SHORT NOTES

Mediterranean Botany
ISSNe 2603-9109

EDICIONES COMPLUTENSE

https://doi.org/10.5209/mbot.86862

Orobanche salviae (Orobanchaceae), new to the flora of the Iberian Peninsula

Arnau Mercadé López[1,2] & Aaron Pérez-Haase[1,2]

Received: 15 February 2023 / Accepted: 15 June 2023 / Published online: 18 March 2024

Abstract. *Orobanche salviae* is a European orophyte and considered an exclusive parasite of *Salvia glutinosa*. Here we provide the first report of the species for the Iberian Peninsula, which we discovered recently in the eastern Catalan Pyrenees. The closest reliable known localities are in the French Maritime Alps, although it was also previously reported with uncertainty from the French Pyrenees. The new found populations are located at the absolute western limit of the distribution of the species. We provide a description of its distribution, habitat and, given its rarity, we suggest a category of threat following the IUCN criteria.

Keywords. *Orobanche salviae*, new record, parasitic plant, endangered species, Pyrenees.

How to cite: Mercadé López, A. & Pérez-Haase, A. 2024. *Orobanche salviae* (Orobanchaceae), new to the flora of the Iberian Peninsula. Mediterr. Bot. 45(1), e86862. https://doi.org/10.5209/mbot.86862

Introduction

Orobanche salviae F.W. Schultz is a heterotrophic plant that parasitizes exclusively *Salvia glutinosa* L. (Sánchez Pedraja *et al.*, 2016a). It is an orophyte distributed across the mountain ranges of southern Europe, from the Maritime Alps to the Balkans. It is a rare species that has the majority of populations concentrated in the Alpine arch mountain ranges. Outside this area, it was recorded with uncertainty in the Romanian Carpathians, the French Central System and the northern slopes of the Pyrenees (Sánchez Pedraja *et al.*, 2016a). Its presence in the central French region of Lemosin (municipalities of Aient and Corresa) has been discarded based on the study of the herbarium voucher specimens (Sánchez Pedraja *et al.,* 2016a).

As for the Pyrenean data, the only two references are from the mid-nineteenth century and come from Nauta Garona and Vallespir (Reuter, 1847; Companyó, 1864). Due to the absence of herbarium specimens suporting these records its occurrence in the Pyrenees has been questioned by most specialists (Bolòs & Vigo, 1996; Foley, 1997; Sánchez Pedraja *et al.*, 2016a). The most unlikely record comes from the Haute-Garonne department, where *Salvia glutinosa* does not occur, and it was observed on *Valeriana officinalis* L. (Reuter, 1847). The other record, more plausible, was based on a collection by Companyó (1864) from the Pyrénées-Orientales (Costoja). Indeed, the only known populations of *S. glutinosa* on the northern slope of the Pyrenees occur there.

In the present note, we confirm the occurrence of the species in the Pyrenees based on a new observation and report it as a novelty for the Iberian Peninsula.

Material and methods

We discovered *Orobanche salviae* in the eastern sector of the Iberian Pyrenees (Catalonia, Spain). We observed it in late July and early August 2019, and we found it in the same place in mid-July 2020. For both periods, samples were collected and preserved in the herbarium of the Barcelona University (BCN herbarium). The code of the vouchers are BCN167269 and BCN167270.

The identification has been made according to the descriptions of specific works on the genus *Orbanche* (Charter & Webb, 1972; Kreutz, 1995) as well as the regional floras of the areas in which it lives (Pignatti, 1982; Tison & Foucault, 2014; Tison *et al.*, 2014; Domina, 2018). In addition, we unearthed an individual growing next to *Salvia glutinosa* to confirm the union between the two species by haustoria in the roots.

Given the rarity of the species, we assessed its threat status using the IUCN methodology (2012a,b).

