

Sarcocapnos crassifolia subsp. *simplicifolia* (Papaveraceae, Fumarioideae), a new narrow-endemic taxon from northeastern Morocco

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Sarcocapnos crassifolia subsp. *simplicifolia* Chambouleyron, Bidat & Léger *subsp. nova* (Papaveraceae, Fumarioideae) was discovered in 2011 in northeastern Morocco (Debdou mountains). Unlike the two other subspecies of *S. crassifolia*, it has simple leaves. Its taxonomic position is discussed.

Introduction

The known Moroccan flora is increasing rapidly. During 1989–2013, the number of known taxa increased by about 15% (Ibn Tattou & Fennane 1989, Fennane & Ibn Tattou 2012), as a consequence of the floristic richness and the fact that numerous parts of the country still remain poorly studied. The national flora was evaluated to comprise around 4200 taxa (Ibn Tattou & Fennane 1989), and then around 5000 taxa (Fennane & Ibn Tattou 2012). Dobignard and Chatelain (2013) recently listed around 5350 taxa from Morocco. Also taxa new to science are continuously described.

Field surveys carried out in 2011 by botanists of the Emirates Center for Wildlife Propagation (ECWP) in the Debdou mountains and the GuerCIF plain (northeastern Morocco) assessed a rich area. Further morphological studies on the plants collected in 2011 (based on dry material) led us

to describe a new subspecies in *Sarcocapnos crassifolia*.

Specimens of the *Sarcocapnos* populations found in the Debdou mountains (Fig. 1) have all their leaves simple (Figs. 2 and 3). In this genus, only one other taxon has this character, namely *S. integrifolia* (syn. *S. baetica* subsp. *integrifolia*, *Aplectrocapnos integrifolia*), which is a Spanish endemic (Lidén 1986a, 1986b, Greuter *et al.* 1989, Salinas 2009). The Debdou mountains populations differ from the latter by their flowers which are much bigger (10–14 mm *vs.* 4.5–6 mm in *S. integrifolia*; Lidén 1986b, Salinas *et al.* 2003, Salinas 2009), spurred (*vs.* unspurred), with lower petal lamina emarginate (*vs.* truncate). These characters assert that these populations are close to compound-leaved *S. crassifolia* subsp. *crassifolia*, a Moroccan–Algerian taxon (Fig. 1), and constitute an undescribed subspecies.

Sarcocapnos crassifolia has another subspecies, subsp. *atlantis*, also with compound leaves.

