The *Ranunculus auricomus* L. complex (Ranunculaceae) in Slovenia

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Abstract: In this article, 25 species of the *Ranunculus auricomus* complex of Slovenia are presented. New indications for Slovenia include *R. allemannii* BRAUN-BLANQ., *R. braun-blanquetii* PIGNATTI, *R. nemorosifolius* HÖRANDL & GUTERMANN, *R. gortanii* PIGNATTI, *R. plavensis* DUNKEL, *R. notabilis* HÖRANDL & GUTERMANN and *R. variabilis* HÖRANDL & GUTERMANN. Diploid sexual species of Slovenia were described recently (DUNKEL & al. 2018); two diploid taxa are added here: *R. glechomus* DUNKEL and *R. vinicae* DUNKEL. Those being described and illustrated for the first time are *R. metlikaensis* (triploid), *R. poldinoides*, *R. arcogoticus*, *R. finodivisus*, *R. perfissus*, *R. labacensis*, *R. lubljanicae* and *R. lanceolifer*. The taxonomy and vulnerability of the above-mentioned are discussed.

Zusammenfassung: In einer vorläufigen Übersicht des *Ranunculus auricomus*-Komplexes in Slowenien werden 25 Arten vorgestellt. Neu für Slowenien sind Nachweise von *R. allemannii* BRAUN-BLANQ., *R. braun-blanquetii* PIGNATTI, *R. nemorosifolius* HÖRANDL & GUTERMANN, *R. gortanii* PIGNATTI, *R. plavensis* DUNKEL, *R. notabilis* HÖRANDL & GUTERMANN und *R. variabilis* HÖRANDL & GUTERMANN. Diploide sexuelle Arten aus Slowenien wurden kürzlich beschrieben (DUNKEL & al. 2018) und hier um *R. glechomus* DUNKEL sp. nov. und *R. vinicae* DUNKEL sp. nov. ergänzt. Neu beschrieben und abgebildet werden *R. metlikaensis* (triploid), *R. poldinoides*, *R. arcogoticus*, *R. finodivisus*, *R. perfissus*, *R. labacensis*, *R. lubljanicae* und *R. lanceolifer*. Ihre Taxonomie und Gefährdung wird diskutiert.

Key words: *Ranunculus auricomus, Ranunculus cassubicus,* Slovenia, new species, taxonomy.

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1 INTRODUCTION

The species spectrum of a country reflects the regional biodiversity and has gained increasing interest (STUESSY & al. 2011, CARDINALE & al. 2012). The group of the ferns and spermatophytes have been well investigated in most of the European countries. Since the first reports on apomixis in the *Ranunculus auricomus* complex by ROZANOWA (1932), there have been many investigations into the species spectrum in several European countries (e.g., BORCHERS-KOLB 1983, 1985; HÖRANDL & GUTERMANN, 1998a, 1998 b, 1998c, 1999; KOCH 1933, 1939; JULIN 1965, 1980, MARKLUND 1961, 1965).

As early as 2001 NEJC JOGAN edited "Materials for the Atlas of Flora of Slovenia." Some of the taxonomically difficult apomictic groups are even dealt with, and some distribution maps are included (22 species of the *Rubus fruticosus* aggregate, 21 of the genus *Alchemilla*, 52 species of *Hieracium* s.l.). Distribution maps of three species of the *Ranunculus auricomus* complex were also presented: *R. aesontinus* PIGNATTI, *R. pospichalii* PIGNATTI, and *R. wraberi* PIGNATTI (PIGNATTI 1976). *R. aesontinus* was recently regarded as conspecific with *R. gortanii* (DUNKEL 2010). While the spectrum of the *R. auricomus* complex of the neighbouring countries (Austria and Italy) is rather well known (HÖRANDL & GUTERMANN 1998a, 1998b, 1998c, 1999, DUNKEL

2005, 2007, 2010, 2011), there has been no newer information available for Slovenia. In Southern Burgenland, E. Hörandl detected *R. notabilis*, a diploid and sexual species (HÖRANDL & al. 1998c). It was investigated by different methods, and it was hypothesized that it was a possible predecessor of the widespread tetraploid and apomictic species with divided basal leaf blades in Central Europe (HÖRANDL & al. 2000). How-ever, recently, the author detected a rather wide spectrum of diploid and sexual taxa in Slovenia (DUNKEL & al. 2018, PAULE & al. 2018). In the current article, two further diploid species are added. Slovenia presents an area with an extraordinary high percentage of diploid sexual species and individuals: The evolutionary origin of the complex might be situated here. In this context, the observation of an isolated triploid population (see 3.2.3 *R. metlikaensis* DUNKEL sp. nov.) is interesting and could help elucidate the step from amphimixis to apomixis (HÖRANDL & TEMSCH 2009, PELLINO & al. 2013, HODAČ & al. 2014, HOJSGAARD & al. 2014, HOJSGAARD & HÖRANDL 2019).

The investigation of an apomictic complex of a whole country will never be totally completed, but the data presented may give a provisional overview and should stimulate further investigations.

According to the data supplied by the world bank, 62% of the Slovenian surface is covered by forests. However, meadows also play an important role in the the picturesque Slowenian landscape. All species of the *Ranunculus phragmiteti* and *R. indecorus* group are coloniser exclusively of grassland. Since the individual plants possess fewer basal leaves and are more cumbersome to collect, the material is often insufficient for a secure determination or new desciption, and these species are underrepresented in public or private herbaria. In Slovenia, at least seven taxa of the *R. phragmiteti* and *R. indecorus* group do occur; six of them are new to science. On the other hand, these habitats of poor-nutrient meadows are extremely endangered either by drainage and eutrophicication or by abandonment of husbandry. For instance, in Switzerland, *R. indecorus*, the name-giving species of the group, disappeared completely without any notice of the responsible agency for nature conservation (KOCH 1939). In Slowenia, within ten years, most of the extremely poor-nutrient meadows changed into mesotrophic grassland with a temporary optimal growth for *Ranunculus auricomus* species. However, it is not difficult to predict that in a few years, these meadows will change into eutrophic grassland without any *Ranunculus auricomus* s.l. or, even worse, as already observed, they will be transformed into corn fields.

Therefore, altogether, the *R. auricomus* complex is not only a worthwhile scientific object of taxonomy but an accurate indicator for the deterioration of habitats and the destruction of the environment. Accordingly, the species of the *Ranunculus auricomus* complex require and deserve consequent protection.

2 MATERIAL AND METHODS

The material collected in Slovenia during 15 excursions (of several days' duration) starting in 2005 was studied. The results concerning diploid sexual taxa have been previously published (DUNKEL & al. 2018).

Additionally, specimens from the following herbaria could be examined: Berlin (B), Dresden (DR), Göttingen (GOE), Ljubljana (LJU), Meise (BR), Munich (M), Trieste (TSB), Zurich (Z, ZT), and the private herbaria of F.G. Dunkel (Du) and J.M. Kocjan. Used abbreviations are added in brackets (THIERS 2017).

In the text, the following abbreviations are used: Hb. = herbarium, s.n. = sine numero, vs. = versus.

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

All data sheets (Fig. 5, 7, 9, 12, 14, 16, 19, 23, 25, 27, 29, 31, 33, 35, 36) 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 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. In all diploid (and sexual) species, the flowers consist of five (rarely 6–7) well developed petals. 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 (HÖRANDEL & GUTERMANN 1998a, DUNKEL 2005, 2010, 2014), a description can be omitted. In the following text, it is absolutely necessary to be familiar 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) (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 LJU; 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 Slovenian origin (Fig. 2–4, 6, 8, 10, 11, 13, 15, 17, 18, 20–22, 24, 26, 28, 30, 32, 34, 37).

The geographical reference was given by coordinates or defined grid fields in the form of quadrants of topographic maps. A quadrant encompasses a latitude of 3' and a longitude of 5' and refers to the number of the official topographic maps of Germany with extrapolation to adjacent countries. For floristic purposes, this reference system is widely used in Central Europe (e.g., JOGAN 2001).

Fresh leaves from cultivated plants of some of the newly described species were used for flow cytometric ploidy estimation 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).

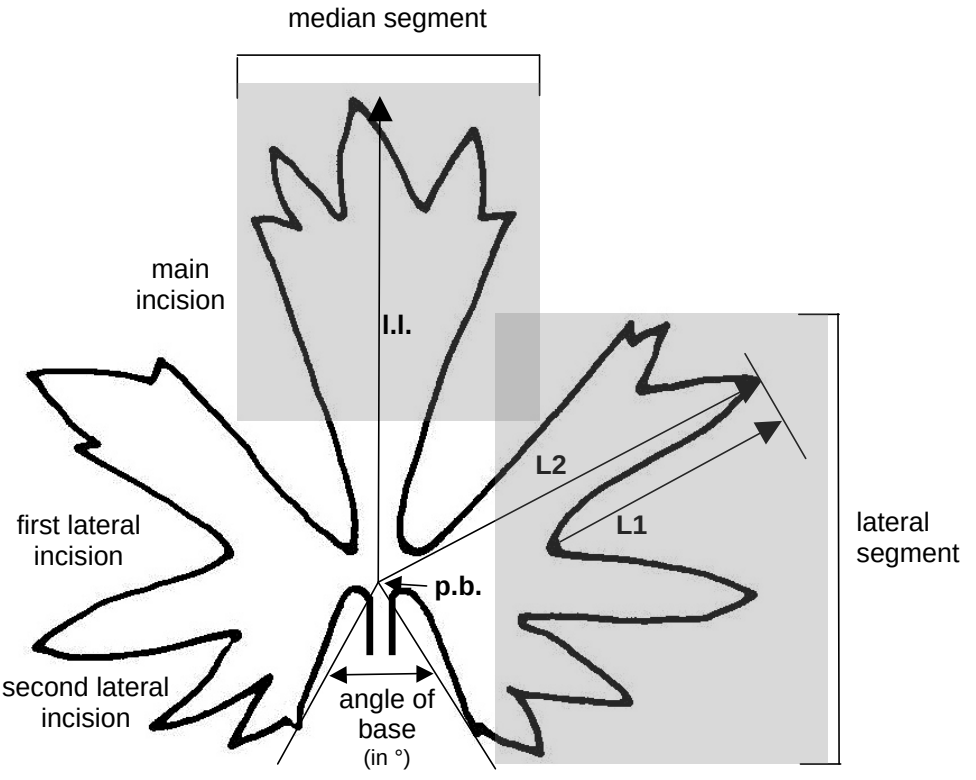


Fig. 1: Basal leaf of *Ranunculus auricomus* s.l. — A simplified diagram illustrating the most important characteristics. L.l. indicates the length of a leaf; the quotient L1/L2 the grade of incision in percent. The basal point (p.b.) is defined by junction of the main leaf veins. The angle of the base is measured from the basal point.

3 PROSPECT OF THE SPECIES

The genus *Ranunculus* and especially the *Ranunculus auricomus* complex still lacks a generally accepted subgeneric classification (TAMURA 1995). Much information on the genus *Ranunculus* has been gained (PAUN & al. 2005, HÖRANDL & al., 2005, 2009, EMADZADE & al. 2010, HÖRANDL & EMADZADE 2012); however, little is known about phylogenetic relationships and the evolution of the microspecies of the *Ranunculus auricomus* complex. Although a uniform procedure in all apomictic complexes is desirable, the *Ranunculus auricomus* complex is still classified by means of informal groups (BORCHERS-KOLB 1983, 1985; HÖRANDL & GUTERMANN 1998a, DUNKEL 2014). In some cases, the grouping is still speculative and based only on morphological criteria. Does *R. pospichalii* belong to the *R. schilleri* group or is it more related to the subalpine *R. degenii* KÜMMERLE & JÁV. with a similar basal leaf cycle? *R. notabilis* represented the only known diploid and sexual species of the *Ranunculus auricomus* collective group. It was attributed to the *R. phragmiteti* group for morphological reasons by HÖRANDL & GUTERMANN (1998a). Since then, seven diploid und mostly proven sexual species have been detected in Slovenia. Despite great morphological differences, these are summarized in their own group here (*R. notabilis* group) (DUNKEL & al. 2018a).

3.1 *Ranunculus cassubicus* collective group
- 3.1.1 *Ranunculus cassubicifolius*
- 3.1.2 *Ranunculus braun-blanquetii*
- 3.1.3 *Ranunculus allemannii*

3.2 *Ranunculus auricomus* collective group

3.2.a *Ranunculus pilisiensis* group
- 3.2.1 *Ranunculus wraberi*

3.2.b *Ranunculus megacarpus* group
- *3.2.2 Ranunculus nemorosifolius*
- *3.2.3 Ranunculus metlikaensis*

3.2.c *Ranunculus argoviensis* group
- 3.2.4 *Ranunculus poldinii*
- 3.2.5 *Ranunculus poldinioides*

3.2.d *Ranunculus notabilis* group
- 3.2.6 *Ranunculus austroslovenicus*
- 3.2.7 *Ranunculus vinicae*
- 3.2.8 *Ranunculus glechomus*
- 3.2.9 *Ranunculus mediocompositus*
- 3.2.10 *Ranunculus subcarniolicus*
- 3.2.11 *Ranunculus notabilis*
- 3.2.12 *Ranunculus peracris*

3.2.e *Ranunculus schilleri* group

3.2.13 *Ranunculus pospichalii*

3.2.f *Ranunculus palaeoeuganeus* group

3.2.14 *Ranunculus gortanii*
3.2.15 *Ranunculus plavensis*

3.2.g *Ranunculus phragmiteti* group

3.2.16 *Ranunculus arcogoticus*
3.2.17 *Ranunculus finodivisus*
3.2.18 *Ranunculus perfissus*

3.2.h *Ranunculus indecorus* group

3.2.19 *Ranunculus variabilis*
3.2.20 *Ranunculus labacensis*
3.2.21 *Ranunculus lubljanicae*
3.2.22 *Ranunculus lanceolifer*

3.1 *Ranunculus cassubicus* collective group

3.1.1 *Ranunculus cassubicifolius* W. KOCH

Ber. Schweizer Bot. Gesellschaft 49: 553, 1939. – L e c t o t y p e : Switzerland, Kt. Solothurn: „Wald östlich Erlenmoos SE Recherswil längs eines Baches am Waldrand, ca. 465 m“, 3.5.1938, leg. W. Koch 38/56, ZT. – Fig. 2, 38.

Pollen quality — 99% well developed (Torlano, Du-15980; DUNKEL 2010).

DNA-Ploidy — 2x (Kamniška Bistrica, Du-32741; Žiri, Sovra, Du-28667; PAULE & al. 2018).

Chromosome number — 2n = 16 (HÄFLINGER 1943).

Distribution — Swiss Jura, northern Prealps and Foreland of Germany and Austria, eastwards reaching Hungary and Croatia (unpublished), Carnic Alps of Italy and adjacent Slovenia, Kamnik-Savinja Alps, Slovenian Prealps.

Ecology — along brooks and streams, in riparian forests, of the plain and mountainous level, 250–520 m.

Etymology — great undivided basal leaves remind to *R. cassubicus* L.

Vulnerability — rare, but not threatened.

Taxonomy — The populations of Slovenia are rather uniform. Complete flowers with 5–6(7) petals at all sites of occurrence and a DNA content indicating diploidy (at two measurements) argue for a sexual diploid species like *R. cassubicifolius*. There are no other plants of this robust habit and size in Slovenia. Therefore, indications for *R. cassubicus* in the literature are attributed to this species (ČUŠIN & DAKSDOBLER 2006).

Specimens seen — Slovenia, Predalpsko Območje, Oberkrain, Steiner Alpen: **9652.4**: Kamnik, im Tal der Kamniška Bistrica, unterhalb der Velika planina, 22 Apr 1968, M. Bäßler & I. Quasdorf, B-100348746; ibidem, Kamnik (Stein), Tal der Kamniška Bistrica, W Seilbahn zum Šimnovec, direkt N der Brücke über den Fluss, Bachauenwald, 510 m, 46°18’12’’N 14°36’28’’E, 17 May 2012, F.G. Dunkel, Du-28860; ibidem, 26 Apr 2015, F.G. Dunkel & S. Wittwer, Du-32741; Alpsko Območje: **9747.3**: Kobarid (Caporetto), Valli del Natisone, Caporetto, Robič, 265 m, 07 Apr 1968, E. Feoli, det. S. Pignatti 21 Oct 1974 sub *Ranunculus cassubicus* L., TSB-2546; ibidem, 04 Jun 1972, L. Chiapella Feoli & E. Feoli, TSB-2546; ibidem, Caporetto: Robič, in silvis solo calcareo, cum *Anemone ranunculoides*, 250 m, 25 Apr 1980, L. Chiapella Feoli, G-00303315 (Société pour l´échange des plantes vasculaires de l´Europe et du Bassin méditerranéen no. 10198); ibidem, B-100348805; ibidem, Robič, Valli del Natisone, am südlichen Ortseingang, Straßengraben östlich der Natinalstraße 10-10, Graben und angrenzender Laubwald, 230–250 m, 30 Apr 2005, F.G. Dunkel, Du-12489; ibidem, 1 May 2007, F.G. Dunkel, Du-19676; Predalpsko Območje, Gorenjska (Oberkrain): **9751.2**: Ovsiše, 500 m južno ob reki Savi = 500 m S Ovsiše, am rechten Ufer der Save [entlang dem Fluss Sava], sipina ob reki Savi [Düne entlang dem Fluss Sava], 380 m, 09 Apr 2002, A. Šubic, LJU-10046605; ibidem, Ovsiše, 46°17’09’’N 14°15’49’’E, 24 Apr 2012, F.G. Dunkel, Du-28673; **9950.4**: Žiri, in silvis vallis rivuli Žirovnica supra vicum Sovra in vicinitate oppidate Žiri, in silvis, 520 m, 15 May 1993, T. Wraber, LJU-10046712; ibidem, Žiri, 3,5 km S Žiri, am S-Ufer des Flüsschens Žirovnica, ca. 200 m vor Kralj, 750 m SW Sovra, bachbegleitender Erlenwald, 515 m, 46°00’39’’N 14°06’14’’E, 22 Apr 2012, F.G. Dunkel, Du-28653; ibidem, cultivatd, leg. 01 May 2012, F.G. Dunkel, Du-28667. Plausible determinations (for the group) in the literature: **9746/3**: Breginjski kot, Most na Nadiži, leskovo grmišče (Asperulo-Carpinetum) nad rečno teraso, ca 400 m n.m. 24 Apr 1998, B. Čušin, det. kot *R. cassubicus*. **9746/4**: Slovenija, Breginjski kot, pod Gradecom, pod vasjo Logje, leskovo grmišče na moreni, ca 400 m n.m, 10 Apr 1997, B. Čušin, det. kot *R. cassubicus*.

3.1.2 *Ranunculus braun-blanquetii* PIGNATTI

Giorn. Bot. Ital. 110: 215, 1976. – H o l o t y p e : Italy, Prov. Verona, Mt. Baldo a Ime, Mai 1876, Goiran, FI, Isotypus VER. – DUNKEL 2005: Fig. 5c-e, 7, 11b; Fig. 3, 38.

syn. *R. gardenensis* PIGNATTI in Giorn. Bot. Ital. 110: 213, 1976.
R. baldensis W. KOCH in schedis (ZT).
R. auricomus ß. thorafolius MICH.
R. auricomus var. *uniflora* GOIRAN in Boll. Soc. Bot. Ital. 1900: 17–18.
R. wraberi Pignatti var. *integrifolius* Dunkel in schedis (TSB).

Pollen quality — bad; 37.9% well developed (Luče ob Savinji, Du-35806-4).

DNA-Ploidy — 4x (Kamnik-Savinja Alps, Luče ob Savinji, Du-28916, PAULE & al. 2018).

Chromosome number — 2n = 32 (Monte Baldo, MARCHI & VISONÀ 1982).

Distribution — Monte Baldo, Dolomites (South Tyrol, prov. of Trento and Belluno), Kamnik-Savinja Alps, and M. Nanos.

Ecology — mountain woodland, mossy edges of spruce forests, in alpine rocky grassland with dwarf mountain-pine, in Slovenia in subalpine meadows, edges of beech forests, 1170–1900 m.

Etymology — refers to J. Braun-Blanquet (1884–1980), Swiss botanist and one of the founders of phytosociology.

Vulnerability — not threatened.

Taxonomy — The centre of distribution and locus classicus of *R. braun-blanquetii* are situated in the region of Monte Baldo, Italy. In the Italian Alps further populations are known from South Tyrol, the northeastern part of the province of Trento and from one site of the province of Belluno (DUNKEL 2005, 2007, 2010). The new indications in Slovenia enlarge the distribution area

Fig. 2: *Ranunculus cassubicifolius* (Du-28860-3) / flower of specimen (Du-32741-3).

Fig. 3: *Ranunculus braun-blanquetii* (Du-27773-1).

Fig. 4: *Ranunculus allemannii* (Du-28883-2).

distinctly further east. At first, plants of M. Nanos with undivided basal leaves were classified as a new variety of *R. wraberi* Pignatti ("*var. integrifolus* Dunkel"). But in comparing the rich material meanwhile collected in the Alps and at M. Nanos by Dunkel, no differences could be found, and the populations of the two or three known Slovenian populations match well with *R. braun-blanquetii*.

Specimens seen — Slovenia, Alpsko Območje, Kamik-Savinja Alps (Steiner Alpen): **9654.1**: Smrekovec W Luče, pascolo su calcare, 1700 m, Escursione della società estalpino-dinarica di fitosociologia, 10 Jul 1993, leg. et det. F. Prosser sub *R. cassubicus* agg., ROV; Luče ob Savinji, Dleskovska Planota-Veža, 3,2 km W Luče, Smrekovec, am Wanderweg Planina Ravne → Molička Planina, lichter Lärchenwald, grasige Stellen, 1510 m, 46°21'13''N 14°41'51''E, 02 Jul 2012, F.G. Dunkel, Du-28914; ibidem, 3,2 km W Luče, Smrekovec, am Wanderweg Planina Ravne → Molička Planina, Schneetälchen im lichten Lärchenwald, 1580 m, 46°21'14''N14°41'49''E, 2 Jul 2012, F.G. Dunkel, Du-28915; ibidem, Smrekovec, am Wanderweg Planina Ravne → Molička Planina, Latschenkiefergebüsch, Horstseggenrasen, 1650 m, 46°21'32''N 4°41'29''E, F.G. Dunkel, Du-28916; ibidem, Luče ob Savinji, Dleskovska Planota-Veža, W Luče, Smrekovec, Planina Ravne, Zwergtrauchheiden, Schneeheidefluren, 1508 m, 46°21'02''N 14°42'02''E, 11 May 2018, F.G. Dunkel, Du-35806; Submediteransko Območje, Trnovski Gozd: **0049.1**: Mali Golak, Golaki on a rock in a beech-forest, 1380 m, 45°58'38''N 13°51'56''E, 27 May 2006, P. Schönswetter & Božo Frajman, WU-4835 (still extant? I looked for the population twice in vain); Dinarsko Območje: **0250.1**: Monte Nanos, ai margini della faggeta sommitale, faggeto, 1200 m, 16 May 1971, leg. L. Poldini, det. S. Pignatti 21 Oct 1974 sub *R. wraberi* Pignatti, TSB-2546 (pro parte); ibidem, Monte Nanos, 28 May 1975, leg. et det. S. Pignatti sub *R. wraberi* Pignatti, rev. E. Hörandl sub *R. wraberi*, rev. F.G. Dunkel 2005 sub *R. wraberi* var. *integrifolius* Dunkel (holotype), TSB-2546 (pro parte); ibidem, Razdrto, cacumen montis Pleša in tractu montis Nanos supra vicum Razdrto, in fagetis, solo calcareo, 1250 m, 30 May 1982, T. Wraber, det. T. Wraber 5.1982 sub *R. wraberi* Pignatti, rev. F.G. Dunkel, LJU-10047240, Du-27773, Du-35938; ibidem, Mt. Nanos, an der Straße von Col, Gipfelhänge und Grat am Südwesthang vor der Abfahrt nach Podnanos, Wiesen, 21 May 1994, leg. et det. W. Lippert 26847 sub *R. wraberi* Pignatti, M-0139776; ibidem, Gipfelbereich des Nanos (= Pleša), S Vojkova koča, ca. 50 m S des Schotterstraßenknicks nach Süden, subalpine Wiesenmatten mit Gebüsch, Buchenwaldrand, 1184 m, 45°46'25''N 14°02'53''E, 17 May 2012, cultivated, F.G. Dunkel, 12 May 2013, Du-29809; ibidem, Zufahrt zum Gipfelbereich des Nanos (= Pleša), 700 m NW Gipfelhaus mit Antennenanlage, Lichtung im Buchenwald, subalpine Wiese, 1177 m, 45°46'36'' N 14°02'49''E, 21 May 2016, F.G. Dunkel, Du-33409; ibidem, Zufahrt zum Gipfelbereich des Nanos (= Pleša), am Ende der Schotterstraße, beidseits des Weges, Buchenwald, Waldrand, subalpine Wiese, 1209 m, 45°46'24.7''N 14°02›59.9''E, 21 May 2016, F.G. Dunkel, Du-33410.

3.1.3 *Ranunculus allemannii* Braun-Blanq.

Sched. Flor Rhaet. Exs. 10:280 [no. 950]. – Holotype: Zentralpen: Samaden 1715 m, auf morrigen Wiesen häufig, Jun 1926, M. Candrian, isosyntpye G-00303281. – Dunkel 2005 Fig. 4, 5a–b, 6a, 11a, 12c; Fig. 4, 38.

syn. *R. cassubicus* Schinz & Keller non L.

Pollen quality — mediocre; 48.3% well developed (Pokljuka, Du-28883-2).

DNA-Ploidy — 4x, 5x (Julian Alps, Pokljuka, Du-28883, Paule & al. 2018).

