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INA DINTER & WERNER GREUTER

Silene rothmaleri (Caryophyllaceae), believed extinct, rediscovered at Cabo de São Vicente (Algarve, Portugal)

Abstract

Dinter, I. & Greuter, W.: *Silene rothmaleri (Caryophyllaceae),* believed extinct, rediscovered at Cabo de São Vicente (Algarve, Portugal). – Willdenowia 34: 371-380. – ISSN 0511-9618; © 2004 BGBM Berlin-Dahlem.

Silene rothmaleri, described in 1956 by Pinto da Silva based on a single herbarium specimen collected in 1945, has been considered as extinct following unsuccessful searches at its locus classicus, the Ponta de Sagres. At nearby Cabo de São Vicente, a small population of at least 10 individuals exists, discovered in spring 2000 and more leisurely studied in 2004. The macro- and micromorphology of the revenant species are described and illustrated.

Introduction

It is a sad event, not only for biologists, when a species is lost. Such was believed to be the case of *Silene rothmaleri* P. Silva. It had been discovered in 1945 and never collected again. A single herbarium specimen, then prepared, was to serve as the basis and holotype for its subsequent description by Silva (1956). Almost four decades later Jeanmonod (in Greuter & Raus 1984: 48), after a thorough but vain search for it at the locus classicus, the Ponta de Sagres near the south-western tip of Portugal, reported it as extinct. It was subsequently listed by Greuter (1991a, 1994) among the few cases of probable extinction in the Mediterranean flora; and was considered as presumed extinct, or possibly extinct, by Greuter & al. (1984: 273), Talavera (1990: 372) and Mabberley & Placito (1993: 25).

During a botanical excursion in Algarve in March 2000 the first author found a plant of a *Silene* unknown to her, which, upon verification back home, turned out to belong to *S. rothmaleri.* The plant was then in early flower; but in 2004 she had the opportunity to revisit the same site at a slightly later date, when she found it in full bloom and with first capsules about to mature. A careful if parsimonious sampling yielded adequate material for a thorough macro- and micromorphological study. The results of this study, together with the basic rediscovery notice, are the subject of the present paper.

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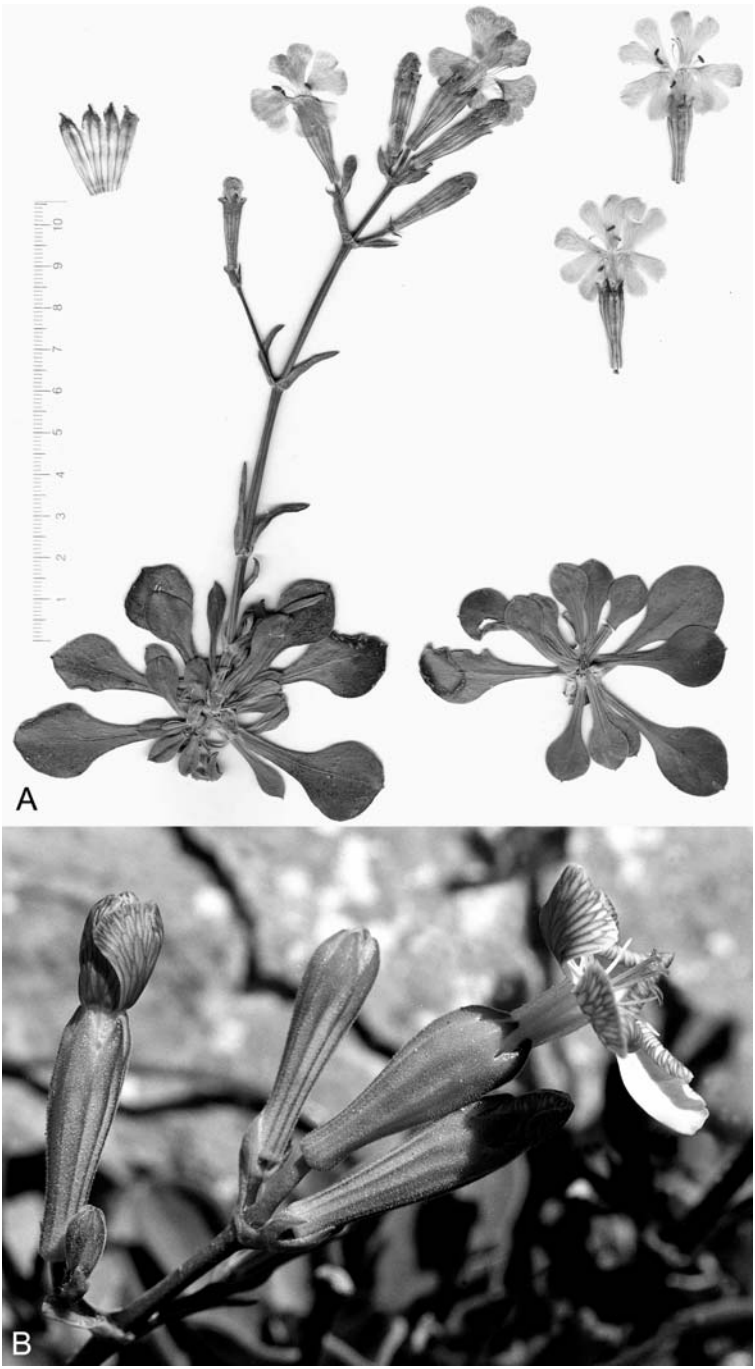


