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A EUROPEAN SPECIES OF THE LICHEN GENUS INGADERIA AND COMMENTS ON THE RELATIONSHIP OF THE GENERA DARBISHIRELLA AND INGADERIA (ROCCELLACEAE)[1]

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Abstract: *Ingaderia troglodytica* Feige & Lumbsch from the Mediterranean region is described as new to science. It represents the first member of that genus to be discovered outside the neotropics. The relationship of the genera *Darbishirella* and *Ingaderia* is discussed and *Darbishirella* is reduced to synonymy with the latter. The new combination *Ingaderia gracillima* (Krempelh.) Feige & Lumbsch is made.

While studying the lichen flora of the Balearic archipelago, one of us (GBF with the help of his son Sebastian) found a peculiar fruticose lichen resembling the neotropical *Darbishirella gracillima* in morphology. This lichen was collected at Cala Morell on Minorca. The same plant had previously been collected by Poelt on the island of Sardinia but at that time was misdeterminedas *Gorgadesia mira* Tavares by Feige (NIMIS & POELT 1987). In the meantime we received further specimens from colleagues who collected this lichen in other parts of the western Mediterranean region. Further study showed it to be an undescribed taxon related to the neotropical genera *Darbishirella* and *Ingaderia*. The new species is described below.

While preparing the description of the new species, it became evident that the generic position of the lichen was somewhat unclear. The distinction of the two monotypic genera *Darbishirella* and *Ingaderia* from the neotropics was therefore reexamined. The results of this study are also presented below.

[1]This manuscript is dedicated to Professor emer. Dr. O.H. Volk (Würzburg) on the occasion of his 90th birthday.

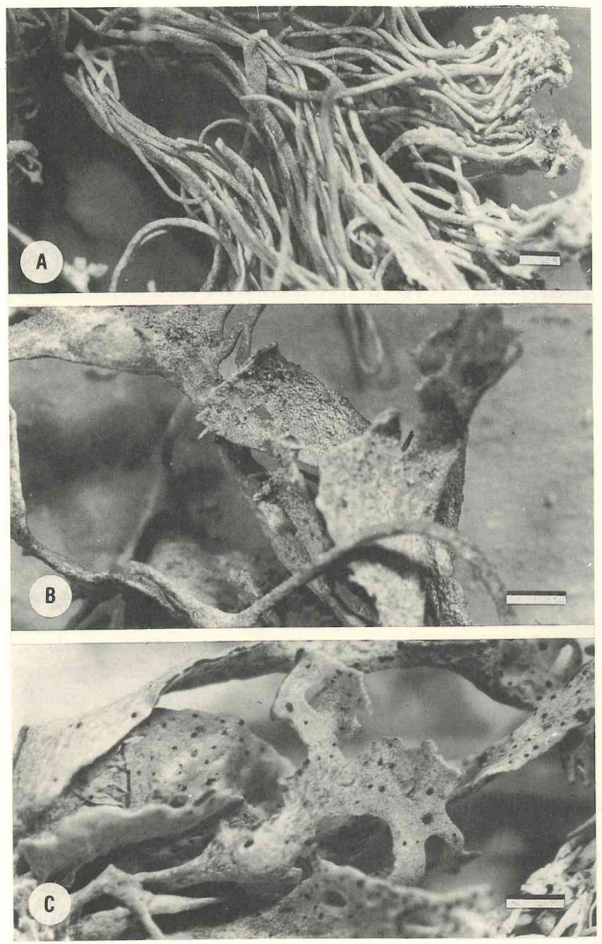

Fig. 1. Morphology of *Ingaderia troglodytica*, part of the holotype (ESS). A. Thin terminal branches, B. & C. Flattened main branches (note dark fruiting bodies of a undetermined lichenicolous fungus in C) (Scale = 1 mm).

Material and Methods

Material. Specimens were studied from the following herbaria: ESS, GZU, M, MUB, S and the private herbaria of S. Huneck (Halle) and H.T. Lumbsch (Essen).

Methods. *Microscopy*. Thalli were cut using a freezing microtome in 16-20 µm thickness and stained with lactophenol cottonblue.

Chemistry. The chemical constituents were identified using thin layer chromatography, TLC (CULBERSON 1972, CULBERSON et al. 1981, CULBERSON & JOHNSON 1982) and high performance liquid chromatography, HPLC, according to Feige et al. (1993).

