S. Afr. J. mar. Sci. 21: 259–270
1999

BENTHIC MARINE CYANOPHYCEAE OF MOÇAMBIQUE

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Twenty species of cyanophytes from the intertidal zone of Maputo, Moçambique, were identified. In all, 16 taxa are new records to Moçambique; eight at the generic level (*Geitlerinema, Hyella, Jaaginema, Kyrtuthrix, Leptolyngbya, Pleurocapsa, Porphyrosiphon* and *Stanieria*) and eight at the specific level (*Aphanothece* cf. *nidulans, Leptolyngbya golenkiniana, L. perelegans, Myxosarcina* cf. *concinna, Oscillatoria* cf. *curviceps*, cf. *Phormidium ambiguum, P.* cf. *cebennense* and *P. okeni*). This paper constitutes the first record of endolithic cyanophytes (*Hyella* and *Kyrtuthrix*) and the first record of *Phormidium formosum* and *Pseudanabaena* sp. from a marine habitat of Moçambique.

During the past 60 years, there have been very few reports on the cyanophytes of Moçambique. The first cyanophytes from Moçambique were reported by Hutchinson *et al.* (1932) and Rich (1932), both from freshwater habitats. A number of reports, also dealing with freshwater algae, were later published (Cholnoky 1952, Sampaio 1964, Rino 1969, 1972, 1979). The first reference to marine cyanophytes of Moçambique was by Silva (1956, 1960), but those studies did not include generic identifications. Sournia (1968) referred to four species of Oscillatoriaceae in the marine plankton and Pocock (1969) identified one benthic marine cyanophyte as part of a list of species of macroalgae around Inhaca Island, about 40 km from Maputo.

The study of cyanophytes of Moçambique was reinitiated by Silva (1991a, b, c) and Silva and Cuamba (1991), who analysed several samples from the seashore, mangroves and plankton of Inhaca Island. To date, there is no report on benthic marine cyanophytes from other parts of that country. This paper aims to extend knowledge of this group of algae from the Moçambique coast.

MATERIAL AND METHODS

The study site was the Costa do Sol Beach (25°58´S, 02°10´E), situated in Maputo in southern Moçambique. The beach receives household discharges and waters from Maputo Bay, where the harbour is located. The bay is about 30 km wide and is widely open to the north (Macnae and Kalk 1962). Five rivers flow into the bay, the Incomáti, Maputo, Matola, Tembe and Umbelúzi.

Several samples of sand and shells were obtained from the beach, in the intertidal zone, at low tide during 1996. The biological material was transported live to South Africa, where the taxonomic work was undertaken. Line drawings and photographs were obtained using both cultured and wild living material. Liquid enrichment cultures were prepared using Provasoli's enriched seawater medium (McLachlan 1973) and subjected to an irradiance of 20 $\mu mol.m^{-2}{\cdot}s^{-1}$, a temperature of 20°C and an alternating 16 L:8 D cycle. Wild and cultured material was studied using a Zeiss photomicroscope equipped with bright field, Nomarski interference and phase contrast optics. A *camera lucida* was used for detailed drawings of specimens. A dilute iodine solution was added to the prepared slides to reduce the motility of the cells or to emphasize the cross-walls of the trichomes. A 1% dilute hydrochloric acid solution was used to remove the calcium carbonate of shells and facilitate the study of endolithic species. The descriptions of the specimens were based on cultured materials.

The system of classification adopted was according to Komárek and Anagnostidis (1986, 1989) and Anagnostidis and Komárek (1988).

RESULTS

A total of 20 taxa of Cyanophyceae was recorded (Table I).

CHROOCOCCALES

Family Microcystaceae

Genus *Aphanothece* Näg.

***Aphanothece* cf. *nidulans* P. Richt., *Bot. Notiser*: 128. 1884 (Figs 1–2)**

Description — Colonies rounded when young, amorphous when old, cells very close together. Mucilaginous

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Manuscript received: July 1998