Fig. 1. *Silene rothmaleri* – A: dried specimen (*Dinter 7941,* herb. Dinter); B: upper portion of an inflorescence, showing flower expanding in the morning hours, photograph by I. Dinter, April 2004.

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Material and methods

Details of the sampling site and extant voucher specimens are given below. Great care was used to remove but a bare minimum of plant material, so as not to impair the survival of the small extant population. Exact site coordinates [omitted here] were established by means of a GPS.

Micromorphological data in the lab were obtained at the Institute of Botany of the University Stuttgart-Hohenheim, using fresh material brought back from the field. Probes were mounted on aluminium stubs with conductive adhesive tabs, dried in an exsiccator, then coated with gold-palladium in a sputter-coater and examined under a scanning electron microscope (Zeiss DSM 940) at 6 kV. For study under the light microscope, pollen was acetolysed according to Erdtman (1966) and embedded in glycerine.

Results

Silene rothmaleri P. Silva in Agron. Lusit. 18: 28.1956. – Holotype: "Prov. Algarve. Sagres, in rupestribus maritimis Promontorii Sacri solo arenoso calcareo", 20.4.1945, *Silva & al. 683* (LISE; reproduced in Jeanmonod 1985a: 21).

Note. – Jeanmonod (1985a: 19) designated one particular individual plant of the holotype as "lectotype". At that time, when the *Code* still lacked an explicit definition of the "specimen" notion, it was arguably possible to do so. Today, the *Code* (Greuter & al. 2000: Art. 8.2) specifies that a specimen "may consist of ... parts of one or several plants, or multiple small plants", provided they are "mounted on a single herbarium sheet". Jeanmonod's "lectotype designation", therefore, has no standing.

Specimens seen. – Algarve, at Cabo de São Vicente, alt. 75 m, 24.3.2000, *Dinter 6361* (herb. Dinter); same place, 14.4.2004, *Dinter 7941* (herb. Dinter, Fig. 1A). For conservational reasons, no details of locality or geographical co-ordinates are given here.

