ascension to] Puerto de Montevejo, ca. 300 m s Prioro, W CL-232, Feuchtwiese, Weidengebüschrand, beidseits des Baches, [humid meadow, willow brushes, at both sides of the brook], 1081 m, 42°53'08" N 04°57'55" W, 19 May 2013, F.G. Dunkel-29912, F.G. Dunkel, MA; isotypes JACA, M, Du-29912. – Fig. 13, 14, 33.

Description — *Flowering shoot* gracile to slim, 18–35 cm, stalk 0.8–2.0 mm in diameter, suberect to moderately divergent (patent), angle between the main and secondary axis 15–50°, flowers 1–4, enrichment shoots 0–1; basal leaves 2–5 per rosette.

Basal leaf cycle: Leaf edge irregularly and coarsely crenated.

First basal leaf 12–20 mm long, with narrow-angled to V-shaped base (50–100°), divided by main incision (70–90%); middle segment deltoid with 3–5 crenated teeth; lateral segment undivided or lobed to cleft by first lateral incision (26–40%).

Second basal leaf 16–25 mm long, with narrow-angled to V-shaped base (20–100°), divided by main incision (80–95%); middle segment deltoid (, rarely spatulate) with 3–9 crenated teeth; lateral segment cleft by the first lateral incision (33–50%).

Third basal leaf 18–25 mm long, with narrow-angled base (10–60°), divided by main incision (85–98%); middle segment deltoid with 5–9 crenated teeth, lateral edge concave to convex; lateral segment cleft to divided by first lateral incision (50–75%), cleft by second lateral incision (33–55%), third lateral incision absent or up to 32%.

Fourth basal leaf 20–28 mm long, narrow- to wide-angled base (20–120°), divided by the main incision (90–98%), middle lobe deltoid with 5(–7) crenated teeth, lateral edge slightly concave to slightly convex; lateral segment divided by first lateral incision (66–80%), cleft by second lateral incision (33–55%), third lateral incision absent or up to 40% .

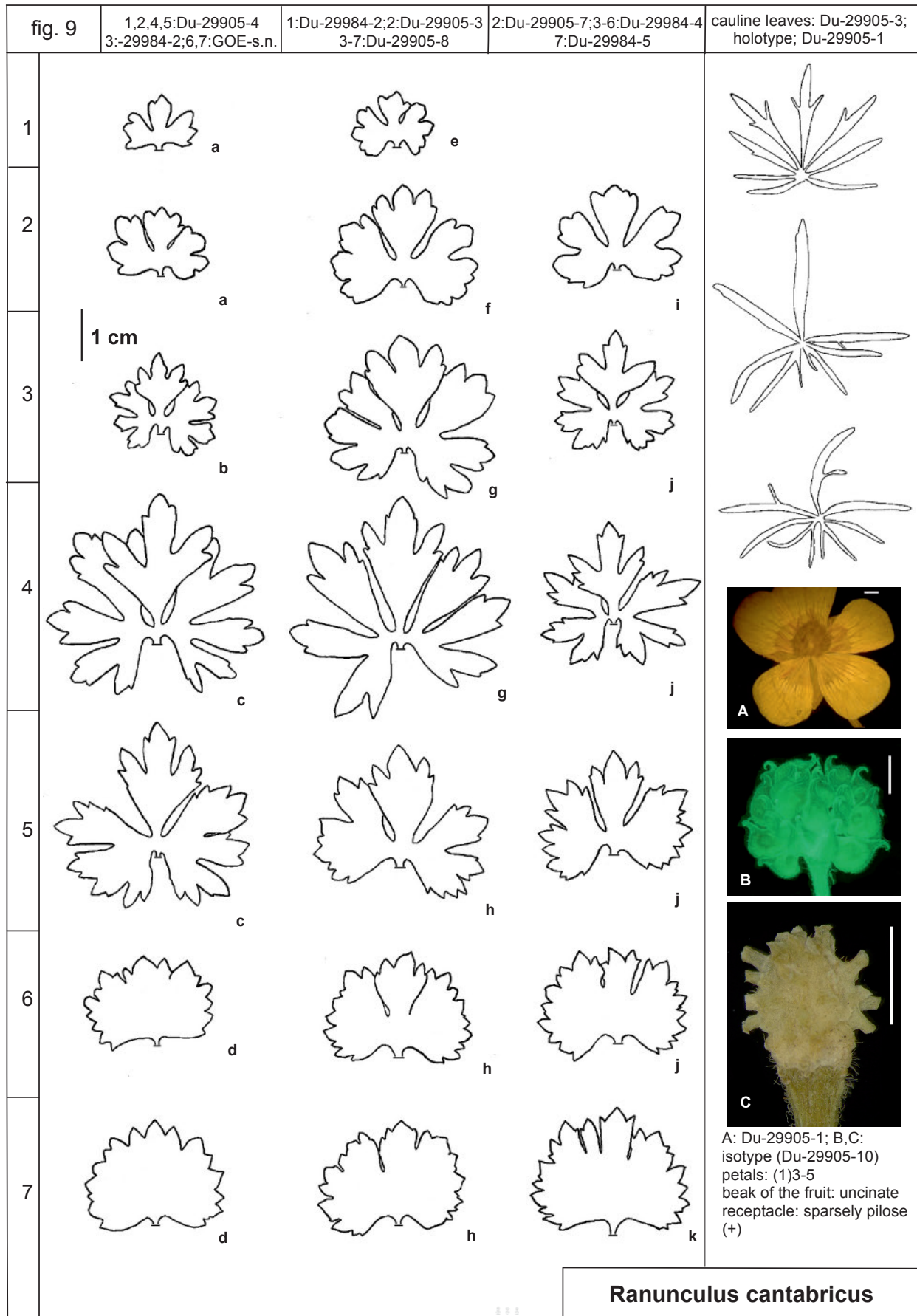
Fifth to seventh leaf 24–34, 24–35, and 22–30 mm long, respectively, with narrow-to wide angled base (90–120°, 90–125°, and 55–110°, respectively); cleft or divided by the main incision (55–85% in the fifth, 45–85% in the sixth and 33–66% in the seventh basal leaf, respectively); middle segment (rectangled) deltoid with 5–7 crenated teeth.

Lowermost stem leaf divided into 5–7 segments, largest segment 22–50 mm long, 2.5–7 mm wide, linear, linear to narrowly lanceolate, undivided or rarely with 2 teeth.

Petals 0–4(5), 9–11 mm long, 6–9 mm wide; *androclinium*

►
Fig. 9: Data sheet (basal leaf cycle, stem leaves, flowers, fruits, receptacle) of *Ranunculus cantabricus*. (Length of bars in figures of details = 2 mm)

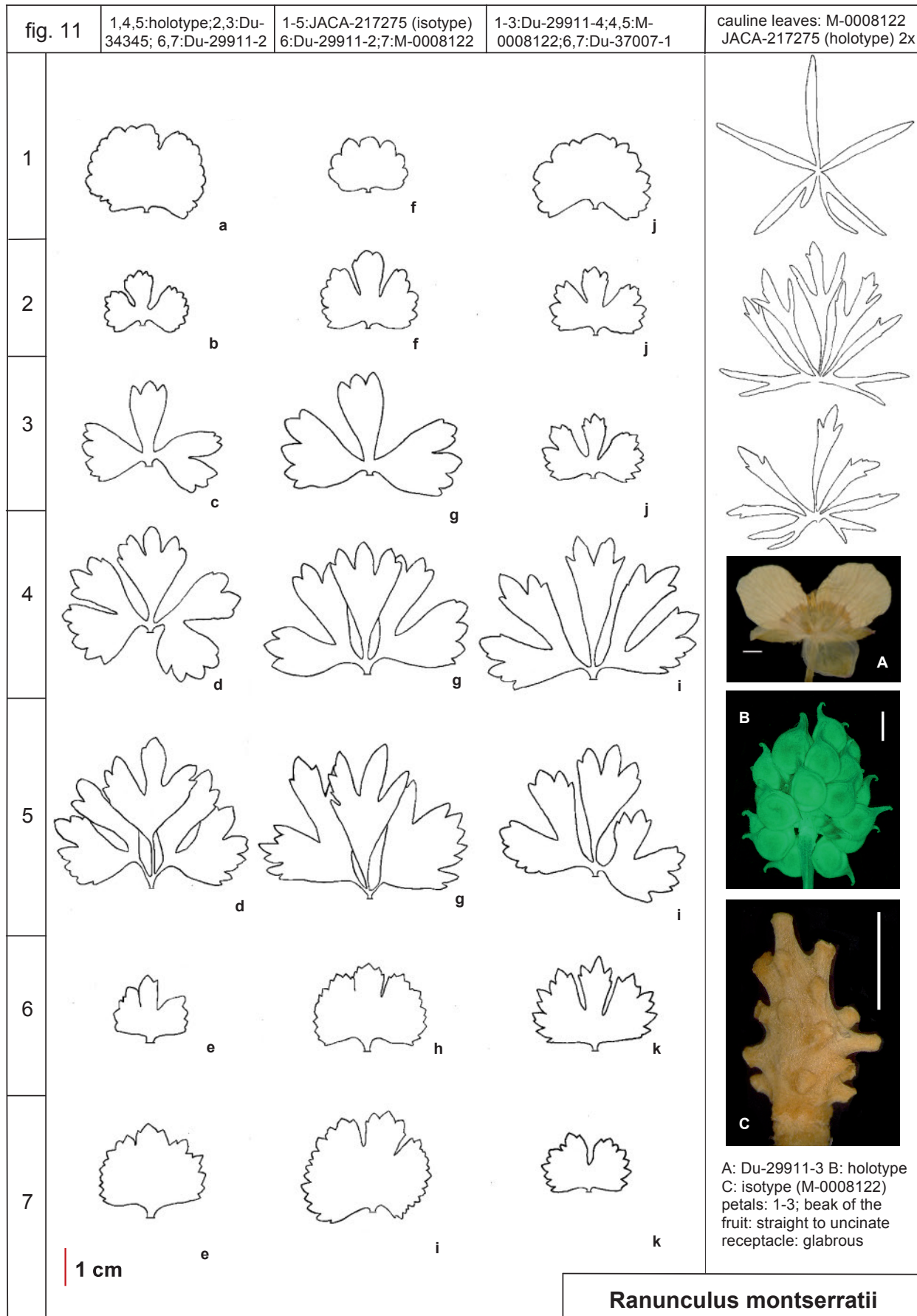
►►►
Fig. 11: Data sheet (basal leaf cycle, stem leaves, flowers, fruits, receptacle) of *Ranunculus montserratii*. (Length of bars in figures of details = 2 mm)



Ranunculus cantabricus



Fig. 10: Holotype of *Ranunculus cantabricus* (MA).



0.2–0.4 mm; *receptacle* ellipsoid 2.5–3.5 mm long, 1.8–2.2 mm wide, glabrous, invervallum absent, carpelliphores 0.2–0.5(0.7) mm long; *fruits* 1.6–2.5 mm long, beak 0.5–1.0 mm long, straight to involuted.

Pollen quality — bad, 35.5% well developed pollen (holotype Du-29912-5).

DNA-ploidy — 4x (Prioro, isotype Du-29912; Paule & al. 2018).

Distribution — west and northwest to Puerto de Montevejo, and Sierra de Cameros.

Ecology — meadows, brushes, riparian forests, beech forests, 1050–1300(1500) m.

Etymology — similar to *Ranunculus montserratii*.

Taxonomy — *R. montserratoides* presents the heterophyllosity of the group in a weaker form. The spring leaves possess divided, often pedately divided spring leaves with one to two deep lateral incisions and the lateral lobes of the big final leaves are undivided. The type population was found at the search for *R. montserratii* and it was taken for this species at first sight. It differs from it by V-formed, or even narrow-angled bases in the initial and final leaves. Two populations of the Sierra de Cameros are also categorized as *R. montserratoides*.

Specimens seen — Spain, Castilla y León, Prov. León, Cordillera Cantábrica, Prioro, Auffahrt zum Puerto de Montevejo, ca. 300 m s Prioro, W CL-232, Feuchtwiese, Weidengebüschrand, beidseits des Baches, 1081 m, 42°53'08"N 04°57'55"W, 19 May 2013, F.G. Dunkel, Du-29912 (isotypes); Prov. León, Riaño, 1050 m, 42°58'N 05°00'30"W, 06 May 1970, Pereda, det. F.G. Dunkel, MA-350062;

La Rioja (Prov. Logroño), Sierra de Castejón, Ortigosa de Cameros, barranco del río de Los Albercos, muy escado y localizado en zona de hayedo con algún tejo, sustrato moderadamente silíceo, 1395 m, 30TWM232659(ETRS89), 30 Jun 2015, J.A. Alejandro-553/15 & M.J. Escalante, F.G. Dunkel, Hb. Alejandro-553/15; ibidem, Pedroso, arroyo Pedroso, en los hayedos de las cabeceras del Arroyo Pedroso, Calizas, 1300 m, 42°17'06"N 02°39'27"W, 28 Jun 1986, J.A. Alejandro-930/86, det. F.G. Dunkel, MA-366600.

Probably belonging to *R. montserratoides*:

Prov. Soria, Sistema Ibérico, Sierra de Montes Claros, Santa Cruz de Yanguas, barranco del arroyo del Acebo, hayedos, substrato ácido, 1500 m, 42°02'45"N 02°28'49"W, 17 May 1994, J.A. Alejandro-200/94, det. F.G. Dunkel, Du-37138.

3.1.9 *Ranunculus obtusitectus* DUNKEL *spec. nova*

Holotype: Spain, Castilla y León, Prov. Palencia, Cordillera Cantábrica, Montaña Palentina, Cardaño de Arriba, 1 km s Cardaño de Arriba, W des Río Carrion, uferbegleitendes Gebüsch, grasig, [brushes along brook, with grasses], 1375 m, 42°57'42.7"N 04°45'33.4"W, 24 May 2019, F.G. Dunkel-37094, MA; isotypes M, Du-37094. — Fig. 15, 16, 33.

Description — *Flowering shoot* gracile, 18–28 cm, stalk 0.5–1.2 mm in diameter, suberect (to moderately divergent), angle between the main and secondary axis 10–30°(40), flowers 1–3, enrichment shoots 0(–1); basal leaves 2–5 per rosette.

Basal leaf cycle: Leaf edge irregularly crenate-serrated, partly with obtuse teeth in the first to fifth basal leaf. Aperture at the base of the basal leaves narrowly angled (5–40°), rarely 40–80° or closed (–10–5°).

First basal leaf 6–12 mm long, divided by main incision (75–90%), middle segment spatulate to deltoid, with 3–5 crenated teeth; lateral segment undivided or lobed to cleft by first lateral

incision (26–50%).

Second basal leaf 8–16 mm long, divided to dissected by main incision (80–100%), middle segment deltoid to spatulate with 5 (crenated) teeth, tricleft with incisions up to 55%, lateral edge slightly concave to straight; lateral segment divided by first lateral incision (70–80%), cleft by second lateral incision (35–50%).

Third basal leaf 12–20 mm long, divided to dissected by main incision (95–100%), middle segment deltoid to spatulate with 5–7 obtuse teeth, overlapping, occasionally stalked up to 2 mm, tricleft with incisions up to 60%, lateral edge straight to slightly convex; lateral segment divided by first lateral incision (66–80%), cleft by second and third lateral incision (50–60%, and 40–50%, respectively), fourth lateral incision absent or up to 40%.

Fourth basal leaf 12–20 mm long, divided to dissected by main incision (97–100%), middle segment deltoid to spatulate with 7–9 obtuse teeth, overlapping, usually stalked up to 2 mm, tricleft with incisions up to 65%, lateral edge slightly concave to slightly convex; lateral segment divided to dissected by first lateral incision (66–100%), divided by second lateral incision (60–80), cleft by third lateral incision (36–60%), fourth lateral incision absent or up to 30%.

Fifth basal leaf 18–24 mm long, divided to dissected by main incision (97–100%), middle segment deltoid to spatulate with 5–9 obtuse teeth, overlapping, usually stalked up to 2 mm, tricleft with incisions up to 70%, lateral edge slightly concave to slightly convex; lateral segment divided by first lateral incision (80–95%), cleft to divided by second and third lateral incision (60–85%, and 40–75%, respectively), lobed to cleft by fourth lateral incision (30–55%), fifth lateral incision absent or up to 50%.

Sixth basal leaf 13–20 mm long, divided by main incision (85–95%), middle segment deltoid to spatulate, with 7–9 crenated teeth, occasionally tricleft with incisions up to 55%, lateral edge slightly concave to slightly convex; lateral segment undivided or cleft by first lateral incision (35–60%).

Seventh basal leaf 12–20 mm long, divided by main incision (70–85%), middle segment deltoid to spatulate, with 7 teeth, lateral edge slightly concave to slightly convex; lateral segment undivided.

Lowermost stem leaf divided into (5)7–9 segments, largest segment 20–32 mm long, 2–4 mm wide, broadly linear, undivided or with 1 to 2 short, occasionally up to 5 mm long and patent teeth.

Petals 0–3, 6–11 mm long, 5–7 mm wide; *androclinium* 0.7–0.9 mm; *receptacle* ellipsoid, 2.0–2.5 mm long, 1.5–1.8 mm wide, glabrous, invervallum absent, carpelliphores 0.15–0.25 mm long; *fruits* 1.5–2.2 mm long, beak 0.5–1.0 mm long, involuted to uncinuate.

Pollen quality — bad, 27.5% well developed pollen (holotype 37094-5).

DNA-ploidy — 4x (Cardaño de Arriba, isotype Du-37094).

Distribution — at present only known from two localities of Montaña Palentina.

Ecology — meadows, (willow) brushes brookside, 1350–1750 m.

Etymology — refers to the spring leaves characterized by closed aperture of the base and overlapping middle segments with obtuse teeth.

Vulnerability — endangered by rarity due to only two populations with a small number of individuals on the one hand, and abandonment of grazing with consequent reforestation on the other.

Taxonomy — The type population of *R. obtusitectus* consists of small plants with a heterophyllous leaf cycle. The spring leaves present deeply divided blades: the middle segment with incisions up to 70%, and a fourth and fifth lateral incision are common. Contrarily, the lateral segment of the sixth basal leaf is usually, the seventh basal leaf, always undivided. In culture, *R. obtusitectus* keeps its small size and the character of the leaf cycle. Actually, *R. obtusitectus* is only known from two populations in the mountains of the Province de Palencia. Due to its conspicuous morphology, the taxon deserves both description and complete protection.

Specimens seen — Spain, Castilla y León, Cordillera Cantábrica, Prov. Palencia, Montaña Palentina: Cardaño de Arriba, 1 km s Cardaño de Arriba, W des Río Carrión, uferbegleitendes Gebüsch, grasig, 1375 m, 42°57′42.7″N 04°45′33.4″W, 24 May 2019, F.G. Dunkel Du-37094 (isotypes); ibidem, Triollo, Alto de los Llanos, lomas y collados erosionados, calizas, bajo arbustos en zonas de suelo mas profundo, 1750 m, 42°51′37″N 04°39′50″W, (30TUN6446), 31 May 1990, J.A. Alejandro-1745/90, det. F.G. Dunkel, Hb. J.A. Alejandro-1745/90.

3.1.e *Ranunculus carlittensis* group

3.1.10 *Ranunculus alejandrei* DUNKEL spec. nova

Holotype: Spain, La Rioja, Sistema Ibérico, Sierra de la Camero Nuevo, Castroviejo, Barranco de las Hoyas, ca. 3 km s Castroviejo, im Hangbuchenwald (hayedo), [slope beech forest], 1265 m, 42°18′10″N 02°39′11″W, 21 May 2019, F.G. Dunkel-37107, MA; isotypes JACA, M, Du-37107. — Fig. 17, 18, 34.

Description — *Flowering shoot* gracile to slim, 18–45 cm, stalk 0.8–1.8 mm in diameter, suberect to moderately divergent, angle between the main and secondary axis 10–40°, flowers 2–4, enrichment shoots 0–1; basal leaves 2–5 per rosette.