The new species

Ingaderia troglodytica Feige & Lumbsch, spec. nov.

(Fig. 1)

Planta saxicola. Thallus fruticosus, uniformis, viridulo-griseus vel albido-griseus, pendulus vel suberectus, albido-grisei pruinosus, ramosus; rami primati applanati, superficierum reticulati, ca. 2-3.5 x 0.1-1.2 cm; rami terminales cylindricei, ca. 0.1-0.2 mm in diametro. Cortex usque ad 35 µm crassus, hyalinus, hyphis periclinalis. Medulla luteola, inconspicua, coalescens. Stratum algarum discontinuum. Alga ad genus *Trentepohlia* pertinens. Soredia et isidia nulla. Ascomata et pycnidia incognita.
Thallus acidum gyrophoricum, lecanorinum et orsellinum continens.

Typus: Spain, Baleares, Minorca, Cala Morell, benaeth prehistoric caves (Coves Troglodytes), NW vertical calcareous cliffs, 3.10.1991, *G.B. & S. Feige* (ESS-11058 - holotype, KOELN, MUB - isotypes, further isotypes will be distributed in Vezda, Lich. rar. exs. 64).

Thallus saxicolous, fruticose, greenish grey to whitish grey, pendant to suberect, whitish grey pruinose, branched; main branches prominent, flat, with a reticulate surface, ca. 2-3.5 x 0.1-1.2 cm; terminal branches terete, ca. 0.1-0.2 mm in diam. Cortex with periclinally arranged hyphae, hyaline, up to 35 µm thick. Medulla yellowish, inconspicuous, coalescent, sometimes not distinguishable from the cortex (=*Darbishirella* type). Algal layer discontinuous. Photobiont belonging to the genus *Trentepohlia*. Soredia or isidia absent. Ascomata or pycnidia not seen.

Chemistry: Gyrophoric (major), lecanoric (minor) and orsellinic (trace) acids by HPLC and TLC.

Morphologically this new species resembles a poorly developed *Roccella* species, but it can readily be distinguished by the presence of gyrophoric acid and the different anatomy of the thalli. It grows on exposed miocene calcareous cliffs on Minorca in coastal areas. The species occurs mainly in small caves in the rock in somewhat shady places. Associated species at the type locality include *Dirina massilensis* Durieu & Montagne, *Lecanactis grumulosa* Fr., *Opegrapha durieui* Montagne and *Roccella phycopsis* (Ach.) Ach.

Further specimens examined: **Italy**, Sardinia, Prov. Sassari, Capo Caccia, 50 m alt., 23.7.1985, *P.L. Nimis & J. Poelt* (GZU). - Sicily, Isole Pelagie, Lampedusa - Punta occidentale dell' Isola, tra Punta Parise, Capo Ponente e C. Teresa, 80-100 m alt., 13.4.1992, *J. Poelt* (ESS-11690, GZU). - **Spain**, Almeria, Carboneras, Punta Los Muertos, 100 m alt., 18.3.1990, *J.E. Egea & Alonso* (MUB-21308). - **Morocco**, Al-Hoceima, Playa del Hotel Quemado I., 0-30 m alt., 11.4.1990, *J.E. Egea & Alonso* (MUB-21305), Carreterra de la costa a 5 km al W., 11.4.1990, *J.E. Egea & Alonso* (MUB-21304). - Ras-el-Mara, Cab de l'eau, 30 m alt., 12.4.1990, *J.E. Egea & Alonso* (MUB-21307).