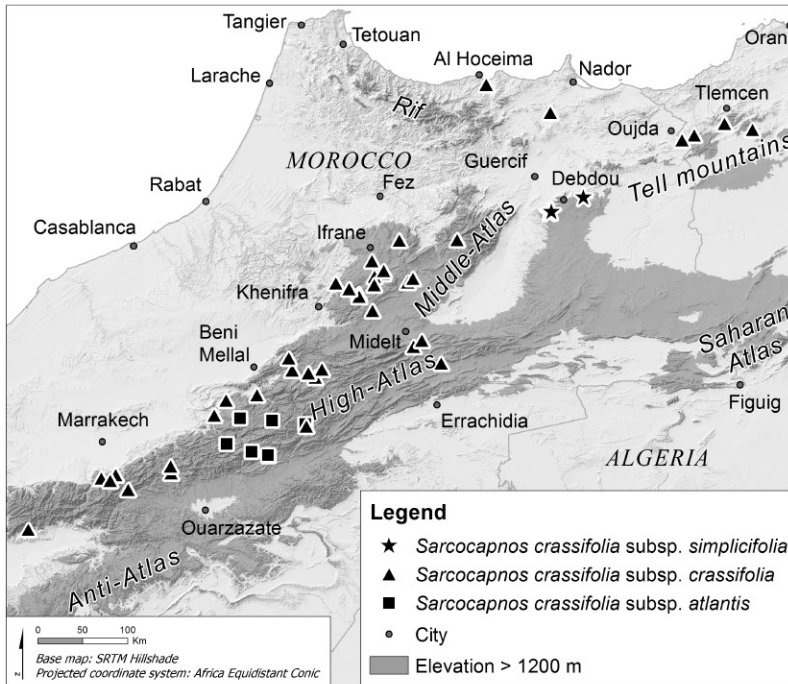


Fig. 1. Distribution of the three subspecies of *Sarcocapnos crassifolia* (based on Jahandiez & Maire 1932, Sennen & Mauricio 1934, Quézel & Santa 1962, Maire 1965, Lidén 1986a, Valdés *et al.* 2002, ECWP herbarium (rec. J.F. Léger), as well as unpublished data of M. Chambouleyron, A. Dobignard, J. Molero, J.M. Montserrat and S. Pyke).

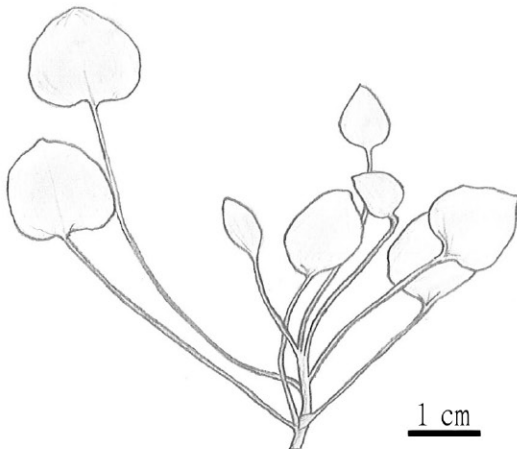


Fig. 2. Leaves of *Sarcocapnos crassifolia* subsp. *simplicifolia* (drawn from the holotype).



Fig. 3. Habit of *Sarcocapnos crassifolia* subsp. *simplicifolia*.

It is characterized by its flowers that are (7)–8–8.5 mm long, not or very shortly spurred, and it is restricted to the High Atlas (Fig. 1).

Leaf morphology is quite variable in *S. crassifolia* subsp. *crassifolia* and subsp. *atlantis*. Thus, the upper leaves have 2–6 leaflets according to Maire (1965), (1)–2–7(–8) according to Lidén (1986a), and 3–6 according to Salinas *et al.*

(2003). Some simple leaves are occasionally present, but they are always lower leaves. All specimens observed in the field (Chambouleyron pers. obs., Middle Atlas, Morocco) and from MPU, P and RAB herbaria (71 herbarium sheets from Algeria and Morocco) have two or more leaflets, as described by Maire (1965), Lidén (1986a) and Salinas *et al.* (2003) (Fig. 4). We consider that the leaflet number is quite variable and so recognize this taxon as a rank to subspecies.

Sarcocapnos crassifolia* subsp. *simplicifolia Chambouleyron, Bidat & Léger, *subsp. nova* (Figs. 2, 3 and 5–7)

TYPE: Morocco. Debdou mountains, province of Guercif, municipality of Mahirija (known as Lamrija locally), 500 m ESE of Rehida village. Elevation: 1350 m a.s.l. Coordinates (WGS84) 33.86325°N, 3.20923°W. Calcareous cliff. 28 June 2013 *M. Chambouleyron s.n.* (holotype ECWP; isotypes RAB!, P!).

ETYMOLOGY: The specific epithet refers to the main morphological feature, compared with the other subspecies of *Sarcocapnos crassifolia*: the simple leaves.