Basal leaf cycle presents relatively homophyllously: leaf edge coarsely crenate-serrated in the first to fifth basal leaf, crenate-serrated (to serrated) in the following leaves.

First basal leaf 9–20 mm, with narrow-angled to V-shaped base (20–90°), divided by main incision (70–90%), middle segment deltoid to spatulate, with 3–5 crenated teeth; lateral segment undivided or lobed by first and second lateral incision (up to 32%).

Second basal leaf 14–20 mm long, with closed to narrowly angled base (0–40°), divided by main incision (90–98%), middle segment deltoid to spatulate with 5–7 crenated teeth; lateral segment cleft by the first lateral incision (50–65%), second lateral incision absent or up to 50%.

Third basal leaf 18–26 mm long, with narrow-angled base (10–70°), divided to dissected by main incision (90–100%), middle

lobe deltoid, occasionally tricleft with incisions up to 35%, with 5–7 crenated teeth, lateral edge slightly concave to convex; lateral segment cleft to divided by first lateral incision (40–70%), cleft by second lateral incision (33–50%), third lateral incision absent or up to 45%.

Fourth basal leaf 20–30 mm long, with narrow-angled to V-shaped base (40–100°), dissected by main incision, middle lobe narrowly deltoid to deltoid, usually tricleft with incisions up to 35%, with (4)5–7 crenated teeth, lateral edge slightly concave to straight; lateral segment cleft to divided by first lateral incision (60–80%), cleft by second lateral incision (33–50%), third lateral incision absent or up to 45%.

Fifth basal leaf 18–32 mm long, with narrowly angled to V-shaped (widely angled) base (40–100°(110)), divided to dissected by main incision (95–100%), middle lobe narrowly deltoid to deltoid, with (4)5–7 (crenated) teeth, lateral edge slightly concave to straight; lateral segment divided by first lateral incision (66–80%), cleft by second lateral incision (33–50%), lobed to cleft by third lateral incision (26–40%).

Sixth basal leaf 16–30 mm long, with narrowly angled to V-shaped (widely angled) base (40–100°(110)), divided to dissected by main incision (95–100%), middle lobe deltoid, with 5–7 (crenated) teeth, lateral edge slightly concave to straight; lateral segment cleft to divided by first lateral incision (60–75%), cleft by second lateral incision (33–50%), third lateral incision absent or up to 30%.

Seventh basal leaf 14–25 mm long, with narrowly to widely angled base (70–130°), divided by main incision (85–95%), middle lobe deltoid, with 5–7 (crenated) teeth, lateral edge slightly concave to straight; lateral segment lobed to cleft by first lateral incision (30–50%), second lateral incision absent or up to 40%.

Lowermost stem leaf divided into 5–7 segments, largest segment 18–22 mm long, 2–4 mm wide, linear to narrowly lanceolate, undivided or with one or two small or up to 10 mm long teeth.

Petals 0–1, 5–8 mm long, 4–6 mm wide; **androclinium** 0.5–0.7 mm; **receptacle** ellipsoid, 1.8–2.5 mm long, 1.2–1.4 mm wide, glabrous, intervallum absent, carpellophores 0.3–0.7 mm; **fruits** 1.8–2.8 mm long, beak 0.4–0.8 mm long, (straight) uncinata (to involuted).

Pollen quality — 76.7% well developed pollen (holotype Du-37107-7)

DNA-ploidy — 4x (Castroviejo, isotype Du-37107).

Distribution — Sierra de Cameros (Sierra de la Camero Nuevo).

Ecology — beech forests, even dark interior parts of dense coppice-poor beech forests, 900–1350(1400) m.

Eponymy — refers to the Spanish botanist Juan Antonio Alejandro, (1947–) who collected rich material of Spanish plants, especially *Hieracium*. He has collected *R. alejandrei* several times since 1985.

►
Fig. 13: Data sheet (basal leaf cycle, stem leaves, flowers, fruits, receptacle) of *Ranunculus montserratoides*. (Length of bars in figures of details = 2 mm)

►►►
Fig. 15: Data sheet (basal leaf cycle, stem leaves, flowers, fruits, receptacle) of *Ranunculus obtusitectus*. (Length of bars in figures of details = 2 mm)

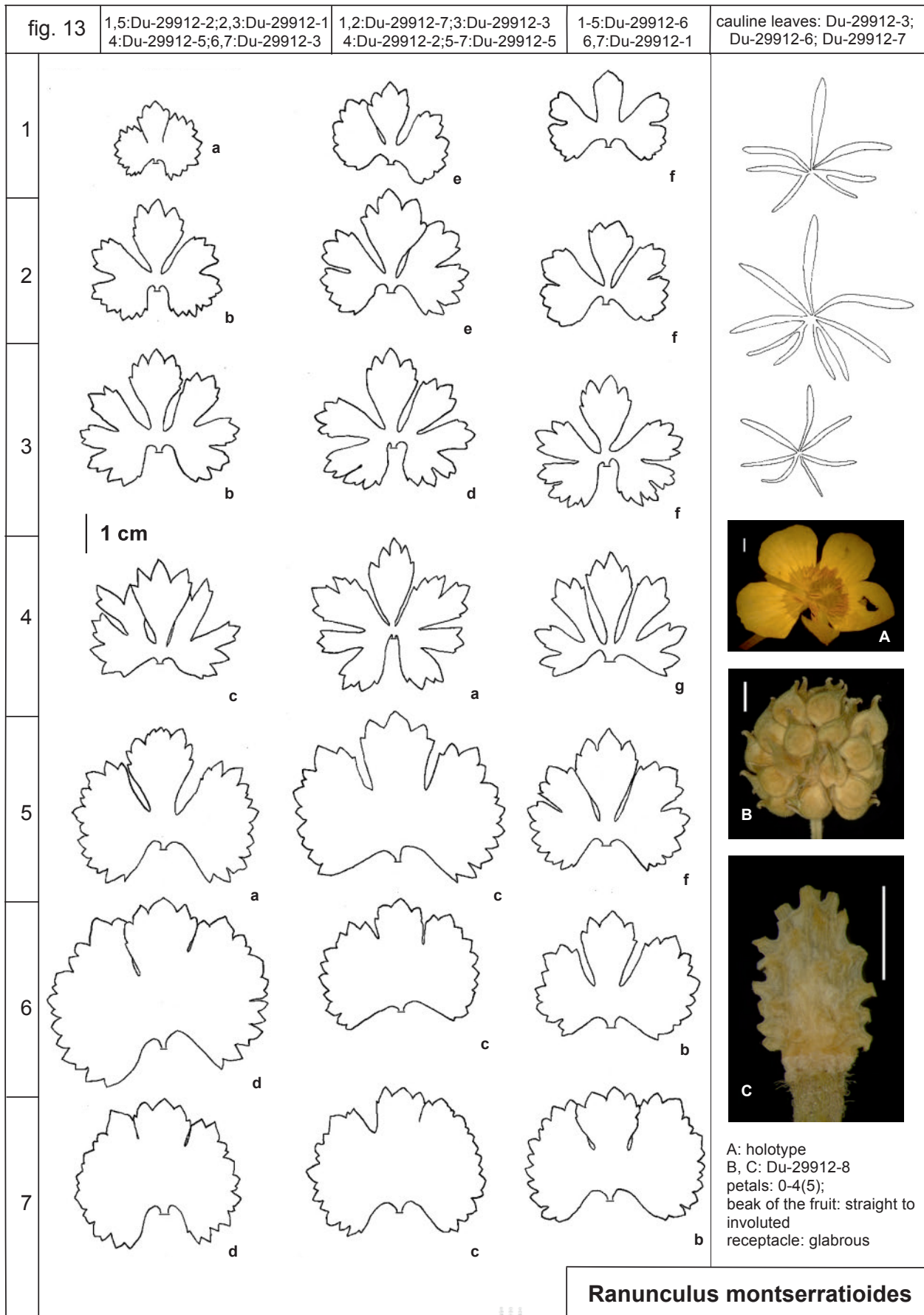




Fig. 14: Holotype of *Ranunculus montserratioides* (MA).

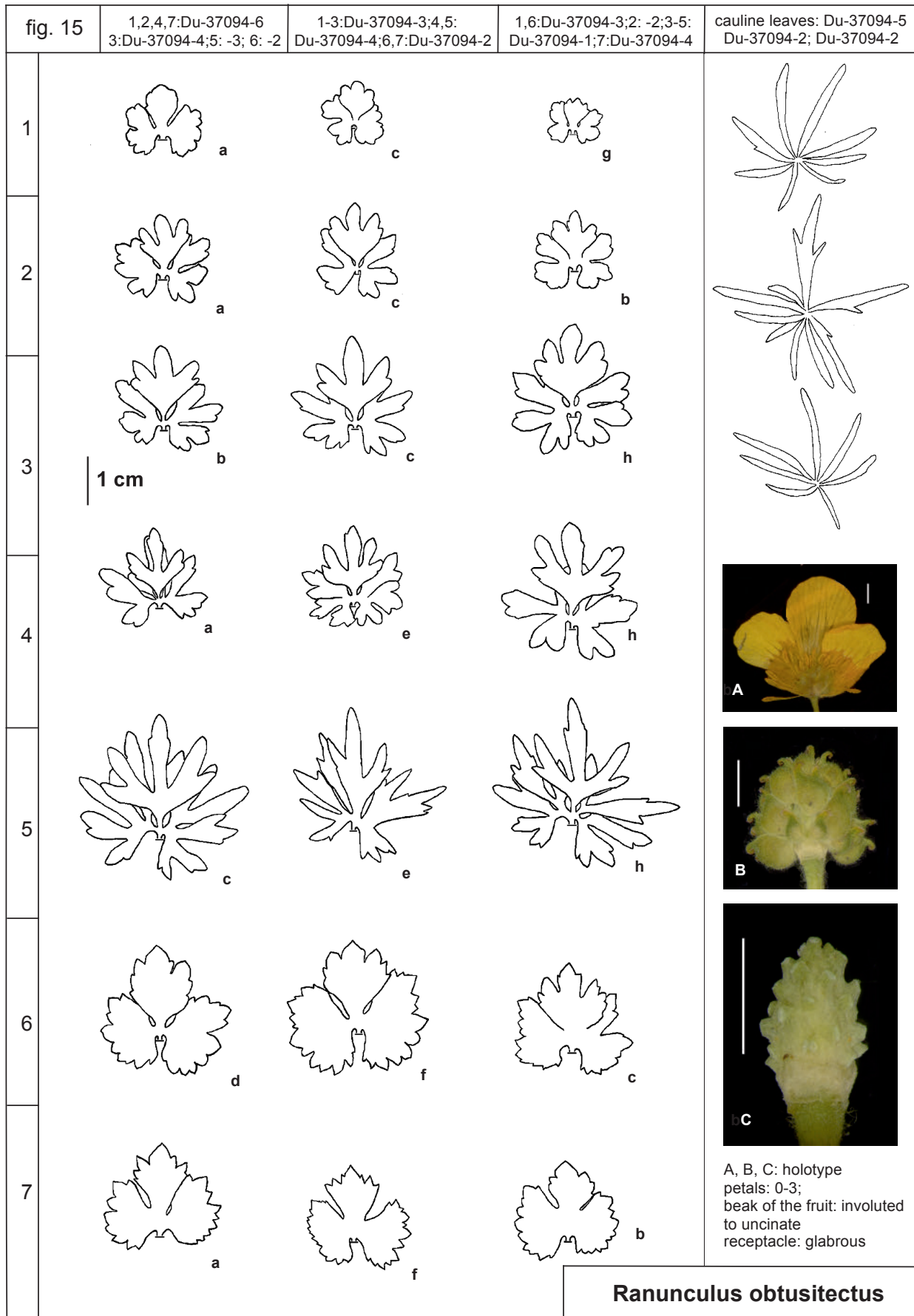




Fig. 16: Holotype of *Ranunculus obtusifolius* (MA).

Vulnerability — not threatened.

Taxonomy — *R. alejandrei* resembles *R. carlittensis*, but the blade of *R. alejandrei* is deeper divided: the first leaf is divided by the main incision (vs. undivided in *R. carlittensis*); the second and seventh leaf with main incisions >90% (vs. <75% in *R. carlittensis*). *R. alejandrei* is ecologically and geographically separated from *R. carlittensis*. The former is strictly bound to beech forests and grows in the Sierra de Cameros of the Iberian System, the latter is found in subalpine meadows and brushes of the Pyrenees.

Specimens seen — Spain, La Rioja (Prov. Logroño), Sistema Ibérico, Sierra de la Camero Nuevo: Castroviejo, Barranco de las Hoyas, ca. 3 km s Castroviejo, im Hanguchenwald (hayedos), 1265 m, 42°18'10"N 02°39'11"W, F.G. Dunkel-37107-7, 21 May 2019, F.G. Dunkel, Du-37107 (isotypes); ibidem: Castroviejo, barranco de Las Hoyas, hacedos sobre conglomerados en vaguada de umbría, 1280 m, 42°17'56"N 02°39'38"W, 28 Apr 1994, J.A. Alejandro-147/94, F.G. Dunkel, Hb. Alejandro-147/94; ibidem: Castroviejo, en laderas de umbría, hayedo, substrato moderadamente ácido, conglomerados, 900–950 m, 42°19'N 02°39'W, 15 Apr 1997, J.A. Alejandro-338/97, F.G. Dunkel, Du-37114, MA-616769; ibidem: Nestares, en vaguada bajo roquedos abruptos, hayedos con boj, acebo y espinos, sustrato calizo, 1320–1350 m, 42°17'30"N 02°38'W, 28 Apr 1994, B.Fz. de Betoño & J.A. Alejandro-27/89, F.G. Dunkel, Du-37108; ibidem, J.A. Alejandro-140/94, F.G. Dunkel, Hb. Alejandro-140/94; ibidem: Anguiano, en cabecera de barrancos (Eingang des Barranco) (Pico del Águila?), hayedos sobre caliza, 1350 m, 42°14'12"N 02°43'15"W (30TWM2376), 07 May 1989, B.Fz. de Betoño & J.A. Alejandro-278/89, F.G. Dunkel, Hb. Alejandro-278/89, MA-486179; ibidem, Anguiano, nahe Wanderweg Sierra Riojana, N-Hang des Pico del Águila, dichter Buchenwald, 1000 m, 42°15'15"N 02°44'29"W, 23 May 2019, F.G. Dunkel, Du-36965; ibidem: Anguiano, en la umbría del Pio del Águila, hayedos, substrato calizo, 1000 m, 42°15'N 02°45'W, 07 May 1989, B.Fz. de Betoño & J.A. Alejandro-27/89, F.G. Dunkel, Du-37112, MA-486198, ZT s.n.;

Sierra de Cameros: Pedroso, barranco del Río Pedroso, hayedos, 1150 m, 42°17'16"N 02°40'02"W, (30TWM2780), 28 Apr 1985, B.Fz. de Betoño & J.A. Alejandro-522/85, F.G. Dunkel, MA-338002; ibidem, en el barranco del Río Pedroso, hayedos, sobre substratos de cascajos-conglomerados, 42°17'16"N 02°40'02"W, 28 Apr 1985, B.Fz. de Betoño & J.A. Alejandro-544/85, F.G. Dunkel, Hb. Alejandro-544/85; ibidem: Pedroso, en las hayedos de las cabeceras del Arroyo Pedroso, hayedos, calizas, 1300 m, 42°17'16"N 02°39'36"W, (30TWM2881), 28 Jun 1986, J.A. Alejandro-930/86, F.G. Dunkel, Hb. Alejandro-930/86;

Sierra de Cameros, Prov. Burgos: Belorado, Eterna, hayedo de Urrecia, ladera N-NE cabecera del barranco de Umbrión, en zonas rellenadas de las fuertes pendientes bajo escarpaduras rocosas, 1240 m, 42°20'42.3"N 03°08'07.3"W (30TVM8884988101), 05 May 2011, J.A. Alejandro-148/11, F.G. Dunkel, Du-37093;

Probably belonging to *R. alejandrei*, material not sufficient for a secure determination:

La Rioja (Prov. Logroño), Sierra de Cameros: Ojacastro, cerro San Torcuato, vaguada en la umbría, hayedo denso, sustrato de contacto entre carbonatos y rocas mod. ácidas, 1050–1080 m, 42°20'N 02°58'W (30TWM0086), 03 Jun 1997, J.A. Alejandro-672/97 & B.Fz. de Betoño, F.G. Dunkel, Hb. Alejandro-672/97; ibidem, Sierra de Camero Nuevo, Nieva de Cameros, hayedos con boj en umbría, al pie de roquedos calizos, 1380 m, 42°14'50"N 02°40'36"W, (30TWM2677), 22 Jun 1991, J.A. Alejandro-535/91 & M.L. Gil Zuñiga, F.G. Dunkel, Hb. Alejandro-535/91, MA-533377; ibidem, montes de Serradero, creston rocoso al sureste sobre el Llano de la Torquilla, en el interior del hayedo de la umbría, carbonatos, 1400 m, 42°14'41"N 02°41'31"W (30TWM254770), 10 Jul 2018, J.A. Alejandro-266-269/18, F.G. Dunkel, Hb. Alejandro-266-269/18.

3.1.11 *Ranunculus besandinus* DUNKEL spec. nova

Holotype: Spain, Castilla y León, Prov. León, Cordillera Cantábrica, Boca de Huérgano, at both sides of Río Besandi-

no, 300–400 m s Besande, rather dry humid meadow, partly with *Narcissus pseudonarcissus*, willow brushes, 1270 m, 42°53'38"N 04°53'11"W, 24 May 2019, F.G. Dunkel-37124, MA; isotypes M, JACA, Du-37124. – Fig. 19, 20, 34.

Description — Flowering shoot gracile to slim, 18–36 cm, stalk 0.8–2.2 mm in diameter, suberect to moderately divergent, angle between the main and secondary axis 15–45°, flowers (1)2–5(6), enrichment shoots 0–1(2); basal leaves 2–5 per rosette.

Basal leaf cycle: Leaf edge of the basal leaves deeply crenate-serrated, of the seventh basal leaf crenate-serrated to serrated.

First basal leaf 10–18 mm, with V-formed to widely angled base (90–135°), divided by the main incision (70–90%), middle segment deltoid with 3(–5) teeth, lateral edge straight to concave; lateral segment cleft by first lateral incision (50–60%), second lateral incision absent or up to 30%.

Second basal leaf 12–18 mm long, with narrowly angled to V-shaped base (10–100°), divided by the main incision (90–97%), middle segment (narrowly) deltoid with 3–5 crenated teeth, lateral edge straight to slightly concave; lateral segment cleft to divided by the first lateral incision (50–75%), lobed to cleft by second lateral incision (25–65%), third lateral incision absent or up to 35%.

Third basal leaf 18–28 mm long, aperture at the base narrowly angled (10–60°), divided to dissected by main incision (93–100%), middle lobe deltoid, trilobed with incisions up to 35%, with 5 crenated teeth, lateral edge slightly convex; lateral segment divided by first lateral incision (66–85%), cleft by second lateral incision (40–55%), cleft by third lateral incision (33–40%), fourth lateral incision absent or up to 35%.

Fourth basal leaf 20–28 mm long, aperture at the base narrowly to widely angled (50–120°), divided to dissected by main incision (98–100%), middle lobe deltoid, stalked up to 4 mm, tricleft with incisions up to 40%, with 3–7 crenated teeth, lateral edge straight to slightly concave; lateral segment divided by first lateral incision (66–92%), cleft to divided by second lateral incision (45–75%), cleft by third lateral incision (35–45%), lobed to cleft by fourth lateral incision (26–40%).

Fifth basal leaf 24–34 mm long, aperture at the base narrowly angled to V-shaped (70–100°), divided to dissected by the main incision (95–100%), middle lobe deltoid, stalked up to 3 mm, tricleft with incisions up to 40%, with 5 crenated teeth, lateral edge straight to slightly concave; lateral segment cleft to divided by first lateral incision (60–90%), cleft by second lateral incision (45–65%), lobed to cleft by third and fourth lateral incision (30–45%, and 26–42%, respectively).

