

## New data on the distribution of *Leptogium azureum* (Swartz) Mont.

Jørgensen & James (1983) in their detailed study of the *Leptogium azureum* group in western Europe, pointed out that *L. azureum* (Swartz) Mont. was absent from Europe and that most of the European material so named belongs to *L. cochleatum* (Dicks.) P. M. Jørg. & P. James. Although both species show some morphological similarity, they also show a great number of differences. *Leptogium cochleatum* develops a darker and thicker thallus than *L. azureum*, with a finely striate upper surface, a different arrangement of the photobiont in the thallus, apothecia with persistent ± wrinkled margins, proper euparaplectenchymatous exciples, the presence of paraplectenchymatous tissue at the base of apothecia and muriform ascospores which are larger than in *L. azureum*. For a summary of the most important characters distinguishing these two species see Jørgensen & James (1983). *Leptogium valdivianum* M. Lindström, a species from cool temperate South America, has also been confused with *L. azureum*, however, it can be distinguished by its distinctly thicker and dark leaden grey-blue thallus, apothecia with persistent thalline margins and its larger and broader distinctly muriform ascospores (Galloway & Jørgensen 1995; Lindström 1996).

While studying material of *Leptogium lichenoides* (L.) Ach. from different European herbaria, M. A. G. Otálora found one Iberian specimen of the *L. azureum* group, in MGC. Surprisingly, the morphological and anatomical characters of this specimen were the same as those of *L. azureum* (Sw.) Mont. and its distinguishing features agreed with previous descriptions (see Galloway & Jørgensen 1995; Jørgensen & James 1983). Subsequently, numerous specimens were requested from other herbaria, UPS, ASU and O, in order to check the Iberian

individuals, and to establish the world distribution pattern of *L. azureum*. Several collections in UPS and O from Portugal and the Canary Islands identified as *L. azureum* were examined. However, all those specimens possessed orbicular lobes, more than 100 µm thick, a distinctly striate upper surface, apothecia with persistent margins, proper euparaplectenchymatous exciples and mature muriform ascospores, 22–35 × 11–16 µm, and belong to *L. cochleatum*.

*Description of Iberian specimen of L. azureum.* Thallus foliose, blue to blue-grey colour, 3–8 cm diam.; lobes orbicular to elongate, c. 5 mm broad, with margins orbicular. Upper surface smooth and non-isdiate. Lower surface without tomentum.

*Apothecia* common, shortly pedicellate, laminal, 0.3–1.0 mm diam., discs flat, red-brown, margins thalline narrow, often excluded at maturity, with small microphylline outgrowths. Lobes 60–85 µm in thickness, ± isodiametric cortical cells of 8–9 µm diam., medulla dense with *Nostoc* mainly in clusters, individual cells 5–6 µm diam. Proper exciple of periclinal hyphae. *Spores* submuriform, 20–31 × 7–10 µm.

*Ecology and distribution.* At the locality in the Sierra de Grazalema (Cádiz prov.), *L. azureum* grows on mossy bark of *Abies pinsapo* Boiss., in a humid valley in the supramediterranean belt (1000 m altitude). One of the most important aspects of the ‘Sierra de Grazalema’ is the high level of precipitation. The average annual rainfall in the area exceeds 2200 mm compared with an average of 600 mm in southern Spain. The existence of fresh and humid valleys in this area, where the summer drought is not so marked, allows a larger number of lichens, more typical of north-western Spain



FIG. 1. Distribution of *Leptogium azureum*. (▲) New datum. Based on herbarium specimens in ASU, MGC and UPS and the following literature: Awasthi & Akhtar (1979), Büdel *et al.* (2000), Elix & McCarthy (1998), Galloway (1985), Galloway & Jørgensen (1995), López-Figueiras (1986), Malme (1924), Sierk (1964), Streimann (1986), Swinscow & Krog (1988) and Verdon (1992). (ArcView Gis 3.1. Program-Countries 1998).

than of the Mediterranean Region, such as *Lobaria amplissima* (Scop.) Forss., *Sticta canariensis* (Bory) Bory and *S. limbata* (Sm.) Ach. to grow.

*Leptogium azureum* has a mainly tropical to subtropical distribution, extending into warm temperate regions (Galloway & Jørgensen 1995) with average annual rainfall of more than 1000 mm (Fig. 1), as have most species of the *Leptogium azureum* group. Although its altitudinal range varies from sea level to 3500 m in East Africa (Swinscow & Krog 1988), it grows mainly in forested areas at 300–1000 m altitude.

*Iberian specimen of L. azureum studied. Spain:* Cádiz: Grazalema, Puerto del Pinar, 1000 m, E. Martín (MGC-Lich. 84).

*Iberian specimens of L. cochleatum previously identified as L. azureum. Spain:* Canary Islands: La Palma, Breña Baja, 600 m E of the picnic ground at refugio El Pilar, WGS84, 1480 m, on *Erica*, 1 ix 2002, S. Rui & E. Tindal (O 101901). Tenerife, Monte de las Mercedes, 950 m, 4 v 1976, H. Krog & H. Østhaugen (O 125499); Anaga, between Mirador Cabezo del Zejo and Piedra de Chinobre, 750 m, in mixed *Erica* and laurel forest, 7 iv 1978, H. Krog & H. Østhaugen (O 125497). La Gomera, La Atalaya S. of Hermigua, 900 m, 12 i 1973, E. Dahl (O 125500); Meriga, 800 m, in moist old laurel forest, 16 iv 1978, H. Krog & H. Østhaugen (O 125498). **Portugal:** *Beira Litoral:* Mt Buçaco, W slope (=18 km NNE of Coimbra), below Cruz Alta, 500 m, on *Cupressus lusitanica*, 15 v 1980, R. Moberg (UPS 19641). *Estremadura:* Castelo dos Mouros, ad rupes graniticas occidentem spectantes, 500 m, 12 iv 1955, C. N. Tavares (O 125495). *Madeira:* 0.2 km W. of Ribeiro Frio, 850 m, on *Laurus azorica*, 23 iv 1969, L. Tibell (UPS s.n.).

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**G. Aragón, I. Martínez and  
M. A. G. Otálora**

G. Aragón, I. Martínez & M. A. G. Otálora: Área de Biodiversidad y Conservación, Escuela Superior de Ciencias Experimentales y Tecnología, Universidad Rey Juan Carlos, c/ Tulipán s/n, 28933-Móstoles (Madrid), Spain.