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Stefan Rätzel, Ralf Hand, Charalambos S. Christodoulou & Holger Uhlich

Abstract

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The new species *Phelipanche chionistrae* Rätzel, Hand, Christodoulou & Uhlich (*Orobanchaceae*) is described from Chionistra, the highest summit of the Troodos range in Cyprus. Morphological data strongly suggest affinities to the *Phelipanche rosmarina* complex, predominantly West Mediterranean taxa, and *Phelipanche olbiensis* (Coss.) Carlón et al. The new taxon can be distinguished by a combination of characters such as general colouration, structure of calyx and type of indumentum. Also, it has a different ecology being restricted to a high-montane serpentinophytic coenosis. Currently, only a few populations of the taxon, which is a parasite mainly on the Cypriot endemic *Alyssum troodi* Boiss. (and possibly other serpentinophilous species), are known. According to the IUCN Red List Categories and Criteria it should be assessed as “Near Threatened”.

Keywords

OROBANCHACEAE – *Phelipanche* – Cyprus – Mediterranean – Serpentinophyte – New species

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Introduction

The genus *Phelipanche* Pomel (= *Orobanche* sect. *Trionychon* Wallr.; RÄTZEL et al., 2017a) which has been accepted as a segregate genus from *Orobanche* L. by several authors (e.g. SCHNEEWEISS, 2013; RÄTZEL et al., 2017a) comprises currently about 60–72 species. *Phelipanche* shows centres of diversification in the West Mediterranean as well as in Asia Minor, Iran and Transcaucasia. Determination of its taxa can be challenging. Many species prove to be poor in diagnostic characters. On the other hand, various characters are extremely variable and difficult to compare, particularly in widespread taxa. Furthermore, many species can be found only very scattered in much fragmented distribution areas and appear irregularly. These facts complicate fieldwork considerably, especially in remote areas.

Recent studies have clarified the taxonomy of various poorly understood taxa, resulting in the description of several new species from the above-mentioned regions (e.g. CARLÓN et al., 2005, 2008; RÄTZEL et al., 2017a).

Several collections that could not be identified with any known species have been made recently in Cyprus, the largest island of the East Mediterranean, which is a biodiversity and endemism hotspot (e.g. MYERS et al., 2000; HADJISTERKOTIS, 2008; MÉDAIL & DIADEMA, 2009). These collections represent a new species that is formally described here as *Phelipanche chionistrae* Rätzel, Hand, Christodoulou & Uhlich.

Our study is based on the long-term fieldwork in Cyprus by CSC and RH and extensive field and herbarium studies by SR and HU of the vast majority of Euro-Mediterranean *Phelipanche* taxa, some of which currently have no valid combination under that genus and are therefore referred to here by their *Orobanche* names. Materials preserved in the following herbaria have been studied: B, COI, CYP, G, JE, K, MB, NMNH, P, W, WU and the private herbarium of Georgios Hadjikyriakou.

Taxonomic treatment

Phelipanche chionistrae Rätzel, Hand, Christodoulou & Uhlich, **sp. nov.** (Fig. 1, 2).

Holotypus: CYPRUS. **Distr. Lemesos:** Troodos, by forest road to Kakopetria not far away from turn-off from Prodromos road, 1795 m, 34°56'29"N 32°51'55"E, 16.VI.2018, *Hand 9011* (B [B 10 1067919]! image available at <https://herbarium.bgbm.org/object/B101067919>).

Phelipanche chionistrae Rätzel, Hand, Christodoulou & Uhlich is similar to *P. olbiensis* (Coss.) Carlón and *P. rosmarina* (Beck) Banfi s.l. but differs by its calyx teeth shorter than the calyx tube to equally long. *Phelipanche chionistrae* further differs from *P. olbiensis* by the longer indumentum of corolla and corolla lobes, by the mostly shorter corolla, by the elongated, longer and more hairy anthers and by the different host spectrum. *Phelipanche*

chionistrae differs from *P. rosmarina* s.l. by the shorter indumentum of the stem, bracts, and calyx, by the shorter corolla, by the longer and more hairy anthers, by the strict specialization on serpentine substrate and by the different host spectrum.

