

Euphorbia duvalii (Euphorbiaceae) in the Iberian Peninsula

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Abstract. *Euphorbia duvalii* Lecoq & Lamotte is an endemic species from the Catalan-Occitan territory —western Mediterranean area— and is usually found in the south of France. *Euphorbia duvalii* has been cited from some localities of the Iberian Peninsula, but in later reviews all of these citations were finally identified as other species of *Euphorbia* L. One of these citations, from the Alt Empordà —Girona, Spain—, was of specific interest because not all the sources agreed on what the species was. To clarify whether or not this species is really present in the Iberian Peninsula, we examined new material from this population in order to establish whether the species is in fact *E. duvalii*. Once the morphology of the specimens from the Serra de Bac Grillera population had been analysed, we were able to confirm that they were indeed *E. duvalii*. This means that this is the only area on the Iberian Peninsula where this endemic species has been identified. The population is located in a rocky meadow that contains some scrub and is surrounded by pinewoods. Because this is the one and only Iberian population, a management and conservation plan needs to be drawn up to ensure its preservation.

Keywords. Alt Empordà, Alta Garrotxa, conservation, singular flora, protected species, Serra de Bac Grillera.

Resumen. *Euphorbia duvalii* Lecoq & Lamotte es una especie endémica del territorio catalano-occitano —área mediterránea occidental— que puede ser hallada normalmente en el sur de Francia. *Euphorbia duvalii* ha sido citada de algunas localidades de la Península Ibérica, pero en revisiones posteriores todas las citas se identificaron finalmente como otras especies de *Euphorbia* L. Una de estas citas, la del Alt Empordà —Gerona, España—, era muy interesante, ya que no todas las fuentes estaban de acuerdo a qué especie correspondía. Para clarificar si esta especie se encuentra en la Península Ibérica, examinamos material nuevo de esta localidad para determinar si la especie era de hecho *E. duvalii*. Tras el análisis de la morfología de los especímenes de la población de la sierra de Bac Grillera, fuimos capaces de confirmar que se trataba de *E. duvallii*. Esto significa que ésta es la única área en la península ibérica donde esta especie endémica ha sido identificada. La población se encuentra en un prado rocoso con algunos matorrales y rodeado de pinares. Ya que ésta es la única población ibérica, es necesario un plan de gestión y conservación de esta especie para su preservación.

Palabras clave. Alto Ampurdán, Alta Garrotxa, conservación, especies protegidas, flora singular, sierra de Bac Grillera.

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INTRODUCTION

Euphorbia duvalii Lecoq & Lamotte (Euphorbiaceae Juss.) is an endemic plant from the Catalan-Occitan territory, of which there are a few populations in the southeast of France where the plants can be found in the rocky calcicolous meadows in the Midi Mountains: Causses des Cévennes, Causses du Quercy, Corbières, and Pyrénées-Orientales in the departments of Ardèche, Aude, Aveyron, Gard, Hérault and Lozère (Simon & Vicens 1999; Tison & al. 2014). However, in the Iberian Peninsula it is known to have only one habitat in the northeast of Catalonia, in the Alt Empordà, in the wilderness area of the Alta Garrotxa (Bou i Tomàs 1985). Although there are citations from the Serra del Boumort (Molero & al. 1988; Pujadas 1981) and Montsec (Romo 1989), these would appear in fact to be referring to *E. dulcis* L. (Simon & Vicens 1999).

There have been several incidences of confusion about the presence of this taxon on the Iberian Peninsula. The Iberian Flora collection refers to the Alt Empordà population as corresponding to *E. angulata* Jacq. (Benedí & al., 1997), while other studies confirm the presence of *E. duvalii* in the Iberian Peninsula (Simon & Vicens 1999). At the same time, the *Flora Manual dels Països Catalans*, ed. 3 describes a doubtful presence of this taxon in the territori ruscínic —*Ruscínium*— (Bolòs & al. 2005).