Sixth basal leaf 20–30 mm long, aperture at the base narrowly to widely angled (50–120°), divided by the main incision (85–98%), middle lobe deltoid, with 5–9 crenated teeth, lateral edge slightly concave; lateral segment cleft to divided by first lateral incision (55–75%), cleft by second lateral incision (45–55%), lobed to cleft by third lateral incision (26–50%).

Seventh basal leaf 18–25 mm long, aperture at the base V-formed to widely angled (90–130°), divided by main incision (70–90%), middle lobe deltoid, with 5–7, partly small, teeth, lateral edge slightly concave to straight; the lateral segment is cleft by first lateral incision (40–60%), lobed to cleft by second lateral incision (26–45%).

Lowermost stem leaf divided into 7–9(11) segments, largest seg-

ment 22–53 mm long, 2.5–5 mm wide, linear, undivided or with 1, rarely 2 short teeth.

Petals 2–5, 8–11 mm long, 6–10 mm wide; *androclinium* 0.6–0.8 mm; *receptacle* globose to ellipsoid, 2.4–3.2 mm long, 1.5–2.2 mm wide, glabrous, invervallum absent, carpellophores 0.3–0.6 mm long; *fruits* 1.5–2.2 mm long, beak 0.5–0.9 mm long, uncinata (to involuted).

Pollen quality — bad, 31.9% well developed (holotype Du-37124-1).

DNA-ploidy — 4x (isotype Du-37124).

Distribution — at present only known from the type locality near Besande (Boca de Huérgano).

Ecology — humid meadows, edge of willow brushes.

Etymology — refers to the name of Besande, the site of the type population.

Vulnerability — endangered by rarity and abandonment or eutrophication of humid meadows.

Taxonomy — *R. besandinus* is similar to *R. carlittensis* and *R. alejandrei*. It differs from both by one or two petiolated middle segments of the spring leaves and a higher number of teeth of the leaf edge, the number of petals is 3–5 vs. 0–1 (*R. alejandrei*) or 1–3 ones (*R. carlittensis*). *R. besandinus* is a local endemic of meadows near Besande (Boca de Huérgano) at the Cordillera Cantábrica.

Specimens seen — Spain, Castilla y León, Prov. León, Cordillera Cantábrica, Boca de Huérgano, at both sides of Río Besandino, 300–400 m s Besande, rather dry humid meadow, partly with *Narcissus pseudonarcissus*, willow brushes, 1270 m, 42°53'38"N 04°53'11"W, 24 May 2019, F.G. Dunkel-37124 (isotypes).

3.1.12. *Ranunculus carlittensis* (SENNEN) GRAU

Mitt. Bot. Staatssamml. München 20: 13. 1984. — Holotype: France, Cerdagne: Carlitte, au Bach de Llivia, vers 2000 m, VI, leg. F. S.-Remy, Sennen: Plantes d'Espagne 1931, No. 8085, BC-959; isotypes BCF Nr. 30511= BCN-141128, M-0099621, MA-40430, G s.n. — Fig. 21, 22, 34.

Basionym *R. auricomus* L. var. *carlittensis* SENNEN, Diagnoses des nouveautés parues dans les exsiccata: plantes d'Espagnes et du Maroc de 1928 à 1935: sér. de 1931: 137 (1936).

syn. *R. auricomus* L. subsp. *carlittensis* (SENNEN) MOLERO, PUJADAS & ROMO in Monogr. Inst. Pirenaico Ecol. (Jaca) 4: 278, 1988.

Pollen quality — bad, 27.9% well developed pollen (Puig Carlit, Du-29986-1).

DNA-ploidy — 4x (France: Puig Carlit, Du-29986-1; Andorre: La Vella, Du-29989; Paule & al. 2018).

Distribution — Eastern Pyrenees of Andorra, France and Spain.

Ecology — meadows, brushes, riparian forests, Alliarion, Pineta de Pinus uncinatus.

Eponymy — refers to Pic Carlit (Puig Carlit in Catalan), the type locality close to the Spanish enclave of Llívia.

Taxonomy — *R. carlittensis* represents the first collected and described species of the *R. carlittensis* group. It can be regarded as the core species of the group. At the basal leaves, the aperture of the base is usually V-formed, rarely narrowly angled. The blade is moderately divided; the first initial leaf and the lateral lobe of the final leaf are undivided at most times. The spring leaves possess a tendency to pedately divided blades. The lowermost cauline leaf is divided into 9–11 segments with obtuse long teeth. The distribution area is restricted to the Eastern Pyrenees where it grows scatteredly in the Upper (French) and Lower (Spanish) Cerdagne, Andorra and the adjacent Pre-Pyrenees (Serra del Cadí and Serra de Moixeró).

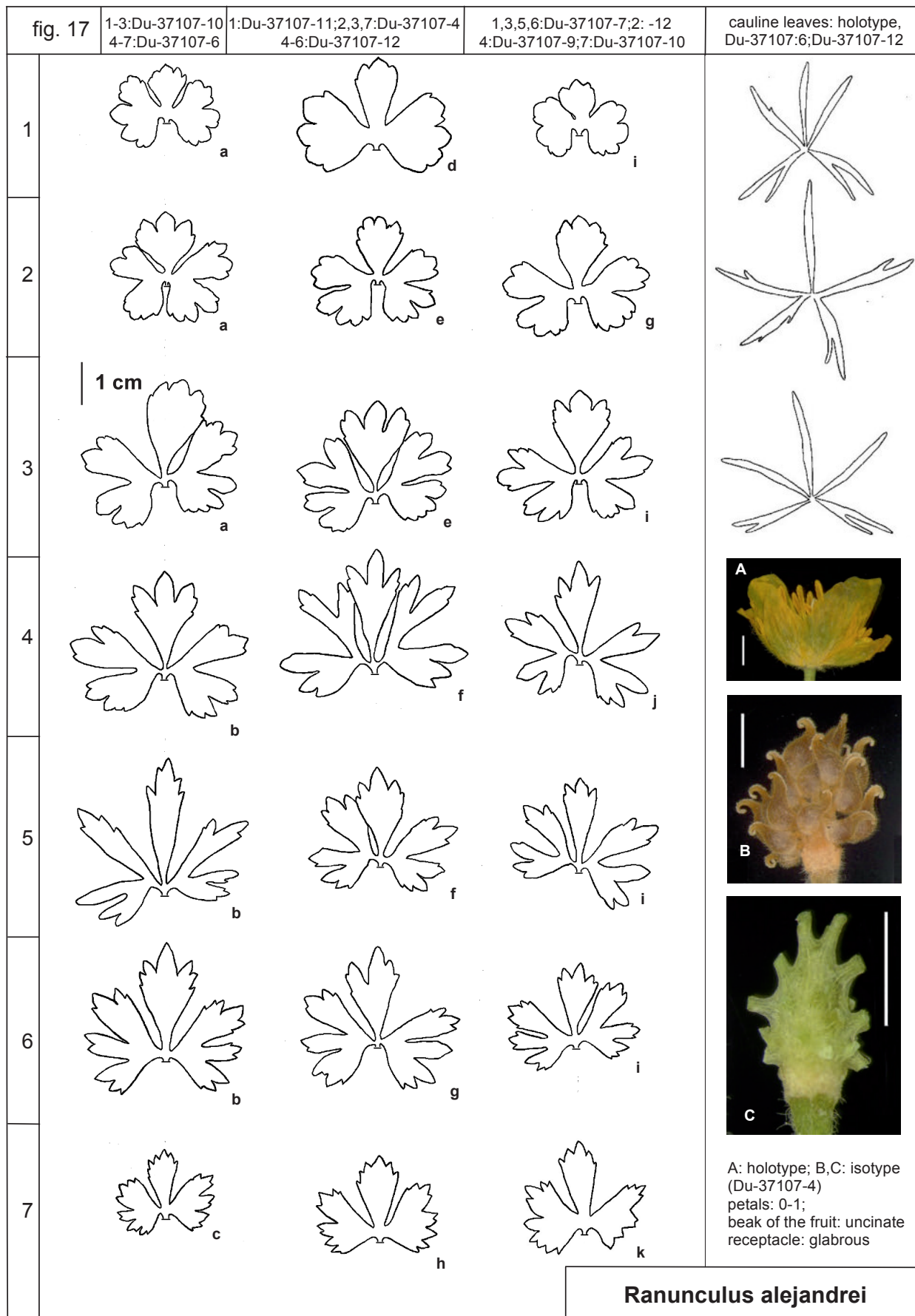
Specimens seen — France, Occitanie, Dépt. Pyrénées-Orientales: Bourg-Madame, s Puig Carlit, an der N 20, 17 km W Bourg-Madame, N Querol, S-Seite der Straße, grasiges Gebüsch, Rasenstreifen, 1460 m, 42°30'31"N 01°49'53"E, 23 May 2013, F.G. Dunkel, Du-29986; Dépt. Midi-Pyrénées, Ariège: Mijanès, Port de Pailhères, au col en face du parking, pelouses mésophiles, 2000 m, 42°44'00"N 01°59'33"E, 30 May 2006, J.-M. Tison, F.G. Dunkel, Hb. Tison 06/12;

Andorra, Pyrenees: Andorra la Vella, prados de Andorra, 42°30'N 01°32'E, prados, May 1948, Losa & Montserrat, J. Grau, BCN-141131; ibidem, 17 May 1948, Losa & P. Montserrat, BCN-141132; Andorra la Vella, borda de Comellas, praderas de la umbros, 1400–1500 m, 42°30'05"N 01°31'45"E, Jul 1949, Losa & P. Montserrat, P. Montserrat 1949 sub *R. auricomus* L. var. *silvicola* Wimm. et Gr., rev. J. Grau 1984 sub *R. carlittensis*, MA-152604; ibidem, la Vella, encima de la borda de Mereig en la umbria de Andorra la Vella, en un prado, 1400–1600 m, 42°33'N 01°35'E; May 1948, Losa & Montserrat, J. Grau, M-0099622, BCN-141133; Canillo, Ransol-El Tarter, megaforbios, arroyos y bosque de *P. uncinata*, 1700 m, 42°34'45"N 01°38'10"E, 03 Jul 1992, P.Montserrat, J.L. Benito & al., P. Montserrat 1992 sub *R. evalirensis* Grau, rev. F.G. Dunkel 12.2018 sub *R. carlittensis*, JACA-145692; ibidem: Ordino, Coll de Ordino, Bosque de *P. uncinata*, 2000–2150 m, 42°33'05"N 01°33'45"E, 05 Jul 1992, P.Montserrat, D. Gomez & J.L. Benito, P. Montserrat 1992 sub *R. bulbosus* L., rev. F.G. Dunkel 12.2018 sub *R. carlittensis*, JACA-174892; ibidem, JACA-174792; ibidem, Iter Andorrano-Aranense, VII-1992, nardetas, 2000 m, 05 Jul 1992, G. Nieto Feliner-3233 & al., MA-514861; La Massana, Parroquia de La Massana, bordes de Setúria, pinar de *P. uncinata*, 2030 m, 42°32'52"N 01°27'10"E, 30 May 2004, C. Aedo, I. Aizpuru & al., J. Pedrol, MA-715006; Andorra, Coll de Ordino, praderas en pinar aclarado, 2115 m, 42°33'54"N 01°34'30"E, 29 May 2004, C. Aedo, I. Aizpuru & al., det. J. Pedrol, MA-714986; Andorra La Vella, s des Ortes, s des Baches "La Comella", ca. 30 m oberhalb des Parkplatzes, Gebüschrand, lichter Bergwald, 1330 m, 42°29'59.6"N 01°31'51.4"E, 23 May 2013, F.G. Dunkel, Du-29989; ibidem, cultivated, 02 May 2014, F.G. Dunkel, Du-31073;

Spain, Pyrenees, Cataluña, Prov. Barcelona, Sierra de Moixeró, Coll de Pal, Passhöhe, 2100 m, 42°18'14"N 01°55'20"E, 26 May 2005, E. Vitek, F.G. Dunkel, M-0251790, W-2006-19350; Prov. Lleida: Alt Urgell, Les Valls d'Aguilar, Llan de Messons, fons de vall, prop d'un rierol, 1390 m, 42°17'N 01°26'E (31TCG5188?), 17 April 2003, I. Soriano 2371 & P. Aymerich, det. F.G. Dunkel, BCN-141127; Cataluña, Prov. Lleida: Urgell, Alt Urgell, Sobre el Querforadat, mulleres, 1640 m, 42°18'50"N 01°37'30" (CG88), 10 Jun 1992, E. Carrillo Or-

►
Fig. 17: Data sheet (basal leaf cycle, stem leaves, flowers, fruits, receptacle) of *Ranunculus alejandrei*. (Length of bars in figures of details = 2 mm)

►►►
Fig. 19: Data sheet (basal leaf cycle, stem leaves, flowers, fruits, receptacle) of *Ranunculus besandinus*. (Length of bars in figures of details = 2 mm)



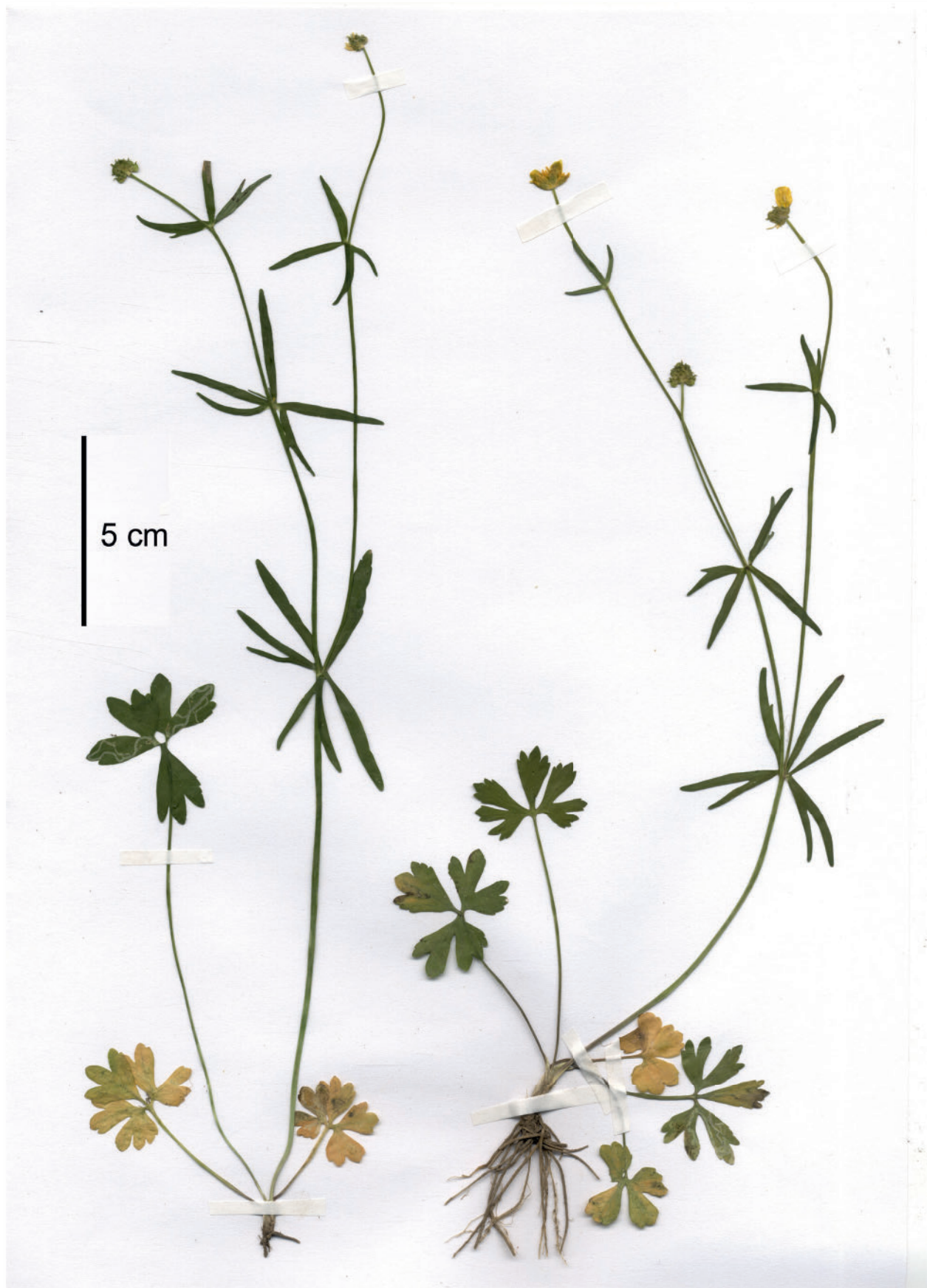


Fig. 18: Holotype of *Ranunculus alejandrei* (MA).

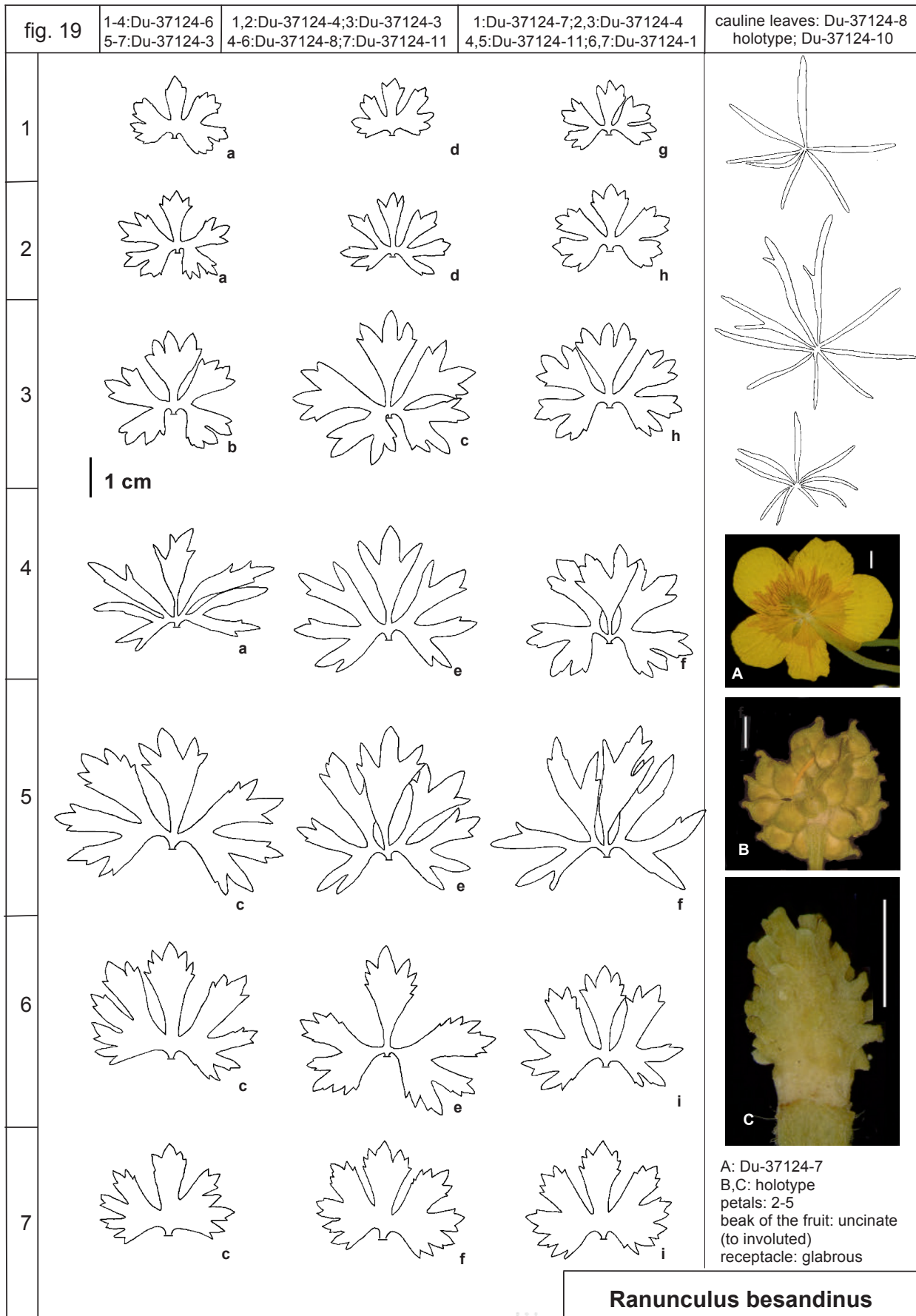




Fig. 20: Holotype of *Ranunculus besandinus* (MA).