Table I: List of marine cyanophytes found in Moçambique

CYANOPHYCEAE Sachs, 1874
- CHROOCOCCALES Wettst., 1924
  - Microcystaceae Elenk., 1933
    - *Aphanothece* Näg., 1849
    - *A.* cf. *nidulans* P. Richt, 1884
    - *Merismopedia* Meyen, 1839
    - *M. glauca* (Ehrenb.) Näg., 1849
  - Dermocarpellaceae Ginsb.-Ardré ex Christ., 1980
    - *Stanieria* Kom. *et* Anagn., 1986
    - *S.* cf. *cyanosphaera* (Kom. *et* Hindák) Kom. *et* Anagn., 1986
  - Xenococcaceae Erceg., 1932
    - *Myxosarcina* Printz, 1921
    - *M. concinna* Printz, 1921
  - Hydrococcaceae Kütz., 1843
    - *Hydrococcus* Kütz., 1833
    - *H. rivularis* Kütz., 1833
    - *Hyella* Born. et Flah., 1888
    - *H. caespitosa* Born. *et* Flah., 1888
    - *Pleurocapsa* Thur. ex Hauk, 1885
    - *P.* cf. *minuta* Geitler, 1932
- OSCILLATORIALES Elenk., 1934
  - Oscillatoriaceae (S. F. Gray) Harv. ex Kirch., 1898
    - *Oscillatoria* Vauch. ex Gom., 1892
    - *O.* cf. *curviceps* Ag. ex Gom., 1892
  - Phormidiaceace Anag. *et* Kom., 1988
    - *Phormidium* Kütz. ex Gom., 1892
    - *P.* cf. *ambiguum* Gom., 1892
    - *P.* cf. *cebennense* Gom., 1899
    - *P. okeni* (Ag. ex Gom.) Anagn. et Kom., 1988
    - *Porphyrosiphon* Kütz. ex Gom., 1892
    - *P. martensianus* (Meneg. ex Gom.) Anagn. *et* Kom., 1988
    - *Spirulina* Turp. ex Gom., 1892
    - *S. labyrinthiformis* (Meneg.) Gom., 1892
    - *Symploca* Kütz. ex Gom., 1892
    - *Symploca* sp.
  - Pseudanabaenaceae Anagn. *et* Kom., 1988
    - *Geitlerinema* Anagn., 1989
    - *G.* cf. *exile* (Skuja) Anagn., 1989
    - *Jaaginema* Anagn. *et* Kom., 1988
    - *J.* cf. *pseudogeminatum* (Schmid) Anagn. *et* Kom., 1988
    - *Leptolyngbya* Anagn. *et* Kom., 1988
    - *L. golenkiniana* (Gom.) Anagn. *et* Kom., 1988
    - *L. perelegans* (Lemm.) Anagn. *et* Kom., 1988
    - *Pseudanabaena* Lauterb., 1915
    - *Pseudanabaena* sp.
- NOSTOCALES (Borzi) Geitler, 1925
  - Scytonemataceae Kütz., 1843
    - *Kyrtuthrix* Erceg., 1929
    - *K. maculans* (Gom.) Umez., 1958

sheath colourless, very close to the cells, usually indistinct. Cells cylindrical (1.2–1.6 μm wide, 2.1–2.3 μm long), protoplast homogeneous, olive-green.
Distribution in Moçambique — First record of occurrence of the species.

The specimens of *Aphanothece* Näg. resemble those of *A. nidulans,* but differ by having closely packed cells and a mucilaginous sheath very close to the cells, which is often indistinct. The differences could be attributable to the habitat, but further studies need to be conducted to confirm the identification.

Genus *Merismopedia* Meyen
***Merismopedia glauca* (Ehrenb.) Näg., *Gatt. einz. Alg*. 55. 1849 (Figs 3, 69)**

Description — Colonies usually rectangular, with cells very close together. Mucilaginous sheath colourless, usually distinct. Cells spherical, subspherical or oval (4.3–5.1 μm wide, 5.6–6.0 μm long), protoplast homogeneous, blue-green.

Distribution in Moçambique — Inhambane: Vilanculos (Rino 1969). Maputo: Ilha da Inhaca (Rino 1972); marine, on sand (Silva 1991a): Ilha dos Portuguêses; marine, on tree trunks in decomposition (Silva 1991b); Namaacha (Rino 1969). Without precise location (Cholnoky 1952).

