

# *Petrosedum thartii* (Crassulaceae), an overlooked species of the Iberian flora

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## Abstract

We report here the presence in the Pyrenees of plants assignable to *Petrosedum thartii* based on current knowledge of the difficult yellow-flowered *Petrosedum* complex. *Petrosedum thartii* has not previously been reported from the Iberian Peninsula and the nearest known locations are in the Alps. However, this plant is quite common in the inland valleys of the south-eastern Pyrenees but has seemingly often been confused with *P. rupestre*, a widespread species in this area whose presence has only been confirmed in areas with a maritime influence in eastern Catalonia. Our observations also indicate that confusion between *P. montanum* and *P. rupestre* is common, which suggests that an updating of the distribution of the yellow-flowered *Petrosedum* species in the Pyrenees is required.

**Key words:** Pyrenees, Spain, distribution, Sempervivoideae, *Sedum*.

## Resumen

### *Petrosedum thartii* (Crassulaceae), una especie olvidada en la flora ibérica

Se da a conocer la presencia en los Pirineos de plantas que son asignables a *Petrosedum thartii*, de acuerdo con los conocimientos actuales sobre el difícil complejo de los *Petrosedum* de flores amarillas. *Petrosedum thartii* es una especie que hasta ahora no había sido citada de la península Ibérica y que tenía las localidades conocidas más próximas en los Alpes. Estas plantas son relativamente comunes en los valles internos del sureste de los Pirineos y parece que habrían sido ampliamente confundidas con *P. rupestre*, una especie muy citada en esta zona pero que sólo hemos confirmado en áreas con influencia marítima del este de Cataluña. Nuestros datos también sugieren que las confusiones entre *P. montanum* y *P. rupestre* habrían sido frecuentes, y que es necesario actualizar la distribución de las especies de *Petrosedum* de flores amarillas en los Pirineos.

**Palabras clave:** Pirineos, flora, distribución, Sempervivoideae, *Sedum*.



## Introduction

Six taxa of *Sedum* ser. *Rupestria* A. Berger are accepted as present in the Iberian Peninsula by Castroviejo & Velayos (1997): *Sedum amplexicaule* DC., *S. forsterianum* Sm., *S. pruinatum* Brot., *S. montanum* E.P. Perrier & Songeon, *S. rupestre* L. and *S. sediforme* (Jacq.) Pau. The latter three species are found in the Pyrenees, a mountain range in which *S. ochroleucum* Chaix also just appears in its NE corner in the Corbières massif (Tison *et al.*, 2014). Subsequent genetic work (Nikulin *et al.*, 2016; Messerschmid *et al.*, 2020) has shown that taxa in the *Rupestria* series are evolutionarily more closely related to *Sempervivum* L. than to other *Sedum* species. Genetic and morphological differences account for its recognition as a distinct genus *Petrosedum* Grulich (e.g. POWO, 2024), which is endemic to the western Palearctic.

The separation of the various *Petrosedum* taxa can be difficult given that the morphological criteria used by authors – and even by the same author – do not always coincide or change over time. As a result, there is no consensus regarding the acceptance of certain species (*P. erectum* (t Harth) Grulich, *P. monteferraticum* Niederle, *P. tenuifolium* (Sm.) Brulich) and subspecies. An additional difficulty is that *Petrosedum* species hybridise readily due to the lack of reproductive barriers. Hybrids have been described between most species and are often difficult to identify, and are generally observed as casual individuals or small populations (Gallo, 2012). The only easily-recognisable hybrid known to form large independent populations is *P. x bellardii* L. Gallo (*P. rupestre* x *P. sediforme*).