tuño & Soriano, E. Carillo, BCN-140968; Prov. Gerona, Baixa Cerdanya: Riera d'Alp, vorada humida (Alliarion), 1180 m, 42°22'N 01°53'E (31TDG19?), 25 May 1985, I. Soriano, I. Soriano 1985 sub *R. auricomus* L. subsp. *carlittensis* (Grau) Molero, Pujadas & Romo, BCN-140957; ibidem, Baixa Cerdanya: Alp, pleta de Saltèguet, prat sec, 1552 m, 42°21'36"N 01°57'39"E (UTM 31 414440 4690289) 13 Mar 20, N. Arnan & V. González, O. Barceló, BCN-117474; ibidem, Baixa Cerdanya: Alp, muntanya de Saltèguet, clariana d'un bosquet de *Rhamnus alpina*, 1678 m, 42°21'28"N 01°57'20"E, 10 May 2009, O. Barceló & R. Plans, det. R. Plans, BCN-117411; ibidem: Alp, pista al torrent de Saltèguet, pineda de pi roig amb avets i pi negre, Exp. N, 1570 m, 42°20'N 01°57'E, 04 May 2008, C. Coll & F. Vallhonrat, C. Coll, BCN-115055; ibidem: Alp, Porxo d'Ovella, prat de dall abandonat, 1417 m, 42°20'N 01°57'E, 10 May 2009, Á. Morell & J. Nuet, N. Arnan, BCN-115022; ibidem: Alp, les Espalloses, pineda de pi roig, 1645 m, 42°21'N 01°56'E, 11 Jul 2009, O. Barceló & R. Plans, det. O. Barceló, BCN-114438; ibidem: Terme municipal d'Alp, Pla de la Masella, clarianes de bosc, 1725 m, 42°20'30"N 01°54'E (31TDG1088), 22 May 2002, C. Blanché, J. Molero & I. Soriano, det. J. Molero, BCN-1211; ibidem, sota el coll de la Moixa, 1850 m, 42°17'30"N 01°47'15"E, 26 Jul 1977, J. Vigo & al., J. Vigo, BCN-140958;

Nuria, Jul 1961, 42°23'50"N 02°09'10"E, 1900–2050 m, Losa España & Losa Quintana, J. Grau, BCN-141130;

Probably belonging to *R. carlittensis*, material not sufficient for a secure determination:

Cataluña, Prov. Lleida, Sant Joan de l'Erm, Font entre Estó i Basseta, morge font, molsa inundada, 1600 m, 42°25'N 01°17'E, 07 Jul 1979, J. Carreras i Raurell, J. Carreras, BCN-140962; ibidem, Espot, Entrada a la Vall d'Espot, Avellanosa, esquistes, 1000 m, 42°34'3"N 01°08'13"E (31TCH41), 26 Apr 1981, A. Carillo & J.M. Ninot, det. J.M. Ninot, BCN-140965; Son del Pi, (Pallars Sobirà), vora el riu, marge de prat humid, 1390 m, 42°37'02"N 01°05'48"E (31T CH4320), 19 May 2007, E. Carillo Ortuño & J.M. Ninot, det. J.M. Ninot, BCN-59391.

3.1.13 *R. gadarramensis* DUNKEL spec. nova

Holotype: Spain, Prov. Madrid, Sierra da Guadarrama, Rascafría, Schotterstraße Richtung Reventón, oberhalb Tennisplatz, noch vor der Schranke, o der Straße, feuchter Pyrenäen-Eichen-Wald (melojares), bachnah, beweidet, [dirty road to El Reventón, above tennis court, before barrier, east of road, humid Pyrenean oak forest], 1200–1300 m, 40°54'28"N 03°53'21"W, 13 Apr 2006, F.G. Dunkel-15636, F.G. Dunkel, MA; isotypes M, JACA, Du-15636. – Fig. 23, 24, 34.

Description — *Flowering shoot* gracile to slim, 12–23 cm, stalk 0.8–2.0 mm in diameter, reddish at the base, suberect (to moderately divergent), angle between the main and secondary axis 10–30(45)°, flowers 1–4, enrichment shoots 0–2; basal leaves 2–5(6) per rosette.

Basal leaf cycle: Leaf edge of the first basal leaf crenated, of the second to sixth basal leaf irregularly and broadly crenate-serrated, of the seventh one crenate-serrated to serrated.

First basal leaf 10–18 mm, with narrowly angled to V-shaped base (10–90°), divided by the main incision (75–90%), middle segment spatulate to broadly deltoid with 3–5 rounded teeth; lateral segment undivided or lobed to cleft by the first lateral incision (26–45%).

Second basal leaf 12–25 mm long, with narrowly angled base (5–80°), divided by the main incision (85–97%), middle segment spatulate to broadly deltoid with 3–7 rounded or crenated teeth; lateral segment cleft to divided by the first lateral incision (60–80%), cleft by the second lateral incision (33–60%), third lateral incision absent or up to 30%.

Third basal leaf 20–28 mm long, aperture at the base closed to

narrowly angled (–20–50°), divided to dissected by main incision (92–100%), middle lobe spatulate to broadly deltoid, tricleft with incisions up to 50%, with 7–9(11) crenated teeth, lateral edge straight to convex; lateral segment divided by first lateral incision (70–85%), cleft to divided by second lateral incision (40–70%), cleft by third lateral incision (33–60%).

Fourth basal leaf 20–28 mm long, aperture at the base closed to narrowly angled (–30–20°), divided to dissected by main incision (95–100%), middle lobe deltoid, tricleft with incisions up to 55%, with 7–11, partly small, crenated teeth, lateral edge straight to slightly concave; lateral segment divided by first and second lateral incision (75–85%, and 70–80%, respectively), divided by second lateral incision (50–75%), cleft by third lateral incision (35–65%), lobed to cleft by fourth lateral incision (26–40%).

Fifth basal leaf 22–30 mm long, aperture at the base closed to narrowly angled (–30–20°), divided to dissected by the main incision (98–100%), middle lobe deltoid, stalked up to 3 mm, tricleft with incisions up to 60%, with 5–9(11) crenated teeth, lateral edge straight to slightly concave; lateral segment divided to dissected by first lateral incision (85–100%), divided by second lateral incision (66–85%), cleft to divided by third lateral incision (55–70%), cleft by fourth lateral incision (50–65%), fifth lateral incision absent or up to 40%.

Sixth basal leaf 24–35 mm long, aperture at the base narrowly angled to V-formed (10–90°), divided to dissected by the main incision (98–100%), middle lobe deltoid, occasionally stalked up to 1 mm, trilobed with incisions up to 50%, with 7–13, partly small, crenated teeth, lateral edge slightly concave to slightly convex; lateral segment divided to dissected by first lateral incision (85–100%), cleft to divided by second lateral incision (60–85%), cleft by third lateral incision (35–65%), fourth lateral incision absent or up to 40%.

Seventh leaf 20–34 mm long, aperture at the base narrowly angled, occasionally V-formed (10–80(100)°), divided to dissected by main incision (80–100%), middle lobe deltoid, trilobed with incisions up to 45%, with 7–11, partly small, teeth, lateral edge slightly concave to straight; the lateral segment is cleft to divided by first lateral incision (45–85%), second and third lateral incision absent or up to 55%, and 33%, respectively.

Lowermost stem leaf divided into 7–11 segments, largest segment 23–48 mm long, 2–7 mm wide, linear, rarely narrowly deltoid, undivided or with 2–6 small falcate teeth.

Petals 0–1, 5–8 mm long, 5–6 mm wide; **androclinium** 0.4–0.7 mm; **receptacle** ellipsoidal, 2.2–3.8 mm long, 1.4–2.1 mm wide, sparsely pilose (+ – ++), intervallum absent, carpellophores 0.2–0.6 mm long; **fruits** 2.0–2.6 mm long, beak 0.5–0.7 mm long, uncinata.

Pollen quality — bad, 28.5% well developed (isotype Du-15636-7).

DNA-ploidy — 4x (isotype Du-15636, Paule & al. 2018 [sub *R. valdesii*]).

Distribution — at present only known from three localities in Sierra da Guadarrama.

Ecology — humid Pyrenean oak forests, brooksides, 1130–1300 m.

Etymology — refers to the Guadarrama river and the town of Guadarrama, both of which are located in the Guadarrama mountains. The word Guadarrama itself is derived from the Ara-

bic words for sandy river — Guad from wadi, meaning river, and arrama from ar-rama, meaning sandy. The epithet “guadarramensis” instead of “guadarramaensis” was chosen according to other taxa, e.g. *Hieracium guadarramense* ARV.-TOUV. or *Nineta guadarramensis* (PICHET 1865).

Vulnerability — endangered by rarity and drainage of humid oak woods.

Taxonomy — *R. guadarramensis* differs from all other taxa of the group by narrowly angled or closed apertures of the base. The middle segments are irregularly asymmetric, tricleft, overlapping and carry deep incisions up to 60%. *R. guadarramensis* belongs to the few taxa with trichomes at the receptacle (see Fig. 23C). The different morphology and the isolated sites in the Central System with three known occurrences justify a description of the taxon.

Specimen seen — Spain, Sistema Central, Sierra da Guadarrama, Prov. Madrid: Rascafría, Schotterstraße Richtung Reventón, oberhalb Tennisplatz, noch vor der Schranke, feuchter Pyrenäen-Eichen-Wald, rechts der Straße, beweidet, 1200–1300 m, 40°08'30"N 03°07'24"W, 13 Apr 2006, F.G. Dunkel, Du-19689; ibidem, cultivated, 02 May 2008, F.G. Dunkel, Du-21262; ibidem, cultivated, 02 May 2013, Du-29939; ibidem: Rascafría, am NW-Ende des Ortes, Straße zum Puerto del Reventón, oberhalb des Tennisplatzes, Quercus-pyrenaica-Eichenwald, nur im Bereich des Baches, 1210 m, 40°54'30"N 03°53'37"W, 20 May 2013, F.G. Dunkel, Du-29930, Du-29931; ibidem: Rascafría, 200 m n M-604, o Rascafría, feuchter Eichen-Hainbuchen-Wald, bachbegleitend, 1135 m, 40°54'36"N 03°52'17"W, 20 May 2013, F.G. Dunkel, Du-29924; ibidem: Rascafría, o Rascafría, 5 m n M-604, Bachüberquerung, Bachsediment im schattigen Bachtal, 1135 m, 40°54'37"N 03°52'08"W, 20 May 2013, F.G. Dunkel, Du-29926; ibidem: Rascafría, Dehesa Boyal y Arpoturas, 1250 m, 26 May 1988, Diaz, J.C. Diosdado & Pérez, det. Diaz sub *R. valdesii*, rev. F.G. Dunkel sub *R. guadarramensis* p.p., SEV 128350.

3.1.14 *Ranunculus guaraensis* DUNKEL spec. nova

Holotype: Spain, Aragón, Prov. Huesca, Pireneos, Sierra de Guara, Nocito s Used, Casetas los Fenales, subalpine Weiden, Gebüschrund, [subalpine meadows, edge of bruhes], 1448 m, 42°18'19"N 00°11'32"W, leg. F.G. Dunkel, 21 May 2013, F.G. Dunkel-29960, MA; isotypes JACA, M, Du-29960. — Fig. 25, 26, 34.

Description — *Flowering shoot* gracile, 10–22 cm, stalk 0.6–1.8 mm in diameter, reddish at the base, suberect to moderately divergent, angle between the main and secondary axis 10–40°, flowers 1–3, enrichment shoots 0–1; basal leaves 2–5 per rosette.

Basal leaf cycle: with narrow- to wide-angled base in the first to fourth basal leaf (50–100(130)°, with wide-angled base in the fifth to seventh leaf (100–130(150)°; basal leaves pedatifid to pedatisect; leaf edge irregularly crenate-serrated.

First basal leaf 8–12 mm, cleft to divided by the main incision (50–85%), middle segment tapezoid to deltoid with 3 crenated teeth; lateral segment undivided or lobed by the first lateral incision (26–32%).

Second basal leaf 10–18 mm long, divided by main incision (66–92%), middle segment deltoid with 3–5(7) crenated teeth; lateral segment cleft by the first lateral incision (33–65%); second lateral incision absent or up to 40%.

Third basal leaf 16–22 mm long, divided to dissected by main incision (85–100%), middle lobe up to 2 mm stalked, deltoid, tricleft with incisions up to 33%, with (4)5 crenated teeth, lateral edge concave; lateral segment divided by first lateral incision (66–85%), cleft by second lateral incision (45–60%), third lateral incision absent or up to 40%.

Fourth basal leaf 18–26 mm long, divided to dissected by main incision (85–100%), middle lobe occasionally stalked up to 5 mm, deltoid, tricleft with incisions up to 30%, with 3, partly crenated teeth, lateral edge concave; lateral segment divided by first lateral incision (66–85%), cleft or divided by second lateral incision (55–70%), lobed or cleft by third lateral incision (26–40%), fourth lateral incision absent or up to 33%.

Fifth basal leaf 16–22 mm long, divided by the main incision (75–95%), middle lobe deltoid, with 3–5 teeth, lateral edge slightly concave to straight; lateral segment cleft by first lateral incision (45–60%), lobed or cleft by second lateral incision (26–40%).

Sixth basal leaf 12–20 mm long, divided by the main incision (66–80%), middle lobe deltoid (rectangle), with 3–5 teeth, lateral edge slightly concave to straight; lateral segment cleft by first lateral incision (35–55%), second lateral incision absent or occasionally up to 50%.

Seventh basal leaf 12–20 mm long, cleft to divided by the main incision (55–75%), middle lobe deltoid, with 3–5 teeth, lateral edge slightly concave to straight; lateral segment undivided, i.e. first lateral incision absent or up to 35%.

Lowermost stem leaf divided into 7–11 segments, largest segment 18–30 mm long, 2–5 mm wide, lanceolate to oblanceolate, with 0–2 small up to 10 mm long teeth.

Petals 0–2(4), 6–8 mm long, 5–6 mm wide; *androclinium* 0.6–0.8 mm, receptacle ellipsoid, 2.5–3.5 mm long, 1.2–2.0 mm wide, glabrous, intervallum absent, carpellophores 0.1–0.25 mm; *fruits* 1.5–2.4 mm long, beak 0.2–0.6 mm long, obviously short or even missing, straight to involuted.

Pollen quality — 27.3% well developed pollen (isotype Du-29560-10).

DNA-ploidy — 4x (isotype Du-29960; PAULE & AL. 2018).

Distribution — Sierra de Guara, the southwestern part of the Spanish Pyrenees.

Ecology — meadows, often in the shelter of brushes.

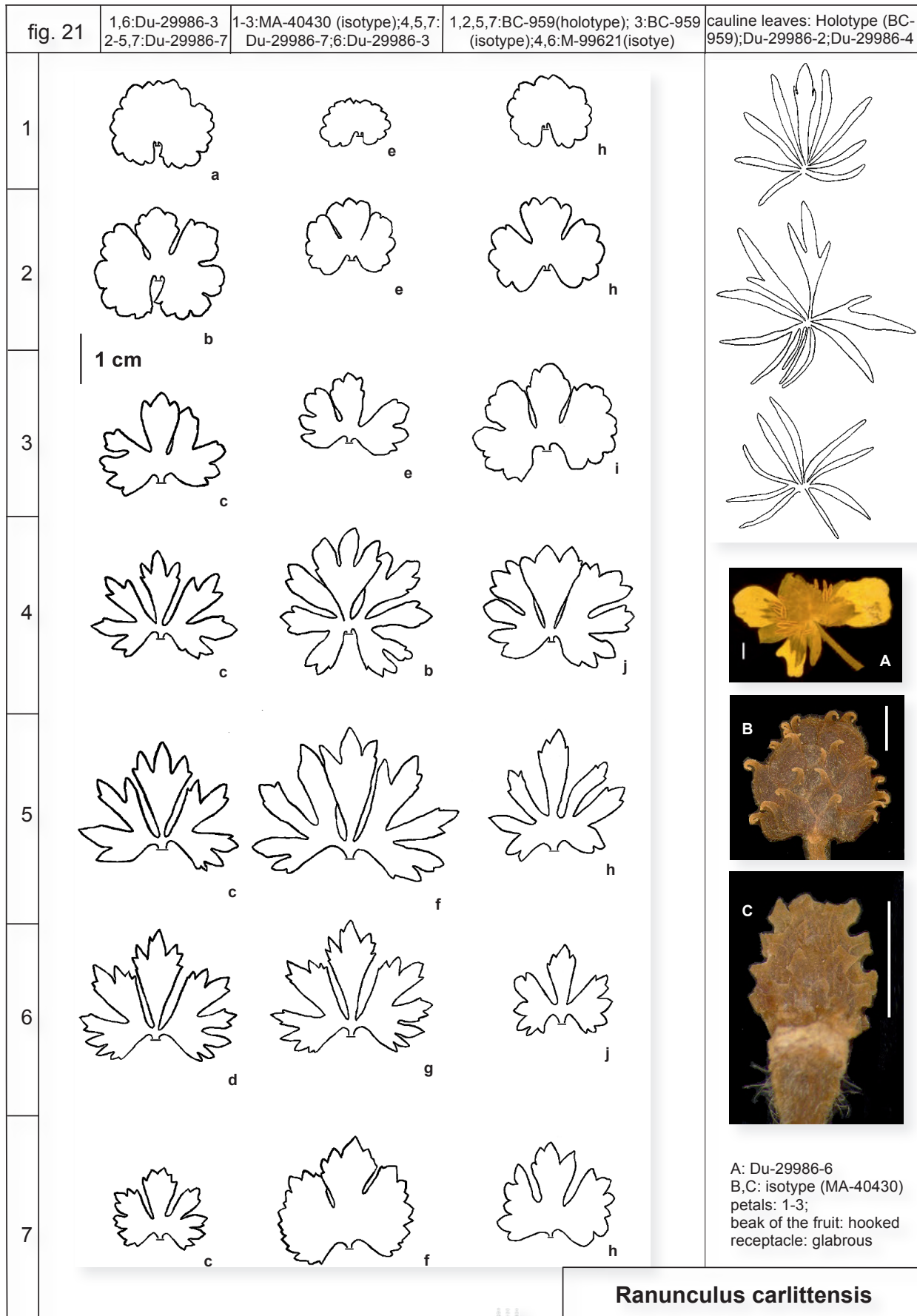
Eponymy — refers to the distribution in the Sierra de Guara.

Vulnerability — only threatened by rarity and perhaps overgrazing.

Taxonomy — *R. guaraensis* is characterized by a pedately di-

►
Fig. 21: Data sheet (basal leaf cycle, stem leaves, flowers, fruits, receptacle) of *Ranunculus carlittensis*. (Length of bars in figures of details = 2 mm)

►►►
Fig. 23: Data sheet (basal leaf cycle, stem leaves, flowers, fruits, receptacle) of *Ranunculus guadarramensis*. (Length of bars in figures of details = 2 mm)



Ranunculus carlittensis



Fig. 22: Holotype of *Ranunculus carlittensis* (BCN-959).