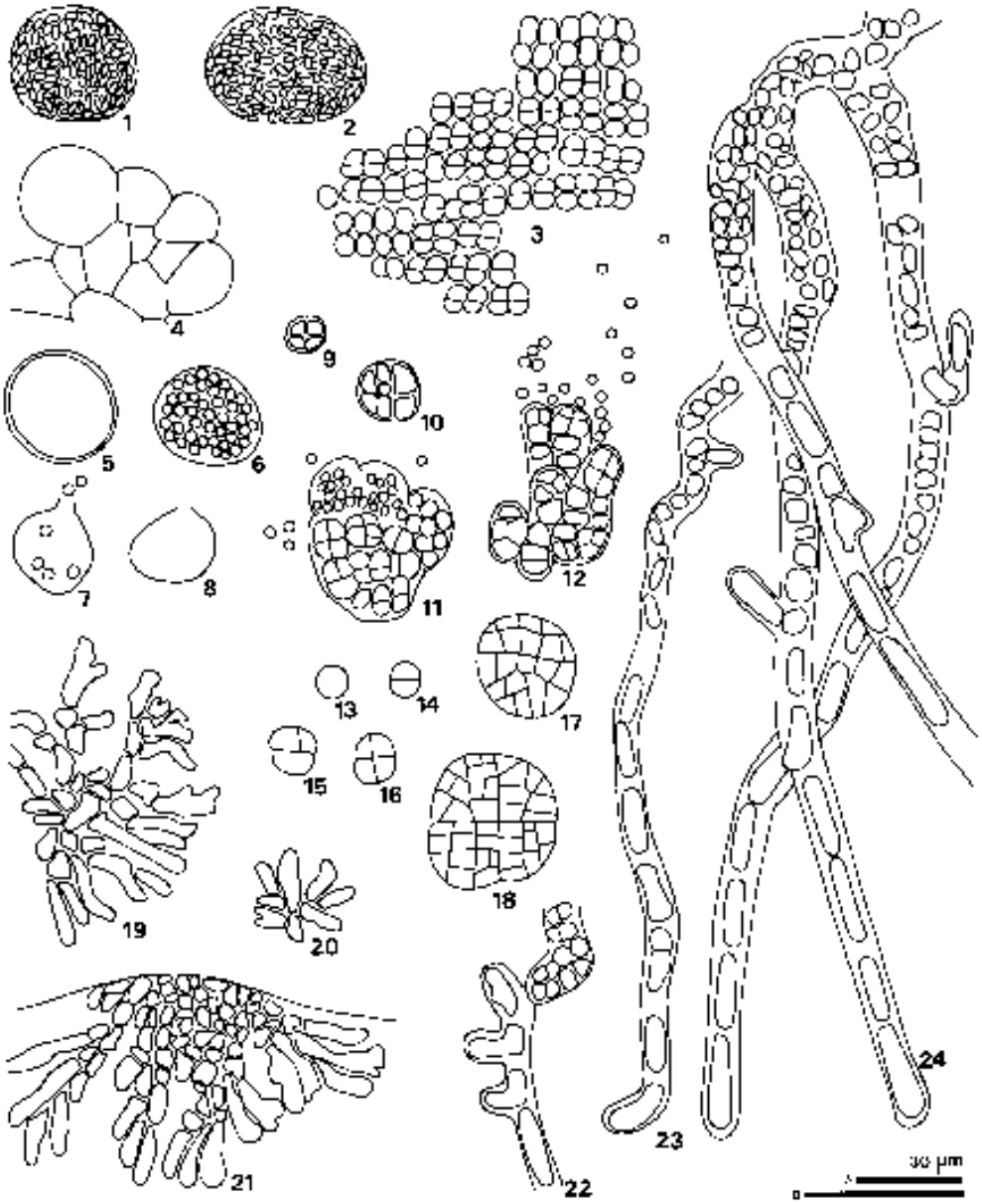
Specimens are similar to *Merismopedia elegans* A. Braun, in relation to the arrangement of the cells in the colonies, but they differ by the slightly smaller dimensions of cells. Acccording to the literature, *M. glauca* (Ehrenb.) Näg. differs from *M. elegans* by the smaller number of cells in the colonies and also by the smaller size of cells (Geitler 1932, Hindák 1992). In this study, specimens were found both free between sand grains or tightly attached to them. Hindák (1992) also reports this species as an inhabitant of planktonic and benthic communities.

Family Dermocarpellaceae
Genus *Stanieria* Kom. *et* Anagn.
***Stanieria* cf. *cyanosphaera* (Kom. *et* Hindák) Kom. *et* Anagn., *Arch. Hydrobiol.* Suppl. 73; *Algol. Stud.* 43: 208. 1986 (Figs 4–8, 70).**
Synonym: *Chroococcidiopsis cyanosphaera* Kom. *et* Hindák, *Algol. Stud*. 13: 320. 1975

Description — Cells subspherical, solitary or in clusters (up to 30.9 μm in diameter), protoplast homogenous or finely granular, brown. Nanocytes spherical (2.5–2.9 μm in diameter).