Plant (5.5–)6.5–8(–12) cm tall, intensely coloured in all parts (except throat bulges). **Stem** gracile, c. 1.2–3(–4.5) mm in diam., simple (very rarely with few branches), sparsely scaly, blackish-dark red to brownish-violet, turning pale brown lower down and dark brown higher up in dried stage, densely light glandular hairy; glandular hairs 0.1–0.2 mm long, with yellowish glands. **Scales** sparse, 5–7(–8) mm long, colouration as in stem, dark brown in dried stage, glandular hairy, glabrous at the base, the lower ones broadly ovate, obtuse to triangular-acuminate, the upper ones narrowly triangular-acuminate, apically sometimes ± cucullate. **Spike** few-flowered, with (3–)5–10(–12) flowers, 2–5 cm × c. 2 cm wide, usually ± dense and distinctly shorter than the remaining stem. **Bracts** 5–7 × 3–4 mm, same colour as the stem, dark brown in dried stage, broadly based triangular-acuminate, whitish glandular hairy (hairs 0.1–0.2 mm long), indistinctly multi-veined, shorter than the calyx teeth, reaching as far as the constriction of the corolla. **Bracteoles** lanceolate, 4–5 × 1–1.4 mm, same colour as the stem, dark brown in dried stage, somewhat shorter than the calyx teeth, with short light glandular hairs. **Calyx** 4-toothed, relatively robust, 6–7 mm long; teeth broadly based narrowly triangular-acuminate, shorter than the calyx tube (rarely lanceolate and about as long as the calyx tube), reaching somewhat beyond the point of insertion of the stamens, same colour as the stem and the bracts, densely light glandular hairy; hairs 0.1–0.2 mm long. **Corolla** (9–)10–13(–15) mm long, erecto-patent, narrowly tubular, slightly curved above the constriction, whitish base largely hidden in the calyx tube, otherwise intensely dark purplish-violet (blackish purple in the budding state), veins indistinctly darker, externally with numerous light glandular hairs; hairs 0.1–0.25 mm long. **Upper lip** 2-lobed; lobes rectangular, vertically erect or slightly recurved, with whitish, eglandular, multicellular hairs outside and apically inside, densely hairy on the margins; hairs 0.2–0.35 mm long. **Lower lip** 3-lobed; lobes approx. equal, rounded to rarely slightly acuminate, antrorse or ligulate in the distal half, somewhat recurved downwards; indumentum as in upper lip. **Throat bulges** white, with antrorse to erect hairs. **Filaments** inserted 3–3.5 mm above the base of the corolla tube, whitish hairy at the lowest quarter, otherwise glabrous; hairs 0.2–0.4 mm long. **Anthers** white, oblong, 1.1–1.4 × 0.8–0.9 mm, apically ± acuminate, with up to 0.4 mm long curly hairs at base and suture. **Ovary** ovate, apically narrowed to the style base. **Style** hyaline glandular hairy, densely hairy below stigma; hairs c. 0.1 mm long. **Stigma** 2-lobed, ± light yellow. **Seeds** dark brown, variously shaped, most often ovate, but also rounded or polygonal, c. 0.2 × 0.4 mm.