Chromosome number — 2n = 48 (Switzerland, Isola, Häfliger 1943).

Distribution — Switzerland (Rhaetian Alps), Italy (Ortler-Livigno-Alps, Adamello, Val di Sole, Val di Meledro), Reschen Pass (North and South Tyol), disjunct in the Julian Alps.

Ecology — supramontainous and subalpine meadows, mires, riparian brushes, and humid forest edges; 700–2300 m, in Slovenia 1260–1270 m.

Etymology — dedicated to Fritz Allemann-Albertini, a friend of J. Braun-Blanquet.

Vulnerability — threatened by extinction due to rarity.

Taxonomy — already collected in 1958 by T. Wraber, the disjunct population at the Julian Alps is still extant. It is situated 230 km further eastwards than the populations of the Province of Trento (Dunkel 2007). The Slovenian population of *R. allemannii* obviously represents two cytotypes; the measured DNA-ploidy was tetra- and pentaploid, but there are only tiny morphological differences to the hexaploid *R. allemannii* of the Western Alps. The main incision of the basal leaves is sometimes more than 50% (in *R. allemannii* up to 30%).

Specimens seen — Slovenia, Alpsko Območje, Julian Alps: **9649.4**: Pokljuka, pred domom na Pokljuki, na travniku, 1267 m, 29 May 1958, T. Wraber, LJU-10046573; ibidem, Pokljuka, am Fuße des Sporthotels Pokljuka, 650 m S der Abzweigung → Koprivnik, subalpine Rasen, 1267 m, 46°20'18''N 13°57'43''E, 17 May 2012, F.G. Dunkel, Du-28883; ibidem, cultivated, 12 May 2013, F.G. Dunkel, Du-29810.

3.2. *Ranunculus auricomus* collective group

3.2.a *Ranunculus pilisiensis* group

3.2.1 *Ranunculus wraberi* Pignatti

Giorn. Bot. Ital. 110: 214, 1976. – Lectotypus hic loco designatur: Dinarsko Območje, Trnovski Gozd: 0250.1: Monte Nanos, margini della faggeta sommitale, faggeto, 1200 m, 16 May 1971, L. Poldini, TSB-2546 (pro parte). – Fig. 5, 6, 38.

Pollen quality — extremely bad; 24.7% well developed (Nanos, Du-12742-2, Du-33411-4).

DNA-Ploidy — 4x (M. Nanos, type locality, Du-28858; Paule et al. 2018).

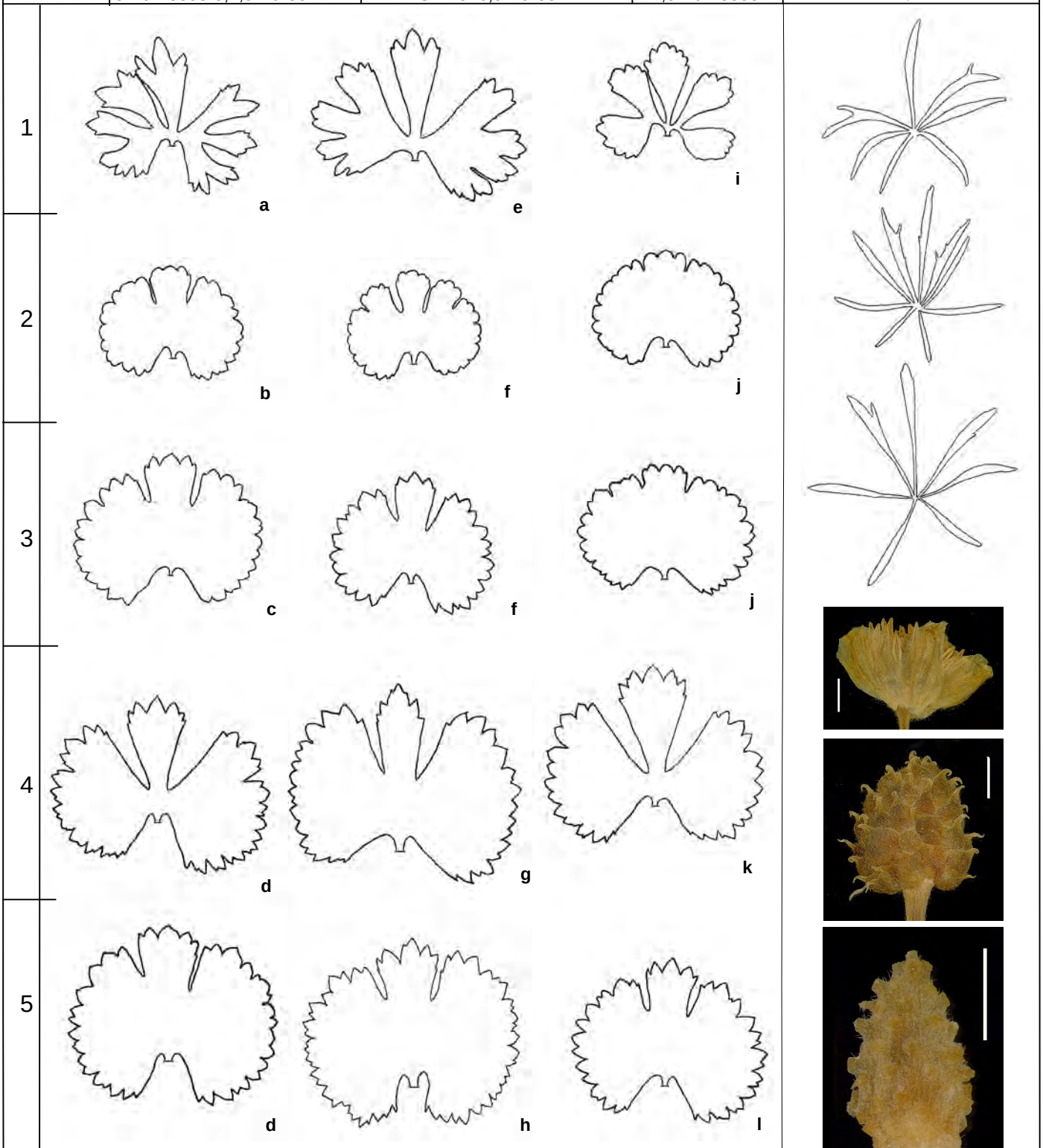
Distribution — endemic of M. Nanos.

Ecology — edges of beech forests, subalpine meadows, 1190–1260 m.

Etymology — dedicated to Max Wraber (1905–1972), Slovenian botanist and phytosociologist.

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

Fig. 5	1:Du-28853-3;2:M-139776 3:Du-28858-5;4,5:Du-33412-2	1:Du-33411-4;2,3: -3; 4:holo-type TSB-2546;5:Du-33411	1,4,5:Du-33412-1 2,3:Du-28858-1	cauline leaves: Du-33411-3 Du-12742-3; Du-33412-1



flower: Du-12742-1; fruits, receptacle: Du-12742-2
petals: 0–2; beak of fruits: straight to uncinate;
receptacle: pilose

Ranunculus wraberi

Fig. 6: *Ranunculus wraberi* – lectotype (TSB).

Vulnerability — threatened due to rarity.

Taxonomy — R. wraberi is constricted to the summit area of M. Nanos. At the type locality it has been collected several times since 1971 by different botanists. During my first visit at the M. Nanos in 2005, I was puzzled by the populations of *R. auricomus* with undivided basal leaf blades. Approximately, only 40% of the collected material presents with the typical main incision up to 66% of at least some basal leaves. Even the type collection consists of a mixed collection: both *R. wraberi* and *R. braun-blanquetii*. In culture, *R. wraberi* keeps the characteristic form of basal leaf blade over years, and, therefore, with certainty it is a valid species. Of course, it would be challenging to elucidate the genetic relation to *R. braun-blanquetii*. Did it arise via a hybrid of *R. braun-blanquetii*? How much percentage of the *R. braun-blanquetii* genome do we find in *R. wraberi*?

Specimens seen — Slovenia, Dinarsko Območje, Trnovski Gozd: **0250.1**: Monte Nanos, nello faggeto e radure, a N del Rifugio della Plesa, 09 May 1971, D. Lausi, TSB-2546; ibidem, Monte Nanos, ai margini della faggeta sommitale, faggeto, 1200 m, 16 May 1971, leg. L. Poldini, det. S. Pignatti 21 Oct 1974 sub *R. wraberi* Pignatti, TSB-2546 (pro parte); ibidem, Razdrto, Gipfelbereich des Nanos (= Pleša), subalpine Wiesenmatten mit Gebüsch, Buchenwaldrand, 1200–1260 m, 25 May 2005, F.G. Dunkel, Du-12742; ibidem, cultivated, 01 Jun 2006, F.G. Dunkel, Du-16765; ibidem, Gipfelbereich des Nanos (= Pleša), Vojkova koča, direkt N des Schotterstraßenknicks nach Süden, subalpine Wiesenmatten, Buchenwald(rand), 1199–1203 m, 45°46’24’’N 14°03’01’’E, 17 May 2012, F.G. Dunkel, Du-28858; ibidem, cultivated, 12 May 2013, F.G. Dunkel, Du-29812; ibidem, Razdrto, Zufahrt zum Gipfelbereich des Nanos (= Pleša), am Ende der Schotterstraße, beidseits des Weges, Buchenwald, Waldrand, subalpine Wiese, 1209 m, 45°46’24.7’’N 14°02’59.9’’E, 21 May 2016, F.G. Dunkel, Du-33411; ibidem, Razdrto, Zufahrt zum Gipfelbereich des Nanos (= Pleša), kurz vor Ende der Schotterstraße, 370 m NW des Gipfelhauses mit Antennenanlage, Waldrand, subalpine Wiese, 1201 m, 45°46’24.5’’N 14°02’55.4’’E, 21 May 2016, F.G. Dunkel, Du-33412.

3.2.b *Ranunculus megacarpus* group

3.2.2 *Ranunculus nemorosifolius* HÖRANDL & GUTERMANN

Bot. Jahrb. Syst. 120 (4): 545–598, 1998. – Holotype: Austria, Steiermark, Murtal, 8958.2, Graz, Botanischer Garten der Universität Graz, Holteigasse 6, 370 m, Arboretum, Wiesen, 29 Apr 1971, W. Gutermann, Gu-9304, Individuum c, holotype WU, isotypes M, W, Hb. Gutermann. – Fig. 7, 8, 38.

Pollen quality — bad; 35% well developed (HÖRANDL & al. 1997).

DNA-ploidy — 4x (Ljubljana, Fužine, Du-28571, PAULE & al. 2018).

Chromosome number — 2n = 32 (HÖRANDL & al. 1997).

Distribution — only known at the type locality at Graz, Austria, and in the city of Ljubljana, Slovenia.

Ecology — in parks or similar meadow-like sites under trees, hedges, historically in forests or groves (“in nemoribus”), at the riverside.

Eponymy — basal leaves resemble *R. nemorosus* DC.

Vulnerability — endangered due to rarity.

Taxonomy — R. nemorosifolius presents with robust plants, typical for the *R. megacarpus* group under which it is grouped together with *R. metlikaensis*. It is rather similar to *R. metlikaensis*, but differs by chromosome number (tetraploid instead of triploid) and a pilose receptacle.

The aperture of the final basal leaves is narrow-angled in *R. metlikaensis* (30–80°); V-shaped to wide-angled in *R. nemorosifolius* (90–135°); and the leaf edge, at least of the final leaves, is more irregular crenate-dentated to dentated.

In Austria, *R. nemorosifolius* is critically endangered due to construction activities. Therefore, the finding and confirmation of further populations in Ljubljana is important for the conservation of the species.

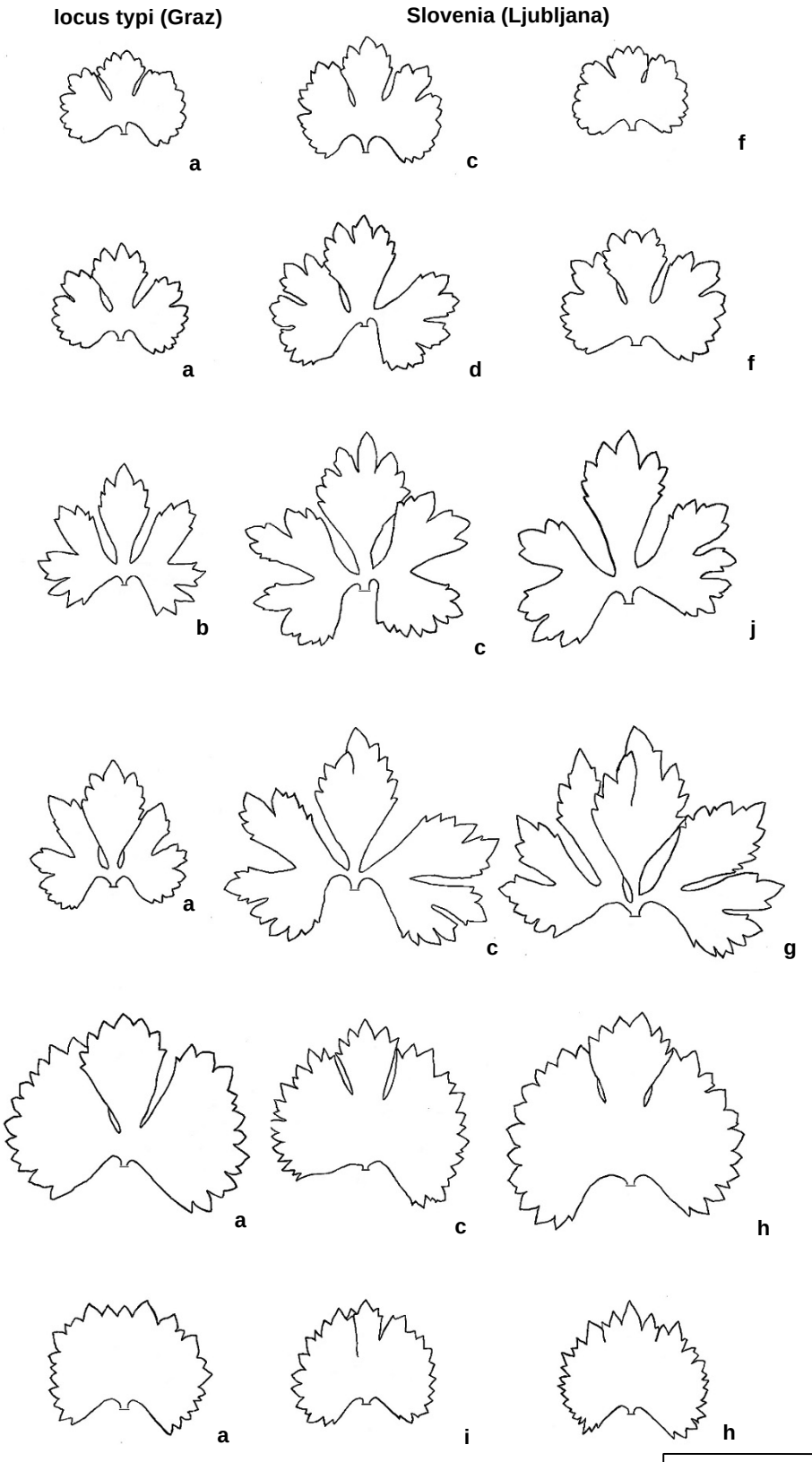
Specimens seen — Austria, Steiermark, Südöstliches Alpenvorland, Murtal: **8958.2**: Graz, spontan und subspontan im Arboretum, Wiesen und Hecken, 370 m, 29 Apr 1971, W. Gutermann-9304, M-0251833 (isotype); ibidem, Graz, Teil der ursprünglichen Vegetation im Arboretum des Botanischen Gartens der Universität, Park, 370 m, 03 May 1974, W. Lonsing, GOE-10/2011/57, LJU-10102527, ZT s.n.; ibidem, Graz, Botanischer Garten der Univ. Graz, Holteig 6, Arboretum, am Rand der Glashäuser kultiviert, kräftige Pflanzen, 04 May 2002, F.G. Dunkel, Du-07146; ibidem, Graz, Botanischer Garten der Univ. Graz, Holteig 6, Arboretum, unter einer großen Kastanie wenige Meter von den neuen Glashäusern entfernt, 04 May 2002, F.G. Dunkel, Du-07141; Slovenia, Predalpsko Območje: **9952.4**: Ljubljana, dictis „Mestni log“ prope urbem Ljubljana, in nemoribus, 250–300 m, A. Paulin, 08 May 1925, LJU-10046585, LJU-10046592, Du-27924-1; **9953.1**: Ljubljana, grad Fužine, 50 m N des Museums of Architecture and Design (MAO), Parkrasen unter Bäumen, 278 m, 46°03’01’’N 14°33’47’’E, 23 Apr 2012, F.G. Dunkel, Du-28571; ibidem, cultivated, 30 Apr 2015, F.G. Dunkel, Du-32728; **9953.3**: Ljubljana, prope pagum Fužine ad urbem Ljubljana, vallis vialis, in nemoribus, 280 m, 01 May 1930, F. Dolšak, LJU-10046586, Du-27925; ibidem, Ljubljana ad ripam sinistram fluvii Ljubljanica prope pagum Fužine in ditione Labacensi, inter frutices, 300 m, 30 Mar 1953, A. Martinčič, LJU-10046595, Du-27926; ibidem, Ljubljana, Fužine (ob gradu), Humus, 280 m, 13 Apr 1938, M. Zalokar, LJU-10046578, Du-27928; ibidem, Ljubljana, ad ripam fluvii Ljubljanica prope pagum Fužine, Ufer, 300 m, 01 May 1958, A. Martinčič, LJU-10046591, Du-27929; ibidem(?), Ljubljana, prope Labacum (Laibach), in turfosis, 25 Apr 1870, Freyer, BR-079 (s.n.), det. A.F. Láng 1870 sub *R. binatus* Kit.; Ljubljana, im Laibacher Stadtwalde, Dr. Gratz?, rev. Prantl sub *R. auricomus* L., ex. Hb. Zuccarini, M s.n.; ibidem, Ljubljana, med Rahovo Jelšo in Ilovico, ob PST, močvirje travišče [= humid meadow], 290 m, 46°01’49.41’’N 14°30’32.49’’E, 13 Apr 2019, J.M. Kocjan, J.M.Kocjan s.n. (001-002), Du-36186.

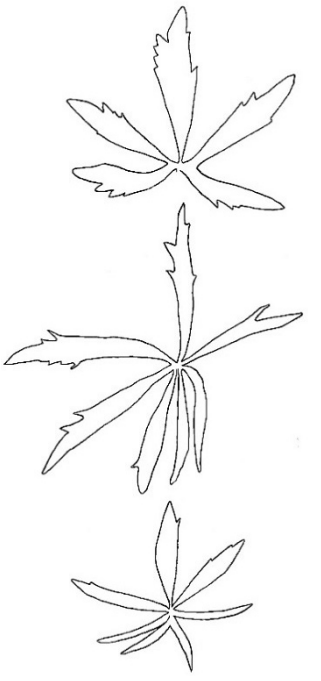
3.2.3 *Ranunculus metlikaensis* DUNKEL spec. nova

Holotype: Slovenia, Preddinarsko Območje, Unterkrain, 0358.1, Metlika, NNE Drasiči, 700 m W Krmačina, am N-Ufer

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

Fig. 7	1,2,4-6:Du-07146-2 3:Du-07141-8	1,3,4,5:Du-28571-8;2:Du-28571-2 6:Du-28571-4	1-3:Du-28571-4;4:Du-28571-2;5,6:Du-28571-1	cauline leaves: Du-28571-11 Du-07147-1; Du-15982-2





flower:Du-07141-2; fruits, receptacle: isotype (GOE)
petals: (1)3–5
beak of fruits: uncinate to involuted
receptacle: pilose

Ranunculus nemorosifolius

Fig. 8: *Ranunculus nemorosifolius* (Du-28571-7).

des Babinec-Baches, Bachauenwald, Pestwurzflur, [northern bank of Babinec brook, brookside forest, butterbur community], 178 m, 45°40'05''N 15°22'33''E, 23 Apr 2012, F.G. Dunkel; holotype LJU, isotypes M, B, Du-28580 – Fig. 9, 10, 38.

Description — *Flowering shoot* slim to robust, 22–40 cm; stalk 0.8–2.5 mm in diameter, suberect to moderately divergent (patent); angle between the main and secondary axis (20–55°); flowers (2)3–8(10); enrichment shoots 0–1; basal leaves 2–6 per rosette.

Basal leaves: leaf edge of all basal leaves very irregularly crenate-serrated.

First basal leaf 14–22 mm long, narrow-angled at the base (30–70°), main incision absent or up to 50%, in the latter case middle lobe trapezoid to deltoid with 5 teeth; lateral segment undivided.

Second basal leaf 17–24 mm long, narrow-angled at the base (50–70°), cleft to divided by the main incision (50–85%); middle lobe (deltoid) spatulate with 5–9 crenated teeth; lateral segment undivided.

Third basal leaf 23–32 mm long, narrow-angled to V-shaped at base (40–100°), divided by main incision (85–98%); middle lobe deltoid to broadly deltoid, trilobed with incisions up to 30%, with 5–11 crenated teeth; lateral edge straight to slightly concave; lateral segment cleft by first lateral incision (40–55%).

Fourth basal leaf 30–45 mm long, narrow-angled to V-shaped at base (40–100°), divided to dissected by main incision (92–100%); middle lobe deltoid to spatulate with 11–13 teeth, lateral edge straight to slightly concave; lateral segment cleft to divided by first lateral incision (50–80%); second lateral incision absent or up to 50%.

Fifth basal leaf 30–38 mm long, narrow-angled at the base (35–80°), cleft to divided by main incision (55–70%); middle lobe (broadly) deltoid with 9–11 teeth, lateral edge straight to slightly concave; lateral segment undivided.

Sixth basal leaf 20–30 mm long, narrow-angled at the base (30–60°), cleft by main incision (33–66%); middle lobe deltoid with 7–11 crenated teeth, lateral edge straight; lateral segment undivided.

Lowermost stem leaf divided into 5–7 segments, largest segment 33–58 mm long, 5–9 mm wide, lanceolate to narrowly deltoid, with 2–8 usually short teeth.

Petals (2)4–5, 10–14 mm long, 6–9 mm wide; *androclinium* 0.8–1.0 mm; *receptacle* ellipsoid, 2.5–3.4 mm long, 1.4–1.8 mm wide, glabrous, invervallum absent, carpellophores 0.15–0.3 mm; *fruits* 1.2–2.2 mm long, beak 0.4–0.7 mm long; uncinate to involuted.

Pollen quality — bad; 31.4% well developed (isotype Du-28580-10).

DNA-ploidy — 3x (Drasiči, Babinec-Bach, isotype Du-28580, PAULE & al. 2018).

Distribution — only known from the type locality near the Slovenian-Croatian border.

Ecology — banks of brooks and small rivers – also in adjacent Butterbur community (Petasitetum hybridi).

Etymology — refers to the type locality near Metlika in Southeastern Slovenia.

Vulnerability — endangered due to rarity.

Taxonomy — *R. metlikaensis* presents with robust plants and can be categorized in the *R. megacarpus* group. It is rather similar to *R. nemorosifolius* but differs by chromosome number (triploid instead of tetraploid) and a glabrous receptacle. The base of the final basal leaves is narrow-angled in *R. metlikaensis* (30–80°), V-shaped to wide-angled in *R. nemorosifolius* (90–135°), and the leaf edge, at least of the final leaves, is more irregular crenate-dentated to dentated.

The DNA-value found by flow cytometrical measurement is striking, as triploid plants are rare and at least in Central Europe seem to be of direct hybrid origin. The only report of a hybrid in nature applies to such of *R. notabilis* (HÖRANDL & al. 2000, HÖRANDL 2004). Only further eastwards, in Romania, *R. flabelloides* (A. NYÁR.) SOÓ forms isolated populations of triploid genome (PAULE & al. 2018). *R. metlikaensis* grows isolated, and at the type locality no other species of the *Ranunculus auricomus* complex as possible parent was found (PAULE & al. 2018).

Specimens seen — Slovenia, Preddinarsko Območje, Unterkrain: **0358.1**: Metlika, okolica vasi Krmačina, [in der Gegend des Dorfes Kramcina], ob potoku Babincu, 200 m, 17 Apr 2006, S. Prus, LJU-10133505; ibidem, Metlika, NNE Drasiči, 700 m W Krmačina, am N-Ufer des Babinec-Baches, Bachauenwald, Pestwurzflur, 178 m, 45°40'05''N 15°22'33''E, 23 Apr 2012, F.G. Dunkel, Du-28580 (isotypes).

3.2.c *Ranunculus argoviensis* group

3.2.4 *Ranunculus poldinii* DUNKEL

Holotype: Italy, Friuli Venezia-Giulia, Collio, prov. di Gorizia, 0046.2, Cormons, Brazzano, Nordfuß des M. Quarin, nahe P. 65 (Abzweigung nach Plessiva), Erlenbruch, grasiger Schotterweg, Waldsaum, [northern bottom of Monte Quarin, close to P. 65 (branch to Plessiva), alder forest, grassy dirt road], 65 m, 10 Apr 2008, F.G. Dunkel; holotype TSB, isotypes Du-21004, FI, M, PAD, ZT. – DUNKEL 2010: Fig. 11u, 40, 41, 44a-c, 47; Fig. 11, 39.

Pollen quality — good; 82% well developed (isotype Du-21004).

DNA-Ploidy — not measured.

Distribution — Italy, most eastern parts of Friuli (Collio: hills west- and northwestward of Gorizia), and the Vipava valley in adjacent Slovenia.

Ecology — alder dominated damp forests, riparian forest, deciduous forest, grassy verges.

Eponymy — dedicated to Livio Poldini, *1930, botanist and vegetation scientist, author of *Nuovo Atlante corologico* and *flora vascolare del Friuli Venezia Giulia* (2002). He detected this species as early as 1976.