Macromorphology. – *Tufted perennials* with a lignified, suffruticose base, bearing several, partly sterile leaf rosettes. *Fertile stems* terminal to a rosette, bearing rosulate innovations at the very base, otherwise unbranched, erect or ascending, (10-)14-24(-30) cm tall; lower internodes 2-3 mm across, distinctly quadrangular, covered with a minute retrorse, eglandular pubescence of 0.1-0.2 mm long hairs, becoming denser toward the nodes; internodes of and immediately below the inflorescence glabrous and slightly sticky in the middle. *Rosette leaves* present at anthesis, dark green or somewhat glaucous, (3-)4-5(-6) × (1-)2-2.5(-3) cm, with an orbicular-spatulate laminar portion narrowed into a broad, flat petiolar portion of about equal length, obtuse to rounded and minutely apiculate at the tip, covered on either side with dense, short, ± retrorsely curved, pointed, white eglandular hairs crowded toward the margin where they form a narrow white fringe. *Stem leaves* up to 3 cm long, mostly in 3 pairs, narrowly lanceolate-spatulate to linear, eglandular-pubescent with short hairs similar to those observed elsewhere on the plant, except that toward the leaf tip and along the margins they are straight, patent, stouter and darkish. All *leaves and bracts* basally widened into a membranous sheath bordered with dense, long and very slender, flexuous and intertwined white hairs. *Inflorescence* an elongate-pyramidal, few-flowered thyrsus with 1-3 often unequal pairs of 1(-3)-flowered cymes borne on peduncles that decrease in length upwardly; pedicel of terminal flower of the inflorescence 8-10 mm long, those of the other flowers much shorter. *Flowers* bisexual and protandrous, diurnal (Fig. 1B). *Calyx* 20-22 mm long, narrowly clavate from a truncate-umbilicate base, not contracted apically, membranous except for the teeth and the 10 longitudinal veins that are unbranched for most of their length, densely covered with 0.1-0.2 mm long, white, eglandular hairs that are ± retrorsely curved (but mostly straight on the teeth); teeth 2-3 mm long, distinctly unequal, the outer wholly herbaceous, green or reddish, triangular, the innermost with the herbaceous portion expanded into a suborbicular membranous, ciliate appendage. *Anthophore* 8-9 mm long, loosely covered with minute papilliform hairs. *Petals* with linear claw expanded into inconspicuous, sometimes spar-

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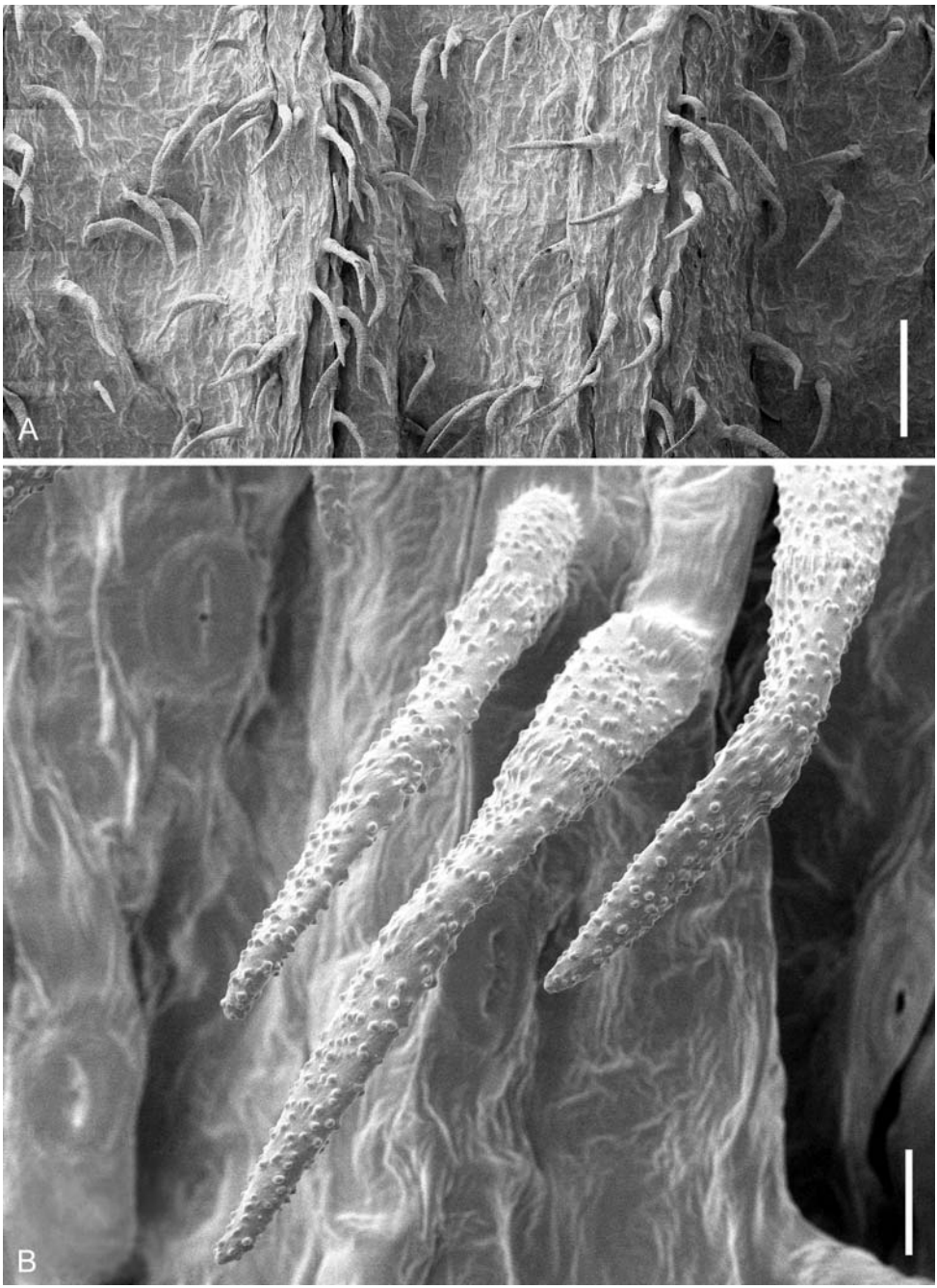