Results and Discussion

Despite the relationship between hosts and species of the genus *Orobanche* s.l. it is often poorly known and under constant review (Piwowarczyk *et al.*, 2018), *O. salviae*

[1] Department of Evolutionary Biology, Ecology and Environmental Sciences, Faculty of Biology, University of Barcelona (UB), Barcelona, Spain. Email: arnaumercadelopez@gmail.com
[2] Biodiversity Research Institute (IRBio), University of Barcelona, Barcelona, Spain.

is considered a strict monophagous taxon (Kreutz, 1995; Sánchez Pedraja *et al.*, 2016b; Piwowarczyk *et al.*, 2018). It parasitizes exclusively the roots of *Salvia glutinosa* (see Figure 1), a native Euro-Siberian species thriving on mountain deciduous forests, particularly on nutrient-rich soils of forest glades and edges.

Figure 1. A, General aspect; B, Unearthed plant

Although it is a well-accepted taxon, recent phylogenetic studies (Carlón *et al.*, 2005, Piwowarczyk *et al.*, 2018) place *Orobanche salviae* in a complex group of montane species that is pending further taxonomic analysis (Piwowarczyk *et al.*, 2018). Within this group, in the flora of the Iberian Peninsula are recorded *O. haenseleri* Reut. (parasite of *Helleborus* L. and *Sideritis* L.) and representatives of the aggregate of *O. alsatica* Kirschl. (parasite of Apiaceae), such as *O. bartlingi* Griseb. and *O. montserratii* A. Pujadas & D. Gómez. The rest of the species in the complex (*O. lucorum* A. Braun, *O. flava* F.W. Schultz and *O. alsatica*) appear to have been erroneously reported from the Iberian Peninsula (Sánchez Pedraja *et al.*, 2016a). The close similarity between these taxa (especially in herbarium specimens), some with deceptive hypochromatic forms, and the unreliable identification of the guests, likely caused such confusion. In this regard, in this species complex the host-parasite relationship seems to have a high specificity, and it is considered a reliable taxonomic diagnostic character (Kreutz, 1995, Sánchez Pedraja *et al.,* 2016a, Piwowarczyk *et al.,* 2018).

Concerning morphology, *O. salviae* can be distinguished mainly by its moderate size and lax inflorescence, particularly at the base. The corolla is small (15–22 mm long) and slightly open, usually yellow or brownish and more or less ciliate-glandular on its surface. Its upper lip is entire or slightly margined, while the lower lip has subequal lobes, ciliated at least at the base of the lower lobe. The stamens are inserted 3 to 5 mm from the base of the corolla and the stigma is usually yellow, turning orange when ripe. Also noteworthy is its late flowering, which takes place mainly in July to September (Kreutz, 1995).

The new population becomes the first confirmed record of the species in the Iberian Peninsula and corresponds to the absolute western end of the taxon distribution area (see Figure 2). Moreover, it lies far from the nearest known ones, which are located in the French Maritime Alps (MNHN & OFB, 2022).