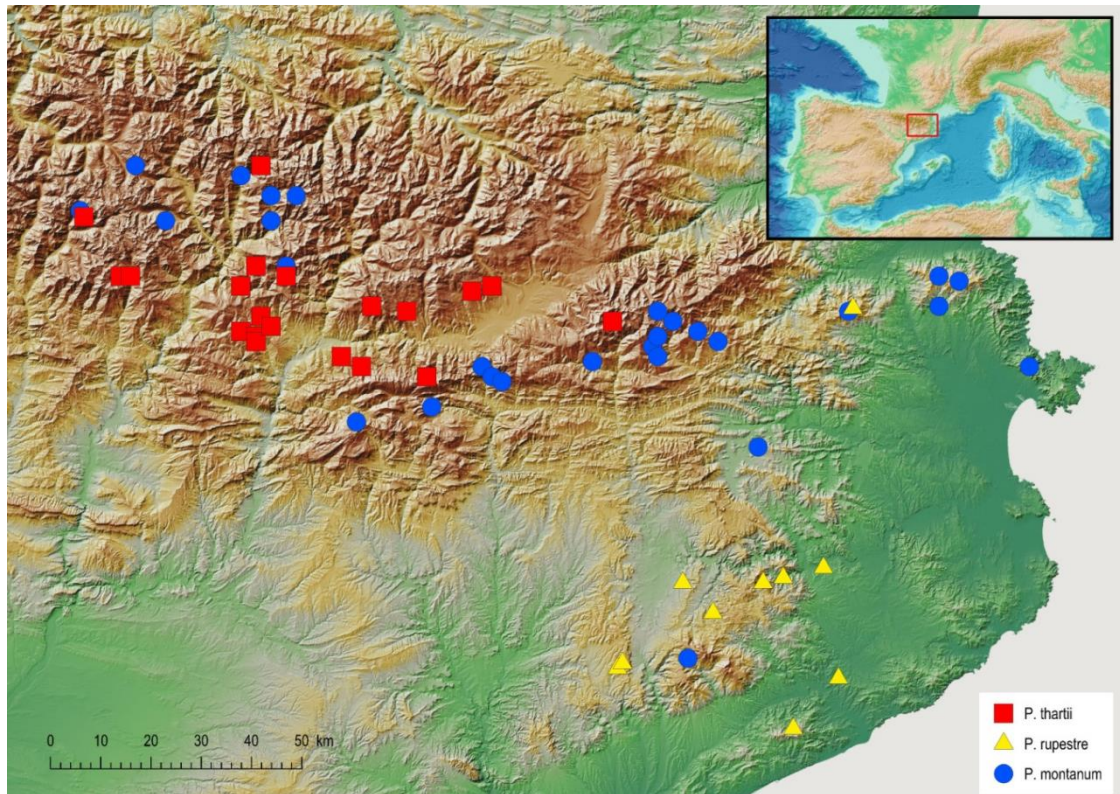
In recent years, we have observed plants in the Pyrenees whose identification is problematical. Certain plants have intermediate characters between *Petrosedum rupestre* (L.) P.V. Heath and *P. montanum* (Songeon & E.P Perrier) Grulich that recall *Petrosedum thartii* (L.P. Hébert) Niederle, a hitherto unknown species in this region. The goal of this work was thus to analyse the presence in the Pyrenees of plants that can be assigned to *Petrosedum thartii* (incl. *P. erectum*) using currently accepted morphological criteria. Additionally, we aimed to improve knowledge of the distribution of all yellow-flowered *Petrosedum* (*P. rupestre* complex) in the eastern half of the Pyrenees.

*Petrosedum thartii* is probably an allopolyploid species originating from the crossing of *P. montanum* and *P. rupestre*, followed by a doubling of the genome (t Hart, 1978). Although still poorly known, knowledge of its natural distribution has improved since the 2000s. It was initially assumed to be native to Eastern Europe but was later confirmed to be fairly widespread in Italy (Gallo, 2017) and present in Switzerland (Gallo, 2014). Due to its use in gardening, it has become an allochthonous species in several European countries (POWO, 2024), as well as in North America (Gallo & Zika, 2014) and Argentina (Arana *et al.*, 2014). To date, the nearest *P. thartii* data to the Pyrenees and the Iberian Peninsula are from the western Italian Alps (native populations) and the French Massif Central, where, according to Gallo (2014), it may have been introduced.

In this work we synonymise *P. thartii* and *P. erectum* (t Harth) Grulich, a criterion also followed in Austria (Morawetz, 2008) and Italy (Gallo, 2017) since the morphological differences between these two species (mainly densely glandular or glabrous sepals) are inconsistent (Gallo 2009). Nevertheless, there is no consensus regarding the synonymisation of these two taxa since *P. erectum* is recognized as a separate species in more analytical treatments (Niederle, 2016) and is currently accepted in some databases (POWO, 2024).