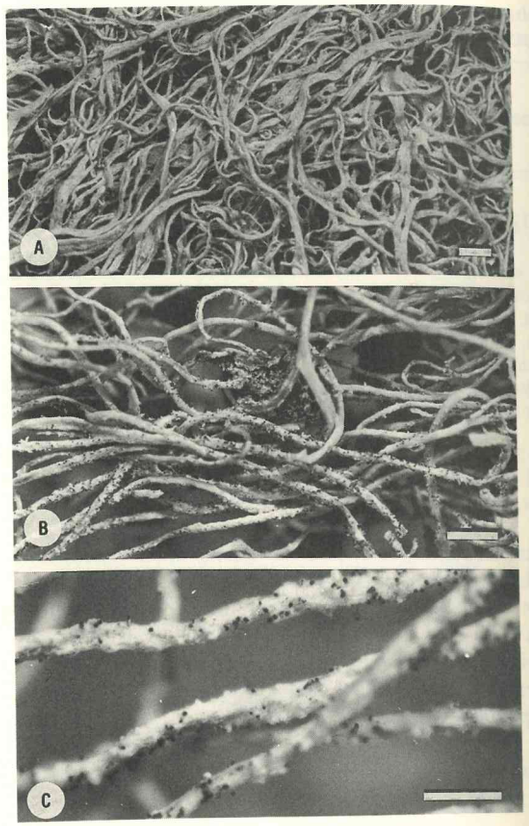

Fig. 2. Morphology of *Ingaderia gracillima* and *I. pulcherrima*. A *I. gracillima* (Tehler 2351, S) B & C *I. pulcherrima* (COLO exs. 558, M) (Scale: A & B =1mm; C = 0.5 mm).

The generic concept

The phylogeny and generic concepts of the Roccellaceae were recently discussed in detail by TEHLER (1990). A description of the genera *Darbishirella* and *Ingaderia* is given there. *Darbishirella* and *Ingaderia* s.str. are distinguished by their morphology and chemistry (Tab. 1). While *Darbishirella* has flat main branches (Fig. 2 A) and contains a despidone chemosyndrome based on psoromic acid, *Ingaderia pulcherrima* contains depsides and has thin main branches (Figs. 2 B & C). TEHLER (1990) has previously mentioned that these genera are very similar especially in their thallus anatomy. However, since the genus *Ingaderia* is only known in the sterile condition it was excluded from the cladistic analyses.

Tab. 1. Comparison of *Ingaderia troglodytica* with *I. (Darbishirella) gracillima* and *I. pulcherrima*.

Species	Morphology	Anatomy	Chemistry	Substrate	Distribution
Ingaderia gracillima (=*Darbishirella gracillima*)	Flat and reticulated main branches, heavily pruinose. Terminal branchlets terete, entire.	*Darbishirella* type	Psoromic 2'-*O*-demethyl-psoromic acids and unknowns	Saxicolous or corticolous	Chile, Peru
Ingaderia pulcherrima	Main branches thin, occasionally reticulated, pruinose. Terminal branchlets terete with blackish papillae.	*Darbishirella* type	Erythrin, lecanoric and orsellinic acids	Saxicolous or corticolous	Chile
Ingaderia troglodytica	Flat and reticulated main branches, heavily pruinose. Terminal branchlets terete, entire.	*Darbishirella* type	Gyrophoric, lecanoric and orsellinic acids and unknowns	Saxicolous	Western Mediterranean

Ingaderia troglodytica exhibits characters of both the monotypic genera *Darbishirella* and *Ingaderia*. This new species has the morphology of *Darbishirella*, but contains depsides, closely related to those present in *Ingaderia pulcherrima*. All three species share the same type of thallus anatomy, which is called here *Darbishirella* type, characterized by a discontinous algal layer.

With the discovery of *Ingaderia troglodytica* the distinction of the genera *Darbishirella* and *Ingaderia* on the basis of the thallus morphology and chemistry, cannot be continued. We consider all three species to be congeneric and thus *Darbishirella* becomes a synonym of *Ingaderia*. The following new combination is necessary:

Ingaderia gracillima (Krempelh.) Feige & Lumbsch, comb. nov.
Bas.: *Roccella gracillima* Krempelh., Verh. Zool.-Bot. Ges. Wien 26: 442 (1877).
Syn.: *Dictyographa gracillima* (Krempelh.) Darb., Ber. Dtsch. Bot. Ges. 15: 6 (1897), nom. illeg. - *Darbishirella gracillima* (Krempelh.) Zahlbr. ex Darb., Bibl. Bot. 9 (45): 13 (1898).

The distribution of the genus *Ingaderia* is quite remarkable being disjunct between western South America and the western Mediterranean. At the moment we cannot interprete this kind of distribution, but it definitely seems to be a relict. A thorough search for this genus should be made in the mediterranean regions of North America. The present distribution might be close to that of *Haematomma subpuniceum* (Müll Arg.) B. de Lesd. (LUMBSCH et al. 1993) which exhibits to the well known western North America western Europe disjunct (KÄRNEFELT 1980) with range extension to South America.

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