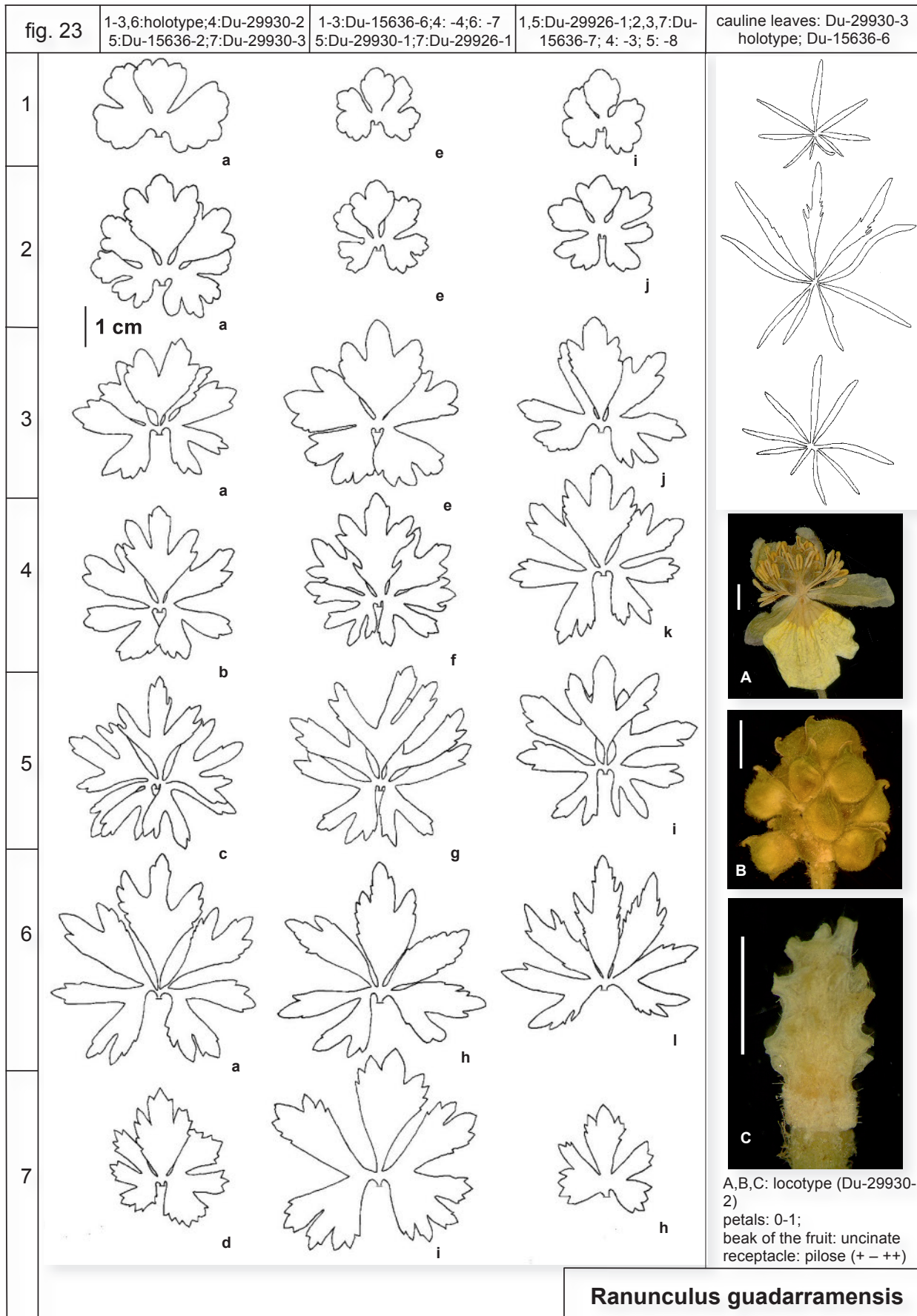




Fig. 24: Holotype of *Ranunculus guadarramensis* (MA).

vided blade of the basal leaves: the main incisions are usually rather vertical to the angle at the base; the first lateral incision is upwardly directed, not horizontal, and therefore does not represent a symmetric plain of the leaf (see HÖRANDL & GUTERMANN 1998a: 6, Abb. 1) The aperture at the base is generally V-formed. *R. carlittensis* is morphologically similar to *R. guaraensis*, but it possesses only single pedately divided basal leaves, and the deltoid middle lobes are usually broader in *R. carlittensis* than in *R. guaraensis*. Both taxa are geographically separated by a distance of more than 120 km.

Specimens seen — Spain, Aragón, Prov. Huesca, Prepirineos, Sierra de Guara: Nocito s Used, Casetas los Fenales, subalpine Weiden, Gebüschrand, 1448 m, 42°18'19"N 00°11'32"W, 21 May 2013, F.G. Dunkel, Du-29960; ibidem: Nocito s Used, Casetas los Fenales, in der Nähe des Refugio de los Fenales, subalpine Weiden, Gebüschrand, 42°18'14"N 00°11'53"W, 1400 m, 21 May 2013, F.G. Dunkel, Du-29961; ibidem: Used, Nueno, Can de Used Prado, casetas y cresta, 1380 m, 30TYM3088, 25 May 1980, P. & J.M. Montserrat, det. J. Grau 1984 sub *R. carlittensis*, JACA-78480; ibidem: Used, Bierge, prado y barranco con bojes, fenales, 1400–1750 m, 30TYM3187, 25 May 1980, P. & J.M. Montserrat, det. J. Grau 1984 sub *R. carlittensis*, JACA-81980.

Probably belonging to *R. guaraensis*, material not sufficient for a secure determination:

Aragón, Prov. Huesca, Sierra de Guara: Used, Sabiñánigo, Pinar explotado, gleras, con *Festuca scoparia*, 1400–1700 m, 30TYM3187, 25 May 1980, P. & J.M. Montserrat, det. J. Grau 1984 sub *R. carlittensis*, JACA-86580.

3.1.15 *Ranunculus rotundifrons* DUNKEL spec. nova

Holotype: Spain, Aragonia, Sierra de Gúdar, Prov de Teruel, Cantavieja, 3,5 km ssw Cantavieja, towards el puer-to de la Tarayuela, Gebüsch, [brushes], 1552 m, 40°29'35"N 00°25'07"W, 27 May 2015, F.G. Dunkel-32854, MA; isotypes JACA, M, Du-32854. — Fig. 27, 28, 34.

Description — Flowering shoot gracile to slim, 17–36 cm, stalk 1.0–2.2 mm in diameter, suberect to moderately divergent, angle between the main and secondary axis 10–40(50)°, flowers 1–5, enrichment shoots 0–2; cataphylls 0(1), basal leaves (1)2–5(6) per rosette.

Leaf edge of the first basal leaves irregularly (and coarsely) crenated, edge of the second to seventh basal leaves irregularly and coarsely crenate-serrated.

First basal leaf 14–20 mm long, V-shaped at base (80–100°), divided by the main incision (80–95%), middle lobe deltoid to spatulate with 5–7 crenates or crenated teeth, lateral edge often concave; lateral segment undivided or cleft to 50%.

Second basal leaf 18–23 mm long, blade with narrow- to wide-angled base (50–140°), divided or dissected by the main incision (95–100%), middle lobe stalked up to 2 mm, deltoid (or spatulate) with 5–7 crenated teeth, trifid by incisions up to 33%; lateral segment cleft by first lateral incision (32–55%), second lateral incision absent or up to 27%.

Third basal leaf 24–32 mm long, V-shaped to wide-angled at the base (80–150°), divided to dissected by the main incision (98–100%), middle lobe stalked up to 2 mm, deltoid with 5–7 crenated teeth, trifid with incisions up to 33%, lateral edge concave; lateral segment almost stalked up to 2 mm, cleft to divided by first lateral incision (50–70%), lobed or cleft by second lateral incision (26–40%), third lateral incision absent or up to 40%.

Fourth basal leaf 24–32 mm long, V-shaped to wide-angled at

base (90–170°), dissected by main incision, middle lobe up to 10 mm long stalked, deltoid to broadly deltoid, trilobed with incisions up to 50%, with 7–9 crenated teeth, lateral edge slightly concave; lateral segment stalked up to 5 mm, cleft or divided by the first lateral incision (60–90%), cleft by the second lateral incision (33–50%), lobed or cleft by the third lateral incision (30–45%).

Fifth basal leaf 22–32 mm long, blade at the base wide-angled (100–120°), divided or dissected by the main incision (95–100%), middle lobe deltoid with 5–9 teeth; lateral segment lobed to divided by the first lateral incision (28–65%), second lateral incision absent or up to 45%.

Sixth and seventh basal leaf similar, 18–26, and 16–24 mm long, respectively; blade at the base wide-angled (100–140°), divided by the main incision (80–90%, and 50–95%, respectively), middle lobe deltoid with 5–7 teeth; lateral segment undivided.

Undermost stem leaf divided into 7–9 segments, largest segment (20)26–50 mm long, 2.5–8 mm wide, narrowly to widely oblanceolate or cuneate, undivided or with up to 4 short or long patent teeth.

Petals 0–4, 7–11 mm long, 5–8 mm wide; *androclinium* 0.2–0.3 mm; *receptacle* ellipsoid, 2.0–3.5 mm long, 1.2–2.3 mm wide, glabrous, intervallum absent, carpellophores 0.15–0.3 mm long; *fruits* 2.2–3.3 mm long, beak 0.3–0.6 mm long, involuted.

Pollen quality — good, 75.0% well developed pollen (isotype Du-32854-11).

DNA-ploidy — 4x (Bronchales, Du-32822; Checa, Du-32838).

Distribution — Sistema Ibérico: Sierra de Cameros (La Rioja), Sierra de Albarracín, Sierra de Teruel, and Sierra de Gudar (Aragón, Prov. Teruel and Castilla-La Mancha, Prov. Guadalajara), and Serranía de Cuenca, Sierra de Valdemeca (Prov. Cuenca); Cordillera Cantábrica: Montaña Palentina (Prov. Palencia), and Picos de Europa (Prov. León). Probably also Sierra de Moncayo (Prov. Soria and Zaragoza).

Ecology — humid meadows, riparian forests, brooksides, brush- es, pine, oak and mixed or residual beech forests, 900–1900 m.

Eponymy — refers to the rounded teeth of the lobes and leaf edge.

Vulnerability — not threatened.

Taxonomy — *R. rotundifrons* is characterized by obtuse and rounded teeth of all segments. The leaf edge bears a low number of large teeth (≤ 28). In addition, the middle lobes of the spring leaves are up to 5 mm petiolated, the beak of the fruits are usually involuted. The geographical range extends from the Cantabrian Mountains (Cordillera Cantábrica) to the southeastern edge of the Iberian System (Sistema Ibérico) in the Sierra de Teruel. This is the widest range of all Spanish taxa of this complex. An old indication even further southwest, in Peñagolosa, Province of Valencia, had been confirmed by VIGO in 1968 but not since then (VIGO 1968; J. Riera in litt.), and I didn't see any newer specimen of this mountain area. Therefore, the determination as *R. rotundifrons* remains doubtful.

Specimens seen — SPAIN, Castilla y León, Cordillera Cantábrica, Prov. Palencia, Montaña Palentina: Cardaño de Arriba, 1 km s Cardaño de Arriba, w des Río Carrion, uferbegleitendes Gebüsch, grasig, 1375 m, 42°57'42.7"N 04°45'33.4"W, 24 May 2019, F.G. Dunkel, Du-36887, Du-37100;

Prov. León, Picos de Europa: Portilla de la Reina, an der Straße LE-243 → Posada de Valdéon, Bachufer, Weidengebüsch, 1270 m, 43°03'30"N 04°51'23"W,

24 May 2019, F.G. Dunkel, Du-37101; *ibidem*: Posada de Valdeón, prado de siega húmedo, 900 m, 30TUN4479, 01 May 1978, C. Garcia Gonzalez 606, JACA15785, det. C. Garcia Gonzalez 1978 sub *R. auricomus* L., rev. F.G. Dunkel Dec 2018 sub *R. cf. rotundifrons*; *ibidem*: Posada de Valdeón, Borde río, prado viejo, 900 m, 30TUN4478, 01 May 1978, C. Garcia Gonzalez ca. 600, rev. J. Grau sub *Ranunculus ± montserratii*, rev. F.G. Dunkel Dec 2018 sub *R. cf. rotundifrons*;

Sistema Ibérico, Aragón, Prov. Teruel, Sierra de Albarracín: Albarracín, 1900, C. Pau, det. J. Grau 1984 sub *R. cf. carlittensis*, rev. F.G. Dunkel Dec 2018 sub *R. rotundifrons* Dunkel, MA40420; *ibidem*: Bronchales, ca. 1,6 km s Bronchales, an der V-90, lichter Kiefernwald, Bachrand, 1650 m, 40°29'41"N 01°35'11"W, 25 May 2015, leg. et det. F.G. Dunkel, Du-32822; *ibidem*: Bronchales, ca. 1,3 km s Bronchales, Gebüsch, 1600 m, 40°29'45.5"N 01°35'09.3"W, 26 May 2015, F.G. Dunkel, Du-32832; *ibidem*: Bronchales, 1710 m, 30TXK1984, 26 May 2009, J. Martin Barrios, det. J. Martin Barrios 2009 sub *R. auricomus* L. subsp. *valdesii* (Grau) Mateo et al., rev. F.G. Dunkel Dec 2018 sub *R. cf. rotundifrons*, JACA-285769; *ibidem*: Fortanete, Peñacerrada, 1000 m, 02 Jun 1993, J.X. Soler & M. Mayol 2814, det. J.X. Soler 1993 sub *R. auricomus* L., rev. F.G. Dunkel Dec 2018 sub *R. cf. rotundifrons* Dunkel, MA-899444; *ibidem*: Fortanete, 4,2 km SW Fortanete, próxima arroyo de Peñacerrada, 100 m E Masía de Peñacerrada, lichter Kiefernwald, Quellbach, 1670 m, 40°28'43.8"N 00°33'32.2"W, 27 May 2015, F.G. Dunkel, Du-32851; Noguera de Albarracín, barranco de la Olmeda, 1470 m, 30TXK, 1780 m, 07 May 2005, G. Mateo, Fabado & Torres, det. G. Mateo sub *R. auricomus* L. subsp. *valdesii*, rev. F.G. Dunkel, VAL-161162; *ibidem*: Noguera de Albarracín, barranco de Peña Aguda, 1400 m, 30TXK1680, 08 Jun 1993, G. Mateo-7849, Mercadal, Fabregat, López, det. G. Mateo sub *R. valdesii* Grau, rev. F.G. Dunkel, VAL-80493;

Castillia-La Mancha, Prov. Cuenca, Sierra de Valdemeca, pr. Collado Aparicio, 1550 m, 30TXK0254, 09 Jun 1991, G. Mateo-4405, F.G. Dunkel, VAL-74323;

Prov. Guadalajara, Sierra de Albarracín: Orea, 2,2 km SSW Orea, próximo arroyo de las Cabañas, Bachrand, feuchte Senken in der Wiese, 1541 m, 40°32'19"N 01°44'15"W, 26 May 2015, F.G. Dunkel, Du-32839; *ibidem*: Orea, sobre el barranco de Las Truchas, 1580 m, 30TXK1084, 29 May 1994, G. Mateo-8799, F.G. Dunkel, VAL-84011; *ibidem*: Checa, 5,1 km E Checa, 4,8 km SSE Alcoroches, sobre el barranco de las Truchas, Trockenrasen, 1620 m, 40°34'51"N 01°43'49"W, 26 May 2015, F.G. Dunkel, Du-32838; *ibidem*: Checa, 1,8 km NNO Checa, Fuente de los vaqueros, 140 m SO GU-982, grasiger Kiefernwald, relativ spärlich, 1395 m, 40°36'08.3"N 01°46'45.4"W, 26 May 2015, F.G. Dunkel, Du-32843;

Aragón, Prov. Teruel, Sierra de Teruel: Orihuela del Tremedal, 1450 m, 30TXK18, 10 Jun 1979, I. Barrera, F.G. Dunkel, JACA278498; *ibidem*: Orihuela del Tremedal, pr. Caimodorro, 1690 m, 30TXK1088, 12 Jun 2007, G. Mateo & col.; *ibidem*: Valdellinares, pr. Collado Gitana, 1900 m, 30TYK0075, 25 May 2012, G. Mateo, det. G. Mateo 2012 sub *Ranunculus carlittensis*, rev. F.G. Dunkel Dec 2018 sub *R. rotundifrons* Dunkel, MA-885488, VAL-209427;

Prov. Teruel, Sierra de Gúdar: Cantavieja, 3,5 km SSW Cantavieja, hacia el puerto de la Tarayuela, Gebüsch, 1552 m, 40°29'35.7"N 00°25'07.5"W, 27 May 2015, F.G. Dunkel, Du-32854 (isotypes);

La Rioja (Prov. Logroño), Sierra de Cameros: Pedroso, barranco del Río Pedroso, hayedos, 1150 m, 30TWM2780, 28 Apr 1985, B.Fz. de Betoño & J.A. Alejandro 522/85, det. J.A. Alejandro 1985 sub *R. auricomus* L. s.l., rev. F.G. Dunkel Dec 2018 sub *R. rotundifrons*, MA-338002; *ibidem*: Ajamil de Cameros, la Dehesa de Torremuña, hayedos residuales, localizado en umbría sobre un substrato moderadamente ácido, 1230–1300 m, 30TWM4971, 17 May 1996, M.L. Gil Zúñiga & J.A. Alejandro 679/96, F.G. Dunkel, MA-616669; *ibidem*: Torremuña, la Dehesa de Torremuña, hayedos residuales, con algunos viejos marojos (*Viscum*), umbría, substrato moderadamente ácido, 1230–1300 m, 30TWM4971, 23 May 1996, J.A. Arizaleta & J.A. Alejandro 679/96, F.G. Dunkel, MA-616763;

Prov. Burgos, Sierra de la Demanda: Monterrubio de la Demanda, La Pradera, robledal-hayedo adehesado y frecuentado por el ganado, sustrato ácido, 1150–1230 m, 30TVM, 28 Apr 2001, J.A. Alejandro-812/01 & M.J. Escalante, F.G. Dunkel, Du-37086; *ibidem*: Monterrubio de la Demanda, in der Umgebung des Picknickplatzes "La Pradera", relativ feuchter Eichen-Buchen-Wald, Gebüsch, 1165 m, 42°08'05"N 03°07'24"W, 22 May 2019, F.G. Dunkel, Du-37117.

Material not sufficient for a secure determination, but occurrence of *R. rotundifrons* is probable for geographical reasons:

Castilla y León, Prov. Soria, Sierra de Moncayo: Cueva de Agreda, cerca de Molino, Prado de la Dehesa, 1350–1400 m, 30TWM9424, 22 May 2000, P.M. Uribe-Echebarria, det. P.M. Uribe-Echebarria 2000 sub *R. arrechae*, rev. F.G. Dunkel Dec 2018 sub *R. cf. rotundifrons* Dunkel, JACA-39200; *ibidem*: Agreda, Agramonte?, barranco de Castilla, 1200–1400 m, 30TWM9629, 25 May 2000, P.M. Uribe-Echebarria, det. P.M. Uribe-Echebarria 2000 sub *R. arrechae*, rev. F.G. Dunkel Dec 2018 sub *R. cf. rotundifrons*, JACA-46700;

Aragón, Prov. Zaragoza, Sierra de Moncayo: Agramonte, Casa de los Ingenieros, 1130–1150 m, [30TWM9829], 12 May 2000, P.M. Uribe-Echebarria, det. P.M. Uribe-Echebarria 2000 sub *R. auricomus* L. s.l., rev. F.G. Dunkel Dec 2018 sub *R. cf. rotundifrons*, JACA-21500; *ibidem*: Trasmozo, Monte de la Mata, 1000–1100 m, 30TXM0028, 23 May 2000, D. Gómez & P.M. Uribe-Echebarria, det. P.M. Uribe-Echebarria 2000 sub *R. arrechae*, rev. Dec 2018 F.G. Dunkel sub *R. cf. rotundifrons*, JACA-42600;

Aragón, Prov. Cuenca, Serranía de Cuenca: Cuenca, El Conillo, bordes de cubetas con cervunales y sabina rastrera, 1600 m, 30TWK9182, 07 May 2006, O. García Cardo & R. García Cardo, det. O. García Cardo 2006 sub *R. valdesii*, rev. F.G. Dunkel Dec 2018 sub *R. cf. rotundifrons*, MA-744099; *ibidem*: Zafrilla, Dehesa de los Dornillos, Rezumaderos con turberas sobre arenas y arcillas albenses, 1540 m, 30TXK0759, 12 May 2009, O. García, det. O. García Cardo 2009 sub *R. valdesii*, rev. F.G. Dunkel Dec 2018 sub *R. cf. rotundifrons*.