## Materials and method

The characters of 59 populations of *Petrosedum* were analysed (Figure 1; Appendix), 47 from the south-eastern Pyrenees and 12 from eastern Catalonia outside the Pyrenees. The study sites range from the upper Noguera Ribagorçana valley in the west to Cap de Creus in the east. All sites are located within the administrative territory of Catalonia (Spain); all samples were collected post-2020, although most were obtained during surveying in 2024.



**Figure 1.** Map showing the location of the Pyrenean populations studied and their specific identification. At this scale nearby sites are represented as a single locality. Red square: *Petrosedum thartii*. Blue circle: *P. montanum*. Yellow triangle: *P. rupestre*.

**Figura 1.** Mapa con las poblaciones pirenaicas estudiadas y su identificación específica. A esta escala, las localizaciones próximas entre sí han sido representadas como una sola localidad. Cuadrado rojo: *Petrosedum thartii*. Círculo azul: *P. montanum*. Triángulo amarillo: *P. rupestre*.

The specific identification of the analysed *Petrosedum* plants was performed using the available bibliography including three works by Gallo (2017), Morawetz (2009) and Niederle (2016) with identification keys. *Petrosedum thartii* is very similar in appearance to *P. rupestre* and *P. montanum*, to the extent that a positive separation of the three species may be impossible if plants do not have inflorescences (Niederle, 2016). The basic criterion that allows for the distinction of *P. thartii* are the combination of erect inflorescences and stamen filaments with a distinctly papillose base. By contrast, *P. montanum* has erect inflorescences and glabrous stamens, while *P. rupestre* has reflexed inflorescences before anthesis and filaments with papillae. Also useful is the presence of glandules on the sepals, bracts and stems of the inflorescence, which in *P. thartii* are usually present in at least some of the plants in a population; conversely, in *P. montanum* they are always present and fairly common but absent in *P. rupestre* (although some authors point out that in this species they may occasionally be present). Whenever possible, plants were identified by the combination of erect inflorescences and stamen filaments with papillae, although the period in which the first character is observed is short, so when plants were already flowering the combination of papillose filaments and the presence of some glands on the sepals and bracts was used as the main criteria for assignment to *P. thartii*. The characters that are most useful for distinguishing *P. thartii* from *P. rupestre* and *P. montanum* are summarised in Table 1.

Other morphological characters compiled in the bibliography were considered but are less useful because they are subtle and their interpretation may be subjective (curvature of the leaves, curvature of the styles, sepal shape, robustness, abundance of plants with glaucous leaves, etc.). Often, there is no consensus on these characters between authors and works (Gallo & Zika, 2014; Gallo, 2017; Niederle, 2016).

**Table 1.** The most useful features for separating the three yellow-flowered *Petrosedum* species present in the Pyrenees.

**Tabla 1.** Las características más usadas para separar las tres especies de *Petrosedum* con flores amarillas presentes en los Pirineos.

Morphological characters	<i>P. thartii</i>	<i>P. rupestre</i>	<i>P. montanum</i>
Position of inflorescences before anthesis	Erect	Reflexed	Erect
Pubescence of the stamen filaments at the base	Papillose	Papillose	Glabrous
Glands in sepals and bracts	Variable, from abundant to absent (in the Pyrenees scarce individually but constant at a population scale)	Absent (exceptionally some isolated glands)	Constant and more or less numerous
Length of sepals	3-4 (7) mm	3-4 mm	4-8 mm
Leaf colour	Usually glaucous	Green or glaucous	Usually green, sometimes glaucous or reddish

## Results

Based on the criteria indicated in the previous section, 20 *Petrosedum* populations from the Pyrenees were identified as *P. thartii*, 26 as *P. montanum* and only one as *P. rupestre* (Appendix). *P. rupestre* was mainly observed in low-altitude areas of eastern Catalonia (9 confirmed locations); *P. montanum* was also found outside the Pyrenees in eastern Catalonia (3 locations).