Vulnerability — threatened due to rarity; probably only one extant population in Slovenia.

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

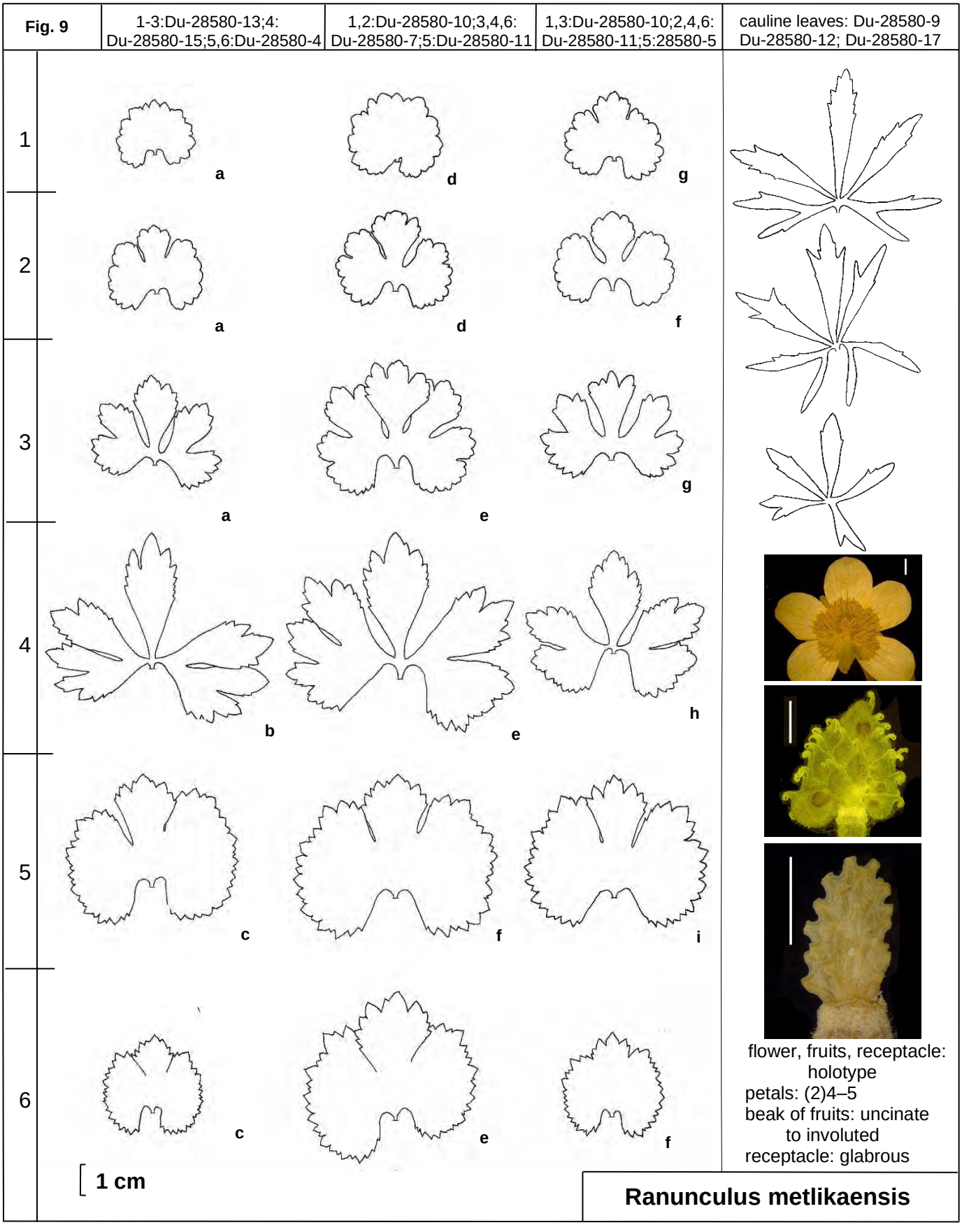


Fig. 9
1-3:Du-28580-13;4: Du-28580-15;5,6:Du-28580-4
1,2:Du-28580-10;3,4,6: Du-28580-7;5:Du-28580-11
1,3:Du-28580-10;2,4,6: Du-28580-11;5:28580-5
cauline leaves: Du-28580-9 Du-28580-12; Du-28580-17
1
2
3
4
5
6
a
d
g
a
d
f
a
e
g
b
e
h
c
f
i
c
e
f
1 cm
flower, fruits, receptacle: holotype
petals: (2)4–5
beak of fruits: uncinate to involuted
receptacle: glabrous
Ranunculus metlikaensis

Fig. 10: *Ranunculus metlikaensis* – holotype (LJU).

Fig. 11: *Ranunculus poldinii* (Du-15976-2).

Taxonomy — R. poldinii is marked by basal leaves with narrow-angled base or closed aperture and a conspicuously irregularly crenate-serrated leaf edge. The main distribution and its type locality is situated in the eastern Colli friulani. From there, it spreads to the adjacent Vipava valley in Slovenia.

Specimens seen — Slovenia, Submediteransko Območje: **0047.4**: Nova Goricia, Stara Gora, Staragora bei Görz (südlich), 12 Apr 1948, C. Zirnich, det. O. Schwarz 06 Sep 1949 sub *R. puberulus* W. Koch, DR-041149, DR-041150; **0147.2**: Miren, Vrtoce, am Ufer der Wippach (Vipava), w der Zufahrtsstraße nach Jerabišče, Erlen-Auenwald, 40 m, 45°53'02''N 13°37'00''E, 25 Apr 2006, F.G. Dunkel, Du-15976; ibidem, cultivated, 01 May 2008, F.G. Dunkel, Du-21240.

3.2.5 *Ranunculus poldinioides* DUNKEL spec. nova

Holotype: Slovenia, Predalpsko Območje, Ljubljansko barje, 9953.3, Ljubljana, ad viam versus vicum Ig ducentem, haud procul confluentis fluviorum Ljubljanica et Iščica, in pratis paludosis, solo argilloso, 290 m, 10 Apr 1972, T. Wraber; holotype LJU-10046583, isotypes LJU-10046583, Du-27930. – Fig. 12, 13, 39.

Description — Flowering shoot slim, 14–26 cm, stalk 0.8–2.3 mm in diameter, suberect to moderately divergent, angle between the main and secondary axis 20–50°, flowers 2–4, enrichment shoots 0–1; cataphylls absent; basal leaves 2–4(5) per rosette.

First basal leaf 9–18 mm long, wide-angled at base (100–150°), divided by the main incision (66–80%); middle lobe deltoid with (3–)5 crenated teeth, lateral edge straight to slightly concave; lateral segment undivided or lobed by the first lateral incision (26–30%); leaf edge deeply and irregularly crenate-serrated.

Second basal leaf 10–20 mm long, wide-angled at base (100–150°), (cleft to) divided by the main incision ((60)66–85%); middle lobe deltoid with 5–7 teeth, lateral edge rarely straight, mostly concave; lateral segment cleft by the first lateral incision (30–40%), second lateral incision absent or up to 30%; leaf edge deeply and irregularly crenate-serrated.

Third basal leaf 18–24 mm long, wide-angled at the base (100–150°), divided by main incision (75–95%); middle lobe deltoid with 7–11 crenated teeth, lateral edge concave; lateral segment lobed to divided by first lateral incision (27–60%), second and third lateral incision absent or up to 32, and 28%, respectively; leaf edge deeply and irregularly crenate-serrated.

Fourth basal leaf 22–32 mm long, narrow- to wide-angled at base (50–170°), dissected by main incision; middle lobe up to 3 mm long stalked, (rhomboid to) deltoid, usually tricleft with incisions up to 45%, with 9–11 crenated teeth, lateral edge concave, possibly rhomboid lateral edge convex; lateral segment divided by the first lateral incision (66–90%), cleft by second lateral incision (35–55%), lobed to cleft by third lateral incision (30–45%); leaf edge deeply and irregularly (crenate-serrated to) serrated.

Fifth basal leaf 24–30 mm long, narrow- to wide-angled at the base (20–135°), divided by main incision (90–98%); middle lobe rhomboid to deltoid, partly tricleft or pentalobed with incisions up to 33%, with 9–15 teeth, lateral edge straight to concave; lateral segment divided by first lateral incision (65–80%), cleft by second lateral incision (35–50%); third lateral incision absent or up to 42%; leaf edge deeply and irregularly (crenate-serrated to) serrated.

Sixth basal leaf 20–28 mm long, narrow- to wide-angled at the base (20–135°), divided by main incision (66–90%); middle lobe deltoid with 7–9 (crenated) teeth, lateral edge (straight to) concave; lateral segment lobed to cleft by first lateral incision (30–65%); leaf edge deeply and irregularly (crenate-serrated to) serrated.

Seventh basal leaf 14–24 mm long, at the base V-shaped to wide-angled (90–130°), cleft to divided by main incision (55–93%); middle lobe deltoid, lateral edge straight to concave, with 5–9 teeth; lateral segment undivided; leaf edge deeply and irregularly (crenate-serrated to) serrated.

Lowermost stem leaf divided into 5–7 segments; largest segment 25–45 mm long, 3–6 mm wide, narrowly lanceolate to lanceolate, (occasionally undivided in gracile plants or) with 2–8 irregular short to long patent teeth.

Petals 0–4(5), 9–11 mm long, 6–11 mm wide; *androclinium* 0.8–1.0 mm; *receptacle* ellipsoidal, 2.6–3.4 mm long, 1.8–2.2 mm wide, glabrous to sparsely pilose (+), invervallum absent, carpellophores 0.2–0.4 mm long; *fruits* 2.2–2.6 mm long, beak 0.7–0.9 mm long, uncinate.

Pollen quality — mediocre; 58.0% well developed (isotype 27930-1).

DNA-ploidy — unknown.

Distribution — at present only known from the type locality near Postojna.

Ecology — humid meadows, willow brushes.

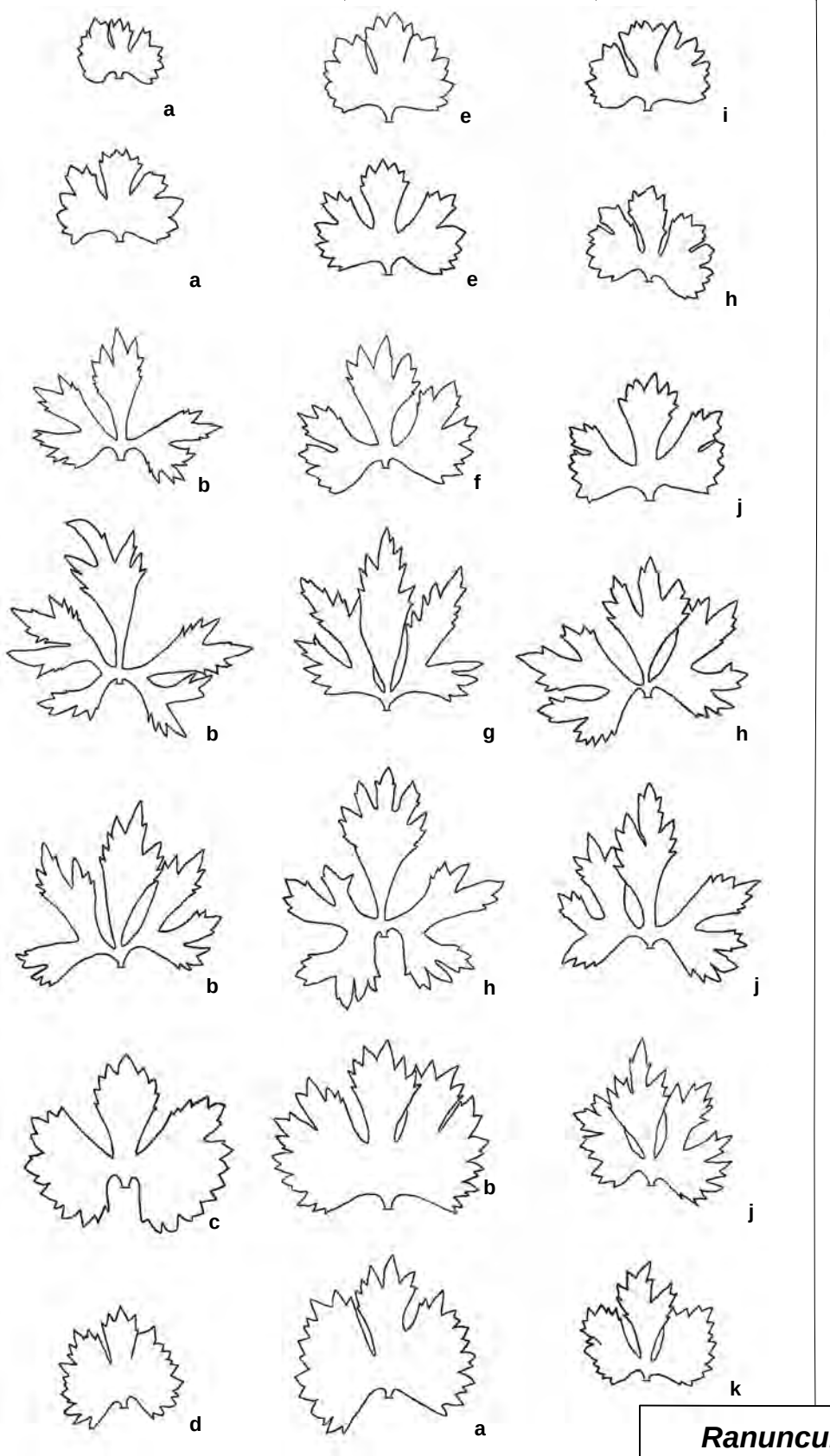
Etymology — refers to the morphological similarity to *R. poldinii* (see above).

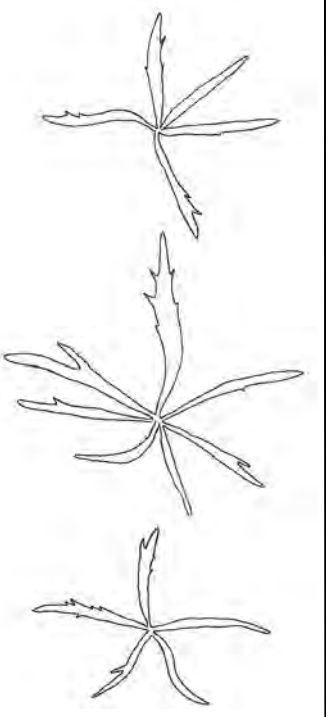
Vulnerability — critically endangered due to rarity, and abandonment or eutrophication of humid meadows.

Taxonomy — R. poldinioides shares with *R. poldinii* the irregularly formed middle and lateral lobes with an irregular crenate-serrated to dentated leaf edge. However, the basal leaves are usually wide-angled at the base, and the middle lobes deltoid; in *R. poldinii* the base of the basal leaves is often closed or narrow-angled, the middle lobe broadly deltoid to spatulate, and the leaf edge more regular, the teeth less acute. Morphologically *R. poldinioides* is similar to *R. nemorosifolius*; however, it is of a much more gracile statue. The diameter of the main stalk measures 0.8–2.3 mm in *R. poldinioides*, and 1.2–3.5 mm in *R. nemorosifolius* (more than indicated by HÖRANDL & GUTERMANN 1998b, p. 569: 1.5–2.5 mm). The receptacle is usually pilose (++) in the latter but glabrous or sometimes scarcely pilose in *R. poldinioides* (- – +). Due to the restricted material seen, it cannot be excluded with absolute certainty that *R. poldinioides* is a *R. nemorosifolius*-ecotype of poor-nutrient and humid meadows.

►
Fig. 12:
Ranunculus poldinioides – data sheet (basal leaf cycle, stem leaves, flowers, fruits, receptacle).
(Length of bars in figures of details = 2 mm.)

Fig. 12	1,2:Du-28585-1;3-5:Du-30656-1 Du-28581-2:6;Du-28585-3:7	1-5:Isotypi;6:Du-30656-1 7: Du-28581-1	1-7:Isotypi (LJU-10046583)	cauline leaves: isotype (k), Du-30656-1; isotype (j)





flower: isotype, fruits, receptacle: Du-30656-1
petals: 0–4(5)
beak of fruits: uncinate
receptacle: glabrous to sparsely pilose (- – +)

Ranunculus poldinioides

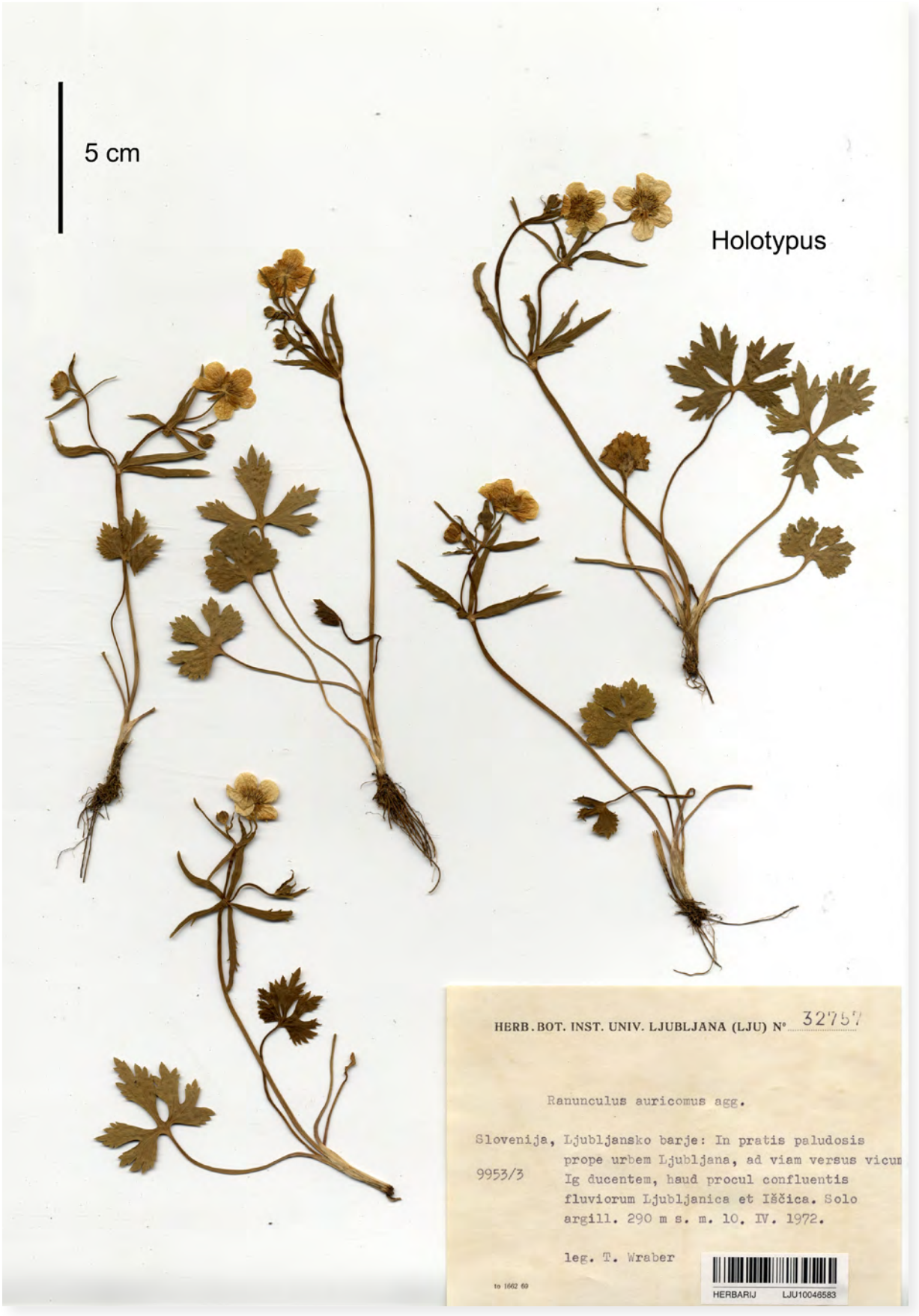


Fig. 13: *Ranunculus poldinioides* – holotype (LJU).

At the type locality near Ljubljana, the author looked for *R. poldinioides* in vain. It is probably extinct there, but it occurs still nearby.

Specimens seen — Slovenia, Predalpsko Območje, Ljubljansko barje: **9953.3**: Ljubljana, ad viam versus vicum Ig ducentem, haud procul confluentis fluviorum Ljubljanica et Iščica, in pratis paludosis, solo argilloso, 290 m, 10 Apr 1972, T. Wraber, holotype LJU-10046583, Du-27930 (isotypes); Dinarsko Območje: **0052.1**: Podpeč, 1 km OSO Podpeč, Jezero, Jezero-See, SW-Ufer und Graben nach Süden, Feuchtwiese, Weidengebüsch, 289 m, 45°58'02''N 14°25'58''E, F.G. Dunkel 24 Apr 2012, Du-28581; ibidem, cultivated, 02 Apr 2013, F.G. Dunkel, Du-30656.

3.2.c *Ranunculus notabilis* group

3.2.6 *R. austroslovenicus* DUNKEL

Holotype: Slovenia, Preddinarsko Območje, 0554.2, Kočevje, an der Kolpa 1 km vor Srobotnik, Gebüsch, Waldrand, [on the rivulet Kolpa 1 km before Srobotnik, shrubbery, forest edge], 250 m, 45°29'43''N 14°48'14'' E, 23 Apr 2013, F.G. Dunkel; holotype LJU, isotypes B, M, Du-30441. – DUNKEL & al. 2018: Fig. 1–3, tab. 1; Fig. 39.

Pollen quality — good; 87.7% well developed (Du-30441, DUNKEL 2018 & al.: tab. 1).

DNA-ploidy — 2x (isotype Du-30441).

Chromosome number — 2n = 16 (Du-30442, DUNKEL & al.: tab. 1).

Distribution — from the Planinsko Polje SW of Ljubljana to the Kočevsko region in southeastern Slovenia and adjacent Croatia.

Ecology — meadows, brushes, riparian forests, beech and hornbeam forests.

Etymology — refers to the type population and main distribution in southern Slovenia.

Vulnerability — critically endangered at poor-nutrient meadows by eutrophication or abandonment; less endangered in forest habitats.

Distribution — from the Planinsko Polje SW of Ljubljana to the Kočevsko region in southeastern Slovenia and adjacent Croatia.

Taxonomy — see DUNKEL & al. 2018.

Specimens seen, not listed in DUNKEL & al. 2018 — Slovenia, Dinarsko Območje, Notranjska: **0252.2**: Cerknica, Grahovo, auf frischen Wiesen, 570 m, 45°46'10''N 14°25'2''E, 03 Apr 1886, J. Šafer, B-100348757 (ex Hb. J. Ullepitsch); **0252.4**: Dane, jugovzhod od vasi Dane, ob reki Obrh, gozd enovrategi gloga Crataegus monogyna, 570 m, 18 May 2019, J.M. Kocjan & D. Kosič, J.M.Kocjan s.n. (004).

3.2.7 *Ranunculus vinicae* DUNKEL spec. nova

Holotype: Slovenia, Bela krajina, 0557.2, Vinica, 800 m OSO Zilje O Vinica, Balkovci, Auwaldgebüsch ± an der Kulpa, [riparian shrubbery ± at the bank of the river Kulpa], 160 m, 45°27'28''N 15°18'34''E, 23 Apr 2018, F.G. Dunkel, holotype LJU, isotypes B, Du-35332. Fig. 14, 15, 39.

Description — Flowering shoot slim, 18–32 cm, stalk 1.2–2.0 mm in diameter, moderately patent to patent, angle between the main and secondary axis (30–75°); flowers 2–4; enrichment shoots 0–1(2); basal leaves 2–4 per rosette.

Basal leaf cycle — Leaf edge crenate-serrated in the first to third (fourth) basal leaf; acutely crenate-serrated to serrated in the following leaves.

First basal leaf 12–22 mm long, blade closed to narrow-angled at the base (0–60°), divided by main incision (75–95%); middle segment spatulate, rhomboid to (broadly) deltoid, occasionally tricleft with incisions up to 50%, with 5–11 teeth; lateral segment divided by first lateral incision (66–85%), second lateral incision absent or up to 45%.

Second basal leaf 15–25 mm long, blade closed to narrow-angled at the base (0–80°), divided to dissected by main incision (90–100%); middle segment spatulate, rhomboid to broadly deltoid, occasionally tricleft with incisions up to 45%, with 5–13 teeth, lateral edge concave to convex; lateral segment cleft to divided by first lateral incision (45–75%), second lateral incision absent or up to 35%.

Third basal leaf 25–35 mm long, blade closed to narrow-angled at the base (0–20°), divided to dissected by main incision (95–100%); middle lobe deltoid, occasionally tricleft with incisions up to 55%, with 5–7 crenated teeth; lateral segment divided by first and second lateral incision (70–90%, and 70–80%, respectively), cleft by third lateral incision (35–50%).

Fourth basal leaf 32–42 mm long, blade closed to narrow-angled at the base (0–60°), divided to dissected by main incision (95–100%); middle lobe occasionally stalked up to 4 mm, rhomboid to deltoid; occasionally tricleft with incisions up to 42%, with 7–9 crenated teeth; lateral segment cleft by first lateral incision (35–60%), second lateral incision absent or up to 55%; leaf edge irregularly and deeply crenate-serrated.

Fifth basal leaf 28–40 mm long, narrow-angled to V-formed at the base (30–100°), cleft to divided by main incision (60–90%); middle lobe deltoid, occasionally trilobed with incisions up to 32%, with 7–9 crenated teeth; lateral segment undivided; leaf edge irregularly crenate-serrated or deeply serrated.