Material not sufficient for a secure determination:

Valencia, Prov. Castellón: Alcalaén, Peñagolosa (Penyagolosa), ex Peñagolosa in Regno Valentino (Valencia), ca. 1840, J.A. Barrera, MA-40417, det. J. Grau 1984 sub *R. cf. carlittensis* Grau, 1984, rev. F.G. Dunkel Dec 2018 sub *R. cf. rotundifrons* Dunkel.

3.1.16. *Ranunculus sennenianus* DUNKEL spec. nova

Holotype: Spain, Aragón, Prov. Huesca, Pirineos Centrales, Laspaules, Collado de Espina, an der N-260, o des Ortes, an der Abzweigung nach Suils, am Wanderweg 50 m o der Straße, grasiger Wegrund, Gebüschrand, [at the N-260, east of Laspaules, branch-off to Suils, at the walking tray 50 m e road, grassy roadside, edge of brushes], 1435 m, 42°28'16.5"N 00°36'12.9"E, 22 May 2013, F.G. Dunkel-29967, MA; isotypes JACA, M, Du-29967; paratype: Laspaules, Collado de Espina, Bachüberquerung der N-260, o des Ortes, direkt W der Abzweigung nach Suils, am Bach, Bachufergebüsch, [w of branch-off to Suils, brookside, brushes along brook], 1432 m, 42°28'15"N 00°36'09"E, 22 May 2013, F.G. Dunkel-29968, MA, M, Du-29968. – Fig. 29, 30, 34.

Description — *Flowering shoot* gracile to slim, 18–30 cm, stalk 1.2–3.0 mm in diameter, suberect to moderately divergent (patent), angle between the main and secondary axis 15–50(60)°,

►
Fig. 25: Data sheet (basal leaf cycle, stem leaves, flowers, fruits, receptacle) of *Ranunculus guaraensis*. (Length of bars in figures of details = 2 mm)

►►►
Fig. 27: Data sheet (basal leaf cycle, stem leaves, flowers, fruits, receptacle) of *Ranunculus rotundifrons*. (Length of bars in figures of details = 2 mm)

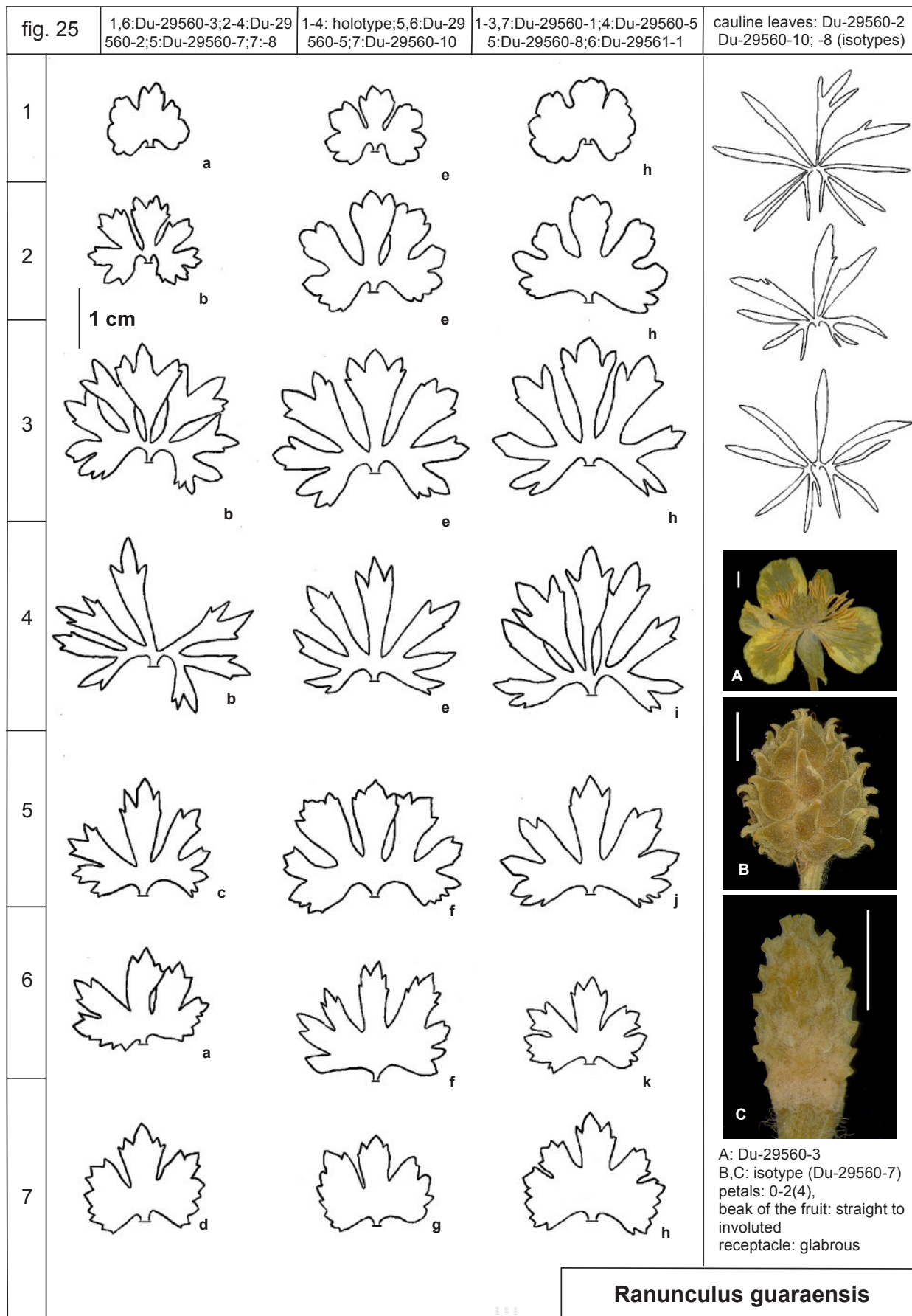




Fig. 26: Holotype of *Ranunculus garaensis* (MA).

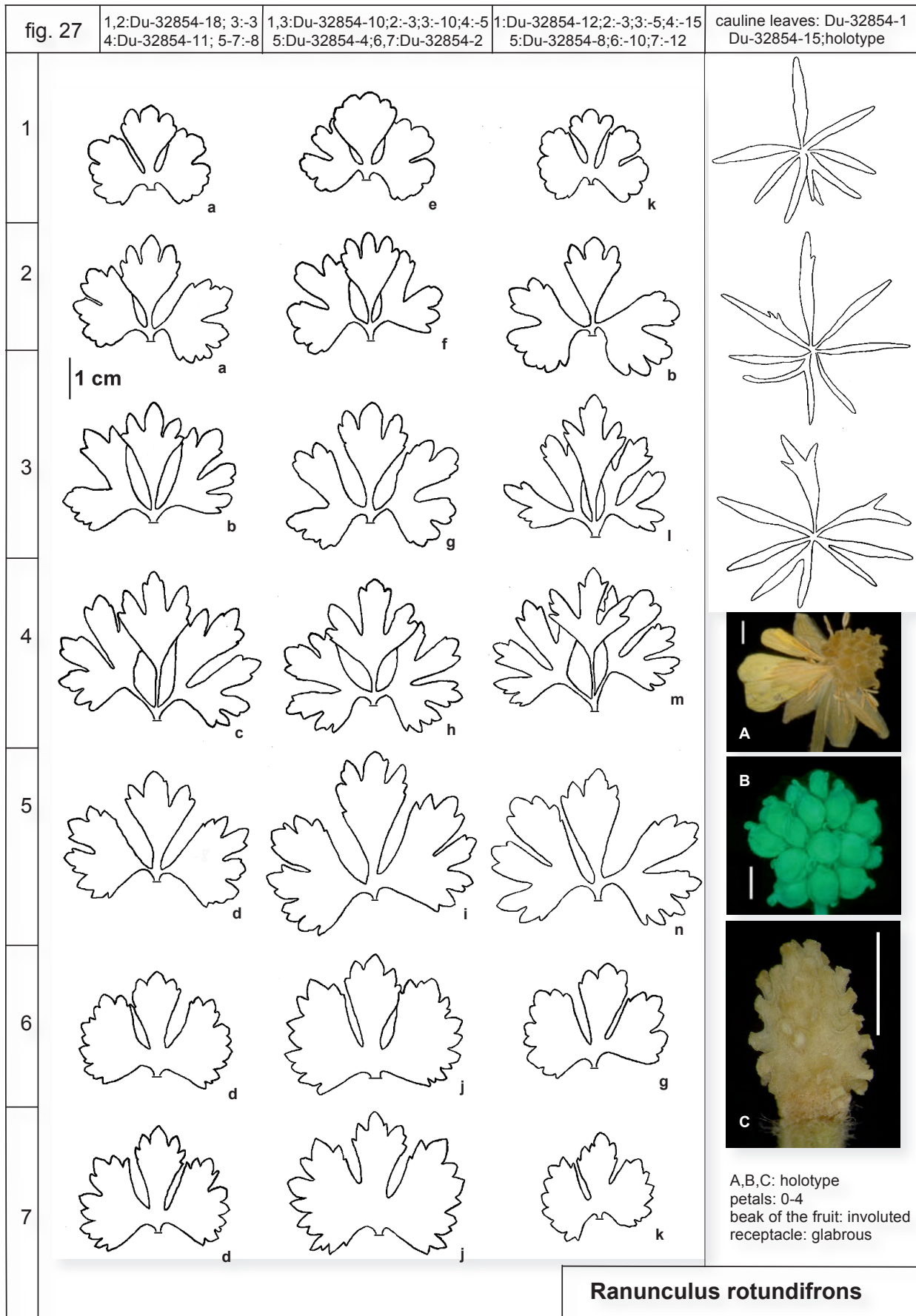




Fig. 28: Holotype of *Ranunculus rotundifrons* (MA).

flowers 2–7, enrichment shoots 0–2; basal leaves 2–6(7) per rosette.

Basal leaf cycle: rather homophyllous, all basal leaves with narrow-angled base (10–60°), in the first basal leaf base rarely closed (-5°), in the sixth and seven basal leaf occasionally V-shaped (90°), basal leaves divided by the main incision ((70)80–95%), in the third and fourth basal leaf blade often dissected by the main incision; middle segment deltoid with concave to straight lateral edge and 7–9(13) crenated teeth, only in the first basal leaf occasionally spatulate with 5 crenated teeth; leaf edge irregularly and coarsely crenate-serrated.

First basal leaf 12–18 mm; lateral segment lobed or cleft by first lateral incision (30–60%), second lateral incision absent or up to 33%.

Second basal leaf 16–28 mm long, middle segment occasionally with incisions up to 33%; lateral segment cleft to divided by first lateral incision (50–80%), cleft by second lateral incision (33–55%), third lateral incision absent or up to 33%.

Third basal leaf 22–28 mm long, middle segment occasionally with incisions up to 37%; lateral segment cleft to divided by first lateral incision (60–75%), cleft by second and third lateral incision (40–60%, and 33–45%, respectively), fourth lateral incision absent or up to 45%.

Fourth basal leaf 22–34 mm long, middle segment occasionally stalked up to 2 mm, occasionally with incisions up to 37%; lateral segment divided by first lateral incision (75–85%), cleft by second lateral incision (55–65%), lobed or cleft by third and fourth lateral incision (30–50%).

Fifth basal leaf 22–32 mm long, middle segment occasionally with incisions up to 37%; lateral segment cleft or divided by first lateral incision (55–70%), cleft by second lateral incision (40–60%), lobed or cleft by third lateral incision (26–35%), fourth lateral incision absent or up to 35%.

Sixth basal leaf 22–30 mm long; lateral segment cleft by first and second lateral incision (30–50%, and 30–45%, respectively).

Seventh basal leaf 18–26 mm long, lobed or cleft by first lateral incision (26–45%), second lateral incision absent or up to 33%.

Lowermost stem leaf divided into 7–11 segments, largest segment 20–52 mm long, 4–8 mm wide, lanceolate to narrowly deltoid, with (0)2–4 small to big, up to 10 mm long patent teeth.

Petals 0–5, 9–12 mm long, 7–10 mm wide; *androclinium* 0.6–0.8 mm; *receptacle* ellipsoid, 2.0–4.0 mm long, 1.2–2.6 mm wide, glabrous to sparsely pilose (+), invervallum absent, carpellophores 0.3–0.7 mm; *fruits* 1.2–2.8 mm long, beak 0.4–0.7 mm long, uncinuate to involuted.

Pollen quality — mediocre, 64.9% well developed pollen (holotype Du-29967-2).

DNA-ploidy — 4x (Laspaüles, isotype Du-29967; PAULE & AL. 2018).

Distribution — at the western Pyrenees, close to Laspaüles (Prov. Huesca, Aragón), and at the high plain of Urbasa, Navarra.

Ecology — in meadows, at the edge of brushes, and brookside forests, 950–1750 m.

Etymology — dedicated to Étienne Marcellin Granié-Blanc, religious name Frère Sennen (1861–1937), a French botanist who collected rich material of plants in France, Spain, and Morocco,

editor of the series of exsiccatae Plantes d'Espagne (SENNEN 1926–1929).

Vulnerability — threatened by rarity.

Taxonomy — *R. sennenianus* is close to *R. carlittensis*, it differs by a tendency to overlapping middle lobes with more teeth of the edge. The leaf cycle is rather homophyllous, the first three leaves are deep divided: eg. main incision 80–95% vs. 0–75% in *R. carlittensis*. *R. sennenianus* is characterized by a deeply crenate-serrated leaf edge with many teeth, e.g. at the seventh leaf >32 teeth vs. ≤28 in *R. carlittensis*. Actually, its known distribution area is restricted to two sites at the Western Pyrenees.

Specimens seen — Spain, Western Pyrenees, Aragón, Prov. Huesca, Laspaüles, à côté du carrefour vers Suils au bord d'une prairie de fauche humide, sur sol siliceux, avec *Polygonum bistorta*, *Taraxacum off.* agg., *Narcissus alpestris* etc., 1420 m, 42°28'20"N 00°36'10"O (UTM 31TCH 0205), 17 May 1986, P. Montserrat & al., J. Grau 1988 sub *R. carlittensis*, JACA-384586, M-0099620, MSB-131971, LG s.n.; ibidem, Laspaüles, Collado de Espina, Bachüberquerung der N-260, O des Ortes, direkt W der Abzweigung nach Suils, am Bach, Bachufergebüsch, 1432 m, 42°28'15"N 00°36'09"E, 22 May 2013, F.G. Dunkel, Du-29968 (paratypes);

Navarra, Prov. Navarra, Olazagutía, Olazagutía-Alsasua, Exclusión de Urbasa, cerca de parcela, 950 m, 42°51'N 02°10'W, (30TWN64), 01 May 1957, P. Montserrat, J. Grau 1984 sub *R. cf. carlittensis*, rev. F.G. Dunkel Dec 2018 sub *R. sennenianus*, JACA-4657;

Material not sufficient for a secure determination:

Spain, Castilla y León, Cordillera Cantábrica, Prov. Palencia, Montaña Palentina: Triollo, Alto de los Llanos, lomas y collados erosionados, calizas, bajo arbustos en zonas de suelo mas profundo, 1750 m, 42°51'37"N 04°39'50"W, (30TUN6446), 31 May 1990, J.A. Alejandro-1745/90, det. F.G. Dunkel sub *R. cf. sennenianus*, MA-493484.

3.4 *Ranunculus vasconicus* DUNKEL spec. nova

Holotype: Spain, Basque Country, Prov. Álava, Cordillera Cantábrica, 600 m n Izarra, 200 m nnw Fußballplatz [football field], 30 m W Schotterstraße [gravel road], lichter Eichenwald [bright oak forest], 615 m, 42°57'31"N 02°54'19"W, 23 May 2015, F.G. Dunkel-32789, MA; isotypes JACA, M, Du-32789. – Fig. 31, 32, 34.

Description — *Flowering shoot* gracile to slim (robust), 18–45(60) cm, stalk 0.8–1.6(3.0) mm in diameter, suberect to moderately divergent, angle between the main and secondary axis 10–45°, flowers 1–4(6), enrichment shoots 0–2; basal leaves 1–(5) per rosette.

Basal leaf cycle: Leaf edge crenated in the first and second leaf, irregularly and coarsely crenate-serrated in the following leaves.

First basal leaf 10–25 mm long, with narrow-angled to V-shaped base (10–90°), divided by main incision (80–95%), middle lobe spatulate to broadly deltoid with 5–9 crenated teeth; lateral segment undivided or first lateral incision amounts up to 72%.

Second basal leaf 14–28 mm long, with narrow-angled to V-shaped base (50–100°), divided by main incision (80–98%), middle lobe spatulate to deltoid with 5–9 crenated teeth; lateral segment undivided or first lateral incision amounts up to 70%, second lateral incision absent or up to 35%.

Third basal leaf 15–32 mm long, with narrow-angled to V-shaped base (20–100°), divided to dissected by main incision (90–100%), middle lobe deltoid, occasionally stalked up to 3 mm, trileft with incisions up to 40%, with 5–9 crenated teeth,

lateral edge concave; lateral segment cleft to divided by first lateral incision (40–80%), lobed to cleft by second lateral incision (26–55%), third lateral incision absent or up to 30%.

Fourth basal leaf 20–33 mm long, with narrow-angled to V-shaped base (10–100°), divided by dissected by the main incision (95–100%), middle lobe occasionally stalked up to 3 mm, narrowly to broadly deltoid, if broadly deltoid trilobed with incisions up to 50%, with 5–11, partly small, crenated teeth, lateral edge straight to concave; lateral segment cleft to divided by first lateral incision (55–80%), cleft by second lateral incision (35–60%), lobed to cleft by third lateral incision (26–50%), fourth lateral incision absent or up to 45%.

Fifth basal leaf 18–30 mm long, with narrow-angled to V-formed base (10–90°), divided by main incision (90–98%), middle lobe deltoid, often tricleft with incisions up to 40%, with (5)7–11 crenated teeth, lateral edge straight to slightly concave; lateral segment cleft to divided by first lateral incision (35–80%), cleft by second lateral incision (35–50%), third lateral incision absent or up to 40%.

Sixth basal leaf 18–34 mm long, with narrow-angled to V-shaped base (40–100°), divided by main incision (85–96%), middle lobe deltoid, often tricleft with incisions up to 40%, with 7–11(13), partly small, crenated teeth, lateral edge slightly concave; lateral segment lobed or cleft by first lateral incision (25–60%), second lateral incision absent or up to 32%.

Seventh basal leaf 18–28 mm long, with narrow- to wide-angled base (50–120°), cleft or divided by main incision (50–98%), middle lobe deltoid, occasionally tricleft with incisions up to 33%, with 7–11, partly small, long crenated teeth, lateral edge slightly concave to straight; lateral segment undivided or with first lateral incision up to 40%

Lowermost stem leaf divided into (7)9–11 segments, largest segment 20–45(60) mm long, 1.5–10 mm wide, linear to narrowly lanceolate or cuneate to narrowly deltoid, undivided or with 1–4 small patent, up to 9 mm long teeth.

Petals 0–3; *androclinium* 0.4–0.8 mm; *receptacle* ellipsoid 1.6–2.8 mm long, 0.8–1.5 mm wide, glabrous (or occasionally with some hairs), inverrallum absent to short (10–25%), carpelophores 0.2–0.8 mm long; *fruits* 1.8–3.0 mm long, beak 0.4–1.2 mm long, straight to involuted.

Pollen quality – bad to mediocre, 36.6%–53.3 %well developed (Luzuriaga, Du-37103-9, Izarra, Du-37106-1).

DNA-ploidy — 4x (Berberana, Du-37102; Amárita, Du-37008; Luzuriaga, Du-37103).

Distribution – Pays Basque, Prov. Álava (Amárita, Arzubiaga, Izarra, Luzuriago), and Castilla y León, Prov. Burgos: Sierra de la Demanda (Monterrubio), and Sierra de Sálvada (Monte Santiago).

Ecology — pastures (dehesas), bright oak forests with *Quercus*

pyrenaica, beech forests, 500–1200 m.