With only one population on the Iberian Peninsula, this unclear situation regarding the current status of *E. duvalii* has generated a serious problem in terms of knowledge about and conservation of this Mediterranean plant. Because of its rarity, *E. duvalii* was declared as strictly protected in Catalonia under the *Pla d'Espais d'Interès Natural* (Generalitat de Catalunya 1993), which was then later modified through the creation of the *Catàleg de la Flora Amençada a Catalunya* (Generalitat de Catalunya



Fig. 1. Populations of *E. duvalii* Lecoq & Lamotte in the western Mediterranean, and in detail in the locality of the Serra de Bac Grillera; the known localities for field work and bibliographic citations are represented. [Prepared by the authors; sources: Generalitat de Catalunya (2017); Institut Cartogràfic i Geològic de Catalunya (2017); Tela Botànica (2017)].

2008), which states this taxon as being a strictly protected species of flora in the wilderness area of the Alta Garrotxa. Therefore, in this study we wanted to check for the presence of this species in the Alt Empordà through field work and by analysing the herbarium material while, at the same time, contributing to the knowledge about this plant by adding new chorological data about the one and only population on the Iberian Peninsula. We also endeavour to provide clarity and useful information to ensure the preservation of this endemism of occidental Mediterranean flora.

MATERIAL AND METHODS

The studied population of *E. duvalii* is found in the eastern part of the Pre-Pyrenees mountain range known as the Serra de Bac Grillera. It is inside the protected area of the Alta Garrotxa which is included in the *Pla d'Espais d'Interès Natural* and also the *Xarxa Natura 2000* (fig. 1). Material was collected to carry out a morphological study, and the specimens were later deposited in the *Herbari de la Universitat de Girona* —HGI—. An identification key

was constructed from the data collected, together with the bibliographic information from Simon & Vicens (1999) and Tison & al. (2014). All the studied specimens of *Euphorbia* are listed in the appendix.

The site studied is an open wilderness space made up of shrub lands and meadows (fig. 2c) and surrounded by a Scots pine forest. The ground is stony with disaggregated red soils that have signs of a marked erosive processes. As with the French populations, the substrate is calcareous (Tison & al. 2014) and more specifically in the Iberian case there are calcareous rocks from Cretaceous and Garumnian facies. The population is located 800 m a.s.l. on a north-east facing site which produces the specific environmental conditions of sub-Mediterranean limestone mountains.

RESULTS AND DISCUSSION

Morphology

The specimens of *E. duvalii* collected in the Serra de Bac Grillera —HGI 23815 and HGI 23816— correspond to a perennial herbaceous plant and are usually glabrous and