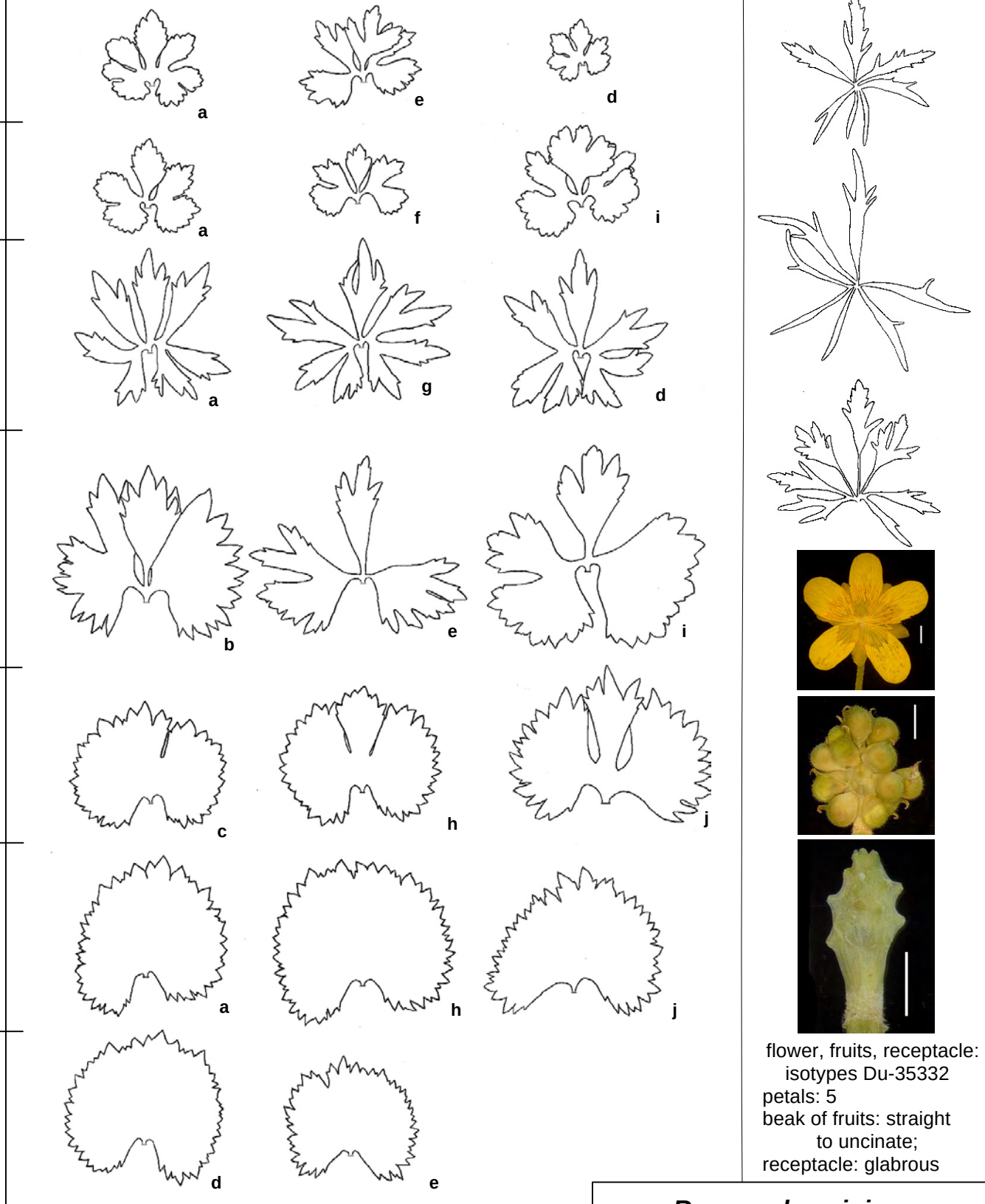
Sixth and *seventh basal leaf* 34–40, and 30–38 mm long, respectively, with narrow-angled to V-formed at the base (40–90°), main incision absent or rarely up to 36%, if main incision present; middle lobe trapezoid with 5–7 teeth; lateral segment undivided.

Lowermost stem leaf divided into 7 segments; largest segment 28–52 mm long, 3–7 mm wide, narrowly lanceolate, with 2–8 parallelous or patent up to 12 mm long teeth.

Petals 5, 6–12 mm long, 5–7 mm wide; *androclinium* 0.6–1.0 mm, *receptacle* cylindrical, 3.0–4.2 mm long, 1.2–1.7 mm wide, glabrous, invervallum long (25–40%), carpellophores 0.2–0.4 mm; *fruits* 1.8–2.2 mm long, beak 0.4–0.8 mm long, straight to uncinate.

►
Fig. 14:
Ranunculus vinicae – data sheet (basal leaf cycle, stem leaves, flowers, fruits, receptacle).
(Length of bars in figures of details = 2 mm.)

Fig. 14	1-3,6: Du-35332-3;4:Du32737-1 5:Du-35332-6;7:Du-35332-1	1,4,7:Du-35332-5;2,5,6: Du-35332-7;3:Du-35332-4	1,3:Du-35332-1;2,4:Du-36128-2;5,6:Du-36128-1	cauline leaves: Du-35332-3 Du-35332-4; Du-35332-4



flower, fruits, receptacle: isotypes Du-35332
petals: 5
beak of fruits: straight to uncinate;
receptacle: glabrous

Ranunculus vinicae

Fig. 15: *Ranunculus vinicae* – holotype (LJU).

Pollen quality — excellent; 98.1% well developed (isotype Du-35332-6).

DNA-Ploidy — 2x (type locality, Du-36128).

Distribution — only known from a small area around Vinica, close to the Slovenian-Croatian border.

Ecology — at brooksides, in willow brushes, and riparian forests at colline level.

Etymology — refers to the type population near the village Vinica, Bela krajina, Slovenia.

Vulnerability — critically endangered by rarity.

Taxonomy — among the large population of *R. austroslovenicus* with undivided final basal leaves and obtuse leaf edge teeth, *R. vinicae* is conspicuous by its acutely serrated irregular leaf edge at the final leaves. The lowermost cauline leaf is regular and mostly undivided in *R. austroslovenicus*, but irregular and dentated by 2–10 teeth in *R. vinicae*.

Morphologically, *R. vinicae* could be of hybrid origin: a crossing of *R. austroslovenicus* with another species. However, no other parent growing nearby is in sight for forming hybrids. Until the hybrid origin is not verified, *R. vinicae* should be regarded taxonomically as a species.

The pollen quality of *R. vinicae* is excellent: over 98% well developed pollen. This argues for continued sexual reproduction which has not been tested yet. The population is small and certainly endangered.

Specimens seen — Slovenia, Preddinarsko območje, Weißkrain (Bela krajina): **0557.1**: Vinica, 1,3 km SW Friedhof und Kirche Vinica, nahe N-Ufer der Kupa, Wiese und schlammiges, ausgetrocknetes Bachbett, 172 m, 45°27’08’’EN 15°14’31’’E, 25 Apr 2015, F.G. Dunkel & S. Wittwer, det. F.G. Dunkel, Du-32737; **0557.2**: Vinica, 800 m OSO Zilje O Vinica, Balkovci, Auwaldgebüsch ± an der Kulpa, 160 m, 45°27’28.0’’N 15°18’34.3’’E, 23 Apr 2018, F.G. Dunkel, Du-35332; ibidem, 13 Apr 2019, F.G. Dunkel, Du-36128.

3.2.8 *Ranunculus glechomus* DUNKEL spec. nova

Holotype: Slovenia, Preddinarsko območje, 0053.2, Grosuplje, W des Ortes, N der Straße nach Ponova vas, 50–100 m W der Brücke über die Bičje, [W of the bridge crossing the brook Bičje, border of a ditch] Grabenrand, 335 m, 45°56’4’’N 14°39’5’’E, 23 Apr 2012, F.G. Dunkel; holotype LJU, isotypes B, M, Du-28563; Fig. 16, 17, 39.

Description — Flowering shoot gracile to slim, 15–27 cm; stalk 0.8–2.0 mm in diameter, suberect to patent, angle between the main and secondary axis 20–75°, flowers 1–4, enrichment shoots 0–2; basal leaves 2–5(6) per rosette.

Basal leaf cycle: all basal leaves are closed or narrow-angled at the base (-5–60°).

First basal leaf 8–12 mm long, cleft by the main incision (40–60%); middle lobe trapezoid to broadly deltoid with 3(–5) crenated teeth, lateral edge slightly convex to straight; lateral segment undivided; leaf edge (coarsely) crenated.

Second basal leaf 10–15 mm long, divided by the main incision (66–80%); middle lobe broadly deltoid (spatulate) with 3(–5) crenated teeth, lateral edge convex; lateral segment undivided; leaf edge (coarsely) crenated.

Third basal leaf 12–18 mm long, divided by the main incision (80–95%); middle lobe deltoid to spatulate with 3–7 crenated teeth, lateral edge straight to (slightly) convex; lateral segment undivided or lobed by first lateral incision (up to 30%); leaf edge irregularly crenated to crenate-serrated.

Fourth basal leaf 10–18 mm long, cleft to divided by main incision (50–80%); middle lobe deltoid with 3–5 long crenated teeth, lateral edge ± straight; lateral segment undivided; leaf edge irregularly and coarsely crenated to crenate-serrated.

Fifth basal leaf 13–22 mm long, divided by the main incision (85–95%); middle lobe deltoid with 3–5 crenated teeth, lateral edge straight to convex; lateral segment undivided or occasionally lobed by the first lateral incision (up to 25%); leaf edge irregularly and coarsely crenated to coarsely crenate-serrated.

Sixth basal leaf 10–20 mm long, lobed or cleft by the main incision (25–66%), main incision occasionally absent; middle lobe deltoid with 3–5 elongated crenated teeth; lateral segment undivided; leaf edge irregularly and coarsely crenate-serrated.

Seventh basal leaf 10–16 mm long, blade undivided; leaf edge irregularly and finely to coarsely crenate-serrated.

Lowermost stem leaf divided into 7(–9) segments, largest segment 18–30 mm long, 1.5–5 mm wide, narrowly oblanceolate, (usually) undivided.

Petals 5, 5–9 mm long, 5–6 mm wide; *androclinium* 0.6–0.8 mm; *receptacle* globose to ellipsoid, 2.0–3.5 mm long, 1.2–2.4 mm wide, glabrous, invervallum absent, carpellophores 0.1–0.25 mm; *fruits* 1.2–2.0 mm long, beak 0.4–0.8 mm long, uncinate to involuted.

Pollen quality — excellent; 91.2% well developed (isotype Du-28563-5).

DNA-ploidy — 2x (Grosuplje, isotype).

Distribution — only known around the type locality near Grosuplje, southeast of Ljubljana.

Ecology — poor-nutrient meadows, willow brushes.

Etymology — refers to the morphological similarity of the basal leaves to those ones of *Glechomus hederacea*.

Vulnerability — critically endangered by possible destruction of brushes, deterioration of meadows, and use for industrial plants. It is uncertain whether the type population still exists.

Taxonomy — *R. glechomus* possesses a rather homophyllous leaf cycle; the basal leaves are characterised by rounded, scarcely divided blades with a narrow-angled base. The main incision reaches 95% at the fifth basal leaf, but the lateral segments are almost always undivided. *R. glechomus* belongs to the group of diploid species, probably amphimictic.

Although these sexual species vary in their morphology considerably, *R. glechomus* differs conspicuously by the rounded leaf shape and a closed to narrow-angled blade at the base.

►

Fig. 16:
Ranunculus glechomus – data sheet (basal leaf cycle, stem leaves, flowers, fruits, receptacle).
(Length of bars in figures of details = 2 mm.)

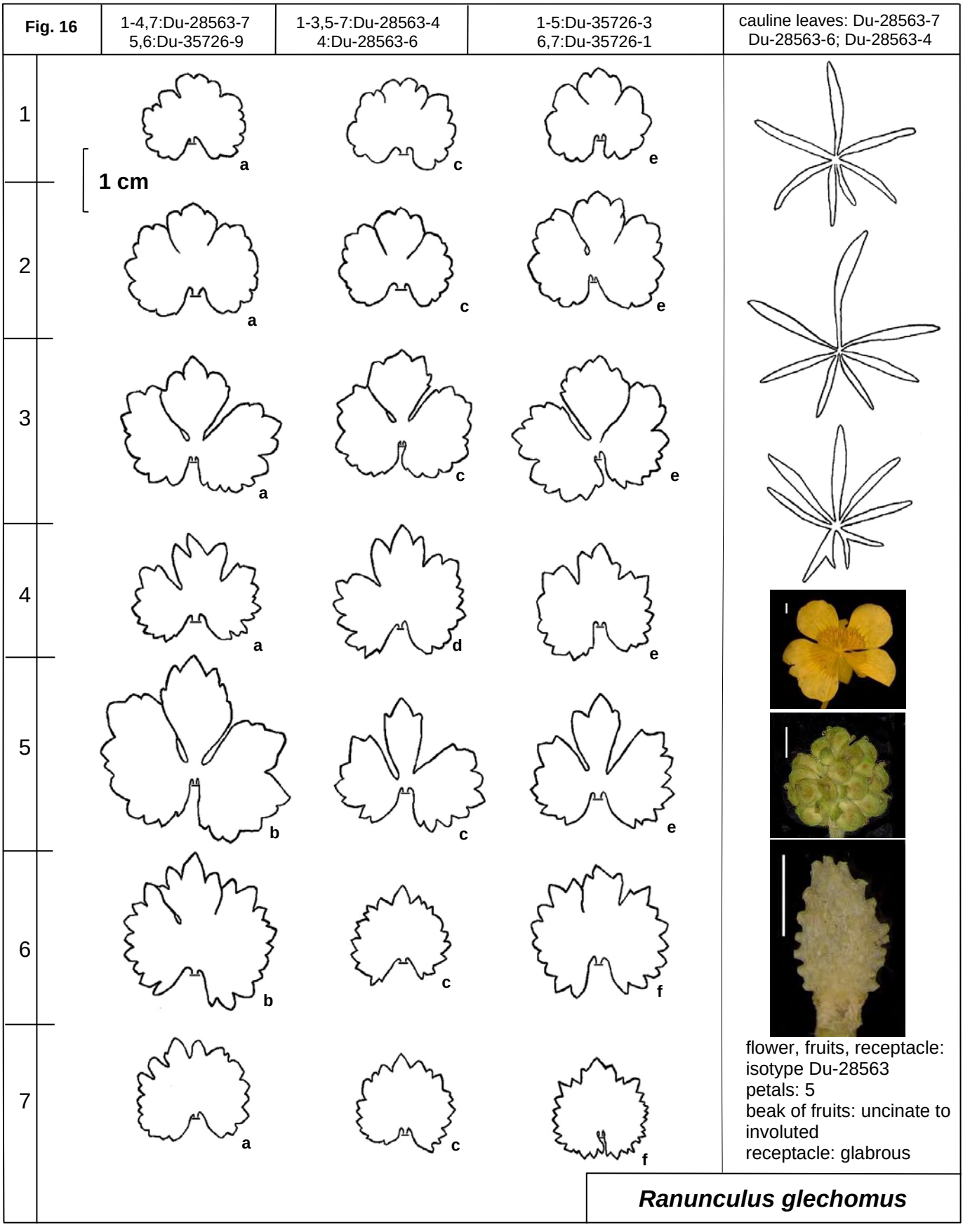


Fig. 16
1-4,7:Du-28563-7
5,6:Du-35726-9
1-3,5-7:Du-28563-4
4:Du-28563-6
1-5:Du-35726-3
6,7:Du-35726-1
cauline leaves: Du-28563-7
Du-28563-6; Du-28563-4
1
2
3
4
5
6
7
1 cm
a
c
e
d
b
f
flower, fruits, receptacle:
isotype Du-28563
petals: 5
beak of fruits: uncinate to involuted
receptacle: glabrous
Ranunculus glechomus

Fig. 17: *Ranunculus glechomus* – holotype (LJU).

Morphologically, *R. glechomus* is similar to *R. schilleri* Soó, and *R. neumanii* (JULIN) ERICSSON (SOÓ 1964, JULIN 1964). It differs by some undivided leaves (no. 1, 2, and 6) from *R. schilleri*. *R. neumanii* belongs to the *R. monophyllus* group and possesses a cataphyll and only 4 basal leaves. It differs by narrowly deltoid cauline leaf segments and a greater angle at the base of the basal leaves.

Specimens seen — Slovenia, Preddinarsko območje, **0053.2**, Grosuplje, W des Ortes, N der Straße Ponova vas, 50–100 m W der Brücke über die Bičje, Grabenrand, 335 m, 45°56'43.2''EN 14°39'05.3''E, 23 Apr 2012, F.G. Dunkel, Du-28563 (Isotypi); ibidem, W Grosuplje, S Straße Ponova vas, 100 m S Brücke über die Bičje, Grauweidengebüsch, 325 m, 45°56'39.0''N 14°39'08.8''E, 23 Apr 2018, F.G. Dunkel, Du-35726.

3.2.9 *Ranunculus mediocompositus* DUNKEL

Holotype: Slovenia, Predalpsko Območje, 0151.4, Logatec Planinsko Polje, E Liplje, E der Straße Planina - Laze, N P. 446, 50–100 m S Flüsschen Unica, magere Wirtschaftswiese, Flachmoor, [E of road Planina - Laze, N of P. 446, 50–100 S of little river Unica, nutrient-poor meadow, mire], 435 m, 45°50'58''N 14°15'32''E, 24 Apr 2012, F.G. Dunkel; holotype LJU, isotypes B, M, Du-28639; DUNKEL & al. 2018: Fig. 1, 10, 11, tab. 1; Fig. 39.

Pollen quality — excellent; 94.3% well developed (Planinsko Polje, isotype, Du-28639).

DNA-ploidy — 2x (isotype, Du-28639; DUNKEL & al.: tab. 1).

Eponymy — refers to the median morphological position between *R. austroslovenicus* and *R. peracris*.

Ecology — poor-nutrient anthropogenic meadows.

Distribution — obviously endemic to Planinsko Polje southwest of Ljubljana.

Taxonomy — see Dunkel & al. 2018.

Specimens seen — see DUNKEL & al. 2018.

3.2.10 *Ranunculus subcarniolicus* DUNKEL

Holotype: Slovenia, Preddinarsko območje, 0053.2, Grosuplje, W des Ortes, ca. 150 m N der Ponova Vas, 250 m W des Flüsschens Bičje, magere Wirtschaftswiese, [W of the village, 250 m W of the brook Bičje, nutrient-poor meadow], 45°56'46''N 14°38'54''E, 325 m, 08 Apr 2017, F.G. Dunkel; holotype LJU, isotypes B, M, Du-34772. – DUNKEL & al. 2018: Fig. 1, 14, 15, tab. 1; Fig. 40.

Pollen quality — excellent; 97.6% well developed (isotype Du-34772).

DNA-ploidy — 2x (Grosuplje, isotype Du-34772).

Ecology — nutrient-poor meadows, moist hornbeam, and alder forests alongside brooks.

Etymology — refers to Lower Carniola, southeastern part of the historical Carniola region.

Distribution — Central Slovenia south of Ljubljana to southeastern Slovenia around Šentjernej, southern border at the Northern Velebit, region of Lika, close to Gospić in Croatia.

Taxonomy — see DUNKEL & al. 2018.

Specimens seen — see DUNKEL & al. 2018.

3.2.11 *Ranunculus notabilis* HÖRANDL & GUTERMANN

Phyton (Horn) 37: 268, 1998. – Holotype: Austria, Burgenland, South Burgenland, 8964/4: Stremtal, Moschendorfer Wald, am Rand 1,5 km ENE Strem, 220 m, Feuchtwiese, [at the edge of Moschendorfer Wald, humid meadow], 1 May 1994, E. Hörandl & W. Gutermann, Hö5613 = Gu27897; holotype WU, isotypes WU, Hb. Gutermann, Hörandl, M, W. – Fig. 18, 40.

Pollen quality — 93–94% well developed (HÖRANDL & al. 1997).

DNA-Ploidy — unknown.

Chromosome number — 2n = 16 (HÖRANDL & al. 1997, C. Dobeš).

Distribution — Austria, South Burgenland, Strem valley, and Slovenia, S of Šentjernej, probably also Planinsko Polje SW of Ljubljana.

Ecology — fresh riparian forests, oak-hornbeam forests, forest edges, humid meadows.

Etymology — *R. notabilis* is one of the remarkable (*lat.* notabilis) diploid and sexual species of the *Ranunculus auricomus* complex in southeastern Central Europe.

Vulnerability — in Slovenia rare and endangered by possible change of meadow management.

Taxonomy — the specimen LJU-10046588 (Fig. 18) collected by R. Luštek in 1969 presents the heterophyllous leaf cycle of *R. notabilis*: typical segments with obtuse teeth of spring leaves and undivided blades of final leaves with wide-angled base and relatively acute teeth. Such plants with well developed flowers of five petals, typical for amphimixis, are only found near Gajma and Logatec. They are rare but cannot be attributed to any other species.

Specimens seen — Slovenia, Preddinarsko Območje: **0158.3**: Šentjernej, Šentjernejska Gmajna (8 km N Šentjernej, bei Krško), 150 m, mokro [wet], 45°54'18''N 15°22'11''E, R. Luštek, LJU-10046588, Du-34932; Predalpsko Območje**: 0151.4**: Planina, 1,2 km SO Planina, beidseits der Straße, feuchte Wirtschaftswiese, 446 m, 45°50'58''N 14°15'31''E, 21 Apr 2018, F.G. Dunkel, Du-35274 sub *R.* cf. *notabilis* HÖRANDL & GUTERMANN.

3.2.12 *Ranunculus peracris* DUNKEL

Holotype: Slovenia, Unterkrain (Dolenjska), 0158.1, 1.6 km S Gmajna an der Straße nach Zameško, O der Straße, Wiese, Waldrand und angrenzender Hainbuchen-Wald, [on the road to Zameško, eastside, meadow, edge of the forest and adjacent hornbeam forest], 45°53'24'' N 15°22'09''E, 153 m, 23 Apr 2013, F. G. Dunkel, Du-30446; holotype LJU, isotypes B, M, WB, Du-30446. – DUNKEL & al. 2018: Fig. 1, 12, 13, tab. 1; Fig. 40.

Pollen quality — excellent; 96.2% well developed (isotype Du-30446, DUNKEL & al. 2018: tab. 1).

DNA-ploidy — 2x (Sajevce, Du-33235; DUNKEL & al.: tab. 1).

Fig. 18: *Ranunculus notabilis* (LJU-10046574).

Etymology — The strongly divided basal leaves recall some forms of the corresponding leaves of *Ranunculus acris* L.

Ecology — humid oak-hornbeam forests, forest edges, shrubbery, humid nutrient-poor meadows.

Distribution — a Slovenian endemic scattered from central Slovenia around Ljubljana to southeast Slovenia around Novo Mesto.

Taxonomy — see DUNKEL & al. 2018. Suprisingly, in a population near Središče ob Dravi found by M. Govedič in 1995, all plants presented with five petals and a DNA-amount indicating diploidy. Although 10% of the plants were morphologically different, most of the plants could be readily attributed to *R. peracris*. The new determination of *R. peracris* enlarges considerably the distribution area to northeast. The second below-mentioned indication is of historical nature; the population is obviously extinct.

Specimens seen — not mentioned in DUNKEL & al. 2018. Slovenia, Subpanonsko Območje: **9563.4**: Središče ob Dravi, za Kmetijo Lokman v Vodranciu S Središče, na robu gozda, 200 m, 08 Apr 1995, M. Govedič, LJU-10046606; ibidem, Stajerska, Središče ob Dravi, unterhalb Vodranci 22, 30 m im Wald, 500 m NW Godeninci, Erlenbruch, 200 m, 46°25'24''N 16°15'38''E, 13 Apr 2019, F.G. Dunkel, Du-36160; Predalpsko Območje, **9952.4**: Ljubljana, ad lagum Mestni Log prope Labacum in silvis umbrosis et humidis, solo argilloso, 300 m, 46°01'48''N 14°28'27''E, leg. A. Martinčič, 07.05.1953, F.G. Dunkel, LJU-10046587, Du-27932.

3.2.d *Ranunculus schilleri* group

3.2.13 *Ranunculus pospichalii* PIGNATTI

Giorn. Bot. Ital. 110: 214, 1976. – H o l o t y p e : Slovenia, Škocjan, S. Canziano pr. Trieste, V.1897, C. Marchesetti, FI s.n. – Fig. 19, 20, 40.

Pollen quality — bad; 28.9% well developed (S. Canziano, locotype Du-12486-1).

DNA-ploidy — unknown.

Chromosome number — unknown.

Distribution — only known at the type locality near the caves of Škocjan (S. Canziano).

Ecology — oak-hornbeem forests in air-humid position.

Eponymy — dedicated to E. Pospichal (1838–1904), teacher at a secondary school in Trieste, author of the *Flora des Oesterreichischen Küstenlandes* (1897–1899).

Vulnerability — endemic; high risk of extinction, possibly already extinct.

Taxonomy — *R. pospichalii* is an interesting endemic of the caves of Škocjan which has belonged to UNESCO's list of natural and cultural world heritage sites since 1986. C. Marchesettii detected the species in this area already in 1897 (holotype in FI, non vidi).

R,. pospichalii is characterised by a basal leaf cycle of four leaves, up to 12 mm wide petals, and a pilose receptacle, all typical for the *R. cassubicus* group, but it is of slim statue, a character of the *R. auricomus* group.