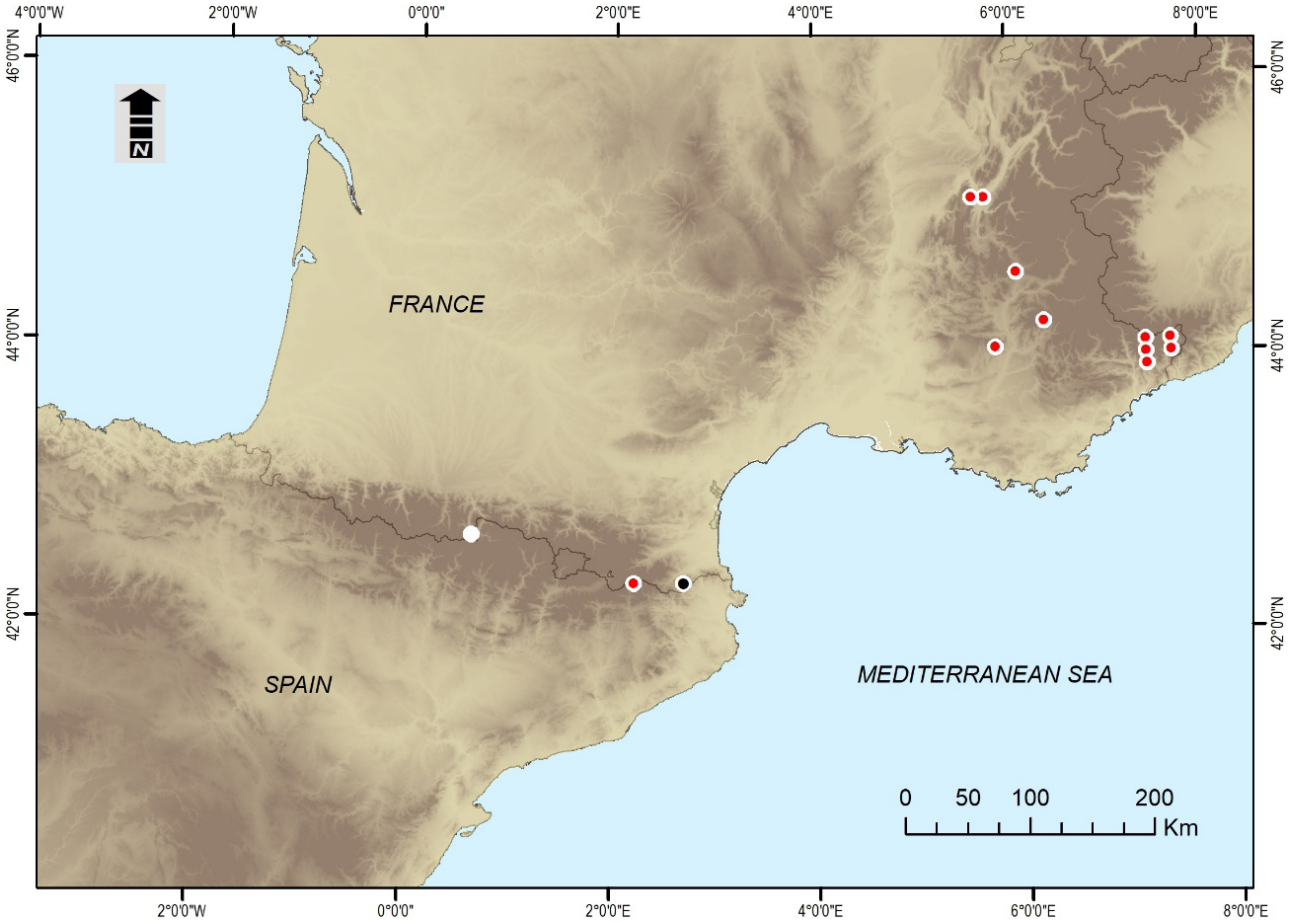

Figure 2. Map with the extreme western localities (France and Spain) of the distribution of *Orobanche salviae*. In red circles we indicate the confirmed localities, including ours in the Pyrenees. Black circle is the plausible but not confirmed location of Companyó (1864); White circle is about the doubtful location by Reuter (1847).

We discovered this taxon in the eastern Catalan Pyrenees (see Figure 2), in the Ribes valley (Ripollès, Girona), in the gorges of the river Freser in a rocky area known as the "Roques de Totlomón" (see Figure 3). The general orientation of the slope is to the South, but the steep terrain, with deep cliffs and canals, makes the environment locally shady and humid, and the soils deep and fertile. The dominant vegetation consists mainly of *Corylus avellana* L. thickets and patches of mixed groves with *Quercus petraea* (Matt.) Liebl., *Fraxinus excelsior* L., *Populus tremula* L. and *Fagus sylvatica* L. In its undergrowth, and in the clearings and margins, *Salvia glutinosa* is quite abundant (see Figure 3).

The populations of *Orobanche salviae* are splitted in two localities, separated from each other by a little more than a kilometre away, and at an altitude between 1,630 and 1,700 m asl. These elevations also represent the upper altitudinal limit of *Salvia glutinosa* in the Pyrenees and the Iberian territories (Bolòs & Vigo, 1996). In the first of them, located on a cliff named Boc (42°22'18.86", 2°10'33.51"), we made a provisional count of about 25–30 individuals. In the second, located near the brook of Joan Déu (42°22'37.39", 2°11'14.78"), we counted about 50 individuals. Since *S. glutinosa* is relatively common in the area, other populations of *O. salviae* could be present, particularly on the inaccessible and abrupt gullies, which were impossible for us to prospect. On the explored nearby gentle slopes, as well as at lower altitudes, *O. salviae* is always missing.