Chasmophyte, with sub-woody stock, 5–15 cm high. Perennial, glabrous and decumbent plant, with fragile, branched stems. Leaves alternate, simple, long-petiolate (petiole up to 6 cm), with a lamina 6–14 × 5–14 mm, cordiform or oval. Racemes terminal, sub-corymbiform, with 4–9 bracteate and pedicellate flowers. Bracts up to 0.8 mm long, triangular, dentate. Peduncles up to 1.5 cm, curved and flexuous. Flowers zygomorphic, hermaphrodite. Sepals white, 1.6–2.1 × 0.8–0.9 mm, oval-lanceolate, acute, more or less dentate. Corolla with free, white petals, the external ones widely spatulate and emarginate. Upper petal 10–14 mm long, with a yellow spot at base of its limb, and an obtuse spur 2.2–2.5 × 1.5–1.9 mm. Lower petal 8–10 mm



Fig. 4. Leaves of *Sarcocapnos crassifolia* subsp. *crassifolia*. Specimen from the Jbel Bou Naceur (Middle Atlas, Morocco), 18 July 2011, *M. Chambouleyron* (ECWP).

long, with a green spot at centre of its limb. Lateral petals 5.5–6.5 mm long with an apical yellow spot. Fruits 3.2–3.6 × 1.4–1.6 mm, ellipsoid, with faces 3-ribbed in their lower part and margins with a thick vein. Seeds 2(–1) per fruit, 0.8–1.3 × 0.6–0.9 mm. Flowering April to July.

HABITAT AND DISTRIBUTION: On calcareous, Jurassic (Medioni 1972, 1977), sub-vertical cliffs, facing north or northeast, from 1350 to 1500 m a.s.l. Mesomediterranean vegetation in semi-arid bioclimate. It grows among numerous chasmophytes including *Rupicapnos africana*, *Biscutella*



Fig. 5. *Sarcocapnos crassifolia* subsp. *simplicifolia* in its habitat among other chasmophytes.



Fig. 6. *Sarcocapnos crassifolia* subsp. *simplicifolia*: a tuft with leaves and flowers.



Fig. 7. *Sarcocapnos crassifolia* subsp. *simplicifolia*: front view of the flowers.

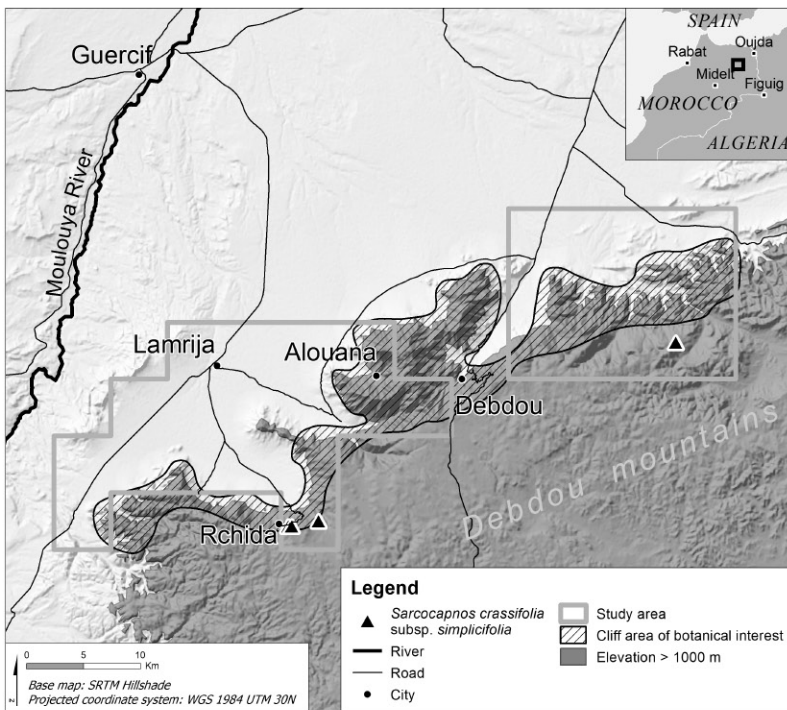


Fig. 8. Locations of *Sarcocapnos crassifolia* subsp. *simplicifolia* and the studied area.