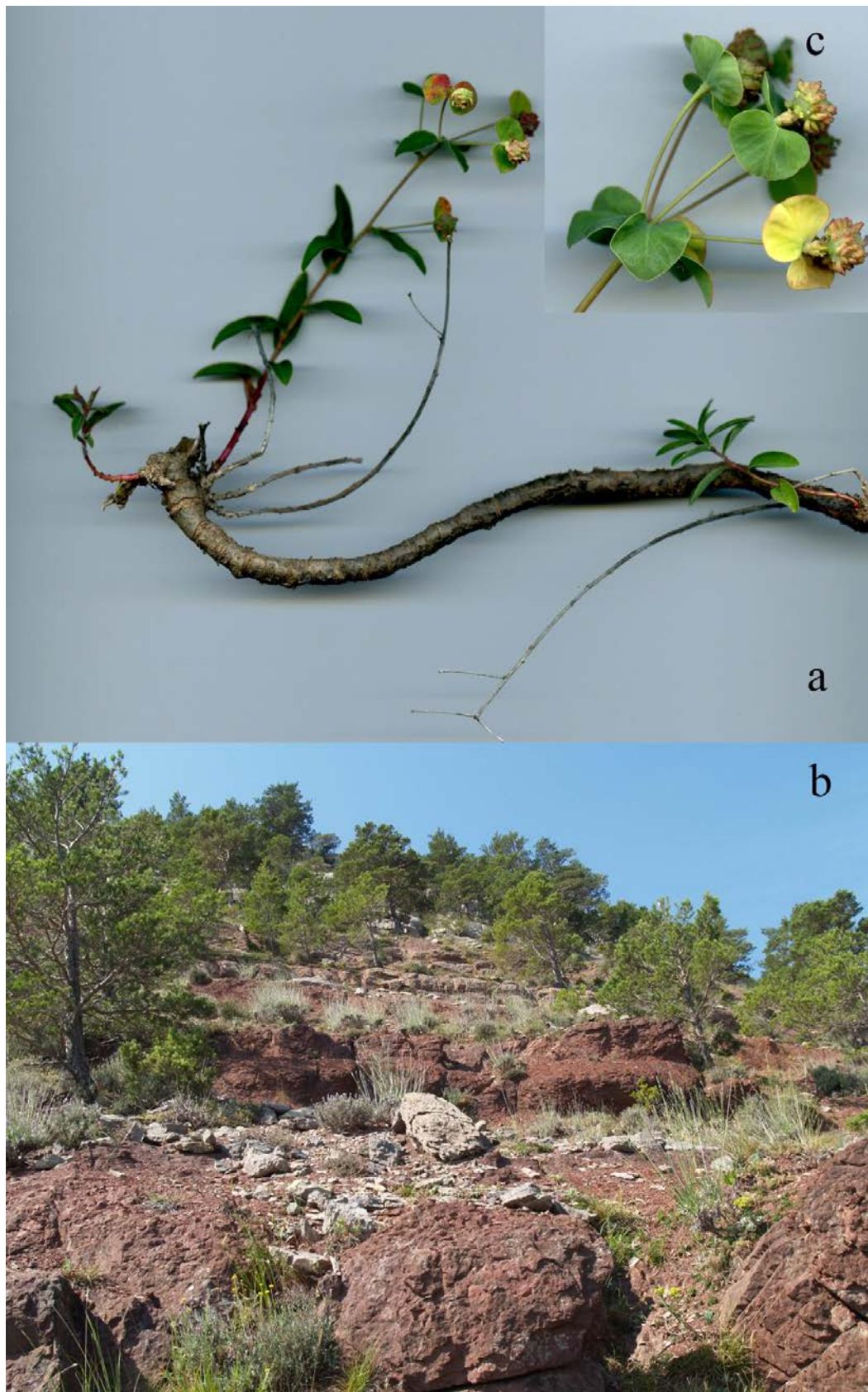


Fig. 2. *Euphorbia duvalii* Lecoq & Lamotte: **a**, complete plant with woody rhizomes; **b**, habitat where the Iberian population grows in the Serra de Bac Grillera; **c**, capsule with sub-pyramidal and sub-conical warts [a, c, HGI 23815].

multicauline. Stems are 10–20(25) cm long, ascending and mostly simple and cylindrical. Woody rhizomes without tuberculous structures are between a dark brown and greyish colour and unarticulated. Leaves are of variable morphology. There are numerous basal cataphylls 2–2.5 × 1.5–2 mm which are scarious, obtuse and with a rounded apex. Cauline leaves are [8]10–20[36] × [2.5]3–6[9.5] mm, firm, sessile and alternate, lanceolate to elliptic in shape, and denticulate in the upper half. Leaves from sterile stems tend to be finely lanceolate and more acute towards the apex. The pleiochasial bracts are [7]8–10[19] × [7]4–8[10] mm, ovate to rhombic in shape which is often quite a lot shorter than the radius. Dichasial bracts are [6]4–5[9] × [7]6–8[14] mm and oblate in shape with a mucronate apex. They are pleiochasium, green, with a 3–5 floral radius, albeit sometimes we were able to observe an axillar floral radius. Nectar glands are a reniform shape and yellow in colour. The sub-globular capsules are [3.3]3.6–4[4.8] mm in diameter, glabrous and green but the mature capsules are red-brown with warts visible to the naked eye. The warts are [0.8]0.7–1.2[1.1] mm long, and although they are thick, they are clearly longer than they are wide, and are sub-pyramidal to sub-conical. The style is long, trifurcated in the middle of the length and persistent to maturity. Seeds are sub-globular with a truncated base and a subacute 2.5 × 2 mm apex, which is smooth and dark brown. They are reniform caruncle with an apparent frontal notch.

All these characteristics lead us to conclude that there is a population of *E. duvalii* in the Serra de Bac Grillera as the morphology of the specimens collected corresponds to the descriptions of Simon & Vicens (1999) and Tison & al. (2014). The same is observed for the samples collected in 1983 —HGI 23847—, which also correspond to *E. duvalii*. Furthermore, we have compared the material we collected with the French specimens of *E. duvalii* from Mont Alaric —HGI 23817— and with herbarium material —BC 649310 and BC 649337—, and the same characteristics are clearly identifiable.

