THREE NEW SPECIES OF OPEGRAPHACEAE (LICHENS) FROM THE NAMIB DESERT

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Abstract.- Bactrospora namibiensis, Lecanographa longicarpa and L. tehleri are described as new from coastal localities of the Namib desert (SW Africa).

INTRODUCTION

The Namib desert is a narrow belt of desert of more than 2000 km along the coast of SW Africa (Namibia) between the Olifants river (South Africa) in the south and the Carunjamba river (Angola). It is one of the most arid parts of the world as virtually the entire area receives less than 100 mm of rain per year, but the
coastal fringe experiences fog on more than 120 days per year, the fog being extremely rich in salt (c. 120 kg/ha/year according to Goudie 1972). Such a persistent and regular mist permits a rich and luxuriant, and adaptively interesting, lichen development, as in similar areas elsewhere in the world (Rundel 1978). One of the best examples of the exuberant lichen vegetation is the so-called "lichen fields" on the gravel and sandy flats near the sea north of Swakopmund, which are dominated by the cushions of Teloschistes capensis (L.f.) Vainio ex Müll. Arg. and T. puber (Ach.) Almborn; the ground cover of these fruticose dominated lichen fields can exceed 70% and their biomass can reach 400 mg/m² (Schieferstein & Loris 1992). Jürgens & Niebel-Loehmann (1995) provide detailed information on the structure and ecology of two extraordinary lichen fields in the Southern Namib (near Lüderitz and near Alexanderbay).

Although not very rich in species, the Namib desert hosts several interesting growth forms and endemic taxa. Several examples are listed below:

- the genus Caloplasca Th. Fr. has numerous species in the desert, with the subfruticose endemic C. eudoxa (Müll. Arg.) Zahlbr. (Poelt & Pelliter 1984) and the spectacular C. elegantissima (Nyl.) Zahlbr. and its isidiate relative C. namibensis Kärnefelt (Kärnefelt 1988), the former being reported from Namibia and the Atacama desert in Peru and the latter being a Namibian endemic (Kärnefelt 1990);
- the monotypic, subfruticose and endemic genus Coronoplectrum Brusse (Brusse 1987);
- the genus Neofuscelia Essl. has several endemic species in the Namib desert: N. follmannii Krug, N. incomposita (Essl.) Essl., N. lagunebergensis Krug, N. namaënsis (J. Stein & Zahlbr.) Essl. and N. tentaculina (Essl.) Essl. (Esslinger 1977; Krug & Sang 1995);
- the fruticose and endemic genus Santessonia Hale & Vobis, with three species which develop a lacunose cortical layer for the interception of fog (Hale & Vobis 1978; Sérusiaux & Wessels 1984; Follmann 1987);
- the genus Teloschistes Norman is represented by three species: T. capensis and T. puber which are very abundant but restricted to the coastal areas of the Namib desert, the Karoo and the North Western Cape province in South Africa, and by T.
chrysocarpoides Vainio, a rare, epiphytic species of the Namib desert (Almborn 1989);
- the monotypic genus Xanthodactylon P. Duvigneaud, abundant along the coasts of the Namib down to the Cape area in South Africa (Kärnefelt 1989);
- the spectacular genus Xanthomaculina Hale, with the terricolous and free-growing endemic X. convoluta (Hue) Hale and the south African endemic X. hottentota (Ach.) Hale (Hale 1985).

This paper is a modest contribution to the knowledge of the lichen flora of the Namib desert and deals with the Opegraphaceae collected there by two of us (E. S. & D. W.) during a joint field trip in 1983. Besides the three species described as new below, the recently described Lecanographa subcaesioides Egea & Torrente (Egea & Torrente 1994) has also been found. It is known from Uruguay and from Namibia.

METHODS

Sections of thalli and ascomata were mounted in water, a 10 % KOH solution (K), Lugol's solution (I) and lactophenol cotton-blue (LCB). All measurements indicated were made in water. The iodine reaction of the asci was studied in Lugol's solution after pretreatment with K (K/I). Thin layer chromatography (TLC) of acetone extracts of thalli was carried out following the standard systems (e.g. White & James 1985).

Bactrospora namibiensis Egea, Sérusiaux, Torrente & Wessels sp. nov. (Fig. 1 A-E)

Thallus endophloeoedodes. Ascomata nigra, dispersa, rotundata vel leviter irregularia, 0.4-1.2 mm lata, primum subimmersa, demum adnata. Excipulum dimidiatum, in parte laterali usque 125 μm crassum. Paraphysoides ad 2 μm crassae, apicem versus leviter incrassatae, ramoso-connexae. Asci 180-240 x 8-10 μm. Ascosporae a typo 'Dryina' dicto. Pycnidia non visa.
Typus: Namibia, Skeleton Coast Park, 11 km N of the Outpost at Ugabmond following the coastal road, near a marble ridge orientated E-W, on dead wood lying on the beach, 2.1983, E. Sérisiaux 5299 & D. Wessels (LG-holotypus).