Below we show a relevé of 100 m^2 of one of the largest populations, located in the undergrowth of a mixed deciduous forest. We have used the Braun-Blanquet (1965) cover-abundance scale:

Fagus sylvatica L. 3; *Fraxinus excelsior* L. subsp. *excelsior* 2; *Quercus petraea* (Matt.) Liebl. 1; *Corylus avellana* L. 2; *Salvia glutinosa* L. 4; *Festuca gautieri* (Hack.) K. Richt. 2; *Orobanche salviae* F. W. Schultz 1; *Digitalis lutea* L. subsp. *lutea* 1; *Aconitum napellus* L. subsp. *vulgare* Rouy & Foucaud 1; *Helleborus foetidus* L. 1; *Poa nemoralis* L. 1; *Euphorbia amygdaloides* L. subsp. *amygdaloides* 1; *Brachypodium sylvaticum* (Huds.) P. Beauv. subsp. *sylvaticum* 1; *Veratrum album* L. +; *Urtica dioica* L. subsp. *dioica* +; *Campanula trachelium* L. +; *Primula veris* L. +; *Moehringia trinervia* (L.) Clairv +; *Silene nutans* L. subsp. *nutans* +; *Cruciata glabra* (L.) Ehrend. +; *Vicia sepium* L. +; *Oxalis acetosella* L. subsp. *acetosella* +; *Prenanthes purpurea* L. +; *Vincetoxicum hirundinaria* Medik. +; *Rabelera holostea* (L.) M.T. Sharples & E. Tripp +.

Figure 3. A, Overview of the area where the populations have been found (Roques de Totlomón, Ripollès, Catalunya); B, detail of the habitat of *Orobanche salviae*.

Conservation status

Despite *Orobanche salviae* is an elusive species, we believe it is most likely extremely scarce in the eastern Pyrenees, both because with our surveys we have not been able to provide more than two population centres and because it had not been previously detected in a territory surveyed in detail (Vigo, 1983; 1996). This situation raises the need to establish a threat category, as has occurred in some European countries. This is the case of France and Switzerland, where the species has been included as Endangered (EN) in the IUCN category (IUCN France, 2018; Info flora, 2022), and Germany, where it has been classified as Highly Threatened according to its own threat assessment system (The Red List Center, 2022).

According to current knowledge, this species should be classified for Spain as a regional Endangered (EN) according to the D criterion since it presents a regionally isolated population with a low number of individuals. Despite the inaccessibility of the area occupied by the species, the proximity of hydroelectric power station infrastructures could pose a real threat.

Acknowledgements

We want to thank the Department of Territory and Sustainability of the Generalitat de Catalunya for financing the project of Cartography of the CORINE's and HIC's habitats of the "Capçaleres del Ter and the Freser Natural Park, 1: 10,000 scale", where we have found *Orobanche salviae*. We also want to thank Cristian Oliete for his company in the field, and Albert Ferré for his valuable review.

Aythorship contribution

AML: Conceptualization, Writing, Visualization; AP-H: Conceptualization, Writing, Visualization.

Conflict of interest

None

References

Bolòs, O. de & Vigo, J. 1996. Flora dels Països Catalans, vol. III. Barcino. Barcelona.

Braun-Blanquet, J. 1965. Plant sociology; the study of plant communities. Mc Graw-Hill, New York.

Carlón, L., Gómez Casares, G., Laínz, M., Moreno Moral, G., Sánchez Pedraja, Ó. & Schneeweiss, G.M. 2005. Más, a propósito de algunas Orobanche L. y Phelipanche Pomel (Orobanchaceae) del oeste del Paleártico. Documentos Jard. Bot. Atlántico (Gijón) 3: 1–71.

Charter, A.O. & Webb, A. 1972. Orobanche L. In: Tutin T.G., Heywood V.H., Burges N.A., Moore D.M., Valentine D.H., Walters S.M. & Webb D.A. (Eds.). Flora Europaea, vol. 3. Pp. 286–293. Cambridge Univ. Press, Cambridge.