Distribution in Moçambique — First record of the occurrence of the genus.

The major difference between the specimens from Moçambique and the type species (Komárek and Hindák 1975, as *Chroococcidiopsis cyanosphaera*) is the habitat. The Cuban material was periphytic in mineral springs and pools, whereas the Moçambican material was found in the marine habitat, between sand grains and mixed with other algae and mollusc shells.



Figs 1–2: *Aphanothece* cf. *nidulans* (detail of colonies, scale bar B). Fig. 3: *Merismopedia elegans (*detail of colonies showing the arrangement of cells*).* Figs 4–8: *Stanieria* cf. *cyanosphaera* (4: general aspect of cells; 5: cell prior to the formation of nanocytes; 6: nanocytes; 7: release of nanocytes; 8: empty cell wall). Figs 9–12: *Pleurocapsa* cf. *minuta* (9: colony with four cells; 10: colony with seven cells showing the planes of cell division; 11: colony with nanocytes and vegetative cells; 12: pseudofilaments). Figs 13–18: *Myxosarcina* cf. *concinna* (developmental stages of the colonies showing the planes of cell division). Figs 19–21: *Hydrococcus rivularis* (20: beginning of the development; 19–20: adult specimens). Figs 22–24: *Hyella caespitosa* (22: beginning of lateral branching). All diagrams refer to scale bar A, unless otherwise stated