Thallus endophloeoal; photobiont: a species of Trentepohliaceae. Ascomata apothecioid, black, scattered, subimmersed to adnate, roundish or somewhat irregular in outline, 0.4-1.2 mm across, slightly pruinose, plane or slightly concave with a shallow margin, becoming +/- convex and immarginate. Excipulum well-developed, laterally dark brown, composed of conglutinate, thick-walled hyphae, up to 125 μm thick, open at the bottom, I-, K/I-. Hymenium colourless, 200-300 μm thick, I-, K/I-. Subhymenium greyish, 50-80 μm thick, I-, K/I-. Paraphysoids dichotomously branched, with few or no anastomoses and loosely interlaced in the hymenium, up to 2 μm wide. Apical cells of paraphysoids strongly branched and anastomosing, forming a reticulate dark brown epithecium. Asci fisstituncate, 180-240 x 8-10 μm, cylindrical with a foot-like base not or slightly widened, easily separated from ascogenous hyphae and often broken, appearing multisporous; exoascus and endoascus not amyloid or hemiamyloid. Ascospores acicular when young, but soon fragmenting within the ascus into unicellular or paucicellular segments (Dryina-type, Egea & Torrente 1993); each cell cylindrical, 3-5 μm in length and 2-2.5(-3) μm in diam. Pycnidia not seen.

Chemistry: Thallus and medulla K-, C-, KC-, P-. No lichen substances detected by TLC.

Distribution and habitat: Bactrospora namibiensis is known only from the type locality at the southern edge of the Skeleton Coast Park in Namibia. It was abundant on dead wood lying on the beach. This locality also hosts an exuberant population of Santessonia namibensis Hale & Vobis (Sérisiaux & Wessels 1984).

Notes: On account of its non-hemiamyloid asci, the inclusion of this new taxon in Bactrospora Massal. is somewhat doubtful, but no other described genus is available for it. This taxon is easily distinguished from other species of that genus with Dryina
-type ascospores (see fig. 2 in Egea & Torrente 1993:214) by its very long, cylindrical asci: the other three species with that type of ascospores always have ascii less than 150 μm long. Since the monograph of the genus published by two of us (Egea & Torrente 1993), Henssen & Thor (1994) have recognized the genus level for the species with ascospores of the *Homalotropa* - and *Jenikii* -type and have adopted *Melampylium* Stirt. ex Müll. Arg. for that group.

**Lecanographa longicarpa** Egea, Sérusiaux, Torrente & Wessels sp. nov. (Fig. 2 A-D)

Thallus crustaceus, albus vel griseoalbus, ecorticatus. Ascomata lirellata (0.5-1.9 x 0.2-0.3 mm), adnata. Discus pruinosis. Paraphysoides ramosae et anastomosantes, usque ad 2 μm crassae. Asci fissitunicati, 62-70 x 17-20 μm. Ascosporae fusiformes, 25-29 x 5.5-6.5 μm, 7-septatae, halonatae, primum incoloratae, deinde brunneae. Pycnidia subimmersa. Conidia recta, 5-7 x 1 μm.

Typus: Namibia, Laguneberg Range (N part), N of Myl 72, basalt hill facing the sea, alt. c. 200 m, on twigs of a small shrub, 2.1983, E. Sérusiaux 5186 & D. Wessels (LG-holotypus).

Thallus crustose, corticolous, white to white-grey, cracked, with a smooth or somewhat farinose surface, delimited by a thin, black prothallus, up to 125 μm in section, ecorticate; medulla white with many crystals of unknown nature (insoluble in K) incorporated between the hyphae. Photobiont: a species of Trentepohliaceae.

Ascomata lirelliform, often branched, 0.5-1.9 x 0.2-0.3 mm, adnate, scattered or crowded, with a conspicuous margin, scarcely or not raised above the level of the disc, covered by a dense coating of white pruina; disc plane. Excipulum well developed, dark brown, K+ dark green. Hymenium hyaline, 80 μm thick, I+ reddish. Subhymenium pale brown, 30 μm thick. Paraphysoids up to 1.5 μm wide, branched and anastomosing, not or slightly widened and with slightly pigmented walls at the apices. Asci of the *Grumulosa* -type (Torrente & Egea 1989), 62-70 x 17-20 μm at maturity, with a distinct ring structure.
Ascospores 25-29 x 5.5-6.5 μm, 7-septate, fusiform, surrounded by a thick gelatinous sheath, hyaline but turning brown when old; cell walls thin, not or slightly widened at level of the septa. Pycnidia submersed, secondarily multilocular. Conidia 5-7 x 1 μm, straight or slightly curved.