Indeed, the leaf cycle of *R. pospichalii* resembles that of *R. neumanii* (JULIN) ERICSSON, a rather widespread species of *R. monophyllous* group in Norway and Sweden (JULIN 1964). The Slovenian endemic differs by almost always undivided obtuse oblanceolate cauline leaves and small receptacle (0.8–1.5 mm long) with few setae vs. narrowly deltoid cauline leaves and a bigger receptacle (2.5–4.5 mm long) with many short hairs in *R. neumanii*. Some Russian species of the *R. monophyllus* group are also similar, but *R. pospichalii* lacks the characteristic cataphyll of the group. Morphologically, also *R. degenii* KÜMMERLE & JÁV. is close to *R. pospichalii* but differs by a more numerous basal leaf cycle and a glabrous receptacle. Provisionally, due to undivided leaf blades *R. pospichalii* is grouped here into the *R. schilleri* group (HÖRANDL & GUTERMANN 1998a).

Unfortunately, neither chromosome number nor genetic data is available. The small amount of well-developed pollen (28.9%) and the usually incomplete flowers with 2–4(5) petals argue for apomixis.

R. pospichalii has been collected several times, e.g., in 1897 and 1914 by C. Marchesetti, and in 1970 by L. Poldinii. The author himself found about 10–15 plants of *R. pospichalii* in a difficult-to-reach area in 2005 but looked in vain for it in 2007. The assumption of further occurrences in the neighbourhood near Laus "anche nelle voragini vicine" has not been confirmed. (PIGNATTI 1976). Therefore, it is possible that *R. pospichalii* is already extinct. In case of rediscovery of this endemic species, *R. pospichalii* deserves absolute protection.

Specimens seen — S l o v e n i a , Submediteransko območje, Küsten- und Karstgebiet: **0349.2**: Divača, Škocjan, Škocjanske jame, (ital.: Grotte di San Canziano),"San Canziano", Jun 1914, C. Marchesetti, det. S. Pignatti 21 Oct 1974 sub *R. pospichalii* Pignatti, FI-050429; ibidem, voragini di San Canziano, 03 May 1970, L. Poldini, det. S. Pignatti, 21 Oct 1974 sub *R. pospichalii* Pignatti, TSB-2546; ibidem, Canziano d. Grotta, 300 m nördlich Matavun (Mattauno), Südrand der südlichen Doline, nordwestlich S. Canziano, oberhalb des Eingangs zur Grotte, beidseits des Aufzuges im untersten Teil, nur vereinzelt, nordexponiert, 300 m, 30 Apr 2005, F.G. Dunkel, Du-12486.

3.2.e *Ranunculus palaeoeuganeus* group

3.2.14 *Ranunculus gortanii* PIGNATTI

Giorn. Bot. Ital. 110: 212. – H o l o t y p e : Italia, Veneto, Val Padana, prov. di Udine, S. Giorgio di Nogaro, Bosco Boscat, 24 May 1959, E. & S. Pignatti, PAD. – DUNKEL 2010: Fig. 11i-j, 19, 20, 25d-g, 46; Fig. 21, 40.

syn. *R. aesontinus* PIGNATTI in Giorn. Bot. Ital. 110: 212, 1976.

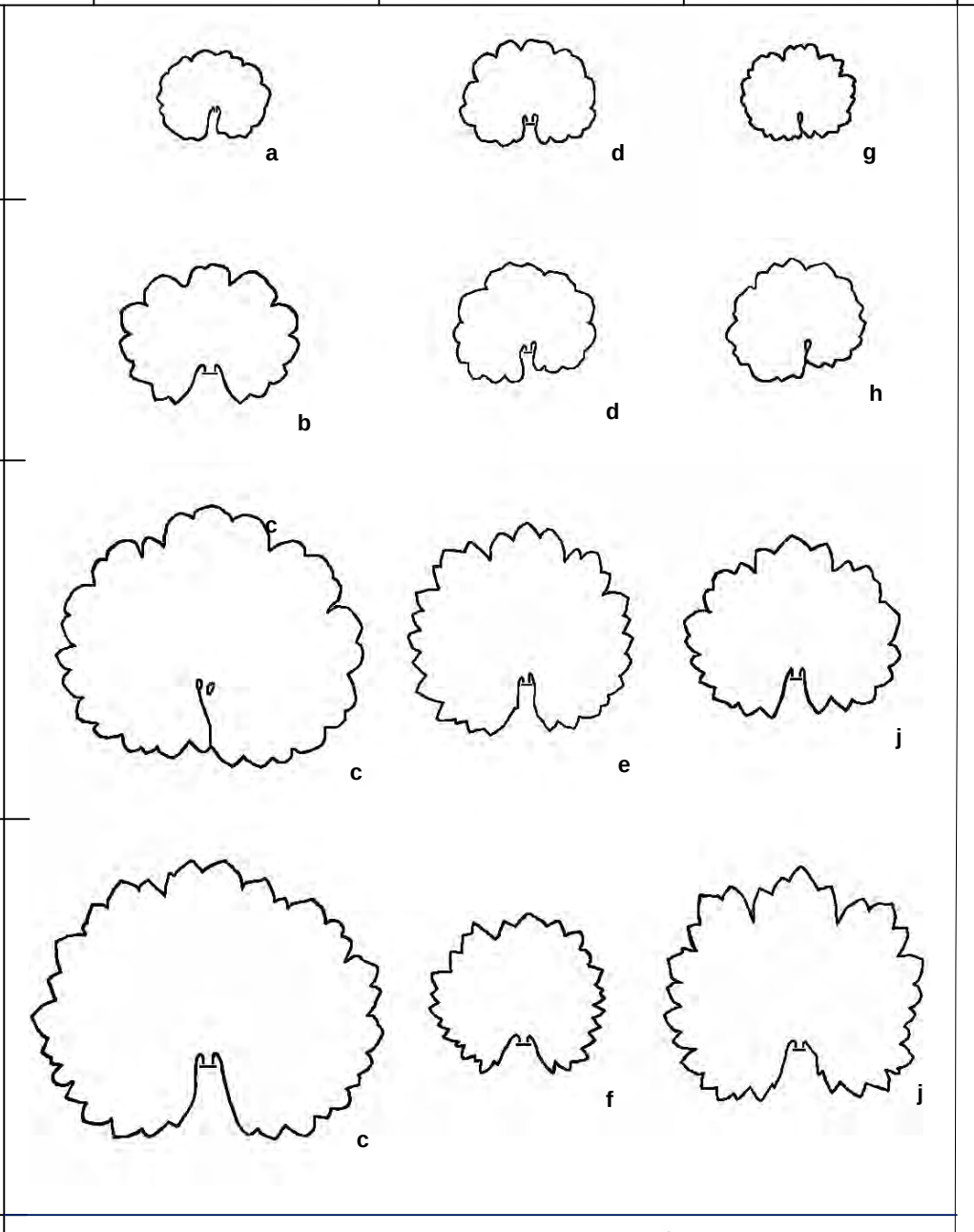
Pollen quality — bad; 31.9% well developed (Kobarid, Du-21005-7).

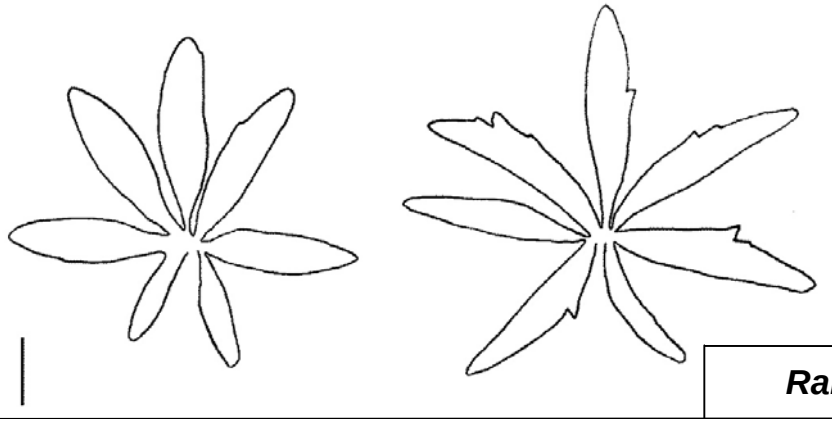
DNA-Ploidy — 4x (Notranjsko-kraška, Postojna, Du-30419).

Chromosome number — 2n = 32 (Italy, Udine, Marano Lagunare, MARCHI & VISONA 1982).

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

Fig. 19	1:Du-12486-1 2-4:Du-12486-3	1-3:Fi-1001283 (Holotyp) 4:TSB-2546	1-4:TSB-2546	cauline leaves: Du-12486-1 Du-12486-2





flower, fruits, receptacle: Du-12559-1

petals: 2-4(5)
beak of the fruit: uncinate
receptacle: pilose (+)

Ranunculus pospichalii

Fig. 20: *Ranunculus pospichalii* (Du-12486-1).

Fig. 21: *Ranunculus gortanii* (Du-21005-7).

Fig. 22: *Ranunculus plavensis* (Du-32740-1).

Distribution — Italy: Prealps of Belluno, Po Valley, Julian Prealps, Colli friulani, and Slovenia: Julian Pprealps (Kobarid), Nova Gorica in extension of the adjacent distribution area in Italy, and obviously rather disjunct near Postojna.

Ecology — fresh riparian forests, oak-hornbeam forests, forest edges, humid meadows.

Eponymy — dedicated to Luigi Gortani (1850–1908, editor (with his son Michele) of the Flora friulana (1905—1906).

Vulnerability — in Slovenia rare and endangered by possible change of meadow management.

Taxonomy — The *R. palaeoeuganeus* group presents a typical and widespread form group of Northern Italy characterised by long and conspicuous petals, mostly five cuneate to narrowly deltoid and dentated lowermost stem leaf segments and middle lobes with a concave lateral leaf edge, i.e., tapering gradually downwards into a stalk. The receptacles are always glabrous. The extreme forms of the group consist of *R. plavensis* DUNKEL (see below 3.2.13) on the one hand and *R. mediogracilis* DUNKEL on the other. The type locality of *R. aesontinus* PIGNATTI, conspecific with *R. gortanii*, is situated on the Slovenian territory (DUNKEL 2010). Within the group, the determination is sometimes difficult, especially the differentiation between *R. gortanii* and *R. palaeoeuganeus*. The latter reaches its eastern edge of distribution at San Giorgio di Nogaro (0145.3, Bosco Boscat; DUNKEL 2010).

Specimens seen — Slovenia, Alpsko Območje: **9747.3**: Nova Gorica, Robič, sul confine italo-slovenic presso Robic, sul margine del bosco, 500m, 25 Apr 1975, S. Pignatti, TSB 2546 (holotype of *R. aesontinus*); **9747.4**: Caporetto (Kobarid), May 1880, C. Marchesetti, FI-4776.25 (s.n.); ibidem, Kobarid (= Caporetto), zwischen Idrsko und Kobarid, zwischen dem Flüsschen Idrija und der Soča, Gemarkung Podklen, Buschhecken und angrenzende Wiesen, Lesesteinriegel, 200 m, 10 Apr 2008, F.G. Dunkel, Du-21005; ibidem, cultivated, 01 May 2008, F.G. Dunkel, Du-21070; Submediterransko Območje: **0047.4**: Gorizia, Kemperlišče im Wippachtal, 08 Apr 1948, C. Zirnich, DR-041172; ibidem, Panovec, östlich Nova Gorica (Bosco di Panovizza), bosco misto di *Carpinus, Fagus, Fraxinus, Acer campestris*, 100 m, 16 Apr 1979, L. Chiapella & E. Feoli, TSB 2546; Panovec, östlich Nova Gorica, Bosco di Panovizza, Carpineto, 170 m, 29 Apr 1984, L. Chiapella & E.Feoli, TSB 2546; ibidem, Nova Gorica, Panovec O Nova Gorica, Taleinschnitt am S-Fuß des Berges an der Hauptquerung von N nach S, N Restaurant Pikol, feuchter Talgrund im Laubmischwald, 107 m, 45°56’26’’N 13°39’55’’E, 22 Apr 2012, F.G. Dunkel, Du-28569; ibidem, Panovec O Nova Gorica, Taleinschnitt am NW-Fuß des Berges, feuchter Talgrund im Laubmischwald, 100 m, 45°56’59’’N 13°39’07’’E, 22 Apr 2012, F.G. Dunkel, Du-28666; ibidem, Nova Gorica, Stara Gora, beim Restaurant “Pikol Boris Gašpari”, Erlenbruch, 96 m, 45°56’16’’N 13°39’04’’E, 26 Apr 2015, F.G. Dunkel & S. Wittwer, Du-32739; **0147.2**: Valle del Vipacco (=Wippach), Vrtoče (Miren), sponde del Vipacco a Lamio orvalae-Sambucetum, ± 50 m, 11 Apr 1998, L. Poldini, TSB 2546; Dinarsko Območje: **0251.1**: Postojna, okolica=Umgebung Postojne, na desnem bregu re Pivke (auf dem rechten Ufer des Pivka), 500 m pred Postojnsko jamo (500 m vor der P. Höhle), Wiese am Fluss, 540 m, 26 Apr 2002, Maja Gril, LJU-10046604; ibidem, Postojna, ca. 400 m vor der Höhle Postojnska jama, nahe Fluss Pivka, 200 m WSW der SO-Ecke des Parkplatzes, Feuchtwiese, lichtes Gebüsch, 528 m, 45°46’48’’N 14°11’58’’E, 22 Apr 2013, F.G. Dunkel, Du-30419; ibidem, 22 May 2016, F.G. Dunkel, Du-33413.

3.2.15 *Ranunculus plavensis* DUNKEL

Webbia 65(2): 200, 2010. – Holotype: Veneto, Prealpi venete, prov. di Belluno, 9937.4, Collesei di Cellarda-Feltre, ceduo, 21 Apr 2007, C. Argenti, FI; isotypes M, Du-19683. – DUNKEL 2010: Fig. 11l, 23, 24, 25k-m, 46; Fig. 22, 40.

Pollen quality — good; 88% well developed (isotype Du-19683, DUNKEL 2010).

DNA-Ploidy — 4x (Italy, Capriva del Friuli, Du-34888).

Distribution — centre of distribution at the Prealps of Belluno and hills of Treviso, most eastern populations at Cessalto (Po valley) and nearby Slovenia.

Etymology — named after the river Piave (flumen plavensis).

Ecology — deciduous forests dominated by hornbeam and hazelnut dominated shrubbery; humid, at least during spring time.

Vulnerability — extremely rare in Slovenia, and therefore critically endangered due to risk of deforestation and eutrophication of shrubbery and forests.

Taxonomy — *R. plavensis* grows together with or close to *R. gortanii*, another representative of the *R. palaeoeuganeus* group (see 3.2.12.). The latter is much more common in Slovenia and possesses a greater distribution area both in Italy and Slovenia. The whole *R. palaeoeuganeus* group reaches its eastern edge in Western Slovenia, only two of six known species occur in Slovenia. Only two specimens of *R. plavensis* were seen by the author; the species is obviously endangered in Slovenia and merits protection.

Morphologically, *R. plavensis* differs from *R. gortanii* by the wide-angled blade of the basal leaves and smaller main incision of the final leaves (33–50% vs. 70–95% in *R. gortanii*) (DUNKEL 2010).

Specimens seen — Slovenia, Submediteransko Območje: **0047.4**: Nova Goricia, östlich Nova Goricia: Bosco di Panovizza, Carpineto, 170 m, 29 Apr 1984, L. Chiapella & E. Feoli, TSB 2546; ibidem, Nova Gorica, Stara Gora, beim Restaurant “Pikol Boris Gašpari”, Erlenbruch, 96 m, 45°56’16’’N 13°39’46’’E, 26 Apr 2015, F.G. Dunkel & S. Wittwer, Du-32740.

3.2.g *Ranunculus phragmiteti* group

3.2.16 *Ranunculus arcogoticus* DUNKEL spec. nova

Holotype: Slovenia, Innerkrain, Dinarsko območje: 0251.1: Postojna, ca. 400 m vor der Höhle Postojnska jama, nahe Fluss Pivka, 200 m WSW Parkplatz, lichtes Gebüsch, Erlenbruch, 528 m, [ca. 400 m to Postojnska jama (Postojna cave), close to river Pivka, 200 m WSW parking place, bright shrubbery, alder forest], 45°46’48’’N 14°11’57’’E, 22 May 2016, F.G. Dunkel; holotype LJU, isotypes M, Du-33414. – Fig. 23, 24, 41.

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

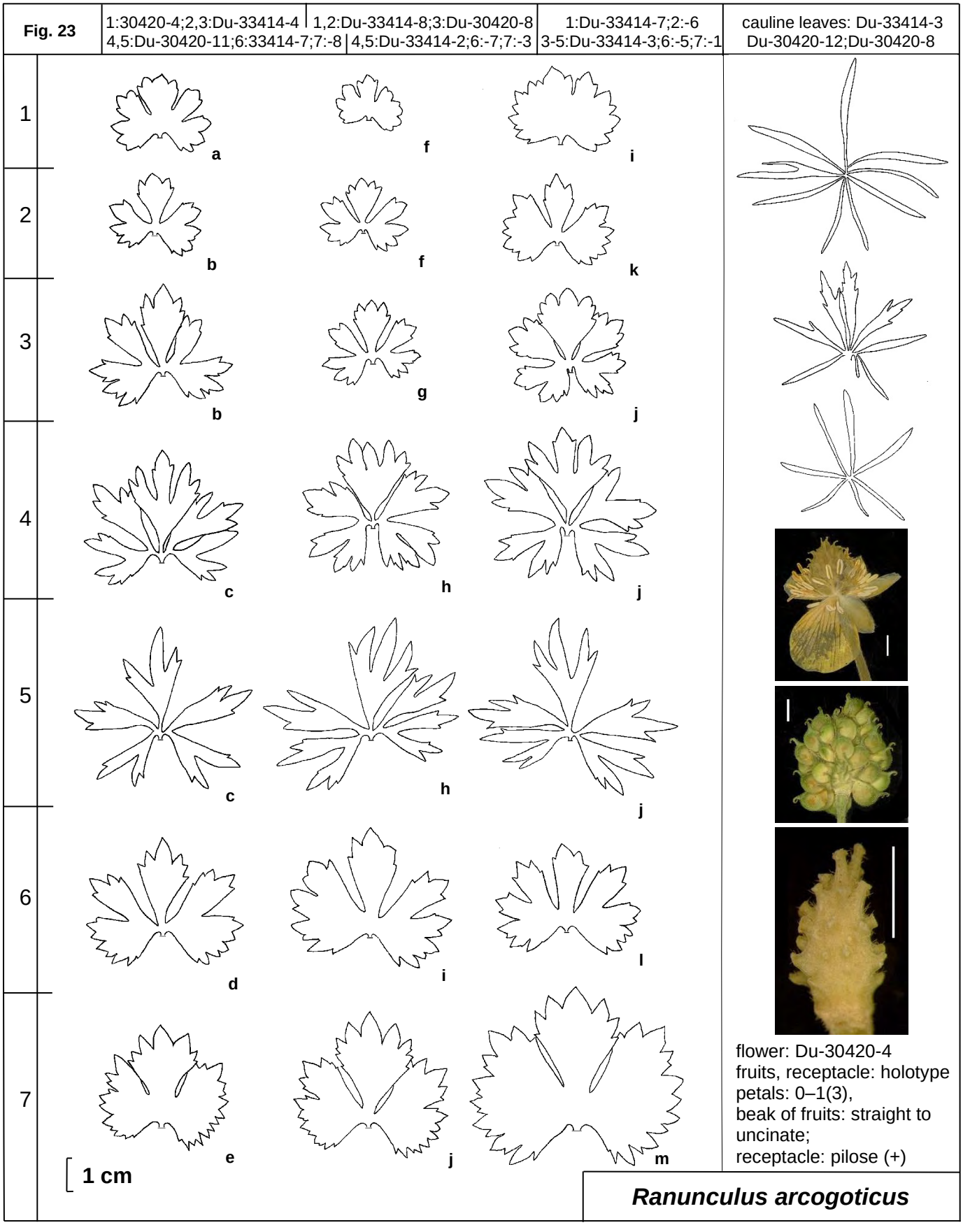


Fig. 23
1:30420-4;2,3:Du-33414-4
4,5:Du-30420-11;6:33414-7;7:-8
1,2:Du-33414-8;3:Du-30420-8
4,5:Du-33414-2;6:-7;7:-3
1:Du-33414-7;2:-6
3-5:Du-33414-3;6:-5;7:-1
cauline leaves: Du-33414-3
Du-30420-12;Du-30420-8
1
2
3
4
5
6
7
a
f
i
b
f
k
b
g
j
c
h
j
c
h
j
d
i
l
e
j
m
1 cm
flower: Du-30420-4
fruits, receptacle: holotype
petals: 0–1(3),
beak of fruits: straight to uncinate;
receptacle: pilose (+)
Ranunculus arcogoticus

Fig. 24: *Ranunculus arcogoticus* – holotype (LJU).

Description — Flowering shoot gracile to slim, 20–36 cm, stalk 1.0–2.5 mm in diameter, reddish at the base, suberect to moderately divergent, angle between the main and secondary axis 10–50°(60°), flowers 1–4(6), enrichment shoots 0–1; basal leaves (1)2–4 per rosette.

Basal leave cycle: *First basal leaf* 10–24 mm long, V-shaped- to wide-angled at base (80–130°), cleft to divided by the main incision (45–80%); middle lobe deltoid to broadly deltoid with 3–5 (crenated) teeth; lateral segment undivided or cleft by first lateral incision (up to 60%), leaf edge irregularly crenate-serrated.

Second basal leaf 14–24 mm long, narrow-angled to V-shaped at base (50–100°), divided by the main incision (85–95%); middle lobe deltoid to broadly deltoid with 5(–7) teeth; lateral segment undivided or cleft by first lateral incision (up to 60%), leaf edge irregularly crenate-serrated.

Third basal leaf 15–28 mm long, narrow-angled at base (30–80°), divided by main incision (90–98%); middle lobe deltoid to broadly deltoid with 5–7 (crenated) teeth, lateral edge slighthly concave; lateral segment divided by first lateral incision (66–85%), cleft by second lateral incision (40–60%), leaf edge irregularly and deeply crenate-serrated.

Fourth basal leaf 22–36 mm long, narrow- to wide-angled at base (25–110°), dissected by main incision; middle lobe up to 3 mm long stalked, deltoid to broadly deltoid, tricleft with incisions up to 50%, with 7–9 crenated teeth, lateral edge straight to concave; lateral segment divided by the first lateral incision (75–90%), cleft to divided by second and third lateral incision (50–70%, and 40-68%, respectively), leaf edge irregularly and deeply crenate-serrated.

Fifth basal leaf 30–42 mm long, narrow-angled to V-shaped at base (40–100°), dissected by main incision; middle lobe up to 3 mm long stalked, deltoid, tricleft with incisions up to 60%, with 5(–7) elongated teeth, lateral edge straight to slightly concave; lateral segment divided by the first lateral incision (80–92%), cleft to divided by second lateral incision (50–80%), and cleft by third lateral incision (33–50%), leaf edge irregularly and deeply crenate-serrated.

Sixth basal leaf 24–36 mm long, narrow-angled to V-formed at base (60–100°), divided by main incision (85–98%); middle lobe deltoid (to broadly deltoid) with (4)5–7 crenated teeth, lateral edge slightly concave; lateral segment cleft by the first lateral incision (33–65%), second lateral incision absent or up to 40%; leaf edge irregularly and deeply crenate-serrated.

Seventh basal leaf 20–44 mm long, V-formed at base (80–100°), divided by main incision (75–95%); middle lobe broadly deltoid to spatulate with 7–11 crenated teeth, lateral edge straight to slightly concave; lateral segment undivided or first lateral present up to 45%; leaf edge irregularly and deeply crenate-serrated.

Lowermost stem leaf divided into 7–9 segments, largest segment 24–45 mm long, 3–5 mm wide, linear to narrowly oblanceolate, undivided or narrowly lanceolate to cuneate with up to 8 long and sometimes patent teeth.

Petals 0–1(3), 6–9 mm long, 5–7 mm wide; *androclinium* 0.4–0.6 mm long, *receptacle* ovoid, 2.5–4.5 mm long, 1.5–2.5 mm wide, intervallum absent, scarcely pilose, carpellophores 0.2–0.4 mm; *fruits* 1.5–2.2 mm long, beak 0.6–1.1 mm long, straight to uncinate.

Pollen quality — mediocre; 52.6% well developed (Postojna, locotype Du-30420-12).

DNA-ploidy — 4x (Postojna, locotype Du-30420; isotype Du-33414).

Distribution — at present only known from the type locality near Postojna.

Ecology — humid meadows, willow brushes.

Etymology — the regular, often V-shaped aperture of the basal leaves recalls a Gothic vault (lat. arcus goticus).

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

Taxonomy — R. arcogoticus is characterised by deep incisions of the middle segment of the spring leaves and a rather regular often V-shaped base of the leaf cycle. Herein it resembles strongly *R. mediosectus* HÖRANDL & GUTERMANN of the Austrian Burgenland and Styria, more than 160 km far away. Therefore, at first the population was categorised under *R. mediosectus*, but further analysis presented some differences: the middle lobe and the final leaves possess more numerous and more acute teeth than *R. mediosectus*; the blade of the seventh basal leaf is undivided in *R. mediosectus*; in *R. arcogoticus* the main incision amounts to 95%.

Specimens seen — Slovenia, Dinarsko območje: **0251.1**: Postojna, ca. 450 m vor der Höhle Postojnska jama, nahe Fluss Pivka, 200 m WSW Parkplatz, verbuschende Feuchtwiese, lichtes Gebüsch, 528 m, [ca. 450 m to Postojnska jama (Postojna cave), close to river Pivka, 200 m WSW parking place, humid meadow, bright shrubbery], 45°46’47’’N 14°11’58’’E, 22 Apr 2013, F.G. Dunkel, Du-30420 (locotype); ibidem, 22 May 2016, F.G. Dunkel, Du-33414 (isotypes).