Fig. 2. *Silene rothmaleri* – calyx indumentum of 2-celled, retrorsely curved eglandular hairs with coarsely granular surface; A: overview, B: detail. – Scanning electron micrographs; scale bars: A= 200 µm, B = 20 µm.

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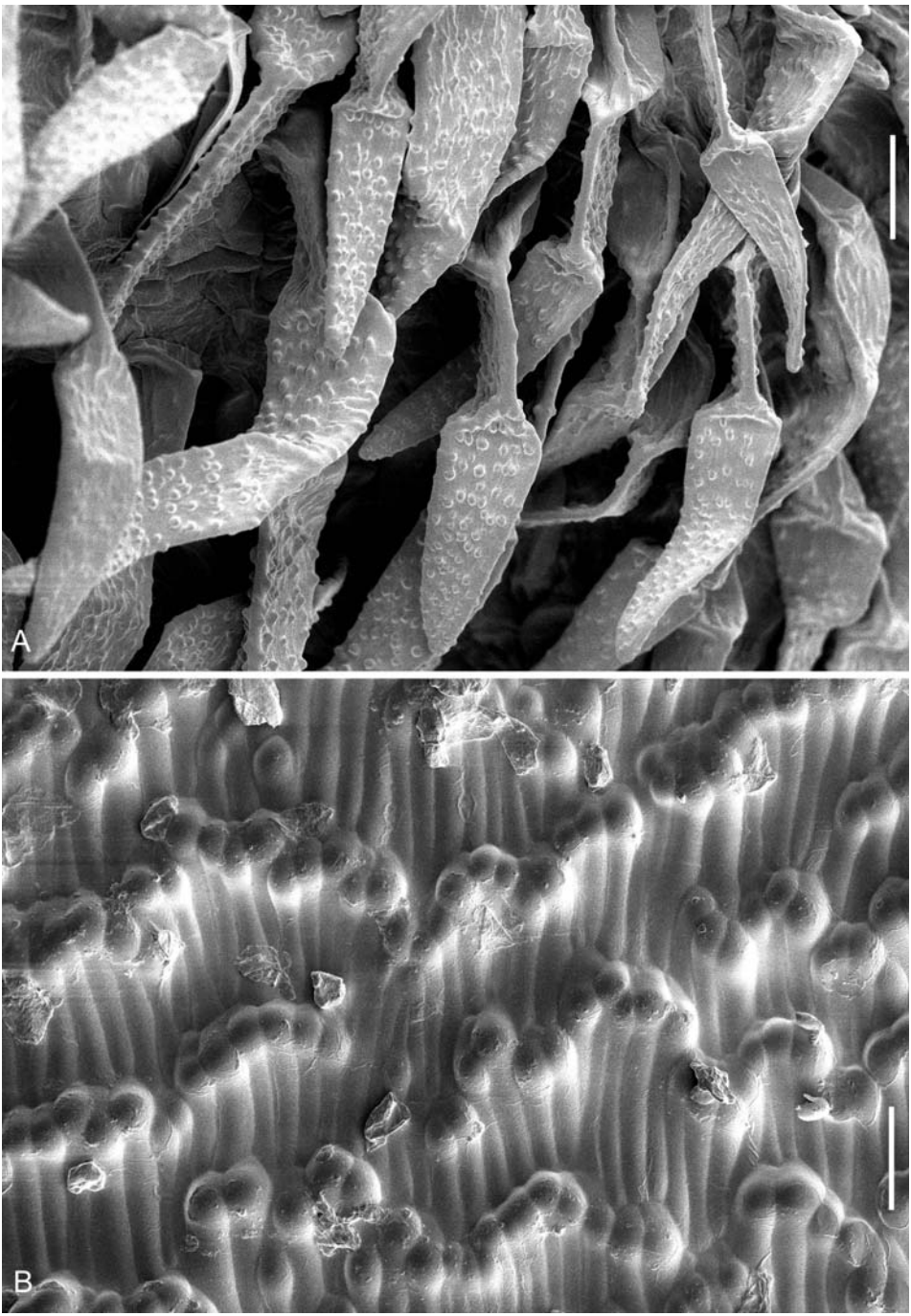