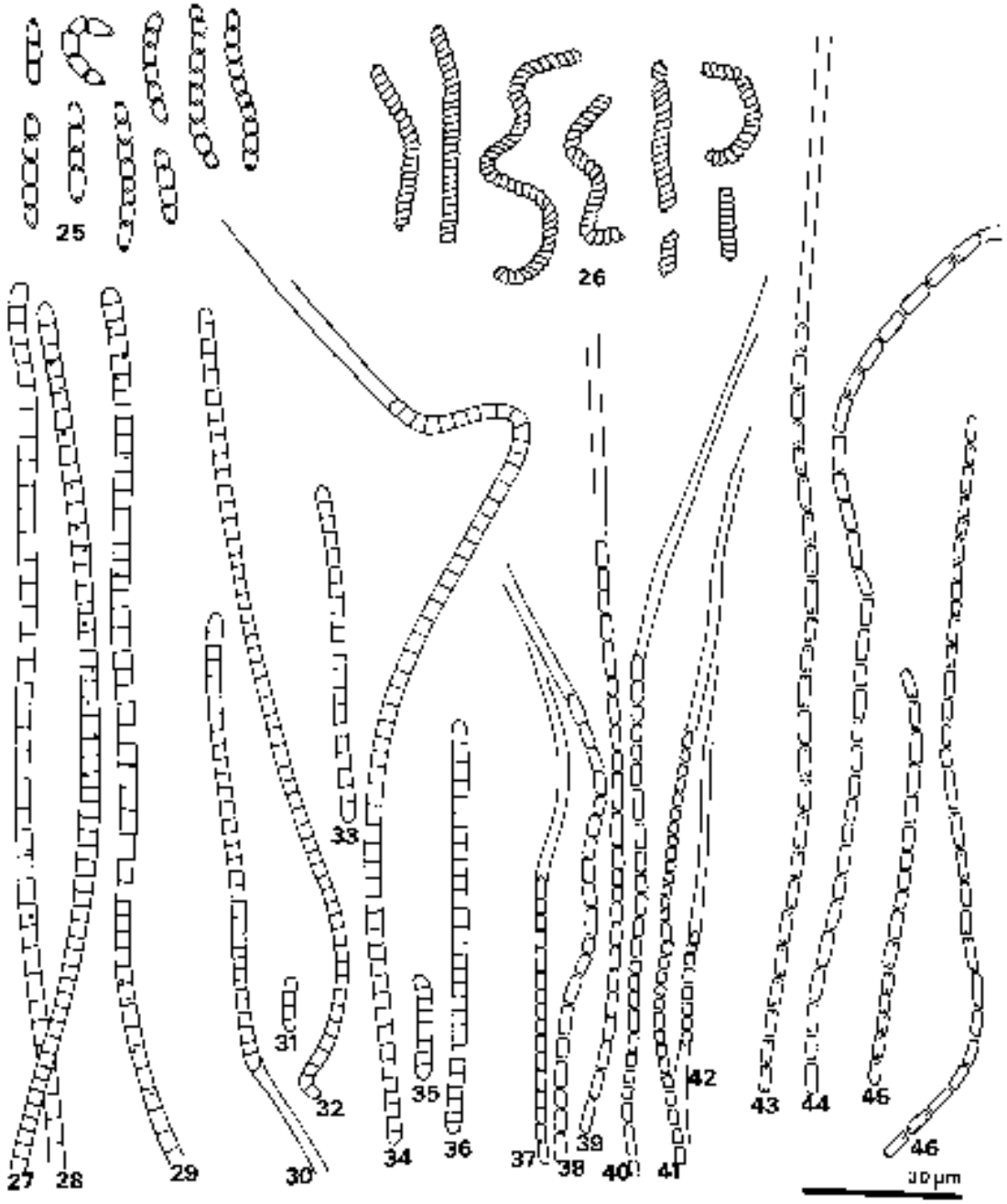
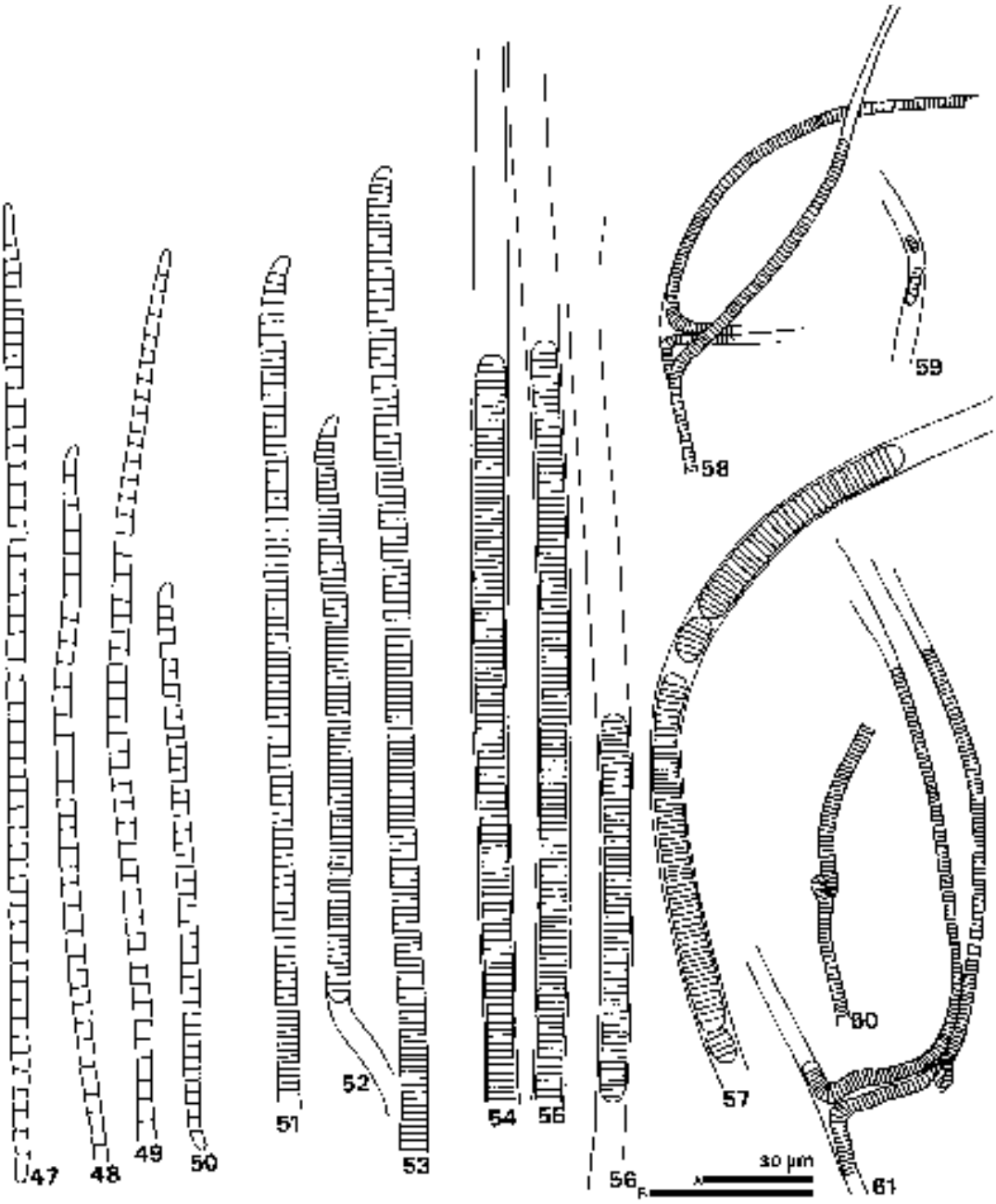