The plants attributed to *P. thartii* (Figure 2) consistently show stamen filaments with a clearly papillose base and, when observed at the beginning of flowering, have erect inflorescences. The sepals are 3-4-mm long and are triangular-lanceolate in shape. Plants initially identified as *P. rupestre* (Figure 3a) due to their reflexed inflorescences had sepals of similar length but with narrower bases and were lanceolate in shape – and were obviously distinct from plants assigned to *P. thartii*. In plants assigned to *P. thartii* the presence of glands in the sepals and bracts was occasional and irregular and glands were only observed in a few inflorescences and flowers, although their presence was constant at population scale; in no case did we observe sepals with numerous glands. The plants referable to *P. montanum* (Figure 3b) were clearly glandulose (and also had longer sepals, >4 mm), while those assigned to *P. rupestre* were glabrous or nearly so (we only saw a gland at the apex of one sepal). Almost all plants attributed to *P. thartii* had glaucous leaves and an erect or ascending habit. Glaucous plants were also seen in the populations attributed to *P. montanum*, but only rarely, and almost never in *P. rupestre*. The habit of *P. montanum* and *P. rupestre* was usually ascending or decumbent, very rarely erect.

The populations assigned to *P. thartii* are mainly found in the valleys of the central-eastern Pyrenees. Outside this area, we only identified them in one locality on the southern slope of the Puigmal massif, in the upper basin of the river Ter. The species has not been observed in the easternmost part of the Pyrenees, between the river Ter and the Mediterranean. According to the data obtained, *P. thartii* and *P. montanum* are partially sympatric in the eastern half of the Pyrenees, although we only found these two species to be syntopic in just one place (Estany de Cavallers, Noguera Ribagorçana valley). To date, no area of sympatry between *P. thartii* and *P. rupestre* is known in the Pyrenees



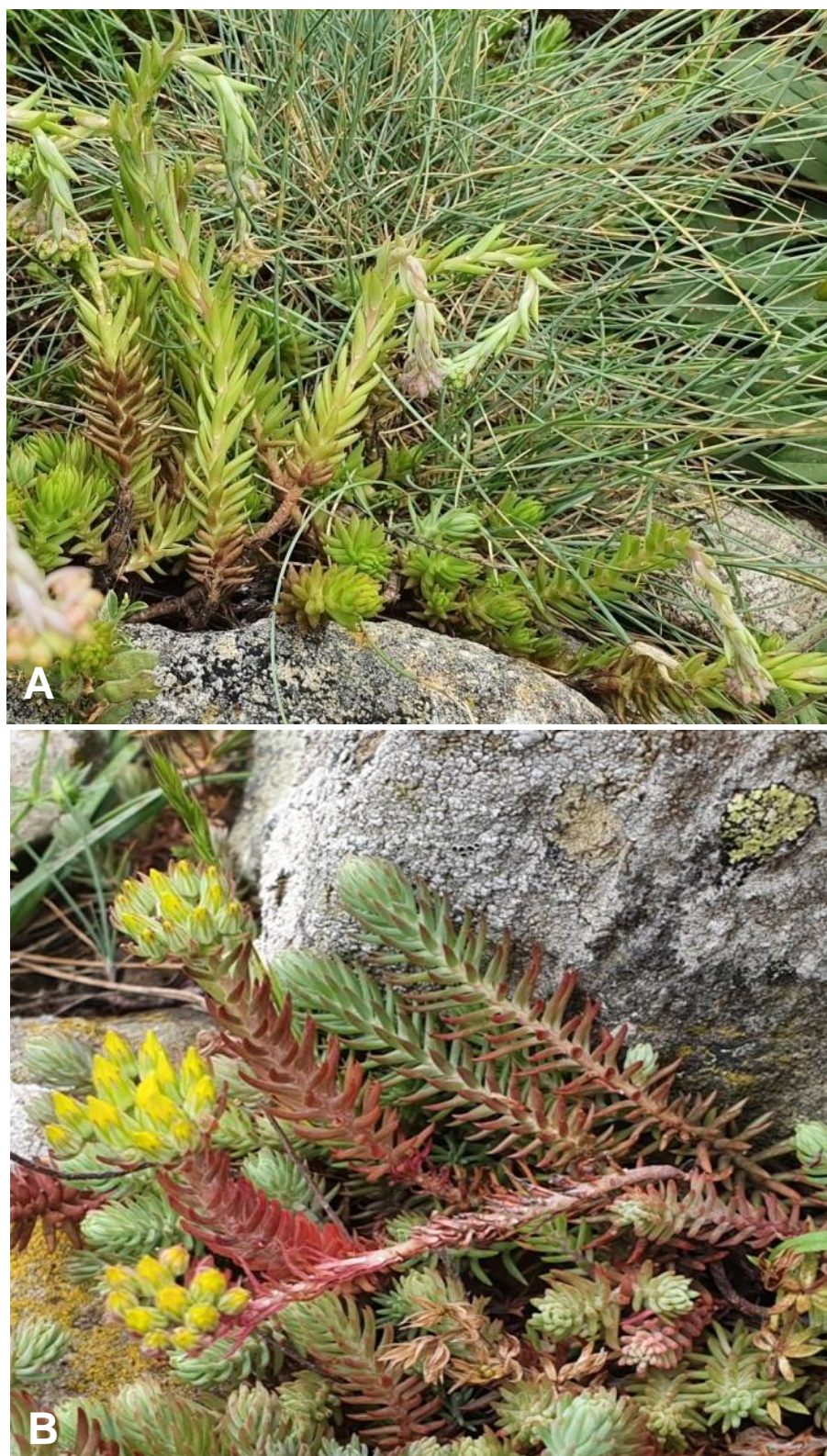
Plants assigned to *P. thartii* thrive at altitudes between 1000 and 2300 m a.s.l. (submontane to subalpine vegetation belts) but are commonest at 1300-1600 m a.s.l. in the montane belt. All localities are on siliceous rocks, in some places slightly carbonated, and to date this species is not known from limestone in the Pyrenees. The most common habitats are rocky slopes with very thin soils and roadsides, always in the open where there is little or no woody cover, and generally on south-facing slopes.