3.2.17 *Ranunculus finodivisus* DUNKEL spec. nova

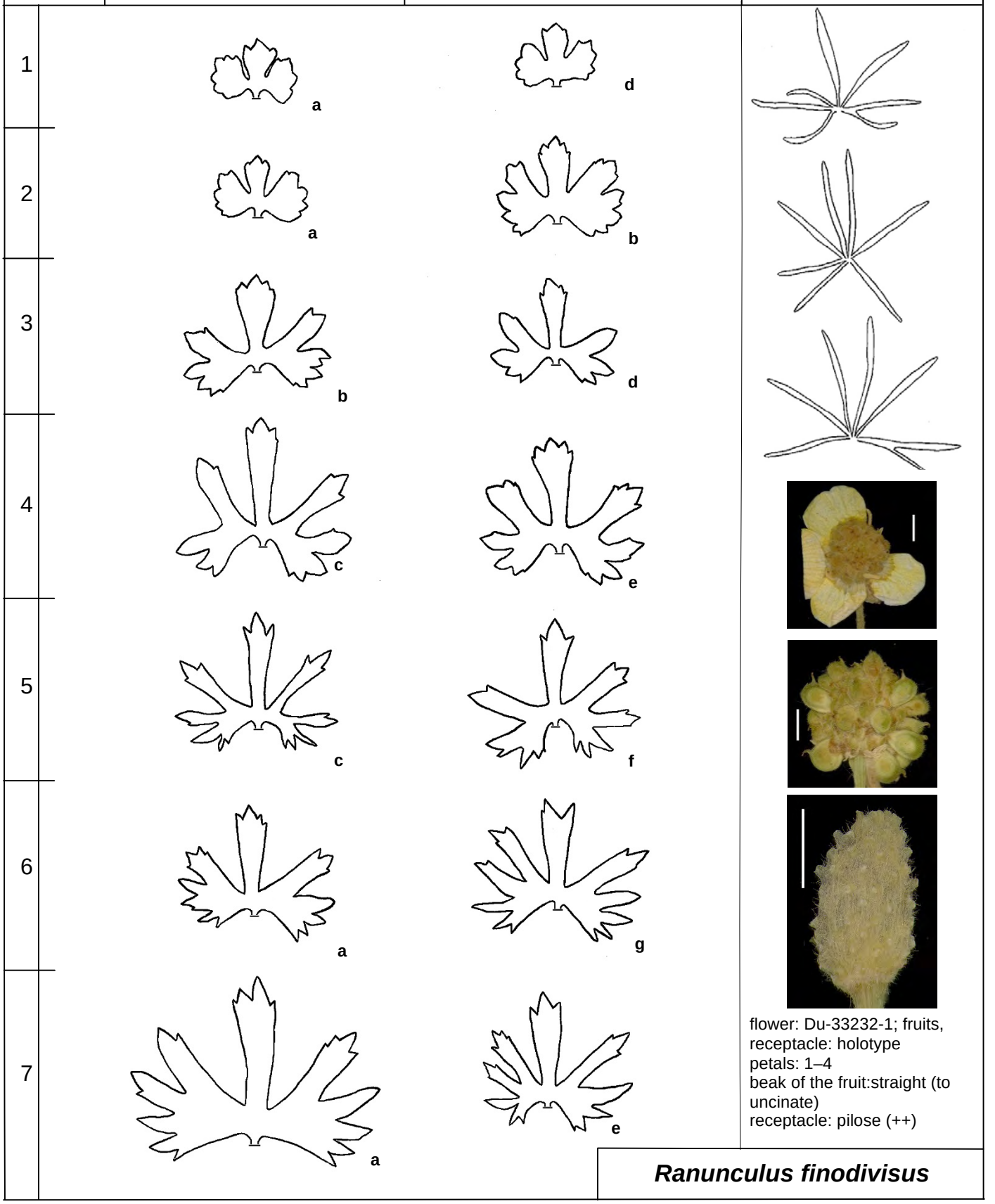
Holotype: Slovenia, Pomurska, Ungarische Tiefebene, 9463.3, Pristava, ca. 700 m SSO Pristava, an der Straße zwischen Stročja Vas und Razkližje, im unteren Teil der Wiese, 170 m, [near the road between Stročja Vas und Razkližje, in the lower part of a humid meadow], Feuchtwiese, 46°30’51’’N 16°14’12’’E, 26 Apr 2016, F.G. Dunkel; holotype LJU, isotypes M, Du-33232. – Fig. 25, 26, 41.

Description — Flowering shoot gracile to slim, 20–37 cm, stalk 0.7–2.2 mm in diameter, suberect (or moderately divergent), angle between the main and secondary axis 15–30(50)°, flowers 1–4, enrichment shoots 0(–1); basal leaves 2–4 per rosette.

Basal leaf cycle: Blade of the initial and final leaves V-formed to wide-angled at the base (80–130°), blade of the spring leaves narrow-angled to V-formed (wide-angled) ((50)70–100(120°)). With the exception of the first basal leaf, the main incision is in all other basal leaves conspicuously wide-angled (40–55°). The leaf edge presents irregularly crenated to crenate-serrated in the

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

Fig. 25	1-2,4-7:Du-33232-3; 3:Du-33232-2	1,3:Du-33232-2;2: Du-33232-3 4,5,7:Du-33232-4; 6:Du-33232-1	cauline leaves: Du-33232-3 Du-33232-3, Du-33232-4



flower: Du-33232-1; fruits, receptacle: holotype
petals: 1–4
beak of the fruit:straight (to uncinate)
receptacle: pilose (++)

Ranunculus finodivisus

Fig. 26: *Ranunculus finodivisus* – holotype (LJU).

initial leaves, deeply crenate-serrated to serrate in the following leaves.

First basal leaf 8–11 mm long, divided by main incision (70–80%); middle segment deltoid with 3–5 crenated teeth; lateral segment undivided.

Second basal leaf 8–15 mm long, divided by main incision (70–85%); middle lobe (narrowly) deltoid with 3–5 crenated teeth; lateral segment undivided or cleft by first lateral incision (up to 42%) and lobed by second lateral incision (up to 32%).

Third basal leaf 13–18 mm long, divided by main incision (75–95%); middle lobe narrowly deltoid to deltoid with 3–5 crenated teeth; lateral segment cleft by first lateral incision (45–65%) and lobed to cleft by second lateral incision (28–50%).

Fourth basal leaf 17–23 mm long, divided by main incision (80–97%); middle lobe narrowly deltoid with 3–5 crenated teeth; lateral segment cleft to divided by first lateral incision (60–90%), cleft by second lateral incision (40–50%).

Fifth basal leaf 16–22 mm long, divided by main incision (85–97%); middle lobe narrowly deltoid with 3–5 teeth; lateral segment cleft to divided by first lateral incision (65–80%), cleft by second and third lateral incision (40–65%, and 35–50%, respectively).

Sixth basal leaf 12–20 mm long, divided by main incision (85–90%); middle lobe narrowly deltoid with 3–5 teeth; lateral segment cleft by first lateral incision (50–65%), cleft by second and third lateral incision (35–60%, and 33–50%, respectively).

Seventh basal leaf 16–28 mm long, divided by main incision (80–95%); middle lobe narrowly deltoid with 3–5 teeth; lateral segment cleft to divided by first lateral incision (50–70%), cleft by second and third lateral incision (40–55%, and 33–55%, respectively), fourth lateral incision absent or up to 28%.

Lowermost stem leaf divided into (5–)7 segments, largest segment 22–38 mm long, 1.5–2.5 mm wide, linear, undivided.

Petals 1–4, 5–8 mm long, 4–6 mm wide, persistent; *androclinium* 0.15–0.3 mm; *receptacle* ellipsoid, 3.5–4.5 mm long, 1.8–2.2 mm wide, pilose (++), invervallum absent, carpellophores numerous, 0.05–0.2 mm long; *fruits* 1.6–2.2 mm long, beak 0.5–0.9 mm long, straight (to uncinate).

Pollen quality — mediocre; 60.3% well developed (Slaptinci, Du-32709-1).

DNA-ploidy — unknown.

Distribution — at present only known from three localities in the Prekmurje region of northeastern Slovenia.

Ecology — humid meadows, grassy robinian groves.

Etymology — refers to the divided blade of the final leaves.

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

Taxonomy — According to HÖRANDL & GUTERMANN, in the *Ranunculus phragmiteti* and *R. indecorus* group, the form of the receptacle is a more important character than the basal leaf cycle. In *R. finodivisus,* the pilose receptacle is conspicuous by its size of 3.5–4.5 mm in length combined with short carpellophores. It is similar to that one of *R. oxyodon* HÖRANDL & GUTERMANN (1998c). From the latter, it differs by the basal leaf cycle with less acute lobe segments. With the exception of the first basal leaf, in all others, the main incision is conspicuously wide-angled (40–55°); the middle segment is narrowly deltoid with only 3–5 short teeth. In almost all species, the blade of the final basal leaves are (much) less divided than the spring leaves. This is different in *R. finodivisus*: the basal spring leaves possess two lateral incisions, the seventh leaf three to four.

Populations of *R. auricomus* occur scatteredly in the Pomurska region; therefore, further sites of this endemic are quite possible.

Specimens seen — Slovenia, Subpanonsko Območje, Pomurska: **9363.4**: Beltinci, 1,5 km NO Beltinci, am Güterweg zwischen Lipa und Gančani, z.T. lichter grasiger Robinienhain, 173 m, 46°37’01’’N 16°15’22’’E 26 Apr 2016, F.G. Dunkel , Du-33219 [at least pro parte]; ibidem, **9462.1**: Slaptinci, 300 m WNW Slaptinci, trockene und magere Wirtschaftswiese, 195 m, 46°33’50’’N 16°00’32’’E, 24 Apr 2015, F.G. Dunkel & S. Wittwer, Du-32709; ibidem, **9463.3**: Pristava, ca. 700 m SSO Pristava, an der Straße zwischen Stročja Vas und Razkližje, im unteren Teil der Wiese, Feuchtwiese, 170 m, 46°30’51’’N 16°14’12’’E, 26 Apr 2016, F.G. Dunkel, Du-33232 (isotypes).

3.2.18 *Ranunculus perfissus* DUNKEL spec. nova

Holotype: Slovenia, Innerkrain, Dinarsko območje, 0251.1, Postojna, ca. 450 m vor der Höhle Postojnska jama, nahe Fluss Pivka, 200 m WSW Parkplatz, verbuschende Feuchtwiese, lichtes Gebüsch, 528 m, [ca. 450 m to Postojnska jama (Postojna cave), close to river Pivka, 200 m WSW parking place, humid meadow, bright shrubbery], 45°46’47’’N 14°11’58’’E, 22 Apr 2013, F.G. Dunkel; holotype LJU, isotpes M, Du-30526. – Fig. 27, 28, 41.

Description — Flowering shoot gracile to slim, 12–28 cm, stalk 1.0–2.4 mm in diameter, reddish at the base, suberect to moderately divergent, angle between the main and secondary axis 10–50°, flowers 2–3(4), enrichment shoots 0–1; basal leaves (1)2–4 per rosette.

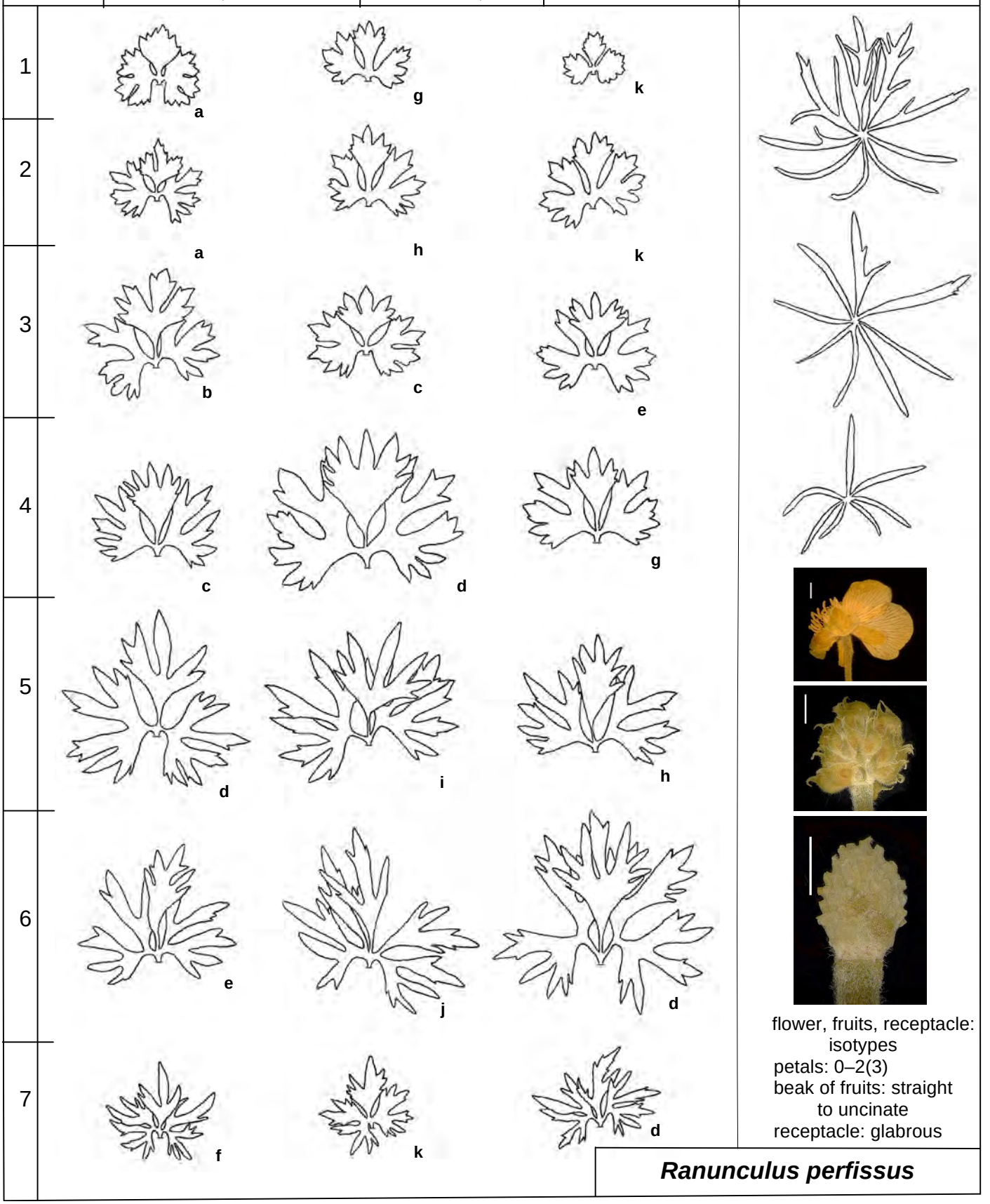
Basal leave cycle: Leaf edge deeply crenate-serrated.

First basal leaf 10–18 mm long, narrow- to wide-angled at base (20–110°), divided to dissected by the main incision (90–100%); middle lobe deltoid to rhomboid with 5–7 (crenated) teeth, sometimes tricleft with incisions up to 30%, lateral edge straight to concave; lateral segment undivided or cleft by first lateral incision (up to 60%), second lateral incision absent or up to 45%.

Second basal leaf 14–19 mm long, narrow-angled to V-shaped at base (50–100°), divided to dissected by the main incision (92–100%); middle lobe stalked up to 1 mm, deltoid to broadly deltoid with 7–15 teeth, irregularly tricleft with incisions up to 62%, lateral edge concave; lateral segment cleft to divided by first lateral incision (45–70%), cleft by second and third lateral incision (35–55%, and 33–50%, respectively), fourth lateral incision absent or up to 33%.

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

Fig. 27	1,2,5:Du-30526-1;3:Du-30526-3 4:Du-30526-2;6,7:Du-30526-6	1-3:Du-30526-2;4:-1 6:Du-30526-4;5,7:-6	1-3:Du-30526-6;4,5:-2 6,7:Du-30526-1	cauline leaves: Du-30526-6 Du-30526-1; Du-30526-6



flower, fruits, receptacle: isotypes
petals: 0–2(3)
beak of fruits: straight to uncinate
receptacle: glabrous

Ranunculus perfissus

Fig. 28: *Ranunculus perfissus* – holotype (LJU).

Third basal leaf 14–22 mm long, narrow-angled at base (50–70°), dissected by main incision; middle lobe stalked up to 4 mm, broadly deltoid to spatulate, tricleft with incisions up to 50%, with 7–11 (crenated) teeth, lateral edge concave; lateral segment cleft by first lateral incision (40–65%), cleft by second and third lateral incision (33–60%, and 33–50%, respectively), lobed to cleft by fourth lateral incision (25–40%).

Fourth basal leaf 18–32 mm long, V-shaped to wide-angled at base (90–140°), dissected by main incision; middle lobe up to 4 mm long stalked, deltoid to broadly deltoid, tricleft with incisions up to 36%, with 5–9 crenated teeth, lateral edge straight to concave; lateral segment cleft to divided by the first lateral incision (50–70%), cleft by the second lateral incision (40–55%), lobed to cleft by the third and fourth lateral incision (30–50%, and 28–43%, respectively), fifth lateral incision absent or up to 35%.

Fifth basal leaf 24–32 mm long, narrow- to wide-angled at base (20–130°), dissected by main incision; middle lobe up to 4 mm long stalked, deltoid to broadly deltoid, tricleft with incisions up to 62%, with 5–9 crenated teeth, lateral edge (straight to) concave; lateral segment occasionally stalked up to 3 mm, cleft to divided by the first and second lateral incision (50–75%), cleft by third and fourth lateral incision (40–60%, and 35–60%, respectively), lobed to cleft by fifth lateral incision (26–50%).

Sixth basal leaf 26–36 mm long, narrow-angled to V-formed at base (50–100°), dissected by main incision; middle lobe up to 4 mm long stalked, deltoid to broadly deltoid, tricleft with incisions up to 60%, with 5–11 crenated teeth, lateral edge concave; lateral segment occasionally stalked up to 3 mm, divided by the first lateral incision (80–90%), cleft to divided by the second lateral incision (60–90%), cleft by third and fourth lateral incision (50–65%, and 45–55%, respectively), lobed to cleft by fifth lateral incision (25–55%).

Seventh basal leaf 14–22 mm long, narrow-angled at base (10–50°), dissected by main incision; middle lobe up to 4 mm long stalked, deltoid to broadly deltoid, tricleft with incisions up to 75%, with 5–9 crenated teeth, lateral edge concave; lateral segment occasionally stalked up to 2 mm, cleft to divided by the first and second lateral incision (55–90%, and 50–75%, respectively), cleft by third and fourth lateral incision (35–66%, and 33–62%, respectively), (lobed to) cleft by fifth lateral incision (32–50%).

Lowermost most stem leaf divided into 5–7 segments, largest segment 26–44 mm long, 2–5 mm wide, linear to narrowly oblanceolate, undivided or with up to 4(5) long and sometimes patent teeth.

Petals 0–2(3), 7–9 mm long, 5–8 mm wide; *androclinium* 0.5–0.7 mm; *receptacle* ovoid, to 2.7–3.7 mm, 2.2–3.0 mm wide, intervallum present (up to 20%), glabrous, carpellophores short: 0.1–0.2 mm; *fruits* 1.2–1.8 mm, beak 0.6–1.0 mm, straight to uncinate.

Pollen quality — bad; 32,1% well developed (isotype Du-30526-1).

DNA-ploidy — unknown.

Distribution — at present only known from the type locality near Postojna.

Ecology — humid meadows, willow brushes.

Etymology — refers to the pronounced division of the basal leaf blades.

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

Taxonomy — Although *R. perfissus* is currently only known from the (small) and endangered population near Postojna, it is a very conspicuous species characterised by pronounced incisions of the basal leaf blades. At least in central Europe there is no other species with a fifth lateral incision almost over the whole basal leaf cycle. In Scandinavia, similar plants grow, e.g. R. *fissifolius* (NANNF. & HARRY SM.) ERICSSON and *R. oligandrandrus* (MARKL.) ERICSSON (JULIN & NANNFELDT 1966, MARKLUND 1961). The former differ by unstalked middle segments, the latter by final leaves with undivided or almost undivided lateral segments. Due to the relatively heavy achenes, an introduction or diversion of a *R. auricomus* taxon of Scandinavia to Central or Southern Europe has not been reported und is quite improbable.

R. perfissus is critically endangered; for the survival of the population, it would be necessary to mow the meadow regularly and prohibit fertiliser.

Specimens seen — Slovenia, Dinarsko območje: **0251.1**: Postojna, ca. 450 m vor der Höhle Postojnska jama, nahe Fluss Pivka, 200 m WSW Parkplatz, verbuschende Feuchtwiese, lichtes Gebüsch, 528 m, [ca. 450 m to Postojnska jama (Postojna cave), close to river Pivka, 200 m WSW parking place, humid meadow, bright shrubbery], 45°46'47''N 14°11'58''E, 22 Apr 2013, F.G. Dunkel, Du-30526 (isotypes).

3.2.h *Ranunculus indecorus* group

3.2.19 *Ranunculus variabilis* HÖRANDL & GUTERMANN

Holotype: Austria: Burgenland, Süd-Burgenland, 8663.3, Pinkatal, Unterschützen, Ortsrand 400 m NW der Kirche, 330 m, feuchte Mähwiese, [edge of the village 400 m NW of church, 330 m, humid hay meadow], 30 Apr 1994, E. Hörandl-5601 & W. Gutermann-27880; holotype WU, istopes WU, M, W. – Fig. 29, 30, 41.

Pollen quality — mediocre; 47% well developed (HÖRANDL & al. 1997).

DNA-ploidy — 4x (Noršinci, Du-33218, PAULE & al. 2018; Spodnji Ivanjci, Du-35811).

Chromosome number — 2n = 32 (Hörandl & al. 1997; C. Dobeš).

Distribution — in the hilly countries of the central and eastern parts of Austria, mainly beyond the Alps; in the northeastern parts of Slovenia Štajerska and Prekmurje, adjacent to Austria.

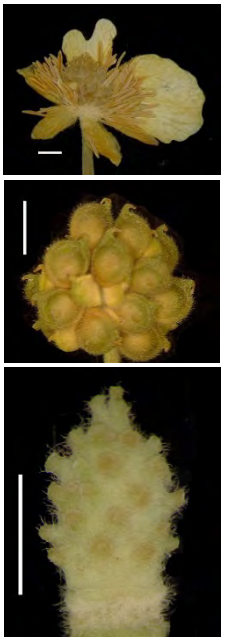
Ecology — humid meadows, edges of humid deciduous forests.

Etymology — refers to the variability of the species, according to HÖRANDL & GUTERMANN (1998c). The taxon may even consist

►

Fig. 29:
Ranunculus variabilis in Slovenia – data sheet (basal leaf cycle, stem leaves, flowers, fruits, receptacle). (Length of bars in figures of details = 2 mm.)

Fig. 29	1-4,6:Du-32707-6;5:Du-32707-3;7:Du-35814-3	1-5:Du-32707-7;6:Du-35814-2 7:Du-35814-10	1-5:Du-35707-3 6:Du-32707-4;7:Du-33218-1	cauline leaves: Du-35814-1 Du-32707-7;Du-32707-7
1	a	d	g	
2	a	d	g	
3	a	d	g	
4	a	d	g	
5	b	d	g	
6	a	e	h	
7	c	f	i	



flower:Du-32707-3
fruits: Du-35814-5
receptacle: Du-35814-1
petals: 0–3(5)
beak of fruits: uncinate
receptacle: pilose (++)

Ranunculus variabilis

Fig. 30: *Ranunculus variabilis* (Du-32707-3).

of different hitherto uncharacterised species.

Vulnerability — endangered by abandonment or eutrophication of humid hay meadows.

Taxonomy — HÖRANDL & GUTERMANN stress the variability of the species (1998c). They depict different receptacles: mostly pilose, yet once in the same population simultaneously glabrous and pilose receptacles do occur. In Slovenia, one finds obviously only populations of *R. variabilis* with a pilose receptacle. Therefore, populations of meadows with a pilose one argue for this species. Characteristic is the foot-like appearance of the spring leaves with a first and second lateral incision of more than 50% combined with an almost undivided seventh leaf.

Populations of *R. auricomus* grow scatteredly all over the Pomurska region; therefore, further occurrences of *R. variabilis* are quite possible.

Specimens seen — Slovenia, Subpanonsko Območje, Podravska region (Draugebiet): **9360.3**: Kušernik, nördlich des Perniško jezero, im Bereich eines Grauweidengebüsches, nur noch Reste, Mädesüßflur mit *Solidago*, degradierte Feuchtwiese, 247 m, 46°36’09’’N 15°43’05’’E, 12 Apr 2019, F.G. Dunkel, Du-36089; ibidem, **9361.3**: Spodnji Ščavnika, 2,050 km SWS Spodnji Ščavnika, ca. 50 m W der N 449, feuchte Wirtschaftswiese, 247 m, 46°38’02’’N 15°54’24’’E, 11.2018 May 2018, F.G. Dunkel, Du-35811; ibidem, Pomurska: **9363.1**: Noršinci, 700 m N Noršinci, relativ trockene Wirtschaftswiese, 187 m, 46°40’27.8’’N 16°12’26.2’’E, 25 Apr 2016, F.G. Dunkel, Du-33218; **9363.4**: Beltinci, 1,5 km NO Beltinci, am Güterweg zwischen Lipa und Gančani, z.T. lichter grasiger Robinienhain, 173 m, 46°37’01’’N 16°15’22’’E, z.T. mit *R. finodivisus*, 26 Apr 2016, F.G. Dunkel, Du-33219; **9461.4**: Zagorci, an der N 712, nahe Zagorci 61/c, N Sakušak, Wirtschaftswiese mit wenigen Pflanzen *Fritillaria meleagris*, 269 m, 46°30’47.03’’N 15°59’56.59’’E, 24 Apr 2015, F.G. Dunkel & S. Wittwer, Du-32707; ibidem, 11.2018 May 2018, F.G. Dunkel, Du-35814; **9462.1**: Slaptinci, 300 m WNW Slaptinci, trockene und magere Wirtschaftswiese, 195 m, 46°33’50’’N 16°0’’32’’E, 24 Apr 2015, F.G. Dunkel & S. Wittwer, Du-32709 (together with *R. finodivisus*); ibidem, 600 m WSW Slaptinci, Erlenbruch, 196 m, 46°33’50.3’’N 16°82’18.1’’E, 24 Apr 2015, F.G. Dunkel & S. Wittwer, Du-32735.