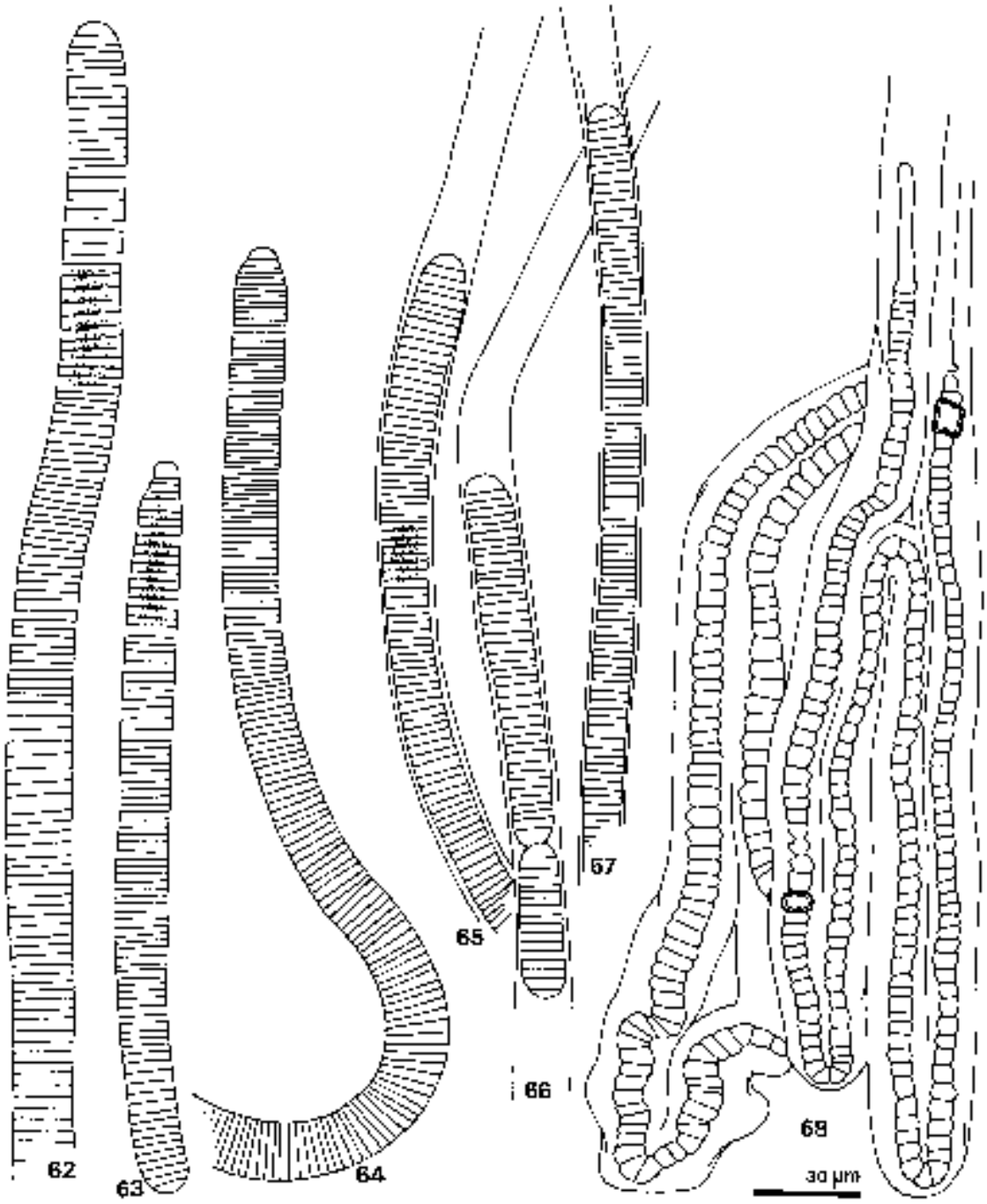