Eponymy — refers to *vasconicus*, Latin name for Pays Basque, the main distribution area of the species.

Vulnerability — threatened by eutrophication of oak forests, abandonment of meadows (JÁÑEZ & AGUT 2019).

Taxonomy — *R. vasconicus* is similar to other members of the *R. carlittensis* group. It differs from *R. carlittensis* in that it has more teeth on the leaf edge of the basal leaves, and from *R. sennenianus* in that it has narrower and less overlapping middle lobes. Overall, *R. vasconicus* is characterized by narrow or narrowly cuneate segments with long (acute) teeth of the lowermost cauline leaf. The seventh leaves often present different right and left main incisions resulting in a unique asymmetry of the blade. *R. vasconicus* is endemic to the Pays Basque where it preferentially grows in old and often remnant oak forests.

Specimens seen — Spain, Basque country, Cordillera Cantábrica, Prov. Álava: Izarra, en el robledal, May 1939, Losa, det. J. Grau sub *R. carlittensis*, rev. F.G. Dunkel Dec 2018 sub *R. vasconicus*, BCN-141129, M-0099623; ibidem: Izarra, 600 m n des Ortes, 200 m nnw Fußballplatz, 30 m w Schotterstraße, lichter Eichenwald, 615 m, 42°57′31.0″N 02°54′19.7″W, 23 May 2015, F.G. Dunkel, Du-23789 (isotypes); Izarra, Urkabuztaiz, al norte de las instalaciones de las piscinas del pueblo, robledal, bordes herbosos de pista agroforestal, 600 m, 42°57′32.0″N 02°54′14.6″W, 30 Apr 2019, J.A. Alejandre-30/19 & J.R. López Retamero, F.G. Dunkel, Du-37106; Amárita, en robledales bien conservados, 42°54′28″N 2°38′04″W (30TWN3051), 03 May 1980, J.A. Alejandre-628.80, J. Grau 1986 sub *R. carlittensis*, MA-268303; ibidem, 05 May 1981, J.A. Alejandre-517.81, F.G. Dunkel, MA-268305; Amárita, 1 km SSW Amárita, 50–100 m W der Mühle (Molino), Eichenwald (robledal), 515 m, 42°54′27″N 02°38′05″W, 21 May 2019, F.G. Dunkel-37008 & J.A. Alejandre, F.G. Dunkel, Du-37008; ibidem: Barrundia, Luzuriaga, 42°52′59″N 02°23′15″W, (30TWN5048), 27 Apr 1981, J.A. Alejandre-427.81, J. Grau 1986 sub *R. cf. carlittensis*, MA-268302; ibidem: Luzuriaga, 500 m o Luzuriaga, robledal, 585 m, 42°53′06″N 02°23′13″W, 21 May 2019, F.G. Dunkel-37103 & J.A. Alejandre, F.G. Dunkel, Du-37103; Arzubiaga, robledal bien conservado, 530 m, 42°52′59″N 02°37′52″W, (W30TWN3048), 24 Apr 1981, J.A. Alejandre-404.81, J. Grau 1986 sub *R. cf. valdesii*, MA-268304; Vizcaya, Ordoñana, robledal, 25 May 1988, Diaz, J.C. Diosdada & Pérez, det. N.N. sub *R. calcareus* BUTCHER, rev. F.G. Dunkel sub *R. vasconicus*, SEV-128351.

Castilla y León, Prov. Burgos, Sierra de Demanda: Monterrubio de Demanda, paraje de la Pradera, dehesa con *Quercus pyrenaica* y *Fagus sylvatica*, 1155–1160 m, 30TVM898649, 07 Jun 2011, J.A. Alejandre 144/11 & J.V. Ferrandes Palacio, det J.A. Alejandre 2011 sub *R. auricomus* L., rev. F.G. Dunkel Dec 2018 sub *R. vasconicus*, JACA-288479;

Sierra de Sálvada: Berberana, Monte Santiago, cerca la cueva de Las Paules, hayedos sobre la plataforma carstificada, 820 m, 30TWN0054, Apr 2002, J.A. Alejandre-609/02 & M.J. Escalante, F.G. Dunkel, Hb. Alejandre-609/02; ibidem: Berberana, Parque del Monumento Natural del Monte Santiago, cerca del merendero, hayedos sobre plataforma kárstica, zonas adhesadas del bosque, carbonatos, 840 m, 42°56′40.4″N 02°59′56.3″W, 27 May 2013, J.A. Alejandre-100/13 & M.J. Escalante, F.G. Dunkel, Du-37099;

ibidem: Berberana, Parque del Monumento Natural del Monte Santiago, N des Parkplatzen, unter Buchen, 1190 m, 42°56′40″N 02°59′56″W, 20 May 2019, F.G. Dunkel, Du-37098; ibidem: Berberana, Monte Santiago, cerca de la zona del merendero de Fuente Santiago, en la proximidad del tronco de algunas grandes hayas, hayedos sobre plataforma kárstica, 840 m, 42°56′38″N 03°00′04″W,

Fig. 29: Data sheet (basal leaf cycle, stem leaves, flowers, fruits, receptacle) of *Ranunculus sennenianus*. (Length of bars in figures of details = 2 mm)

Fig. 31: Data sheet (basal leaf cycle, stem leaves, flowers, fruits, receptacle) of *Ranunculus vasconicus*. (Length of bars in figures of details = 2 mm)

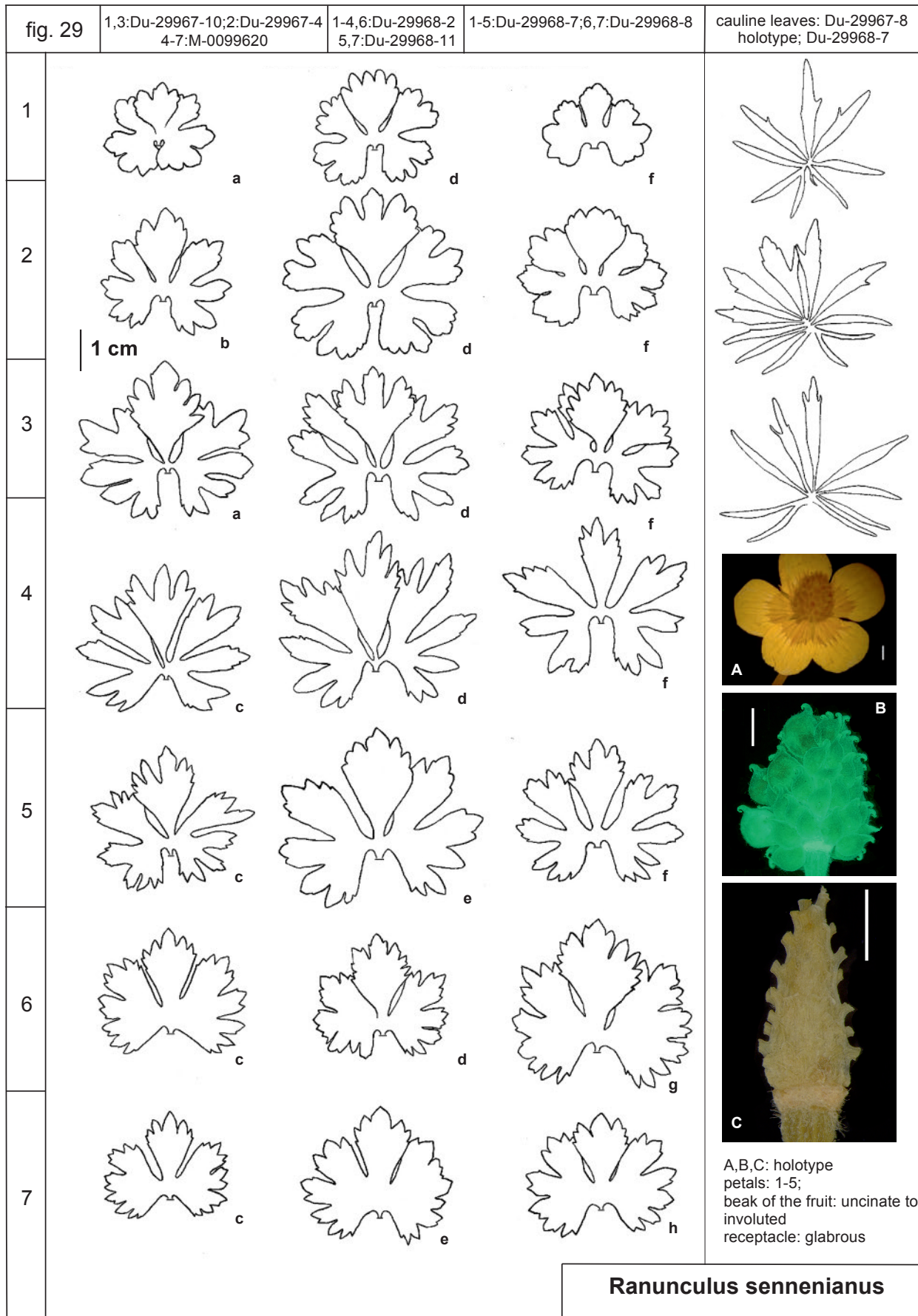




Fig. 30: Holotype of *Ranunculus sennenianus* (MA).

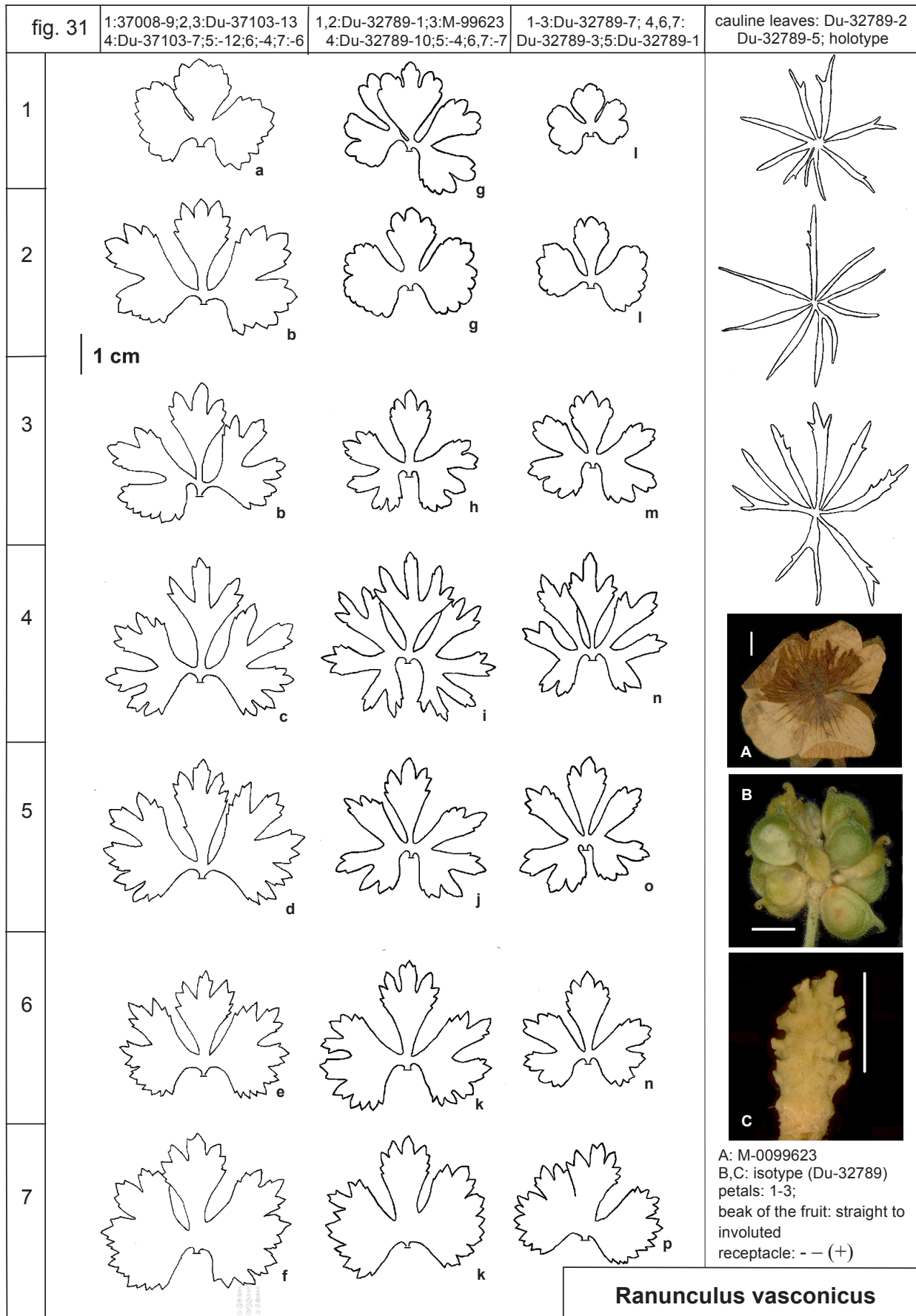




Fig. 32: Holotype of *Ranunculus vasconicus* (MA).

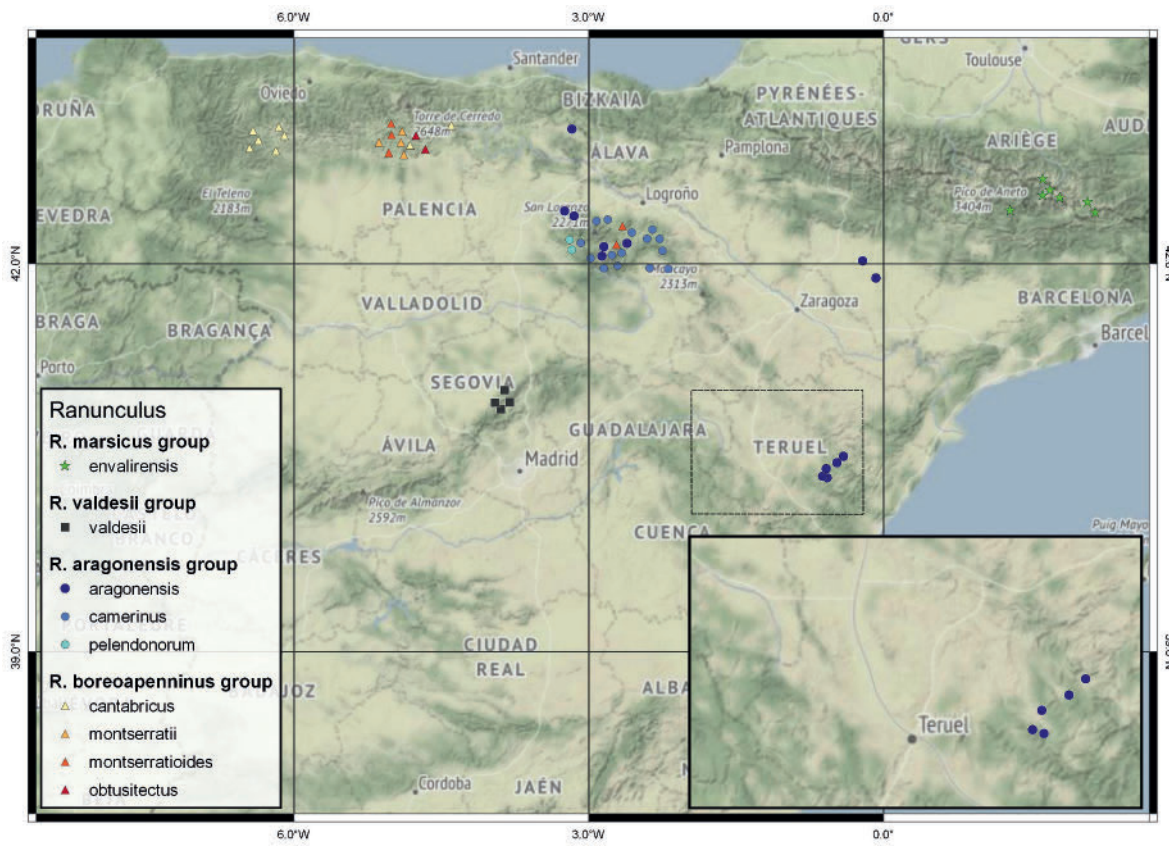


Fig. 33: Distribution map of *R. envalirensis*, *R. valdesii*, *R. aragonensis* group, and *R. boreoapenninus* group.

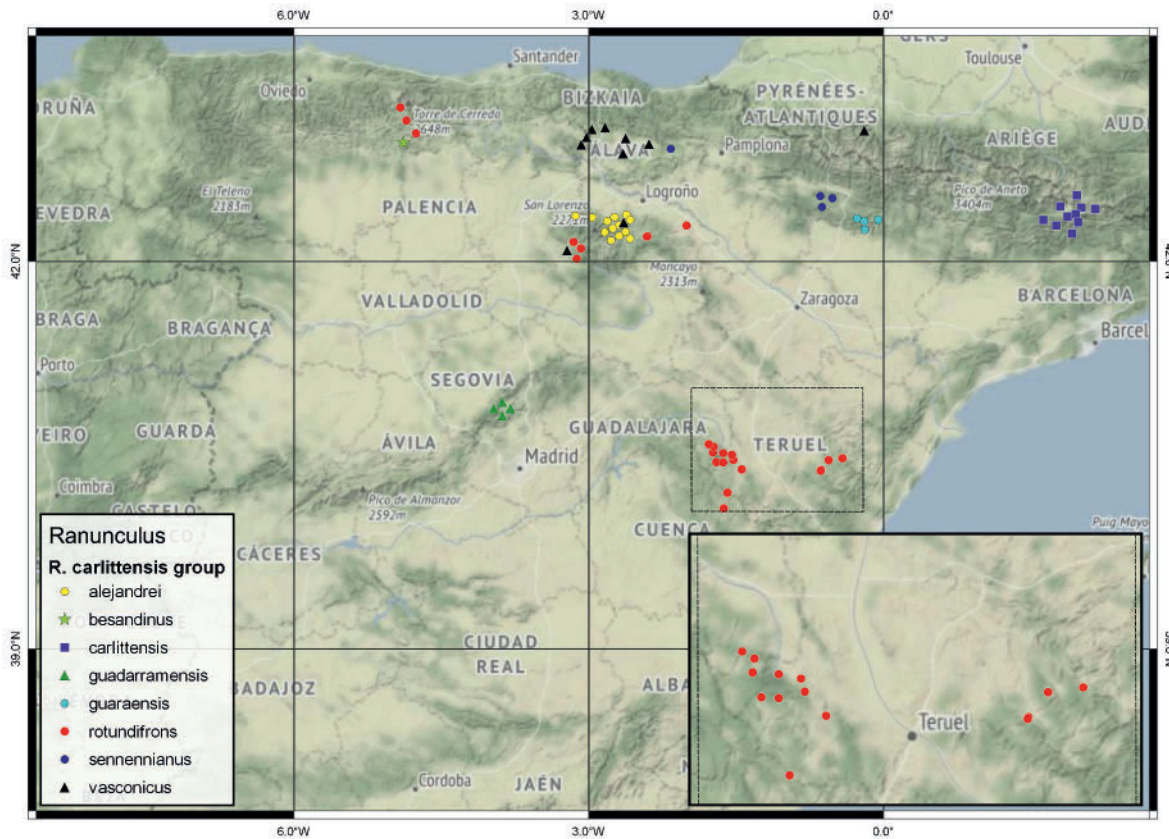


Fig. 34: Distribution map of *R. carlittensis* group.