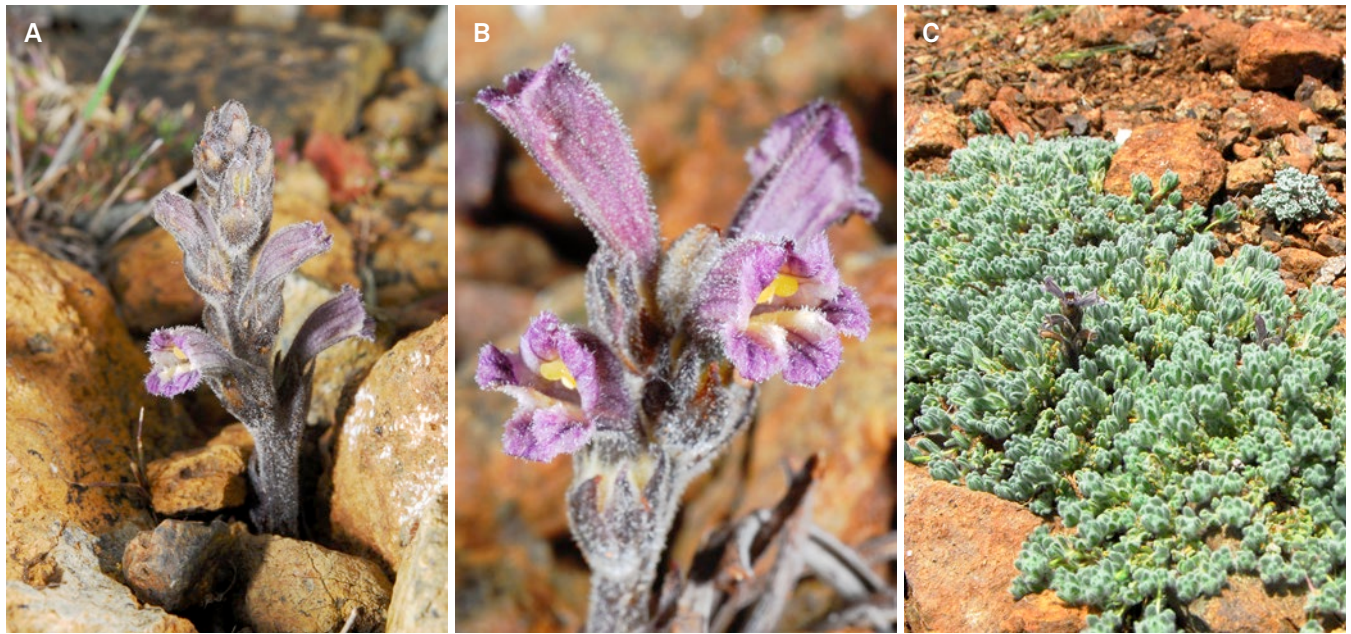


Fig. 1. – *Phelipanche chionistrae* Rätzel, Hand, Christodoulou & Uhlich in Mt Chionistra. **A.** Single plant habit; **B.** Inflorescence; **C.** Habitat, plants in *Teucrium cypricum* Boiss. [Photos: C.S. Christodoulou]

Etymology. – The epithet *chionistrae* refers to the Mt. Chionistra, colloquially also known as Mt. Olympos, reaching 1.952 m above sea level and forming the highest elevation of both the Troodos range and the island of Cyprus.

Distribution and habitat. – *Phelipanche chionistrae* seems to be endemic to the highest altitudes of Mt. Chionistra (Fig. 3). MEIKLE (1985) does not cite any material from the higher altitudes of Mt. Chionistra under the name *Orobanche ramosa* s.l. possibly because of its relative rareness. The summit consists of Upper Cretaceous, more or less serpentinized and tectonized harzburgites which belong to the Troodos ophiolite complex (GSD, 1995). The vegetation of the peak is generally dominated by very open stands of *Pinus nigra* subsp. *pallasiana* (D. Don) Holmboe. *Phelipanche chionistrae* has been found on large openings with sparse vegetation cover, often less than 10%. The terrain is extremely rocky complicating the determination of hosts of the new taxon, which sometimes grows in clefts of bare serpentine rocks at considerable distance from any other vascular plant. Hitherto, it has only been found at an altitude of 1500–1900 m.

Phenology. – Flowering individuals of *P. chionistrae* have been found from May to June.

Conservation status. – *Phelipanche chionistrae* was first observed in 2009 and since then several small populations (1–20 plants) have been located at eight places on the higher

parts of Mt. Chionistra in an area of 10 km², all found within the Troodos National Forest Park, which is also a Natura 2000 site, with controlled human activities. However, climate change is a potential threat for this high-altitude species. Considering the protected status of its distribution area, the low level of threat, the small known population (< 1000) and the restricted Area of Occupancy (< 10 km²) (IUCN, 2012) as well as incalculable habitat changes as a result of climate change (e.g., GIANNAKOPOULOS et al., 2010; HADJINICOLAOU et al., 2011), the species could be preliminarily assessed as “Near threatened” [NT]. Further surveys are needed in the higher peaks of central Troodos such as neighbouring Madari and Papoutsas peaks to better understand its distribution.

Notes. – *Phelipanche chionistrae* parasitizes *Alyssum troodi* Boiss. (Brassicaceae), most probably *Teucrium cypricum* Boiss. (Lamiaceae; Fig. 1C) and possibly *Alyssum cypricum* Nyár. and *Hypericum confertum* subsp. *stenobotrys* (Boiss.) Holmboe (Hypericaceae) but does definitely not parasitize *Rosmarinus officinalis* L. (Lamiaceae).

Current opinion is divided as regards the taxonomy of species that obligately parasitize *Rosmarinus officinalis* L. We treat here these species as a complex including *Phelipanche rosmarina* (Beck) Banfi et al. s.str., *Orobanche mariana* A. Pujadas, *Phelipanche pseudorosmarina* (A. Pujadas & Muñoz Garm.) Uhlich and *Orobanche rumseyana* A. Pujadas & P. Fraga. This complex may represent different species and does not necessarily mean a definite synonymisation advocated