In addition, samples of other species —*E. dulcis* and *E. angulata*— that could be confused with *E. duvalii* have been analysed. As has been observed, with the complete sample of *E. angulata* —BC 149063, BC 149079, HGI 23850, and HGI 23851—, the rhizome with nodules that this taxon presents can be clearly seen, and so cannot be confused with the woody rhizome of *E. duvalii*. However the differences between the rhizomes of *E. dulcis* —BC 651571 and BC 917673— and *E. duvalii* are not obvious at first sight, and so the capsules need to be analysed, because *E. dulcis* has a lower density of warts than does *E. duvalii* and they are also shorter.

To clarify these differences, the following identification key has been developed:

1. Woody and unarticulated rhizomes. Sub-globular capsules with 0.7–1.2 mm long sub-pyramidal to sub-conical warts *E. duvalii* Lecoq & Lamotte
- Fleshy and articulated rhizomes. Sub-globular capsules with 0.4–0.7 mm long sub-conical warts 2
2. Rhizomes with continuous segments *E. dulcis* L.
- Rhizomes with discontinuous nodules *E. angulata* Jacq.

State of conservation

The population of *E. duvalii* in the Serra de Bac Grillera is unique to the Iberian Peninsula and, due to its restricted distribution in France, its conservation is of great importance. However, the possible presence in other localities in the northeast of the Iberian Peninsula cannot be discarded. To preserve this unique element of western Mediterranean flora, knowledge concerning the biology and ecology of this species needs to be extended and an efficient management plan needs to be developed.

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Tison J.-M., Jauzein P. & Michaud H. 2014. *Flore de la France Méditerranéenne Continentale*. Naturalia Publications, Turriers.

APPENDIX

***Euphorbia duvalii* Lecoq & Lamotte**

FRANCE. Aude: Comingne, Mont Alaric (Corbières), 23–VII–2017, *J. Bou*, *R.M. Manobens* and *J. Bou Manobens* s.n. leg. (HGI 23817); Gard, Fontaret, près de Blandas, 21–VI–1880, *L. Anthonard* s.n. leg. (BC 649310). Unknown department: Pert, V–1889, *L. Giraudias* s.n. leg. (BC 649337).

SPAIN. Girona: Alt Empordà, Maçanet de Cabrenys, a la Serra de Bac Grillera, a la Collada dels Gesos, 31TDG7689, 750 m a.s.l., 24–VI–2017, *J. Bou Manobens*, *J. Bou i Tomàs* and *R.M. Manobens* s.n. leg. (HGI 23815, HGI 23816); Alt Empordà, Maçanet de Cabrenys, calcàries del Castell de Bac Grillera, DG79, 750 m a.s.l., 05–VI–1983, *J. Bou i Tomàs* s.n. leg. (HGI 23847).

***Euphorbia dulcis* L.**

SPAIN. Lleida: Alt Urgell, la Guàrdia d'Ares, Barranc Fondo, 10–VII–1980, *J. Molero* and *J. Pujadas* s.n. leg. (BC 651571). Asturias: Oviedo, Monte Naranco, 30TTP70260757, 288 m a.s.l., 16–IV–2011, *M.C. Fdez.-Carvajal* s.n. leg. (BC 917673).

***Euphorbia angulata* Jacq.**

SPAIN. Girona: Ripollès, Sant Amanç, 1700 m a.s.l., 26–VI–1962, *J. Vigo* s.n. leg. (BC 149063); Ripollès, Sant Amanç, 1700 m a.s.l., 17–VIII–1962, *J. Vigo* s.n. leg. (BC 149079); Alt Empordà, Maçanet de Cabrenys, les Salines, DG79, 1000 m a.s.l., 13–VI–1983, *J. Bou i Tomàs* s.n. leg. (HGI 23850); Alt Empordà, Maçanet de Cabrenys, vers Tapis, DG79, 500 m a.s.l., 3–VII–1983, *J. Bou i Tomàs* s.n. leg. (HGI 23851).