Fig. 25: *Pseudanabaena* sp. (trichomes with different number of cells). Fig. 26: *Spirulina labyrinthiformis* (different aspects of the trichomes). Figs 27–29: cf. *Jaaginema pseudogeminatum*. Figs 30–36: *Phormidium* cf. *cebennense* (31–33, 35–36: detail of trichomes; 30,34: detail of trichomes and mucilaginous sheaths). Figs 37–42: *Symploca* sp. (detail of the filaments showing terminal capitate cells). Figs 43–46: *Leptolyngbya perelegans* (detail of the trichomes/filaments showing cross-walls with a single granule on either sides)



Figs 47–50: *Geitlerinema* cf. *exile* (detail of trichomes showing attenuated apices). Figs 51–53: *Phormidium okeni* (51, 53: detail of trichomes with attenuated apices; 52: detail of a filament). Figs 54–57: cf. *Phormidium ambiguum* (detail of filaments). Figs 58–61: *Leptolyngbya golenkiniana* (58, 61: geminate branches, scale bar B; 60: beginning of a geminate branch; 59: detail of two hormogonia, scale bar B). All diagrams refer to scale bar A, unless otherwise stated



Figs 62–64: *Oscillatoria* cf. *curviceps* (62: detail of trichomes with round apex; 63–64: detail of trichomes with attenuated apices). Figs 65–67: *Porphyrosiphon martensianus* (detail of filaments). Fig. 68: *Kyrtuthrix maculans* (detail of the filaments with heterocytes)

Family Xenococcaceae
Genus *Myxosarcina* Printz
***Myxosarcina* cf. *concinna* Printz, *K. norske Vidensk. Selsk. Skr.* 35. 1920 (Figs 13–1, 71)**

Description — Colonies usually rounded, more than 50 celled. Mucilaginous sheath colourless, usually indistinct. Cells usually as long as broad (2.9–5.6 µm wide, 3.5–5.6[–8.6] µm long), protoplast homogeneous, dark olive-green or dark blue-green. Nanocytes not observed.

Distribution in Moçambique — First record of occurrence of the species.

The genus *Myxosarcina* Printz has only recently been found in Moçambique (Silva 1991a). The species *M. concinna* was described in 1921 by Printz (Geitler 1932), based on samples from subaerial habitats. Since then, it was only once referred to the southern African region, by Silva (1994), from samples of seaweeds and rocks from Isipingo, South Africa.

Family Hydrococcaceae
Genus *Hydrococcus* Kütz.
***Hydrococcus rivularis* Kütz., *Linnaea* 8. 1833 (Figs 19–21, 72–73)**

Description— Pseudofilaments prostrate, radially arranged. Mucilaginous sheaths homogeneous, colourless, usually indistinct. Cells square or transversally oblong, ([1.2–]2.9–5.1 µm wide, 3.5–7.0[–12.1] µm long), protoplast homogeneous, blue-green. Terminal cells up to nine times longer than wide (3.9–7.0 µm wide, up to 31.5 µm long).

Distribution in Moçambique — Maputo: Inhaca Island, on mangrove trees, on *Bostrychia* spp., *Caloglossa* sp., *Gelidium* sp. and *Murrayella* sp. (Silva 1991c).

The current material was only observed as an endophyte on rhodophytes.

Genus *Hyella* Born. *et* Flah.
***Hyella caespitosa* Born. *et* Flah., *J. Bot.* 2: 163. 1888 (Figs 22–24, 77–78)**

Description — Pseudofilaments straight or flexuous, thin (5.6–10.9 µm wide), lateral branching and sparse. Mucilaginous sheath thin and colourless. Intercalary cells square or narrowly oblong (3.5–5.6 µm wide, [2.5–] 5.1–39.7 µm long), protoplast homogeneous, blue-green or olive-green. Apical cells cylindrical, up to seven times longer than wide (4.3–7.4 µm wide, [10.9–]16.1–23.5 µm long). Nanocytes not observed.

Distribution in Moçambique — First record of occurrence of the genus.

This is the first report of euendolithic cyanophytes for Moçambique. The specimens were obtained from several mollusc shells, after removing the calcium carbonate using a 1% hydrochloric acid solution. The specimens resemble those reported by Le Campion-Alsumard and Golubić (1985) from the lower intertidal zone of the limestone coasts near Marseille, France.

Genus *Pleurocapsa* Thur. ex Hauck
***Pleurocapsa* cf. *minuta* Geitler, *Rabenh.'s Krypt.-Fl.* 14:355. 1932 (Figs 9–12, 74–75)**

Description — Cells irregularly grouped or forming pseudofilaments, distinct or not, uni or biseriate. Mucilaginous sheath thin, colourless. Cells subspheric, square or transversely elliptic (2.9–8.2 µm wide, 2.9–6.0 µm long), protoplast homogeneous, blue-green or brownish. Nanocytes not observed.