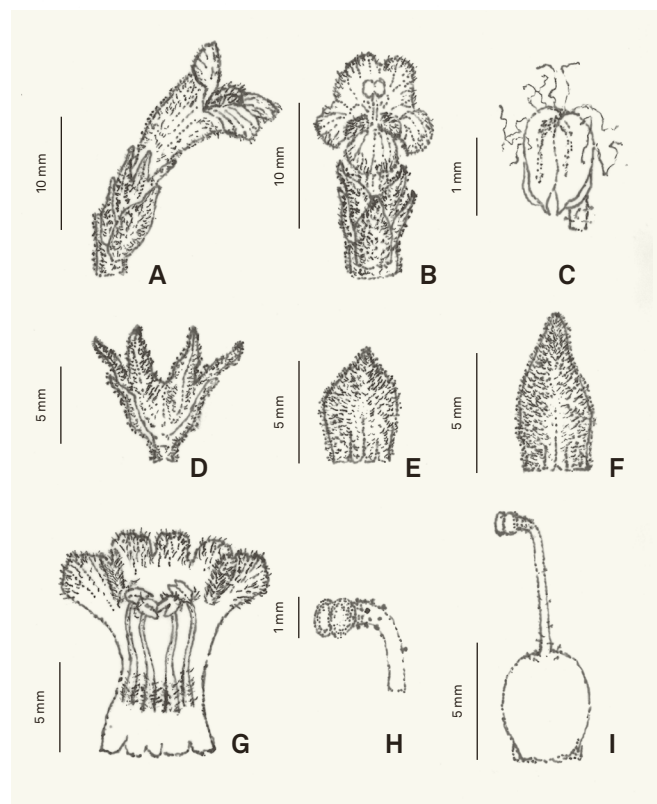


Fig. 2. – *Phelipanche chionistrae* Rätzel, Hand, Christodoulou & Uhlich. **A.** Flower, side view; **B.** Flower, front view; **C.** Anther; **D.** Calyx and bracteoles; **E.** Bract, outside; **F.** Stem scale, outside; **G.** Corolla, open, inside with stamens; **H.** Stigma and upper part of the style; **I.** Ovary with style and stigma. [Drawings: S. Rätzel]

by SÁNCHEZ-PEDRAJA et al. (2020). *Phelipanche chionistrae* is morphologically closely related to *Phelipanche olbiensis* (Coss.) Carlón et al. and the *Phelipanche rosmarina* complex. Morphological comparison can be found in Table 1. Several diagnostic characters are lost in herbarium specimens of *Orobanchaceae* and they need to be studied in fresh material. This is the case for example of the indumentum in *P. olbiensis* which provides a good diagnostic character (Table 1). Its flowering shoots are densely covered with short glandular hairs with relatively large yellow-hyaline heads; longer glandular hairs are scarce or lacking. Depending on the light conditions, plants look matt velvety or glittering (Fig. 4A). As it contrasts with the colour of the stem and bracts this character can be clearly seen. All other taxa have a rather silky indumentum (Fig. 4B) which is caused by a mixture of short and long glandular hairs with smaller, inconspicuous glandular head that cover stem and bracts.

Phelipanche chionistrae also differs by its preference for higher altitudes. With the exception of *P. sinaica* (Beck) Rätzel & Uhlich which however shows a differing host spectrum, the other taxa prefer lower altitudes (sea-level up to c. 650 m). *Phelipanche sinaica* differs from *P. chionistrae* by

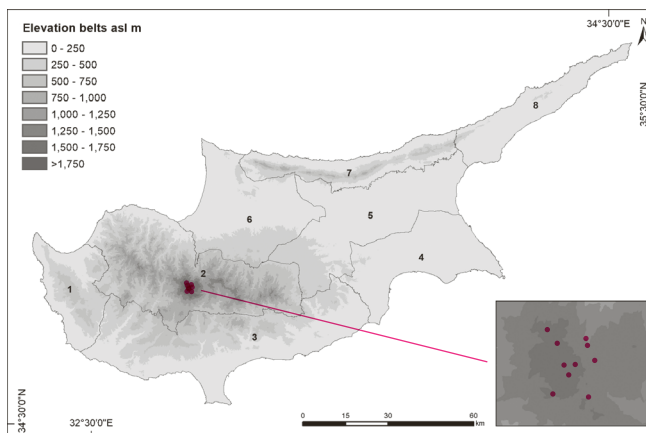


Fig. 3. – Distribution map of *Phelipanche chionistrae* Rätzel, Hand, Christodoulou & Uhlich in Cyprus and in the central Troodos range (inlay). Elevation is represented in levels of grey. Phytogeographical divisions follow MEIKLE (1985). [Map: A. Antoniou & K. Papasavvas]

its permanently compact inflorescences which are relatively rich in flowers (c. (8–)14–28(–30) vs. c. 3–10(–12)) and by its paler to dull violet corollae. *Phelipanche sinaica* parasitizes *Lactuca viminea* (L.) J. Presl & C. Presl and it is known to occur in Azerbaijan, Egypt and Iran (RÄTZEL et al., 2017b). Apart from *P. nowackiana* (Markgr.) Soják, a NE Mediterranean species that also parasitizes perennial taxa of *Alyssum* s.l., *Phelipanche chionistrae* is the second species known to be a strict serpentinophyte.