Fig. 3. *Silene rothmaleri* – A: indumentum of calyx in bud, with cells of hairs collapsing at right angle to each other upon desiccation; B: cellular pattern of outer capsule wall. – Scanning electron micrographs; scale bars: A = 20 µm, B = 50 µm.

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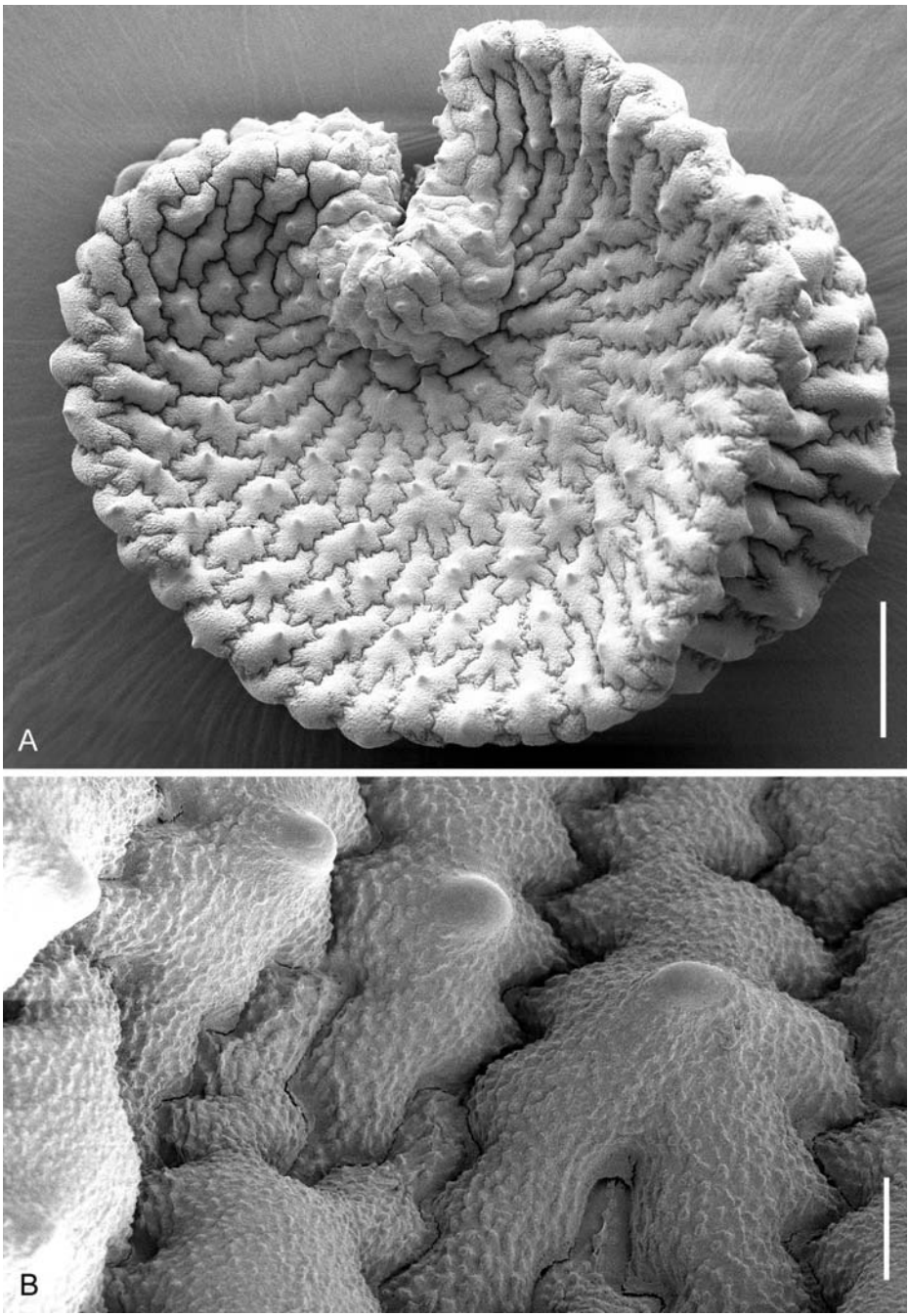


Fig. 4. *Silene rothmaleri* – A: seed (not fully mature) in lateral view; B: testa cells in detail. – Scanning electron micrographs; scale bars: A = 200 µm, B = 20 µm.

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ingly ciliolate auricles, otherwise glabrous, elongating through anthesis to exceed the calyx teeth by up to 6 mm; coronal scales absent; limb 11-13 mm long and wide, broadly cuneate-obcordate, inside white to pale pink, outside with a pronounced, richly branched reticulum of purple veins, bifid for c. 60 % of its length into broadly rounded lobes. *Stamens* with glabrous filaments and brown anthers 2-2.5 mm long; eventually overtopped by the styles. *Capsule* 10-12 mm long, narrowly ovoidal, constricted into a short beak, opening (after post-maturation) by 5 short (c. 2 mm) triangular teeth. *Seeds* (not fully mature) blackish, 1-1.5 mm in diameter, orbicular-reniform in side view, with a broadly grooved back.