Companyó, L. 1864. Histoire Naturelle du Département des Pyrénées-Orientales 2. Imprimerie de J.-B. Alzine. Perpignan.

Domina G. 2018. Orobanche. In: Pignatti, S. (Ed.) Flora d'Italia, vol 2, 2ºed,. Edagricole, Milano, Pp. 376–389.

Foley, M.J.Y. 1997. Orobanche L. In: Paiva, J., Sales, F., Hedge, I.C., Aedo, C., Aldasoro, J.J., Castroviejo, S., Herrero, A. & Velayos, M. (Eds.). Flora Iberica, vol. 14. Pp. 32–72. Real Jardín Botánico, CSIC, Madrid.

Kreutz, C.A.J. 1995. Orobanche. The European broomrape species. Central and Northern Europe. Natuurhistorisch Genootschap. Maastricht.

Pignatti, S. 1982. Flora d'Italia, vol. 2. Edagricole, Bologna.

Piwowarczyk, R., Denysenko-Bennett, M., Góralski, G., Kwolek, D., Sánchez Pedraja, Ó., Mizia, P., Cygan, M. & Joachimiak, A.J. 2018. Phylogenetic relationships within Orobanche and Phelipanche (Orobanchaceae) from Central Europe, focused on problematic aggregates, taxonomy, and host ranges. Acta Biologica Cracoviensia. Series: Botanica 60(1): 45–64. doi: 10.24425/118044

Reuter, G. 1847. Orobanchaceae. In: De Candolle, Alphonse (Ed.). Prodromus Systematis naturalis regni vegetabilis 11: 1–45.

Tison, J.M. & de Foucault, B. 2014. Flora Gallica. Biotope Éditions, Mèze.

Tison, J.M., Jaunzein, P. & Michaud, H. 2014. Flore de la France méditerranéenne continentale. Naturalia Publications, Turriers.

UICN France, FCBN, AFB & MNHN. 2018. La Liste rouge des espèces menacées en France - Chapitre Flore vasculaire de France métropolitaine. Paris, France.

Vigo, J. 1983. Flora de la vall de Ribes. I. Generalitats. Catàleg florístic. Acta Bot. Barc. 35: 1–793.

Vigo, J. 1996. El poblament vegetal de la vall de Ribes. Les comunitats vegetals i el paisatge. Institut cartogràfic de Catalunya. Barcelona.

Websites

Info flora. 2022. The National Data and Information Center on the Swiss Flora. https://www.infoflora.ch/en/species-conservation/lists.html#regional-red-list-2019 [Accessed 5 December 2022].

IUCN. 2012a. Red List Categories and Criteria: Version 3.1. 2nd ed. https://portals.iucn.org/library/node/10315 [Accessed 7 December 2022].

IUCN. 2012b. Guidelines for Application of IUCN Red List Criteria at Regional and National Levels: Version 4.0. https://portals.iucn.org/library/node/10336 [Accessed 7 December 2022].

MNHN & OFB [Ed]. 2003–2022. Sheet of Orobanche salviae F.W.Schultz ex W.D.J.Koch, 1833. Inventaire national du patrimoine naturel (INPN). Website: https://inpn.mnhn.fr/espece/cd_nom/111661 - December 5, 2022

Sánchez Pedraja, Ó., Moreno Moral, G., Carlón, L., Piwowarczyk, R., Laínz, M. & Schneeweiss, G.M. 2016a [continuously updated]. Index of Orobanchaceae. Liérganes, Cantabria, Spain. http://www.farmalierganes.com/Otrospdf/publica/Orobanchaceae%20Index.htm [Accessed 5 December 2022].

Sánchez Pedraja, Ó., Moreno Moral, G., Carlón, L., Piwowarczyk, R., Laínz, M. & Schneeweiss, G.M. 2016b [continuously updated]. Index of Orobanchaceae [Host - References - Images]. Liérganes, Cantabria, Spain. http://www.farmalierganes.com/Otrospdf/publica/Orobanchaceae%20Index.htm [Accessed 5 December 2022].

The Red List Center. 2022. Central coordination of the national Red Lists and technical support. https://www.rote-liste-zentrum.de/en/index.html [Accessed 5 December 2022].