3.2.20 *Ranunculus labacensis* DUNKEL spec. nova

Holotype: Slovenia, Predalpsko obmocje, 9952.2, Ljubljana, 250 m W Večna pot, Mostec, N Vič, O-Seite von Ljubljana, Feuchtwiese, Mädesüßflur, 298 m, 46°03’11.5’’N 14°27’59.1’’E, 11 May 2018, F.G. Dunkel; holotype LJU, isotypes B, M, Du-35734. – Fig. 31, 32, 41.

Description — Flowering shoot gracile to slim, 22–52 cm, stalk 1.0–2.5 mm in diameter, reddish at base, suberect to moderately divergent, angle between the main and secondary axis 10–50°, flowers 1–7, enrichment shoots 0–1(2); basal leaves 2–4 per rosette.

Basal leaf cycle: blade of the basal leaves wide-angled at base (100–170%), occasionally the third and fourth leaf V-shaped at base (90–100%). The leaf edge presents irregularly and broadly, partly obtuse, crenate-serrated in all basal leaves.

First basal leaf 12–22 mm long, divided by main incision (75–93%); middle segment deltoid with 3–7 teeth; lateral segment undivided or cleft by first lateral incision (40–50%).

Second basal leaf 16–28 mm long, divided by main incision (88–93%); middle lobe (narrowly) deltoid to deltoid with 3–7 crenated teeth; lateral segment lobed to cleft by first lateral incision (26–60%), second lateral incision absent or up to 32%.

Third basal leaf 23–34 mm long, divided by main incision (88–95%); middle lobe (narrowly) deltoid with 3–7 crenated teeth; lateral segment cleft to divided by first lateral incision (50–75%), second lateral incision absent or rarely up 30%.

Fourth basal leaf 28–34 mm long, divided by main incision (90–98%), narrowly deltoid with 5–7 partly crenated teeth; lateral lobe cleft to divided by first lateral incision (45–75%), second lateral incision absent or up to 38%.

Fifth basal leaf 26–40 mm long, divided by main incision (92–98%); middle lobe narrowly deltoid with 3–7 partly crenated teeth; lateral segment cleft by first lateral incision (45–65%).

Sixth basal leaf 24–32 mm long, cleft to divided by main incision (50–85%); middle lobe narrowly deltoid with 3–7 teeth; lateral segment undivided or rarely lobed by first lateral incision (26–30%).

Seventh basal leaf 18–28 mm long, lobed to cleft main incision (28–50%); middle lobe deltoid with 1–3 teeth; lateral segment undivided.

Lowermost stem leaf divided into 7–9 segments, largest segment 24–55 mm long, 2–5 mm wide, linear to narrowly lanceolate, undivided (or rarely with 1 tooth).

Petals 0–3(5), 7–10 mm long, 5–7 mm wide; *androclinium* 0.7–0.9 mm; *receptacle* ellipsoid to cylindrical, 1.8–2.5 mm long, 0.8–1.5 mm wide, glabrous, invervallum short (up to 15%), carpellophores 0.4–0.75 mm; *fruits* 1.8–2.3 mm long, beak 0.5–1.0 mm long, uncinate to involuted.

Pollen quality — mediocre, 60.8% well developed (isotype Du-35734-4).

DNA-Ploidy — 4x (Ljubljana, W Večna pot, locotype Du-30529; PAULE & al. 2018).

Distribution — Central Slovenia around and (formerly) in Ljubljana.

Ecology — humid meadows, willow brushes, alder forests.

Etymology — refers to the occurrence in the region of Ljubljana, lat. Labacum.

Vulnerability — endangered by abandonment or eutrophication of humid meadows.

Taxonomy — *R. labacensis* is restricted to an area around Ljubljana, morphologically it is characterised by a V-formed or wide-angled base, a narrowly deltoid middle segment with a rather wide-angled main incision. The receptacle of *R. labacensis* carries long carpellophores, similar to those of *R. indecorus* W. KOCH (1939). Therefore *R. labacensis* fits perfectly into the *R. indecorus* group. In this group, the receptacles of *R. variabilis* and *R. lanceolifer* are pilose, contrarily, these of *R. labacen-*

►
Fig. 31:
Ranunculus labacensis – data sheet (basal leaf cycle, stem leaves, flowers, fruits, receptacle).
(Length of bars in figures of details = 2 mm.)

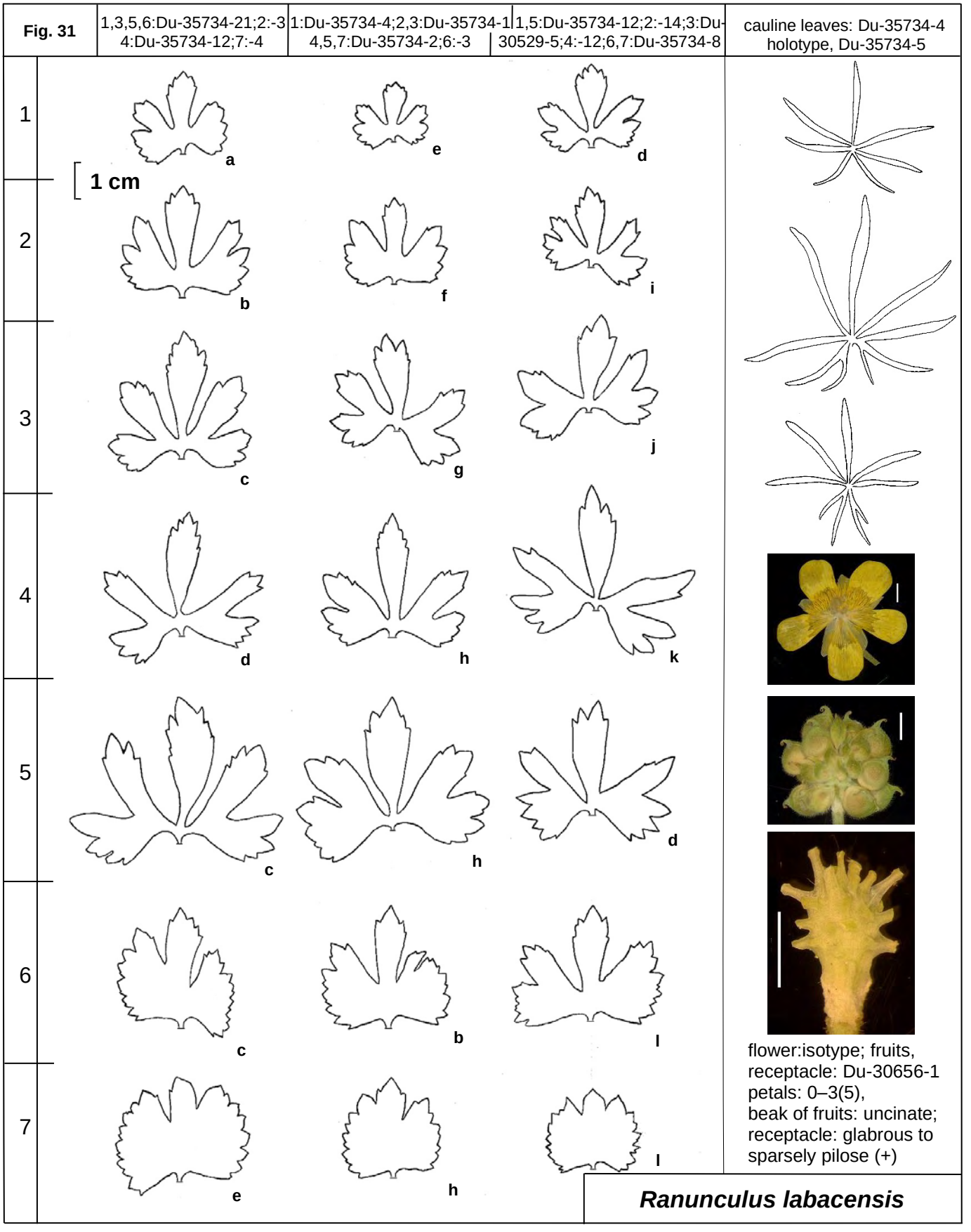


Fig. 31
1,3,5,6:Du-35734-21;2:-3
4:Du-35734-12;7:-4
1:Du-35734-4;2,3:Du-35734-1
4,5,7:Du-35734-2;6:-3
1,5:Du-35734-12;2:-14;3:Du-30529-5;4:-12;6,7:Du-35734-8
cauline leaves: Du-35734-4
holotype, Du-35734-5
1
2
3
4
5
6
7
1 cm
a
e
d
b
f
i
c
g
j
d
h
k
c
h
d
c
b
l
e
h
l
flower:isotype; fruits,
receptacle: Du-30656-1
petals: 0–3(5),
beak of fruits: uncinate;
receptacle: glabrous to
sparsely pilose (+)
Ranunculus labacensis

Fig. 32: *Ranunculus labacensis* — holotype (LJU).

sis and *R. lubljanicae* carry no (or occasionally only very few) hairs. The latter two species differ among others by the lateral segments of the final leaves: undivided in *R. labacensis,* and at least cleft in *R. lubljanicae*. The species resembles *R. sorviodurus* Dunkel of Southern Germany but it differs by narrowly deltoid instead of deltoid middle segments and fewer teeth of the lateral segments (Dunkel 2015).

Specimen seen — Slovenia, Predalpsko območje: **9853.3**: Nodgorica, N-Fuß des Berges Soteški hrib, 1,7 km W Dragomelj, in der Nähe des Baches Dobravščica, direkt W der Forststraße, Erlenburch, 288 m, 46°06’36’’N 14°34’18’’E, 13 Apr 2019, F.G. Dunkel, Du-36156; **9952.2**: Ljubljana, hortus publicus Tivoli dicti urbis Ljubljana, in graminosis fruticosis humidis, solo argillacea, 300 m, 46°03’19’’N 14°29’40’’E, T. Wraber, LJU-10046576, Du-34933; ibidem, Ljubljana, ad radices collis Rožnik secus viam Večnopot dictum in silvis paludosis (Alnetum glutinosae), 310 m, 46°03’43’’N 14°28’41’’E, 09 May 1998, T. Wraber, LJU-10046602, Du-34934; ibidem, Ljubljana, 250 m W Večna pot, Mostec, N Vič, O-Seite von Ljubljana, Feuchtwiese, Mädesüßflur, 298 m, 46°03’11.5’’N 14°27’59.1’’E, 23 Apr 2013, F.G. Dunkel, Du-30529; ibidem, 11 May 2018, F.G. Dunkel, Du-35734 (isotypes); ibidem, Ljublana, Brdo, severozahodno od Bioloskega oredišča, močuinco travišče, 290 m, 46°03’12.27’’N °27’59.20’’E, 14 Apr 2019, J.M. Kocjan, Hb. Kocjan s.n. (008–009), Du-36199; ibidem, 46°03’10.76’’N 14°28’59’02.15’’E, 14 Apr 2019, J.M. Kocjan, Hb. Kocjan s.n. (010–011), Du-36199; **9953.3:** Ljublana, Ljubljansko barje, Rahova Jelša, jušno od maselja, blizu Ljubljanice, močuinco travišče, 290 m, 46°01’56.55’’N 14°30’31.70’’E, 25 Apr 2019, J.M. Kocjan, Hb. Kocjan s.n. (006-007), Du-36198; **0053.1**: Hauptmance, 250 m E Straße nach Ig S Ljubljana (N 642 = Ižanska cesta), ca. 50 m S Straße Hauptmanca, Flachmoor, Weidengebüsch, 281 m, 45°59’58’’N 14°31’12’’E, 26 Apr 2016, F.G. Dunkel, Du-33280.

3.2.21 *Ranunculus ljubljanicae* Dunkel spec. nova

Holotype: Dinarsko Območje, Ljubljansko barje, 0052.1, Podpeč, Notranje Gorice → Podpeč, Moorwiesenreste S der Straße, ca. 1 km vor Podpeč, Feuchtwiesen, [rest of a flat moor, S of street, humid meadows], 290 m, 45°58’54’’N 14°24’20’’E, 24 Apr 2012, F.G. Dunkel; holotype LJU, isotypes M, Du-28680. – Fig. 33, 34, 41.

Description — Flowering shoot gracile to slim, 20–37 cm, stalk 0.7–2.2 mm in diameter, suberect (or moderately divergent), angle between the main and secondary axis 15–30(50)°, flowers 1–4, enrichment shoots 0(–1); basal leaves 2–4 per rosette.

Basal leaf cycle: blade of the initial and final leaves V-formed to wide-angled at the base (80–130°), blade of the spring leaves narrow-angled to V-formed (wide-angled) ((50)70–100(120°)). With the exception of the first basal leaf, the main incision is in all other basal leaves conspicuously wide-angled (40–55°). Leaf edge presents irregularly and deeply crenate-serrated; in the seventh basal leaf crenate-serrated to serrated.

First basal leaf 8–16 mm long; blade V-formed to wide-angled at the base (80–130°), cleft to divided by main incision (50–75%); middle segment deltoid with 3–5 (crenated) teeth; lateral segment lobed to cleft by fist lateral incision (25–40%).

Second basal leaf 8–16 mm long; blade V-formed at the base (80–100°), divided by main incision (75–90%); middle lobe deltoid with (3–)5 crenated teeth; lateral segment cleft by first lateral incision (35–50%).

Third basal leaf 16–26 mm long, blade V-formed to wide-angled at the base (90–140°), divided by main incision (70–90%); middle lobe deltoid with 5–9 crenated teeth, lateral edge straight to concave; lateral segment cleft by first lateral incision (50–60%) and lobed to cleft by second lateral incision (28–45%).

Fourth basal leaf 20–30 mm long, blade narrow-angled to V-formed at the base (40–90°), almost completely divided by main incision (90–98%); middle lobe deltoid with 3–5 crenated teeth; lateral segment divided by first lateral incision (75–95%), cleft by second lateral incision (33–65%).

Fifth basal leaf 16–27 mm long, blade V-formed to wide-angled at the base (80–110°), divided by main incision (90–99%); middle lobe (narrowly) deltoid with 3–5 crenated teeth, angle of the main incision wide (25–60°); lateral segment cleft to divided by first lateral incision (65–85%), second lateral incision absent or up to 50%.

Sixth basal leaf 18–26 mm long, blade V-formed to wide-angled at the base (90–140°), divided by main incision (85–97%); middle lobe deltoid with 3–7 teeth; lateral segment cleft to divided by first lateral incision (60–80%), second lateral incision absent or up to 40%.

Seventh basal leaf 16–26 mm long, blade V-formed at the base (90–100°), divided by main incision (85–95%); middle lobe deltoid with 3–7 teeth; lateral segment cleft by first lateral incision (40–60%), second lateral incision absent or up to 40%.

Lowermost stem leaf divided into 7–9 segments, largest segment 20–40 mm long, 1.3–4 mm wide, lanceolate, undivided or occasionally with one up to 6 mm long tooth.

Petals (0)1–4, 7–11 mm long, 5–10 mm wide; *androclinium* 0.7–0.9 mm; *receptacle* ellipsoid, 2.8–4.0 mm long, 1.3 to 1.8 mm wide, glabrous, invervallum absent or short (up to 15%), carpellophores 0.3–0.5 mm; *fruits* 1.8–2.3 mm long, beak 0.6–1.0 mm long, straight to uncinate.

Pollen quality — good; 64.6% well developed (Podpeč, isotype Du-28680-1).

DNA-ploidy — unknown.

Distribution — at present only known from two to three localities south of Ljubljana.

Ecology — humid meadows, grassy robinian groves.

Etymology — refers to the name of the river Ljubljanica, the main stream in the Ljubljansko barje, the hitherto known distribution area of the species.

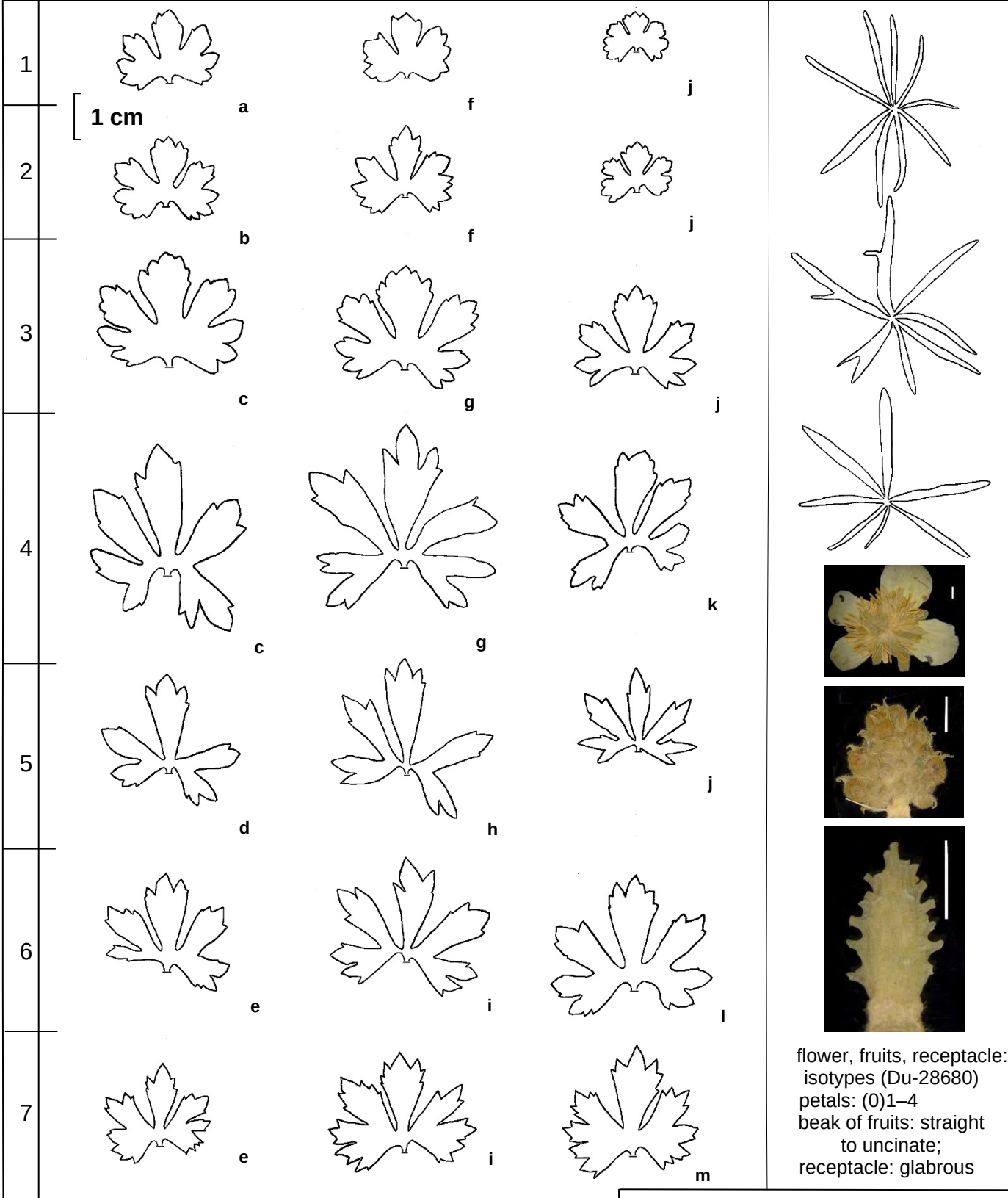
Vulnerability — endangered due to rarity and abandonment or eutrophication of humid meadows.

Taxonomy — R. lubljanicae is characterised by a rather homophyllus basal leaf cycle, comparable to *R. homophyllus* Dunkel (2019) but differs by a glabrous receptacle and fewer teeth of the middle lobe: usually three instead of 5–7 in *R. homophyllus*. The

►
Fig. 33:
Ranunculus ljubljanicae – data sheet (basal leaf cycle, stem leaves, flowers, fruits, receptacle).
(Length of bars in figures of details = 2 mm.)

Fig. 33

1:Du-26860-6;2,5-7: -13,4:Du-28680-3	1,2,5:Du-28680-5;3,4: 28680-3;6,7:Du-28680-1	1-3,5:Du-28680-2;4:Du-28583-4 6:Du-28680-4;7:Du-28680-3	cauline leaves: Du-28680-5 Du-28680-3; Du-28523-4



flower, fruits, receptacle: isotypes (Du-28680)
petals: (0)1–4
beak of fruits: straight to uncinate;
receptacle: glabrous

Ranunculus ljubljanicae

Fig. 34: *Ranunculus ljubljanicae* — holotype and isotype (LJU).

angle of the main incision is rather wide (up to 60°) and the final leaves are divided by the main and the first, sometimes also the second lateral incision. The lateral segment of the seventh leaf is undivided in all other Slovenian members of the *R. indecorus* group (*R. variabilis*, *R. labacensis*, and *R. lanceolifer*).

R. ljubljanicae is endangered due to its occurrence in humid meadows, but the finding by J.M. Kocjan & D. Kosič demonstrate that the species could still grow in the Ljublansko barje elsewhere.

Specimens seen — Slovenia, Dinarsko Območje, Jubljansko barje: **0052.1**: Podpeč, Notranje Gorice → Podpeč, Moorwiesenreste S der Straße, ca. 1 km vor Podpeč, Feuchtwiesen, 290 m, 45°58'54''N 14°24'20''E, 24 Apr 2012, F.G. Dunkel, Du-28680 (isotypes), ibidem, 1 km OSO Podpeč, Jezero, Jezero-See, SO des Sees, Feuchtwiese mit *Leucojum aestivum*, 290 m, 45°58'N 14°26'E, 24 Apr 2012, F.G. Dunkel, Du-28583; probably also *R. ljubljanicae*: Notranjska (Innerkrain): **0052.1**: Vrhnika, Ljubljansko barje, obolica Vrhnike, zahodno od Goričice pod Krimom (s Goričica pod Krimom), močisipno travišče, 300 m, 45°57'11.2''N 14°22'14.3''E, 23 May 2019, J.M. Kocjan & D. Kosič, Hb. J.M. Kocjan s.n. (014–015).

3.2.22 *Ranunculus lanceolifer* DUNKEL spec. nov.

Holotype: Slovenia, Preddinarsko Območje, 0053.2, W Grosuplje, 130 m N Ponova Vas, 250 m W des Flüsschens Bičje, magere Wirtschaftswiese, [W of the rivulet Bičje, poor-nutrient meadow], 45°56'45''N 14°38'54''E, 325 m, 26 Apr 2016, F.G. Dunkel; holotype LJU, isotypes M, Du-33273. – Fig. 35–37, 41.

Description — Flowering shoot gracile to slim, 22–38 cm, stalk 0.8–2.5 mm in diameter, suberect to moderately patent (patent), angle between the main and secondary axis 10–50(60)°, flowers (1)2–6(9), enrichment shoots 0–1(2); basal leaves 2–4 per rosette.

Basal leaf cycle: blade of the basal leaves V-formed to truncated at base (90–180%), occasionally the fourth, fifth, and sixth leaf can be narrow-angled (50–80°). The leaf edge presents irregularly and deeply crenate-serrated in all basal leaves.

First basal leaf 12–20 mm long, cleft to divided by main incision (60–80%); middle segment deltoid with 3–5 teeth; lateral segment undivided.

Second basal leaf 18–26 mm long, divided by main incision (85–95%); middle lobe narrowly deltoid to deltoid with (3–)5 crenated teeth; lateral segment cleft by first and second lateral incision (33–50%, and 33–44%, respecively).

Third basal leaf 20–30 mm long, divided by main incision (90–99%); middle lobe narrowly deltoid with 3–5 crenated teeth; lateral segment cleft by first lateral incision (35–60%) and lobed to cleft by second lateral incision (26–50%).

Fourth basal leaf 28–38 mm long, divided to dissected by main incision (98–100%); middle lobe usually stalked up to 4 mm, narrowly lanceolate and then undivided or narrowly deltoid with 3(–5) crenated teeth; lateral lobe with linear segments, occasionally stalked up to 2 mm, divided by first lateral incision (75–85%), cleft by second lateral incision (45–55%), lobed to cleft by third lateral segment (26–40%).

Fifth basal leaf 24–40 mm long, divided by main incision (95–99%); middle lobe narrowly lanceolate and then undivided or narrowly deltoid with 3(–5) crenated teeth, angle of the main incision wide (40–50°); lateral segment cleft to divided by first lateral incision (60–80%), cleft by second lateral incision (33–55%), lobed to cleft by third lateral segment (26–40%).

Sixth basal leaf 14–24 mm long, divided by main incision (85–90%); middle lobe narrowly deltoid with 3(–5) teeth; lateral segment undivided or lobed to cleft by first lateral incision (26–40%).

Seventh basal leaf 15–26 mm long, divided by main incision (70–85%); middle lobe narrowly deltoid (to deltoid) with 3–5 teeth; lateral segment undivided or lobed by first lateral incision (26–30%).

Lowermost stem leaf divided into 7–9 segments; largest segment 24–54 mm long, 1.5–4 mm wide, linear, undivided (or rarely with 1–2 teeth).

Petals 0–4, 9–12 mm long, 6–8 mm wide, sometimes lobed; *androclinium* 0.4–0.6 mm, filaments 2 mm long; *receptacle* ellipsoid, 2.0–3.5 mm long, 1.0–2.2 mm wide, pilose (+–++), invervallum short (up to 20%), carpellophores 0.2–0.5 mm long; *fruits* 1.5–2.4 mm long, beak (0.3)0.5–1.0 mm long, (straight to) uncinate.