Additional specimens examined. – **CYPRUS. Distr. Lemesos:** Chionistra, near giant *Pinus nigra* tree, 1850 m, 12.VI.2009, *Christodoulou s.n.* (B); *ibid. loco*, on S slopes of massif, 1735 m, 34°55'08"N 32°51'31"E, 22.V.2013, *Hand & Christodoulou 6104* (B); *ibid. loco*, 1825 m, 34°55'59"N 32°52'26"E, 30.V.2013, *Christodoulou s.n.* (B). **Distr. Lefkosia:** Troodos, on forest road to Kakopetria, towards N Shoulder, close to seismological station on top E of forest road, 1828 m, 34°56'49"N 32°51'38"E, 16.VI.2018, *Hand 9013* (B); 300 m S of Kannoures spring, 1550 m, 34°56'26"N 032°52'47"E, 24.VI.2019, *Hadjikyriakou 7754* (Herb. Hadjikyriakou); Kannoures spring, 1500 m, 34°56'36"N 32°52'45"E, 18.VII.2019, *Hadjikyriakou 7762* (Herb. Hadjikyriakou).

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Fig. 4. – A. *Phelipanche olbiensis* (Coss.) Carlón et al. on *Helichrysum* L. in Crete, Greece; B. *Phelipanche rosmarina* (Beck) Banfi et al., Serra dos Candeeiros in Portugal.
[Photos: A: A. Jagel & T. Schmitt; B: P. Pinho]

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Table 1. – Comparison of morphological characters and hosts between *Phelipanche chionistrae* Rätzl, Hand, Christodoulou & Uhlich, the *P. rosmarina* complex and *P. olbiensis* (Coss.) Carlón et al. Characters diagnostic for one species are in bold.

		<i>P. rosmarina</i> s.l.	<i>P. chionistrae</i>	<i>P. olbiensis</i>
Habit	plant height [cm]	(4–)6–26(–35)	(5.5–)6.5–8(–12)	(3–)5–12(–17)
Stem	colour	pale, partly greyish, rarely reddish brown	dark brown-purple to red-brown, blackish purple in bud	dark brown-purple to red-brown, blackish purple in bud
	hairs length [mm]	(0.1–)0.2–0.4(–0.9)	0.1–0.2	0.1–0.15
Bracts	glandular hairs length [mm]	0.2–0.5(–0.6)	0.1–0.2	≤ 0.1
	length [mm]	8–10	6–7	(6–)7–9(–11)
Calyx	relation teeth to tube	somewhat longer	somewhat shorter up to as long	somewhat longer
	hairs length [mm]	0.3–0.6	0.1–0.2	0.1–0.2
Corolla	length [mm]	(12–)14–18	(9–)10–13(–15)	(10–)12–16(–18)
	tube glandular hairs length [mm]	(0.1–)0.15–0.25(–0.4)	(0.1–)0.15–0.25	0.05–0.1(–0.2)
	lobes and folds eglandular hairs length [mm]	0.2–0.4(–0.5)	0.2–0.3	0.1–0.2(–0.3)
Anther	shape	oblong	oblong	roundish
	filament, height of insertion [mm]	3.5–5.0	3.0–3.5	2.5–3.5 (–4.5)
	length [mm]	(0.9–)1.2–1.5 × (0.6–)0.8(–1.0)	1.1–1.4 × 0.8–0.9	1.1–1.3 × 1.1–1.3
	indumentum	glabrous to sparsely hairy	basally and at suture with scattered to numerous hairs	glabrous or very sparsely hairy at suture
	hairs length [mm]	0.2–0.4	0.3–0.5	0.1–0.2
Host		<i>Rosmarinus officinalis</i>	<i>Alyssum troodii</i> , very probably also <i>Teucrium cyprium</i> , possibly <i>Alyssum cypricum</i> , <i>Hypericum confertum</i>	<i>Helichrysum stoechas</i> , <i>H. conglobatum</i> , <i>H. pendulum</i> , <i>H. xrhodium</i> , <i>Phagnalon saxatile</i> , <i>P. rupestre</i> subsp. <i>graecum</i> and subsp. <i>rupestre</i>