Chemistry: Thallus K-, C-, P-; confluentic acid detected by TLC.

Distribution and habitat: Lecanographa longicarpa is known only from the type locality, a low basalt hill near the sea in the Namib desert, where it grows on twigs of small shrubs. The shrubs in this locality have a luxuriant lichen flora with Trichoramalina melanothrix (Laur.) Rundel & Bowler, Xanthodactylon flammeum (L. f.) Dodge, Xanthoria turbinata Vainio, and many, still unidentified species (incl. a Ramalina and an Usnea species). Santessonia lagunenbergii Sérusiaux & Wessels, S. hereroensis (Vainio) Follm. (= S. sorediata Sérusiaux & Wessels) and Xanthomaculina hottentota are abundant on rocks and pebbles of the desert pavement in the same locality.

Notes: The 7-septate ascospores surrounded by a thick gelatinous sheath, and the C-negative thallus suggest a close relationship to Lecanographa subcaesioides Egea & Torrente, known from Uruguay and the Namib desert, and to L. dialeuca (Cromb.) Egea & Torrente, known from coastal areas in the Cabo Verde Is, the Canary Is and Madeira, in the Macaronesian region (Egea & Torrente 1994). The two latter species differ in having narrower asci (14-17 μm) and ascospores (3.5-5 μm), and by their saxicolous habitat. In addition, L. subcaesioides has more rounded and shorter ascomata (0.2-0.7 mm).

Lecanographa tehleri Egea, Sérusiaux, Torrente & Wessels sp. nov. (Fig. 2 E-G)

Thallus crustaceus, brunneus, ecorticatus. Ascomata lirellata (0.4-1 x 0.2-0.4 mm), subimmersa vel adnata. Discus pruinosisus. Paraphysoides ramosae et anastomosantes, usque ad 2 μm crassae. Asci fissitunicati, 60-65 x 14-15 μm. Ascusporae fusiformes, 18-21 x 5-6 μm, (4-)5-septatae, halonatae, primum
incoloratae, deinde brunnea. Pycnidia immersa. Conidia recta, 6-7 x 1 μm.

Typus: Namibia, Laguneberg Range (S part), N of Myl 72, basalt hill facing the sea, alt. c. 150 m, on small twigs of a shrub, 2. 1983, E. Sérusiaux 5199 & D. Wessels (LG-holotypus).

Other specimen examined: Road from Swakopmund to Hentiesbaai, 2 km S of Myl 14, coastal flats, marble outcrops, on twigs of a dead shrub, 2.1983, E. Sérusiaux 5057 & D. Wessels (LG).

Thallus crustose, brownish, cracked, with a granulose surface, without any distinct prothallus, very thin in section, ecorticate; medulla white with crystals of unknown nature (insoluble in K) incorporated between the hyphae. Photobiont: a species of Trentepohliaceae.

Ascomata lirelliform, 0.4-1 x 0.2-0.4 mm, simple, subimmersed to +/- adnate, scattered or rarely crowded, with a conspicuous margin, pruinose; disc plane, widened at maturity. Excipulum well developed, dark brown. Hymenium hyaline, 100-140 μm thick, I+ blue or reddish. Subhymenium brownish, 20-25 μm thick. Paraphysoids up to 2.5 μm wide, sparingly branched, slightly widened at the apices, and with slightly pigmented walls forming a greenish epithecium. Asci of the Grumulosa-type (Torrente & Egea 1989), 60-65 x 14-15 μm at maturity, with a distinct ring structure. Ascospores 18-21 x 5-6 μm, (4-)5-septate, fusiform, surrounded by a thick gelatinous sheath, hyaline but turning brown when old; cell walls thin and not or slightly widened at the level of the septa. Pycnidia immersed, secondarily multilocular. Conidia 6-7 x 0.8 μm straight.

Chemistry: Thallus K-, C-, P-; no lichen substances detected by TLC.

Distribution and habitat: Lecanographa tehleri is known from two localities in the coastal areas of the Namib desert. It is an epiphytic species growing on twigs of shrubs. The lichen vegetation of the type locality is similar to that of the site where L. longicarpa grows (see above).
Notes: The size of the asci and the number of septa of the ascospores suggest some affinities with *Lecanographa lyncneoides* (Müll. Arg.) Egea & Torrente (known from a single locality in coastal areas in Venezuela; Egea & Torrente 1994), which differs in having narrower (1.5-2 μm) and much branched paraphysoids, narrower (4-5 μm) and more or less constricted ascospores, and a dark brown epithecium. A further closely related taxon occurs in coastal areas of California and will be described in a forthcoming paper by two of us (J. M. E. & P. T.) as a subspecies of *L. tehleri*.

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