Micromorphology. – *Hairs* (those of the calyx are shown in Fig. 2A-B, 3A) usually 2-celled, tapering to a blunt tip, with granular-verrucose outer walls; the mature hairs remain terete upon drying, but in early developmental stages the individual cells collapse at right angles to each other (Fig. 3A). *Capsule* with a distinctive ornamentation to its outer wall, where the cellular pattern consists of tightly packed longitudinal bulges, each bulge ending distally in a rounded protuberance, the protuberances being in turn arranged to form irregular transverse rows (Fig. 3B). The *seeds* (not fully mature) show the cellular pattern that is characteristic for most species of the genus (Greuter 1995: 548): radially or transversally elongated cells interlocked by their wavy margins, each with a granular outer surface and with a single, ± central mamilla (Fig. 4); the mamillae are not disposed in clear and regular concentric rows and, significantly, they lack the central apiculum (Fig. 4B) that is characteristic of Greek representatives of the same section (Greuter 1995: 549). The *pollen grains* are 46-63 µm long and, on average, 56 µm wide (13 measuements taken); they are of the *Silene* type (Beug 2004), i.e., periporate (PP) with anulate pores (anulus width: 0.6-1.0 µm); the perforation number is significantly lower than that of the columellae, which do not form a reticulum (FRET; terminology as in Nowicke 1994).