**Figure 2.** *Petrosedum thartii*. (A) inflorescences before anthesis (above Coll de Vanses in Alàs i Cerc); (B) inflorescences during anthesis (to the east of Port del Cantó in Montferrer i Castellbò).

**Figura 2.** *Petrosedum thartii*. (A) inflorescencias antes de la anthesis (por encima de Coll de Vanses en Alàs i Cerc); (B) inflorescencias en anthesis (al este del Port del Cantó en Montferrer i Castellbò).





**Figure 3.** (A) *Petrosedum rupestre* with inflorescences before anthesis (Salines massif in Maçanet de Cabrenys); (B) *P. montanum* with inflorescences before anthesis (Albera massif in La Jonquera).

**Figura 3.** (A) *Petrosedum rupestre* con inflorescencias antes de la antesis (macizo de Salines en Maçanet de Cabrenys); (B) *P. montanum* con inflorescencias antes de la antesis (macizo de Albera en La Jonquera).

## Discussion and conclusions

The information obtained shows that populations referable to *P. thartii* (including *P. erectum*) are present in the Pyrenees. When analysed before anthesis, these plants have papillose stamen filaments and erect inflorescences with flower buds, a combination usually accepted as diagnostic for *P. thartii* (Gallo, 2017; Morawetz, 2009; Niederle, 2016). This ascription is made based on current knowledge, although other future interpretations cannot be ruled out if more information becomes available since knowledge of the *Petrosedum* genus is still fairly patchy.

The possibility that the plants assigned to *P. thartii* are interspecific hybrids has been evaluated but it is considered unlikely. First, they are found over a large area and form large populations (generally in the order of hundreds of individuals). The only *Petrosedum* hybrid for which a similar behaviour is known is *P. x bellardii* *P. x luteolum* (Chaboiss.) Grulich (*P. sediforme* x *P. rupestre*) and the Pyrenean plants obviously do not belong to this taxon due – amongst other differences – to the intense yellow colour of the flowers. Likewise, it is clearly not *P. x affomarcoi* (L. Gallo & Afferni) L. Gallo (*P. montanum* x *P. rupestre*) either because this hybrid has very different characters from the plants found in the eastern Pyrenees (reflexed inflorescences, stamen filaments glabrous or rarely papillose). A hybrid between *P. sediforme* and *P. montanum* would be more likely as these species often grow in close proximity in the Pyrenees; nevertheless, this interspecific hybrid is not currently accepted (POWO, 2024).