4 DETERMINATION KEY FOR THE SPANISH SPECIES

- 1 petals 5, flowers always complete, fruits well developed, cauline leaves undivided, Pyrenees above 1500 m 3.1.1. *R. envalirensis*
- 1* petals (0)1–4, rarely 5, flowers at least partially incomplete, fruits only partially perfectly developed 2
- 2 all basal leaves with an aperture $\geq 120^\circ$ (rarely 100°), Puerto de Montevejeo 3.1.7 *R. montserratii*
- 2* basal leaves with an aperture $< 120^\circ$, occasionally single first and final leaves up to 120° 3
- 3 teeth of spring leaves conspicuously obtuse 4
- 3* teeth of spring leaves \pm acute, not obviously obtuse, leaf edge crenate-serrated, only the spring leaves sometimes with obtuse teeth 6
- 4 (with exception of first and final leaves,) blades overlapped, Sierra de la Peña 3.1.9 *R. obtusitectus*
- 4* at maximum two, rarely three blades of the basal leaves overlapped 5
- 5 main incision at maximum 92%, middle segments without petioles, only Sierra de Guadarrama 3.1.2 *R. valdesii*
- 5* spring leaves dissected by main incision (100%), middle segment petiolulated, scattered in Central and Northern Spain 3.1.15 *R. rotundifrons*
- 6 leaf cycle heterophyllous, spring and final leaves different, lateral segments of the spring leaves with at least two, only in *R. montserratii* one, lateral incision(s), the lateral segments of the final leaves undivided (*R. boreoapenninus* group) 7
- 6*(3) leaf cycle homophyllous, final and spring leaves similar 10
- 7 teeth of spring leaves elongated and obtuse, basal aperture $\geq 120^\circ$, only Puerto de Montevejeo. 3.1.7 *R. montserratii*
- 7* teeth of spring leaves obtusely rounded to crenate-serrated 8
- 8 final leaves with an aperture $130\text{--}180^\circ$, almost undivided 3.1.6 *R. cantabricus*
- 8* final leaves with an aperture $80\text{--}120^\circ$, main incision $40\text{--}90\%$ 9
- 9 spring leaves overlapped, up to 5 lateral incisions. (see 4) 3.1.9 *R. obtusitectus*
- 9* spring leaves not overlapped, up to 2 lateral incisions 3.1.8 *R. montserratioides*
- 10(6) middle segment of spring leaves with $>12(10)$ teeth, all leaves strongly divided, mostly with multiple laciniae, 5 segments of the lowermost cauline leaf with lateral teeth (*R. aragonensis* group) 11
- 10* middle segment of spring leaves with <10 teeth, (0)1–3 segments of the lowermost cauline leaf with small lateral teeth (occasionally in *R. vasconicus* 5 segments) (*R. carlittensis* group) 13
- 11 2–4 basal leaves with closed aperture ($-20\text{--}10^\circ$), mainly Aragón 3.1.3 *R. aragonensis*
- 11* 0, rarely 1, basal leaf with closed aperture 12
- 12 lateral segment of the first and final leaves undivided, leaf edge irregular, with crenated teeth, Sierra de Cameros 3.1.4 *R. camerinus*
- 12* lateral segment of the first and final leaves with 1–3 lateral segment, leaf edge with multiple laciniae and elongated teeth, Sierra de la Demanda. 3.1.5 *R. pelendonorum*
- 13 at least one basal spring leaf with closed aperture or overlapping blade, only Sierra da Guadarrama (often together with *R. valdesii*) 3.1.13 *R. guadarramensis*
- 13* basal leaves with open aperture, blade not overlapped 14
- 14 at least one spring leaf dissected and with petiolated middle segment, rarely 1–2 basal leaf pedately divided (in *R. carlittensis*, *alejandrei*) 15
- 14* main incision up to 90%, not dissected, basal leaves pedately divided, Sierra de Guara 3.1.14 *R. guaraensis*
- 15 middle segments of spring leaves with 3–5(6) teeth 16
- 15* middle segments of spring leaves with (6)7–9(11) teeth 18
- 16 lateral segments of the initial and seventh leaves undivided or at most with first lateral incision, Pyrenees 3.1.12 *R. carlittensis*
- 16* lateral segments of the initial and seventh basal leaf with two, rarely only with one lateral incision 17
- 17 in meadows, petals 2–5, Besande (Boco de Huérgano, León) 3.1.11 *R. besandinus*
- 17* in (beech) forests, petals 0–1, Sierra de la Camero Nuevo 3.1.10 *R. alejandrei*
- 18(15) basal leaves often overlapping (at least 3 leaves), angle of main incision $0\text{--}10^\circ$, flowers rather often complete (= petals 5), Pyrenees 3.1.16 *R. sennenianus*
- 18* occasionally 1 or 2 basal leaves overlapping, angle of main incision $>10^\circ$, petals 0–3, Pays basque . . . 3.1.17 *R. vasconicus*

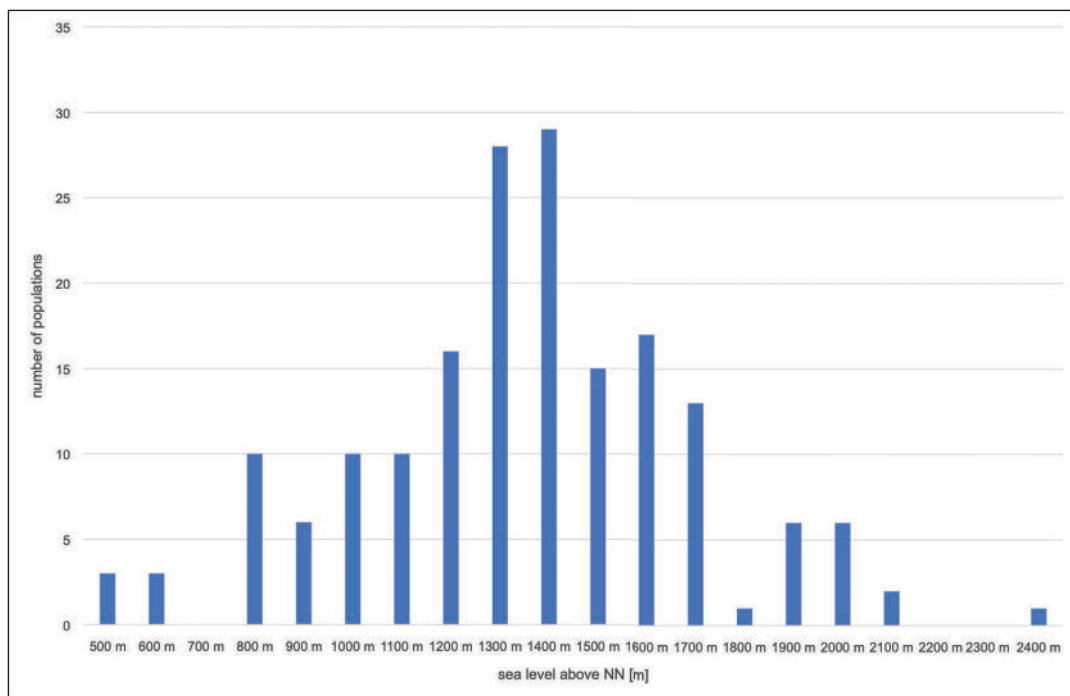


Fig. 35: Altitudinal distribution of the taxa of the *R. auricomus* complex in Spain.

03 Jun 2013, J.A. Alejandro-100/13 & M.J. Escalante, F.G. Dunkel, Du-37102; ibidem, 30TWN0008354658, 27 May 2013, J.A. Alejandro-100/13 & M.J. Escalante, F.G. Dunkel, Hb. Alejandro-100/13; ibidem: Berberana, Monte Santiago, hayedos sobre plataforma kárstica, escaso y localizado en zonas adhesionadas, junto a la base de hayas, carbonatos, 844 m, 42°56'39.7"N 03°00'00.6"W, 27 May 2013, J.A. Alejandro-95/13 & M.J. Escalante, F.G. Dunkel, Du-37110, Hb. Alejandro-95/13; ibidem: Berberana, Monte Santiago, sobre plataforma kárstica, cerca de la zona del merendero de Fuente Santiago, localizadas poblaciones en la proximidad del tronco de algunas grandes hayas, 845 m, 30TVN999546, 03 Jun 2013, J.A. Alejandro-122/13, F.G. Dunkel, Hb. Alejandro-122/13; ibidem: Berberana, Parque del Monumento Natural del Monte Santiago, sobre plataforma kárstica, hayedos, con algunos asomos rocosos, carbonatos, 854 m, 30TVN0021454634, 26 May 2013, J.A. Alejandro-88/13 & M.J. Escalante et al., F.G. Dunkel, Hb. Alejandro-88/13; ibidem: Berberana, Monte Santiago, sobre plataforma kárstica, hayedos, escaso y localizado en zonas adhesionadas, junto a la base de hayas, carbonatos, 845 m, 30TVN9994954621, 26 May 2013, J.A. Alejandro-94/13, M.J. Escalante & al., F.G. Dunkel, Hb. Alejandro-94/13; ibidem: Berberana, a la base de hayas, carbonata, 844 m, 30TVN0004154623, 27 May 2013, J.A. Alejandro-97/13 & M.J. Escalante, F.G. Dunkel, Hb. Alejandro-97/13; Probably belonging to *R. vasconicus*, material not sufficient for a secure determination:

Prov. Burgos, Sierra Salvada, Junta de Villalaba de Losa, de La Lober hacia el Hondón del Hayal, hayedos sobre plataforma kárstica, 920 m, 30TVN8662, 29 Apr 2002, J.A. Alejandro-4763/02, F.G. Dunkel, Hb. Alejandro-4763/02, Du-37169; ibidem, 29 Apr 2002, J.A. Alejandro-764/02 & M.J. Escalante, F.G. Dunkel, Hb. Alejandro-764/02.

5 ALTITUDINAL DISTRIBUTION OF THE *RANUNCULUS AURICOMUS* COMPLEX IN SPAIN

A rough demonstration of the altitudinal distribution of the Spanish *R. auricomus* populations presents a vertical range from 500 to 2450 m. Solely, *R. vasconicus* grows in oak forests below

800 m on the one hand, and on the other hand only *R. carlittensis* and *R. envalirensis* reaches a sea level of 2000 meters. The majority of the populations grows in meadows at a highly mountainous to subalpine level from 1200 m to 1700 m, most of them from 1250 to 1450 m (Fig. 35).

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7 REFERENCES

- ALEJANDRE SAÉNZ J.A., GARCÍA LOPEZ J.M. & MATEO SANZ G. (Editores científicos:) (2009): Atlas de la flora vascular silvestre de Burgos. Monografías de Botánica Ibérica, n° 2, 925 pp. — Jaca (Huesca).
- BORCHERS-KOLB E. (1983): *Ranunculus sect. Auricomus* in Bayern und den angrenzenden Gebieten. I. Allgemeiner Teil. — Mitt. Bot. Staatssamml. München 19: 36–429.
- BORCHERS-KOLB E. (1985): *Ranunculus sect. Auricomus* in Bayern und

- den angrenzenden Gebieten. II. Spezieller Teil. — Mitt Bot. Staatssamml. München **21**: 49–300.
- DOLÉŽEL J., GREILHUBER J., LUCRETTI S., MEISTER A., LYSÁK M.A., NARDI L. & al. (1998): Plant genome size estimation by flow cytometry: Inter-laboratory comparison. — *Ann. Bot.* **82** (Suppl. A): 17–26.
- DOLÉŽEL J., GREILHUBER J., SUDA J. (2007): Estimation of nuclear DNA content in plants using flow cytometry. — *Nat. Protoc.* **2**: 2233–2244.
- DUNKEL F.G. (2005): Der *Ranunculus auricomus*-Komplex in Südtirol—Artenpektrum, Verbreitung und Gefährdung. — *Gredleriana* **5**: 85–102.
- DUNKEL F.G. (2010): The *Ranunculus auricomus* complex in Northern Italy. — *Webbia* **65**: 179–227.
- DUNKEL F.G. (2011): The *Ranunculus auricomus* L. complex (Ranunculaceae) in Central and Southern Italy with additions for the north. — *Webbia* **66**: 165–193.
- DUNKEL F.G. (2014): Le complexe de *Ranunculus auricomus* (Ranunculaceae) en Alsace. — *J. Bot. Soc. Bot. France* **66**: 3–53.
- DUNKEL F.G. (2015): *Ranunculus pindicola* sp. nov., the only species of the *R. auricomus* complex (Ranunculaceae) in Greece. — *Willdenowia* **45**: 223–230.
- DUNKEL F.G. (2019): The *Ranunculus auricomus* L. complex (Ranunculaceae) in Slovenia. — *Staphia* **111**: 33–91.
- DUNKEL F.G., GREGOR T. & PAULE J. (2018): New diploid species in the *Ranunculus auricomus* complex (Ranunculaceae) from W and SE Europe. — *Willdenowia* **48**(2): 227–257. <https://doi.org/10.3372/wi.48.48205>.
- Ericsson S. 1992: The microspecies of the *Ranunculus auricomus* complex treated at the species level. — *Ann. Bot. Fennici* **29**: 123–158.
- Ericsson S. 2001: Microspecies within the *Ranunculus auricomus* complex. In: Jonsell B. (ed.), *Flora Nordica*. **2**: 382–397. — Stockholm: The Swedish Museum of Natural History.
- FABREGAT LLUECA C., LÓPEZ UDÍAS S. & PÉREZ ROVIRA P. (2008): Aportaciones a la Flora del Macizo de Penyagolosa (Castellón), II. — *Toll Negre* **10**: 71–73.
- GARCÍA CARDO O. & SÁNCHEZ MELGAR I. (2007): Aportaciones a la Flora de la Provincia de Cuenca, II. — *Flora Montiberica* **35**: 3–16.
- GRAU J. (1984): Preliminary review of the Iberian Representatives of *Ranunculus* sect. *Auricomus*. — *Mitt. Bot. Staatssamml. München* **20**: 1–28.
- HOJSGAARD D. & HÖRANDL E. (2019): The Rise of Apomixis in Natural Plant Populations. — *Front Plant. Sci.* **10**: 358. doi: 10.3389/fpls.2019.00358.
- HÖRANDL E., DOBEŠ C., LAMBROU M. (1997): Chromosomen- und Pollenuntersuchungen an österreichischen Arten des apomiktischen *Ranunculus auricomus*-Komplexes. — *Bot. Helvet.* **107**: 195–209.
- HÖRANDL E. & GREILHUBER J. (2002): Diploid and autotetraploid sexuals and their relationships to apomicts in the *Ranunculus cassubicus* group: insights from DNA content and isozyme variation. — *Plant Systematics and Evolution* **234**: 85–100.
- HÖRANDL E. & GUTERMANN W. (1998): Der *Ranunculus auricomus*-Komplex in Österreich. 1. Methodik; Gruppierung der mitteleuropäischen Sippen. — *Bot. Jahrb. Syst.* **120**: 1–44.
- JALAS J. & SUOMINEN J. 1989: Atlas Florae Europaea, Distribution of Vascular Plants in Europe. **8**. *Nymphaceae* to *Ranunculaceae* — Helsinki: The Committee for Mapping the Flora of Europe & Societas Biologica Fennica Vanamo.
- JANEZ A. & AGUT A (2019): Nuevos datos sobre la flora amenazada de la Zona Especial de Conservación Río Zadorra / Zadorra Ibaia (Vitoria-Gasteiz). — *Munibe, Cienc. nat.* **67**. <https://doi.org/10.21630/mcn.201967.05>.
- JULIN E. (1965): Der Formenkreis des *Ranunculus auricomus* L. in Schweden 2. — *Ark. Bot.* **2** Ser. **6**: 29–108.
- JULIN E. (1980): *Ranunculus auricomus* L. in Södermanland, East-Central Sweden. — *Opera botanica* **57** 1–145. Stockholm.
- KARBSTEIN, K., TOMASELLO, S., HODAČ, L., DUNKEL, F. G., DAUBERT, M., & HÖRANDL, E. (2020): Phylogenomics supported by geometric morphometrics reveals delimitation of sexual species within the polyploid apomictic *Ranunculus auricomus* complex (Ranunculaceae). — *BioRxiv*. <https://doi.org/10.1101/2020.01.07.896902>.
- MARKLUND G. (1961): Der *Ranunculus auricomus*-Komplex in Finnland. I. Diagnosen und Fundortslisten einiger Sippen des *R. auricomus* coll. (s. str.). — *Fl. Fenn.* **3**.
- MARKLUND G. (1965): Der *Ranunculus auricomus*-Komplex in Finnland. II. Diagnosen und Fundortslisten einiger Sippen von *R. fallax* (W. & Gr.) Schur, *R. monophyllus* Ovcz. und *R. cassubicus* L. — *Fl. Fenn.* **4**.
- MATEO SANZ G., FABREGAT LLUECA C., LÓPEZ UDÍAS S. & MERCADAL FERRERUELA N.-E. (1995) Contribuciones a la Flora del Sistema Ibérico, VII. — *An. Biol. Fac. Biol. Univ. Murcia* **20**: 101–110.
- MATEO SANZ G. & PISCO GARCÍA J.M. (1997): Contribuciones a la Flora del Sistema Ibérico, XII. — *Flora Montiberica* **5**: 47–49.
- MATEO SANZ G., MAYORAL GARCÍA-BERLANGA O. & GÓMEZ-SERRANO M.A. (2004): Nuevos datos sobre la Flora de la Provincia de Cuenca, XXI. — *Flora Montiberica* **27**: 42–46.
- MONTERRAT I MARTÍ, JOSEP MA (1986): Flora y vegetación de la Sierra de Guara: Prepirineo aragonés. — Diputación General de Aragón, Departamento de Agricultura, Ganadería y Montes.
- OTTO F. 1990: DAPI staining of fixed cells for high-resolution flow cytometry of nuclear DNA. In: Crissman H.A., Darzynkiewicz Z. (Eds.) *Methods in Cell Biology*. Vol. **33**. — Academic Press, New York, pp. 105–110.
- PAULE J., DUNKEL F.G., SCHMIDT M. & GREGOR T. (2018): Climatic differentiation in polyploid apomictic *Ranunculus auricomus* complex in Europe. — *BMC Ecol* **18**:16, 1–12. <https://doi.org/10.1186/s12898-018-0172-1>.
- PIGNATTI, S. (1976): Note critiche sulla Flora d'Italia. IV. Il gruppo di *Ranunculus auricomus* L. in Italia e sulle montagne adiacenti della Slovenia. — *Giorn. Bot. Ital.* **110**: 203–217.
- SÁEZ L., MOLERO J., CARILLO E, NINOT J.M., GUARDIOLA M., GUARDIA VALLE L, MACÍAS C. & AYMERICH P. (2008): Nove contribuciones al conocimiento de la flora vascular del massís de Boumort (Prepirineus ibèrics, NE de la península Ibèrica). — *Orsis* **23**: 137–162.
- SEGURA ZUBIZARRETA A. & MATEO SANZ G. (1995): De Flora Soriana y otras notas botánicas, IV. — *Stud. bot. (Salamanca)* **14**: 191–200.
- SENNEN, F. (1926–1929): Plantes d'Espagnes. — *Bulletin de la Sociedad Ibérica de Ciencias naturales Zaragoza* **25**: 52–65, 107–122, 134–149, 206–221; **26**: 76–91, 114–129, 183–198; **27**: 30–45, 61–76, 133–148, 173–188, 205–220; **28**: 29–44, 62–77, 105–120, 168–183.
- TAMURA M. (1995): In: HIEPKO P. (ed.), ENGLER A. & PRANTL K.: Die natürlichen Pflanzenfamilien. Angiospermae: Ordnung Ranunculales Fam. Ranunculaceae. Band **17** a IV. Systematic Part: 223–519. — Dunker & Humblot, Berlin.
- THIERS B. (2020+): [continuously updated]: Index herbariorum: A global directory of public herbaria and associated staff. New York Botanical Garden's virtual herbarium. — Published at <http://sweetgum.nybg.org/science/ih/> (link is external) [accessed 1 Jul 2020].
- VALDES-BERMEJO F. & LOPEZ G. (1977) Aportaciones a la Flora Española. *Anal. Inst. Bot Cavanilles* **34**(1): 158.
- VIGO J. (1968): La vegetació delmassís de Penyagolosa. — *Inst. Estud. Catalns, Arx. Secc. Cien.* **37**: 1–246.
- WANG W. & GILBERT M.G. (2001): *Ranunculus*. — In: WU Z. & RAVEN P. (eds.): *Flora of China, Caryophyllaceae through Lardizabalaceae*, Vol. **6**. — Science Press, Beijing and Missouri Botanical Garden Press, St. Louis.

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Autor(en)/Author(s): Dunkel Franz-G.

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