Locality and habitat. – At Cabo de São Vicente, the rocky coast of Algarve ends in the south-westernmost tip of continental Europe. The whole Sagres promontory consists of carbonate rocks, termed "dolomitic limestone" by Measures & Measures (1996) but, we suspect, predominantly calcareous. The coastline is formed of steep inhospitable cliffs up to 100 m high. The whole area, even though obviously grazed, belongs to the Parque Natural do Sudoeste Alentejano e Costa Vicentina. The landscape is dominated by a characteristic plant formation of cushion-like dwarf shrubs, shorn to their shape and size by the steadily blowing maritime winds. Low scrub of *Cistus ladanifer* L. (the dwarf variant described as *C. palhinhae* Ingram) covers large surfaces, together with shrubby *Juniperus phoenicea* L. and the thorny cushions of *Stauracanthus genistoides* (Brot.) Samp., *Astragalus tragacantha* L. and *Genista hirsuta* Vahl (locally known as *G. algarbiensis* Brot.), the chamaephytic *Thymus camphoratus* Hoffmanns. & Link and the showy mats of *Pallenis maritima* (L.) Greuter. Some plants have evolved endemic subspecies here: *Calendula incana* subsp. *algarbiensis* (Boiss.) Ohle, *Lithodora prostrata* subsp. *lusitanica* (Samp.) Valdés and *Biscutella sempervirens* subsp. *vicentina* (Samp.) Grau & Klingenb. The new locality of *Silene rothmaleri,* situated at a distance of barely 7 km from the *locus classicus* at Ponta de Sagres (Fig. 5), is on sheltered ledges and in crevices of the rock at the cliff shoulder, overlooking the Atlantic Ocean, where ten plants were found growing over an area of 100 m², about 70 m above sea level. Sheltered from view on lower, barely accessible ledges, further individuals may likely exist.

Discussion and conclusions

The rediscovery of *Silene rothmaleri,* thus redeemed from its prematurely reported doom, brings down to less than 30 the total of Mediterranean species believed extinct (Greuter 1994). Similar happy resurrections have taken place before: see the cases of *Onobrychis aliacmonia* Rech. f., which reappeared close to its flooded locus classicus (Tan & Iatrou 1996); *Diplotaxis siettiena* Maire, successfully re-colonising its native Alborán Island after survival in a seed bank (Anonymous 2003); *Lysimachia minoricensis* Rodr., reintroduced into nature in Menorca from botanic garden stock (Fraga Arguinbau 2000); and another Iberian *Silene, S. tomentosa* Otth of the Gibraltar rock, presumed extinct (Talavera 1990: 376, García Murillo 1993, Greuter 1994) but

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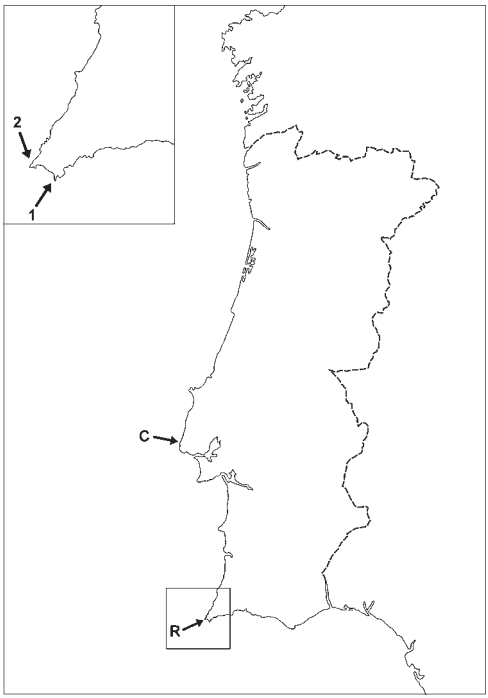