The discovery of *P. thartii* in the Pyrenees is a remarkable expansion of its known distribution area towards SW Europe, since the nearest confirmed native populations are in Piemonte (NW Italy). In France, although it has been reported from two departments adjacent to Switzerland (Gallo, 2014), its current status is still unclear in areas closer to the Pyrenees. A floristic database (Tela Botanica, 2024) accepts its presence in the Massif Central and the Hautes-Alpes department but, according to Gallo (2014), a locality in the northern Massif Central could be allochthonous, while records of *P. erectum* (a taxonomic synonym of *P. thartii*) in the French Alps correspond to *P. montanum*. The Pyrenean populations of *P. thartii* seem generally to be located at higher altitudes than in the rest of Europe (for example, in Italy it is known mainly between 0 and 1200 m a.s.l., occasionally up to 1500 m a.s.l.), but information is scarce; the high average altitude could be explained by the Mediterranean influence in the south-eastern Pyrenees.

Although *P. thartii* has become naturalised in several areas of Europe and America, its Pyrenean populations should be regarded as native since they are found in areas with almost no human settlement and it is known to thrive above all in natural habitats. Furthermore, we have never seen this species cultivated in gardens in either the Pyrenees or Catalonia. Its presence in anthropogenic habitats such as road margins (Figura 4) is interpreted as an opportunistic colonisation of artificial habitats, which is also observed in other *Petrosedum* (for example, *P. sediforme* can proliferate on the roadsides of warmer areas in the Pyrenees).

It seems that in the Pyrenees *P. thartii* has hitherto been overlooked due to confusion with *P. montanum* or *P. rupestre*, as has happened in other areas. It is very easy to confuse *P. thartii* with *P. rupestre* if plants are not observed at the beginning of flowering. However, there will also have been confusion with *P. montanum* in cases where *P. thartii* with glandular sepals were observed but the stamens were not examined.

Our results demonstrate that a reassessment of the distribution of the taxa of the *Petrosedum montanum* / *thartii* / *rupestre* complex in the Pyrenees and nearby areas is required, to which we contribute the data obtained during our fieldwork (Figure 1, Appendix). According to our results, the most widespread species is *P. montanum*, which occurs both in the Pyrenees and in nearby areas. It has probably been overlooked due to confusion with *P. rupestre* since in our survey we found *P. montanum* in areas (maritime end of the Pyrenees, Montseny massif) where previously only *P. rupestre* had been reported (Font, 2000; Franquesa, 1995; Sáez *et al.*, 2017). Based on current data, *P. thartii* seems to be restricted to Pyrenean valleys with a fairly continental climate, while *P. rupestre* has only ever been observed exceptionally, just once in the easternmost part of this area. Above all, the current distribution of *P. rupestre* in the Pyrenees – where it has been widely reported (e.g. Atlas Flora Pirineos, 2024) – needs to be clarified. It is likely that most Pyrenean reports of *P. rupestre* in fact correspond to *P. thartii*. A similar situation arose in Switzerland



in light of the revision of herbarium sheets attributed to *P. rupestre*, which turned out to be *P. thartii*, thus, the presence of *P. rupestre* in this country could not be confirmed (Gallo, 2014). We found *P. rupestre* mainly at low altitudes in areas of subhumid Mediterranean climate, which coincides with observations by Italian authors who consider that this species is found chiefly in relatively low and warm areas (Gallo, 2017).



**Figure 4.** Population of *Petrosedum thartii* on a roadside, to the east of Port del Cantó in Montferrer i Castellbò.  
**Figura 4.** Población de *P. thartii* junto a una carretera, al este de Port del Cantó en Montferrer i Castellbò.