frutescens, *Sedum* spp., *Umbilicus patens*, *Saxifraga globulifera*, *Prunus prostrata*, *Sanguisorba ancistroides*, *Anthyllis vulneraria* subsp. *maura*, *Rhamnus lycioides* subsp. *oleoides*, *Erodium trifolium*, *Petroselinum crispum*, *Lithodora moroccana*, *Teucrium faurei*, *Antirrhinum tortuosum*, *Chaenorrhinum villosum* subsp. *granatense*, *Linaria tristis* subsp. *mesatlantica*, *Centranthus battandieri*, *Bellis rotundifolia*, and *Centaurea pubescens*. It appears to be endemic to a small

area of the Debdou mountains (Fig. 8), pertaining to the biogeographical unit Tell Atlas, Debdou-Mekam (“XX-3”) according to Sauvage and Vindt (1954), or Debdou (“XV-a”) according to Dobignard (1989) and Dobignard *et al.* (1992). This unit corresponds to the geographical unit “Om-3: Debdou” of Fennane and Ibn Tattou (1998, 2005).

Sarcocapnos crassifolia subsp. *simplicifolia* has been found on three cliffs, the estimated population comprising around 600 individuals.

Table 1. Discriminant characters of the four morphologically close *Sarcocapnos* taxa (data from Maire 1965, Lidén 1986a, López-Vélez, 1991, Salinas *et al.* 2003, Salinas 2009, Pérez-Gutiérrez *et al.* 2012, M. Chambouleyron & A. Dobignard pers. obs.).

Characters	<i>S. crassifolia</i> subsp. <i>atlantis</i>	<i>S. crassifolia</i> subsp. <i>crassifolia</i>	<i>S. crassifolia</i> subsp. <i>simplicifolia</i>	<i>S. integrifolia</i>
Leaves	3–6 leaflets	(1–)2–7(–8) leaflets	simple	simple
Lower petal total length	8–8.5 mm	11–14.5 mm	8–10 mm	5 mm
Seed number per fruit	2	2	2(1)	1(2)
Spur length*	no spur or very short (up to 1 mm)	1–5 mm	2.2–2.5 mm	no spur
Corolla length (spur included)*	7–8.5 mm	10–18 mm	10–14 mm	4.5–6 mm

* According to Salinas *et al.* (2003), “flower spur has been reduced several times in different groups of the genus”, which reduces the taxonomic significance of this character.

According to the IUCN criteria (IUCN 2012), it should tentatively be listed as Vulnerable (VU) because its area of occupancy (AOO) is less than 10 km², with < 5 known localities, and number of mature individuals < 1000. According to Fennane and Ibn Tattou (1998), it should be added to the list of rare, threatened and endemic plants of Morocco as a Very Rare (RR) and Endemic (E) taxon, because it is known from fewer than five localities.

TAXONOMIC NOTES: The wide morphological variability of *Sarcocapnos crassifolia* has led to the description of numerous taxa, based on spur and flower dimensions, flower colour, and petal morphology. Maire (1965) and Dobignard and Chatelain (2013) recognized 11 varieties in the species.

Lidén (1986a) and Greuter *et al.* (1989) recognized only three subspecies within *S. crassifolia* (subsp. *crassifolia*, subsp. *atlantis*, subsp. *speciosa*). However, recent molecular analyses (Salinas *et al.* 2003, Pérez-Gutiérrez *et al.* 2012) treat subsp. *speciosa* as an independent species, *S. speciosa*, characterized by its large, pink flowers. Those studies also support recognizing a clade of three morphologically and genetically close taxa, viz. *S. crassifolia* subsp. *crassifolia*, subsp. *atlantis* and *S. integrifolia*.

The phylogenetic position of *S. crassifolia* subsp. *simplicifolia* is unknown and intriguing, as it shares the simple leaves with *S. integrifolia* and the spurred flowers with *S. crassifolia* subsp. *crassifolia* (cf. Table 1). Further studies are needed to clarify its phylogeny.

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