Fig. 5. Outline map of Portugal, showing the location of *Silene cintrana* (C: Sintra, Cabo de Roca) and *S. rothmaleri* (R: Sagres Peninsula). On the inset, the locus classicus of *S. rothmaleri* (1: Ponta de Sagres) and the new locality (2: Cabo de São Vicente) are indicated.

which survives to the present day (García Murillo 1999). Is there, perhaps, some truth in the optimistic statement (Greuter 1991b: 16) that "endangered species appear to have an almost miraculous capacity for survival or a guardian angel watching over their destiny"?

Be this as it may, the happy event we are reporting here will hopefully help solve the enigma, mentioned by Jeanmonod (1985a: 8), of the systematic position and affinities of *Silene rothmaleri*. His best guess is that the species is close to *S. longicilia* subsp. *cintrana* (Rothm.) Jeanmonod (i.e., *S. cintrana* Rothm.), yet he places it outside the *S. italica* aggregate to which the latter belongs, in a peripheral position at the outer fringe of the *S. italica* complex (Jeanmonod 1985b: 43). That complex is a natural assemblage, coextensive with *S.* sect. *Italicae* (Rohrb.) Schischk. as defined by Greuter (1995: 560) – which excludes *S. nutans* L., the type of the name *S.* sect. *Siphonomorpha* Otth that Jeanmonod uses.

There can be no doubt on the close relationship between *Silene rothmaleri* and *S. cintrana.* Both are similar in habitat (coastal rocks), habit (suffruticose, low-growing perennials), leaf shape, eglandular indumentum, and many other features. Comparing the photographs or the holotypes (Jeanmonod 1984b: 632 vs. 1985a: 21) one wonders whether the two plants are really distinct. One distinctive feature adduced by Jeanmonod, the allegedly white flowers of *S. rothmaleri,* is lessened by the presence of often ± pink, always purple-veined flowers in the new population. Other possible differences: densely vs. loosely rosulate innovation leaves, few- vs. several-flowered inflorescences, may partly depend on environmental factors (perhaps also on substratum: *S. cintrana* grows on siliceous rocks). The remaining diagnostic features, however, are stable, and in this group are generally used to discriminate between species: calyx and anthophore length as well as length and density of calyx indumentum. The treatment proposed by Talavera (1990), with two similar but distinct sister species, is supported by our results.

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Less clear are the affinities of this species pair. Judging on overall similarity one is tempted to postulate a relationship with other cliff-inhabiting, mainly coastal W Mediterranean taxa such as *Silene hifacensis* Willk., the already mentioned *S. tomentosa,* and an as yet unnamed taxon related to it recorded and illustrated by Galán de Mera (1993; see García Murillo 1999). These are suffruticose plants with a compact growth, and as far as there are images at hand on which to judge (as is the case of, at least, *S. hifacensis, S. tomentosa, S. velutina* Loisel., as well as the Greek *S. goulimyi* Turrill and *S. cythnia* (Halácsy) Walters), they are day-flowering (diurnal). In contrast, the species that Jeanmonod (1985b) places at the core and root of the section are widespread submediterranean, mat-forming, dusk-flowering (vespertine) woodland herbs such as *S. italica* (L.) Pers.

If Jeanmonod is correct, as he well may be, then the similarity between *Silene cintrana-rothmaleri* and the other day-flowering chasmophytes just mentioned is due to convergence, resulting from independent colonising of the specialised cliff habitat by distinct offshoots of the herbaceous, vespertine sectional core. It is equally possible to hypothesise that the rupicoles are of a single stock, which would mean that our species pair is misplaced in the *S. italica* aggregate and rather belongs to the *S. mollissima* group (Jeanmonod 1984a). A third possibility is to consider suffrutescent and day-flowering habit as plesiomorphic in the section, reversing the sense in which Jeanmonod's evolutionary scheme is to be read. Supplementary studies, making use of molecular techniques, are needed to elucidate this question.

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