## Conflict of interest

The author declare that he has not conflicts of interest relevant to the content of this manuscript.

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## Appendix

Populations of each yellow-flowered *Petrosedum* species identified during our survey (ordered from west to east). All sites are located within the administrative limits of Catalonia. For each site, the province (in bold), municipality, location, UTM square, altitude a.s.l., main habitat and observation date are given. The coordinates correspond to UTM 1x1 km grid (ETRS89 zone 31 North). (\*): *P. thartii* samples in the author's personal herbarium. (\*\*): *P. thartii* samples sent to Universitat Autònoma de Barcelona herbarium (BCB).

### ***Petrosedum thartii***

**GIRONA:** \*Guils de Cerdanya, Feixa road, DH0601, 1580 m, road margin, on siliceous substrate, 23-VII-2024; Moscador de Dalt, DH0200, 2115 m, stony soil on siliceous rocks, 23-VII-2024; \*Queralls, Núria, west side of Pic de l'Àliga, DG3094, 2300 m, stony soil on siliceous rocks, 2-IX-2024. **LLEIDA:** La Vall de Boí, Estany de Cavallers, CH2416, 1750 m, rocky slope on siliceous substrate, 5-VIII-2024; \* La Torre de Cabdella, Filià valley, CH3203, 1870 m, stony soil on siliceous rocks, 24-VII-2024; Filià valley, CH3403, 1350 m, road margin, on siliceous substrate, 24-VII-2024; \*Lladorre, west of Bordes de Son, CH6025, 1520 m, rocky slope on siliceous substrate, 15-X-2024; Farrera, near Coll de So de Farrera, CH5905, 1870 m, road margin, on siliceous substrate, 12-VIII-2024; \*Les Valls de Valira, south of Bordes de Jussà, CH6503, 1600 m, rocky slope on siliceous substrate, 12-VIII-2024; Llavorsí, between Montenartró and Romadriu, CH5601, 1240 m, road margin, on siliceous substrate, 18-VII-2024; \*\*Montferrer i Castellbò, to the east of Port del Cantó, CG5692, 1660 m, road margin, on siliceous substrate, 9-VII-2024; Serrat de

Carlà, CG5990, 1500 m, road margin, on siliceous substrate, 18-VII-2024; below Canturri, CG5991, 1500 m, rocky slope on siliceous rocks, 18-VII-2024; \*north of Sant Andreu de Castellbò, CG6095, 1320 m, road margin, on siliceous substrate, 18-VII-2024; Collada del Pubill, CG6293, 1280 m, road margin, on siliceous substrate, 18-VII-2024; Valls de Valira, Bescaran, Cortal del Mestre, CG8297, 1785 m, stony soil on siliceous rocks, 29-X-24; \*\*Alàs i Cerc, above Coll de Vanses, CG8085, 1500 m, rocky slope on volcanic rocks, 1-VII-2024; \*above Collet de Bentanacs, CG7687, 1050 m, stony soil on volcanic rocks, 1-VII-2024; Lles de Cerdanya, Arànsers, Font Freda, CG8996, 1725 m, stony soil on siliceous rocks, 2-VII-2024; Montellà i Martinet, to the west of Prat d'Aguiló, CG9383, 1950 m, stony soil on siliceous rocks, 23-VII-2024.