Pollen quality — good; 73,8% well developed (holotype, Du-33273-1).

DNA-ploidy — unknown.

Distribution — at present only known from type locality at Grosuplje, southeastern of Ljubljana, and two meadows in the Pomurska region of Northeastern Slovenia.

Ecology — humid meadows.

Etymology — refers to the lance- or spear-like middle segment of the fourth and/or fifth basal leaf.

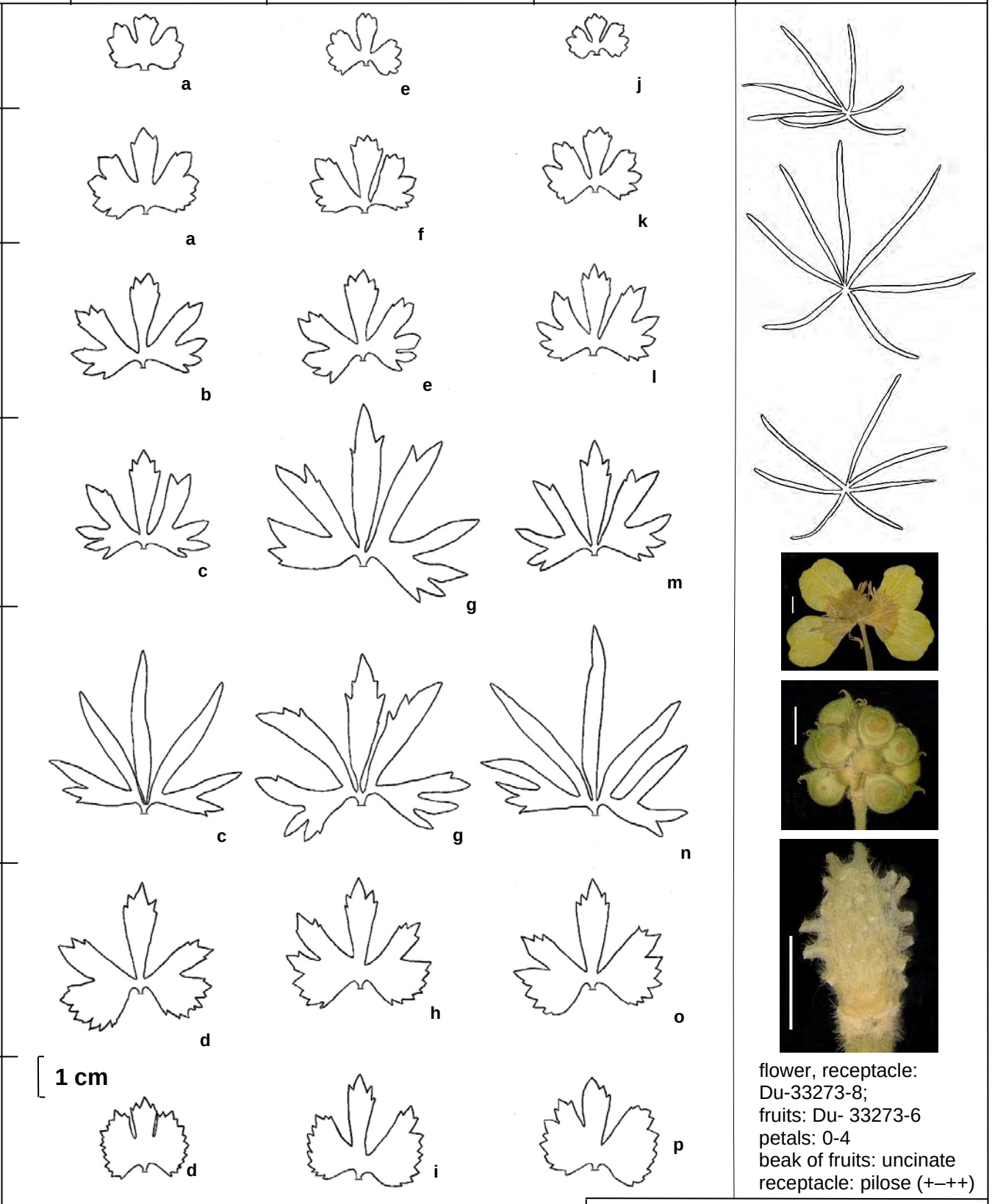
Vulnerability — endangered due to rarity and abandonment or eutrophication of the humid meadows.

Taxonomy — R. lanceolifer is characterised by occasional undivided almost linear middle segments of the fourth and fifth basal leaf; it therefore resembles *R. noricus* HÖRANDL & GUTERMANN but differs by fewer teeth of the middle and lateral lobe of the final leaves (14–18 teeth in *R. noricus*, 23–30 teeth in *R. lanceolifer*); petals mostly lacking in *R. noricus*, few in *R. lanceolifer* (0.3 vs. 2.1 on average); the intervallum is less than 20% in *R.*

►
Fig. 35:
Ranunculus lanceolifer – data sheet (basal leaf cycle, stem leaves, flowers, fruits, receptacle).

►►
Fig. 36:
Ranunculus lanceolifer (Pomurska) – data sheet (basal leaf cycle, stem leaves, flowers, fruits, receptacle).
(Length of bars in figures of details = 2 mm.)

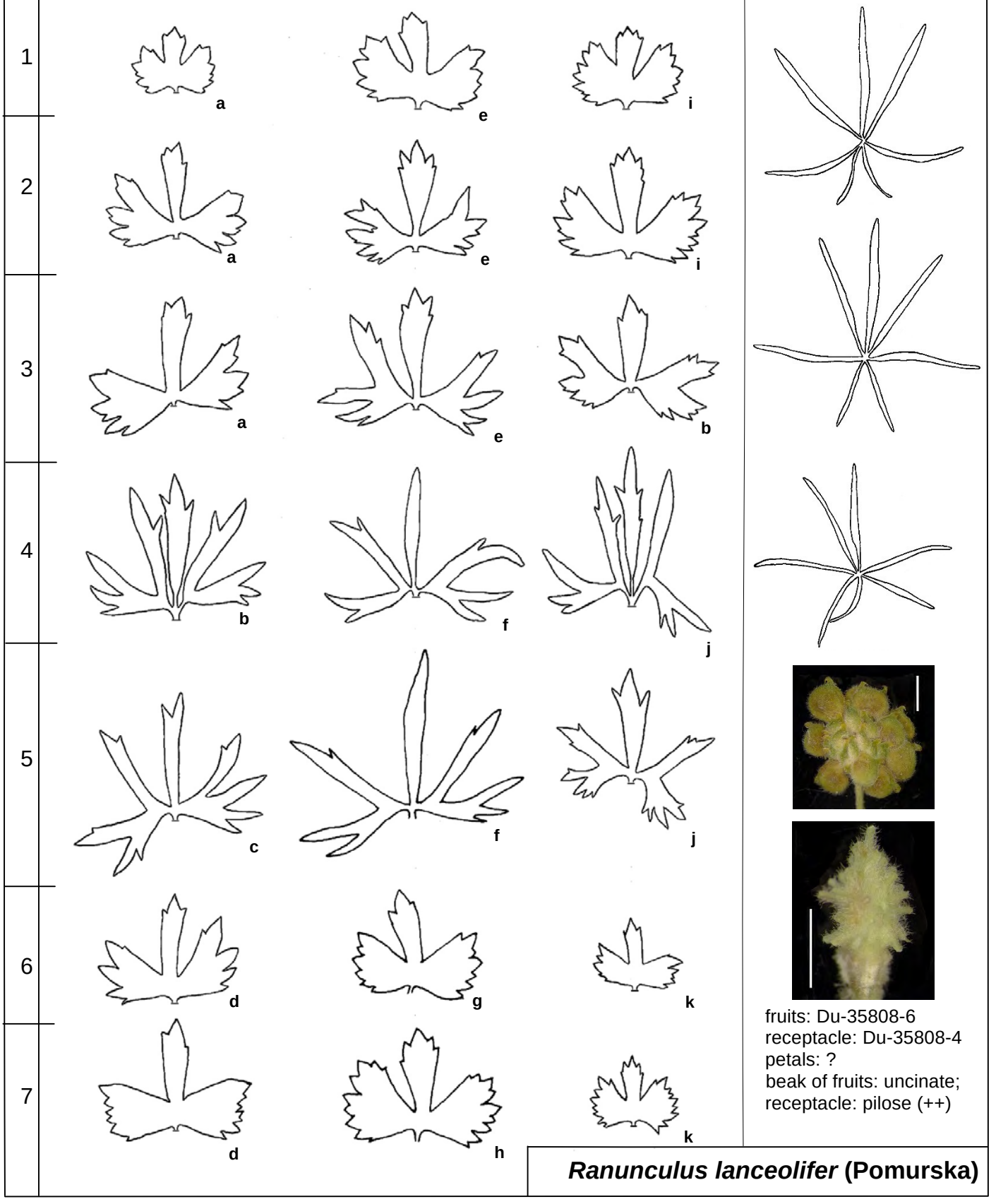
Fig. 35	1-2:Du-33273-5;3:-8 4,5:Du-33273-1;6,7:-6	1-3:Du-33273-1;4,5:Du-33273-5 6:Du-33273-6;7:Du-33273-7	1:Du-33273-10;2:-8;3,4: Du-33273-4;5:-7;6,7-3	cauline leaves: Du-33273-1 Du-33273-8, Du-33273-1



flower, receptacle: Du-33273-8;
fruits: Du- 33273-6
petals: 0-4
beak of fruits: uncinate
receptacle: pilose (+–++)

Ranunculus lanceolifer

Fig. 36	1-3:Du-35808-3;4,5:Du-35808-2;6,7:Du-35808-7	1-3:Du-35808-6;4,5:Du-35808-3:4,5 6:Du-35808-8;7:Du-35808-7	1-3:Du-35808-2;4,5: Du-35808-4;6,7:-8	cauline leaves: Du-35808-1 Du-35808-8, Du-35808-6



fruits: Du-35808-6
receptacle: Du-35808-4
petals: ?
beak of fruits: uncinate;
receptacle: pilose (++)

***Ranunculus lanceolifer* (Pomurska)**

Fig. 37: *Ranunculus lanceolifer* — holotype and isotype (LJU).

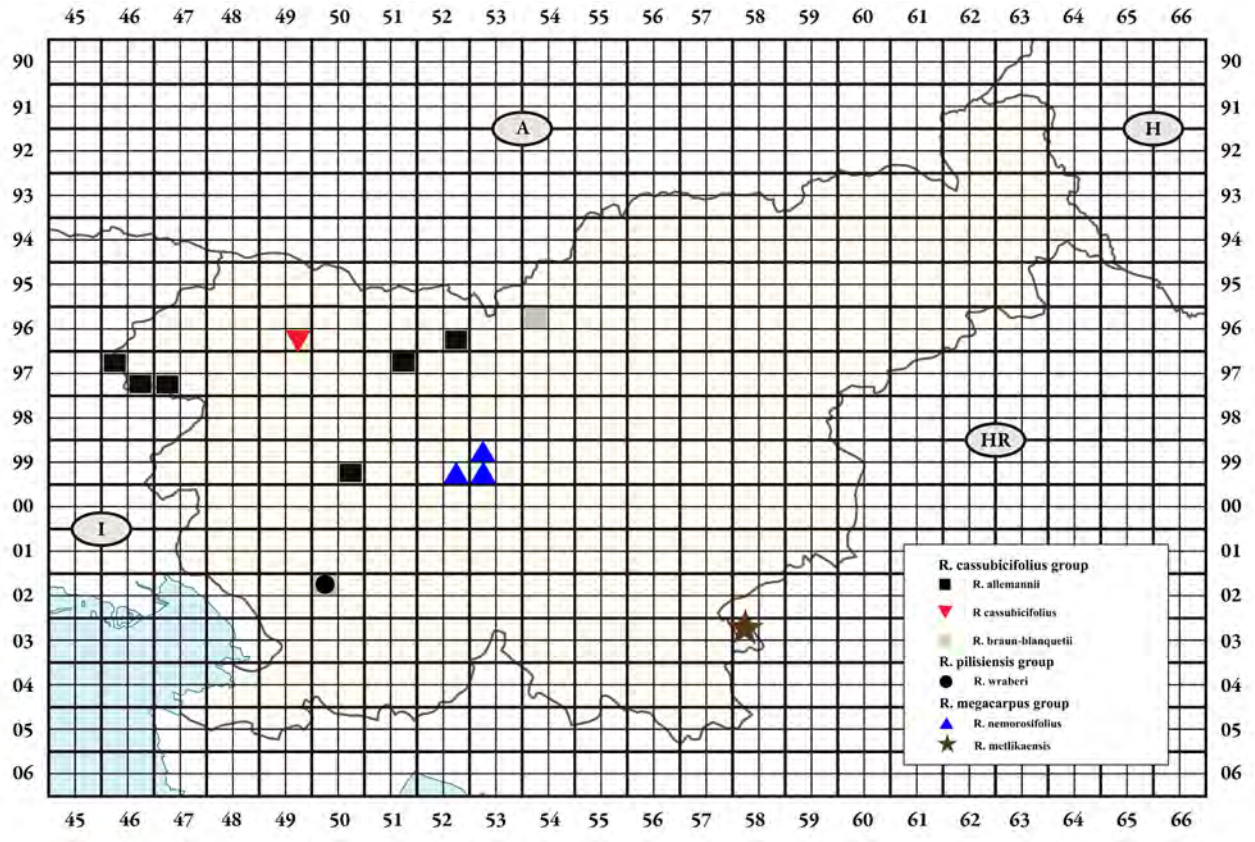


Fig. 38: Distribution map of the *R. cassubicifolius* group, *R. pilisiensis* group and *R. megacarpus* group.

lanceolifer, > 25% in *R. noricus*. *R. oxyodon* differs by shorter carpellophores (10% vs. 25% of the width of the receptale in *R. lanceolifer*) and a smaller main incision of the seventh leaf (in *R. oxyodon* 33–50%, in *R. lanceolifer* 70–85%). The type locality is situated south of Ljubljana at Grosuplje. Further populations are attributed to *R. lanceolifer* in the Stajerska region of NE Slovenia, all at a distance of at least 130 km to the next populations of similar *R. noricus*.

Specimens seen — Slovenia, Subpanonsko Območje, Štajerska: **9363.1**: Noršinci, zwischen Murska Sobota und Noršinci, direkt N der Straße, rasiger Straßengraben, 187 m, 46°39’48.6’’N 16°11’05.2’’E, 25 Apr 2016, F.G. Dunkel, Du-33217; ibidem, 700 m N Noršinci, relativ trockene Wirtschaftswiese, 187 m, 46°40’27.8’’N 16°12’26.2’’E, 25 Apr 2016, F.G. Dunkel, cultivated, 27 Apr 2018, F.G. Dunkel, Du-35113; **9461.4**: Spodnji Ivanjci, 2,3 km ONO Sp. Ivanjci, direkt O N 714 S Bad Radkersburg (Radgona), Wirtschaftswiese, mit *Lychnis flos-coculi*, 217 m, 46°36’41.8’’N 15°59’45.2’’E, 11.2018 May 2018, F.G. Dunkel, Du-35808; Preddinarsko Območje: **0053.2**: Grosuplje, W des Ortes, 130 m, N der Ponova Vas, 250 m W des Flüsschens Bičje, magere Wirtschaftswiese, 325 m, 26 Apr 2016, F.G. Dunkel, Du-33273 (isotypes).

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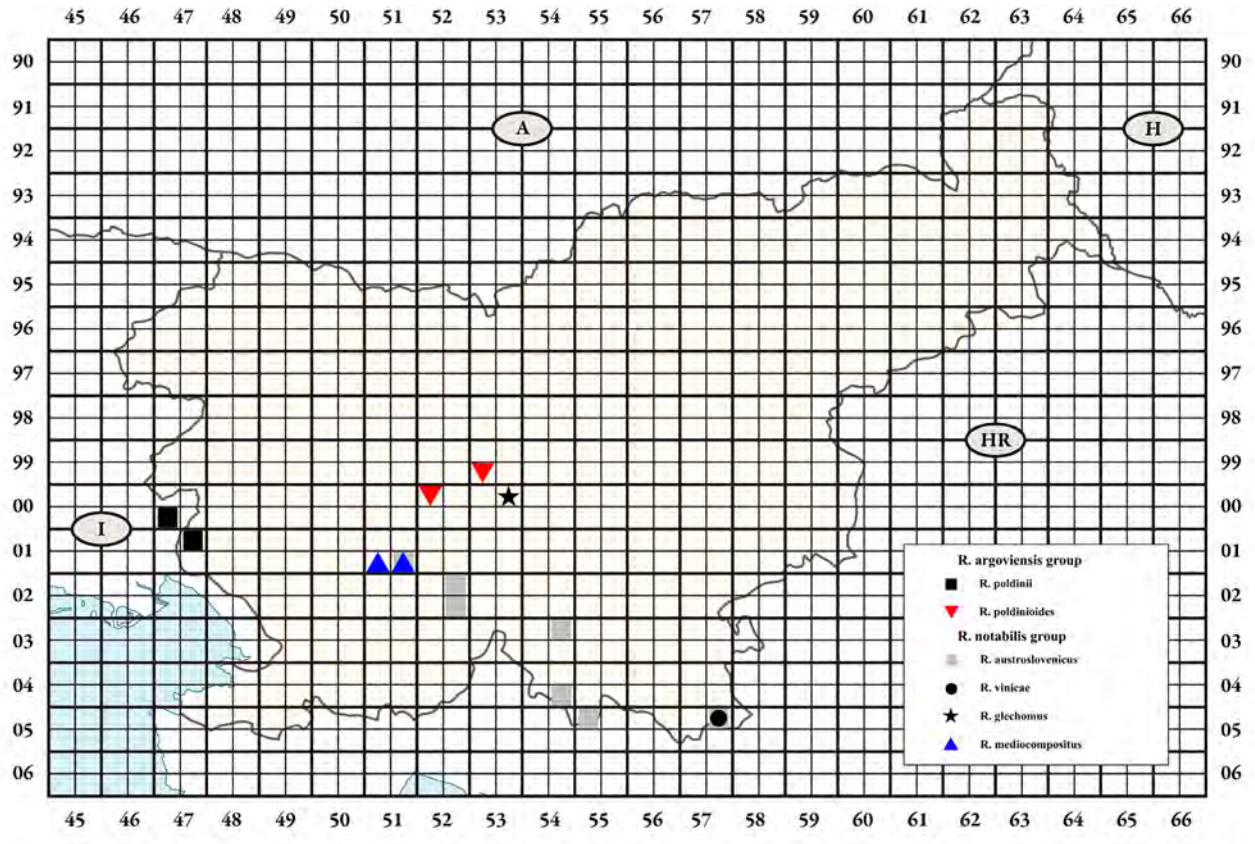

Fig. 39: Distribution map of the *R. argoviensis* group and *R. notabilis* group.

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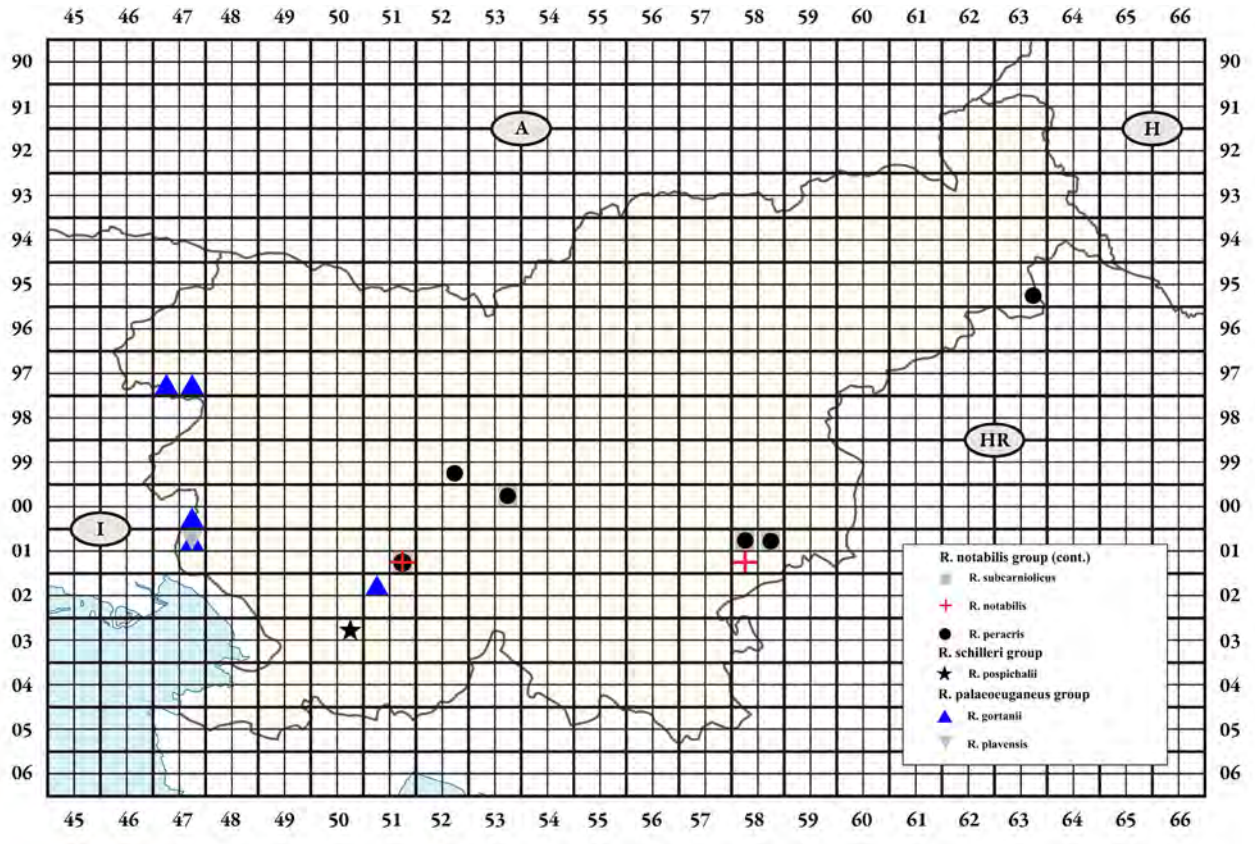

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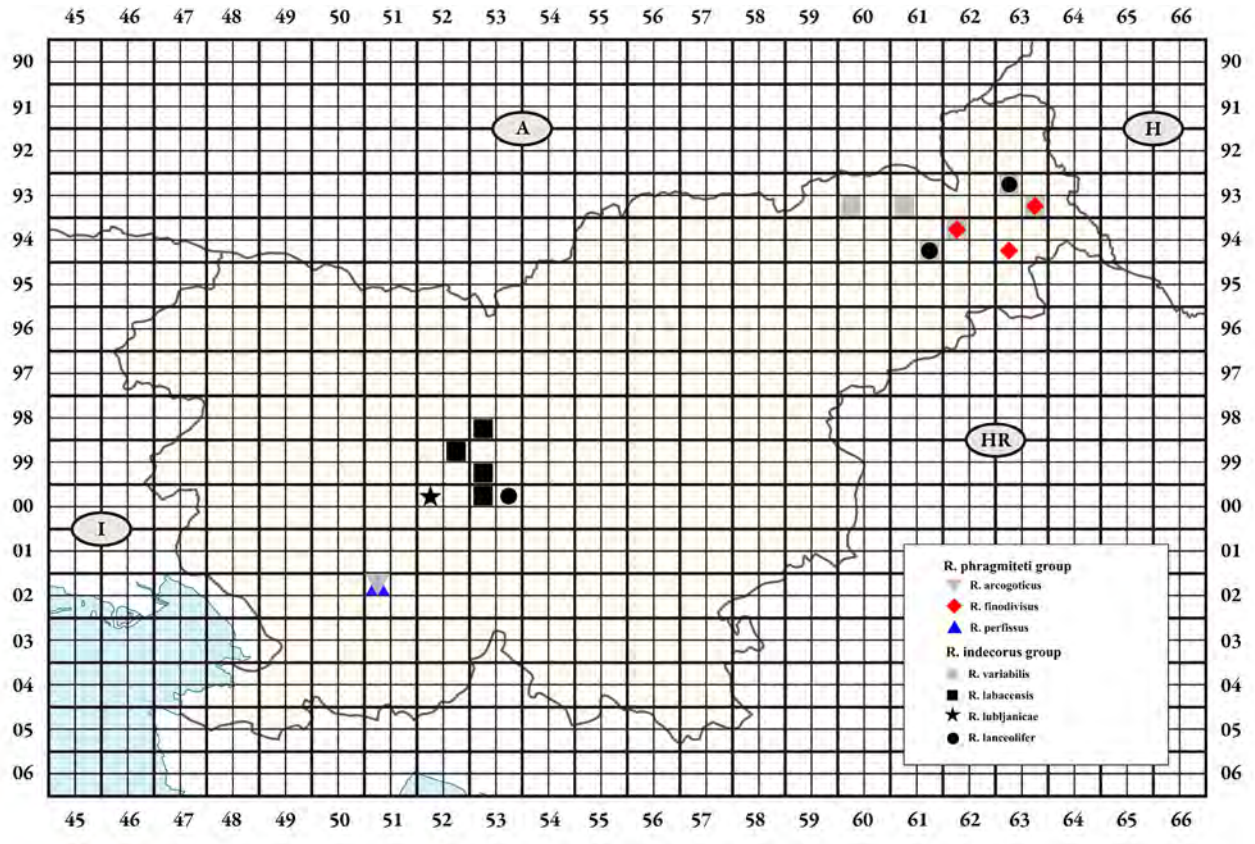

Fig. 41: Distribution map of *R. phragmiteti* group and *R. indecorus* group.

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