### ***Petrosedum montanum***

**BARCELONA:** Saldes, Pedraforca massif, CG9477, 1820 m, limestone scree, 14-VIII-2024; Guardiola de Berguedà, Gréixer, DG0683, 1235 m, stony soil on siliceous rocks, 1-VIII-2024; Bagà, below Pla Bagà, DG0882, 1850 m, road margin, on siliceous substrate, 1-VIII-2024; El Brull, Montseny massif, Collformic, DG4527, 1140 m, stony soil on siliceous rocks, 17-VI-2024. **GIRONA:** Planoles, road to Coll de les Barraques, DG2686, 1500, road margin, on siliceous substrate, 16-VIII-2024; Vilallonga de Ter, Tregurà, Presa de Tregurà, DG3987, 1460 m, stony soil on siliceous rocks, 30-X-2024; Tregurà, near Collet de la Gralla, DG3889, 1940 m, road margin, on siliceous substrate, 16-VII-2024; Catllar valley, DG3991, 1500 m road margin, on siliceous substrate, 24-VII-2024; Setcases, Jaça de les Eugues, DG3996, 2100 m, stony soil on siliceous rocks, 16-VII-2024; Camps d'en Cabrera, DG4294, 1590 m, road margin, on siliceous substrate, 16-VII-2024; Molló, road Setcases to Espinavell, DG4792, 1560 m, road margin, on siliceous substrate, 16-VII-2024; Pont de Fabert, DG5190, 1140 m, stony soil on siliceous rocks, 30-X-2024; Maçanet de Cabrenys, Salines massif, Roc del Comptador, DG7796, 1440 m, stony soil on siliceous rocks, 15-VI-2020; La Jonquera, Albera massif, Puig Neulós, DH9503, 1200 m, stony soil on siliceous rocks, 3-VI-2020; Requesens, Coll del Medàs, DG9597, 395 m, stony soil on siliceous rocks, 3-VI-2020; Espolla, Albera massif, Puig dels Quatre Termes, DH9902, 1130 m, stony soil on siliceous rocks, 3-VI-2020; Port de la Selva, below Sant Pere de Rodes, EG1385, 460 m, road margin, on siliceous substrate, 18-VI-2023; Olot, Batet de la Serra, DG5969, 640 m, artificial wall of volcanic rocks, 13-VII-2023. **LLEIDA:** La Vall de Boí, Estany de Cavallers, CH2416, 1775 m, rocky slope on siliceous substrate, 5-VIII-2024; Alt Àneu, close to Port de la Bonaigua, CH3525, 2100 m, rocky slope on siliceous substrate, 31-VII-2024; Espot, Costa dels Aills, CH4114, 2020 m, fissures of siliceous rocks, 31-VII-2024; Lladorre, between Lladorre and Tavascan, CH5621, 1080 m, stony soil on siliceous rocks, 19-VII-2024; above Tavascan, CH5623, 1250 m, road margin, on siliceous substrate, 19-VII-2024; Alins, Pla de Boet, CH6719, 1880 m, stony soil on siliceous rocks, 29-VII-2024; Pla de Boet, CH6219, 1390 m, road margin, on siliceous substrate, 29-VII-2024; near Santa Maria de la Torre, CH6214, 1130 m, stony soil on siliceous rocks, 29-VII-2024; Les Valls de Valira, north of Bordes de Jussà, CH6505, 1725 m, road margin, on siliceous substrate, 12-VIII-2024; Josa i Tuixén, road Tuixén - Coll de Port, CG7974, 1580 m, road margin, on limestone substrate, 13-VIII-2024; Riu de Cerdanya, Torrent del Saüc, DG0485, 1470 m, rocky slope on limestone, 13-VII-2022.

### ***Petrosedum rupestre***

**BARCELONA:** Folgueroles, Pla de les Cabres, DG4442, 615 m, stony soil on siliceous rocks, 5-VI-2024; Castellcir, Castell de Catellcir, DG3125, 850 m, siliceous rocks, 15-XII-2024; Sauva Negra, DG3226, 870 m, road margin, on siliceous substrate, 15-XII-2024; Sant Celoni, Fuirosos valley, DG6613, 250 m, sandy soil in Mediterranean scrub, 15-V-2024. **GIRONA:** Maçanet de Cabrenys, Salines massif, El Moixer, DG7796, 1425 m, stony soil on siliceous rocks, 15-VI-2020; Espinelves, north side of Turó de les Lloberes, DG5036, 670 m, road margin, on siliceous substrate, 5-VI-2024; Osor, between Mines d'Osor and Osor, DG6443, 285 m, artificial wall of siliceous rocks, 8-VI-2024; Serra Gran, DG6042, 510 m, road margin, on siliceous substrate, 8-VI-2024; Bescanó, close to Can Rocasalva, DG7245, 145 m, road margin, on siliceous substrate, 8-VI-2024; Maçanet de la Selva, turó de Montalegre, DG7523, 150 m, sandy soil in Mediterranean scrub, 25-V-2022.