Distribution in Moçambique — First record of occurrence of the species.

The specimens from Moçambique resemble *Pleurocapsa minuta* Geitler (Geitler 1932, D'Hont and Coppejans 1988). The cells are slightly wider than in the type species, but this could be the result of the cultural conditions under which this alga was growing. According to Silva (1994), changes in cell size of *Pleurocapsa* sp. may be affected by cultural conditions such as light and temperature.

OSCILLATORIALES
Family Oscillatoriaceae
Genus *Oscillatoria* Vauch. ex Gom.
***Oscillatoria* cf. *curviceps* Ag. ex Gom., *Ann. Sci. Nat. 7, Bot.* 16: 213. 1892 (Figs 62–64, 76)**

Description — Trichomes single, straight or coiled, not attenuated or slightly attenuated at the apices, not constricted at the cross-walls. Cells wider than long (13.0–16.9 µm wide, 1.2–3.9 µm long), protoplast granular, dark olive-green or brown. Cross-walls not granulated. Terminal cells usually rounded.

Distribution in Moçambique — First record of occurrence of the species.

Family Phormidiaceae
Genus *Phormidium* Kütz. ex Gom.
cf. *Phormidium ambiguum* Gom., *Ann. Sci. Nat. 7, Bot.* 16: 178. 1892 (Figs 54–57, 79)

Description — Filaments entangled, curved (7.8–

8.6 µm wide), mucilaginous sheaths thin, colourless. Trichomes straight or somewhat curved, not constricted or slightly constricted at the cross-walls, cross-walls rarely granulated. Cells up to four times wider than long (6.4–7.8 µm, 2.1–3.4 µm long), protoplast homogeneous, rarely granulated. Terminal cells rounded.

Distribution in Moçambique — First record of occurrence of the species.

The alga from Moçambique differs from the type species by having thinner mucilaginous sheaths, often indistinct, except at the apices of the filaments and slightly wider trichomes.

***Phormidium* cf. *cebennense* Gom., *Bull. Soc. bot. Fr.* 46: 38. 1899 (Figs 30–36)**

Description — Filaments entangled or parallel. Mucilaginous sheaths rare, thin, colourless. Trichomes straight or somewhat flexuous, not constricted at the cross-walls. Cells usually as broad as long, rarely longer (2.1–2.5 µm wide, 2.1–2.5[–3.9] µm long), protoplast homogeneous, blue-green. Terminal cells rounded.

Distribution in Moçambique — First record of occurrence of the species.

The specimens morphologically resembled *Phormidium bohneri* Schmid and *P. cebennense* Gom. The similarity of the two species was earlier pointed out by Geitler (1932). *P. cebennense* was adopted here because of its prior date of publication.

***Phormidium okeni* (Ag. ex Gom.) Anagn. & Kom., *Arch. Hydrobiol.* Suppl. 80, 1–4; *Algol. Stud.* 50–53: 405. 1988 (Figs 51–53). Synonym: *Oscillatoria okeni* Ag. ex Gom., *Ann. Sci. Nat. 7, Bot.* 16: 232. 1892**

Discription — Filaments single or entangled. Mucilaginous sheaths rare, thin, colourless. Trichomes straight, slightly constricted at the cross-walls or not. Cells up to three times wider than long (5.1–7.0 µm wide, 1.6–2.9 µm long). Terminal cells obtuse, usually bent.

Distribution in Moçambique — First record of occurrence of the species.

Genus *Porphyrosiphon* Kütz. ex Gom.
***Porphyrosiphon martensianus* (Menegh. ex Gom.) Anagn. et Kom., *Arch. Hydrobiol.* Suppl. 80, 1–4; *Algol. Stud.* 50–53: 409. 1988 (Figs 65–67, 80). Synonym: *Lyngbya martensiana* Menegh. ex Gom., *Ann. Sci. Nat. 7, Bot.* 16: 145. 1892**

Description — Filaments straight or somewhat curved (9.6–14.9 µm wide). Mucilaginous sheaths thin, colourless. Trichomes not attenuated at the apices, not constricted at the cross-walls, crosswalls sometimes granular. Cells up to nine times wider than long (8.6–10.9 µm wide, 1.2–2.1 µm long), protoplast granular, brownish. Terminal cells rounded. Calyptra absent.

Distribution in Moçambique — Maputo: Sabiè (Rino 1972, as *Lyngbya martensiana* Menegh. ex Gom.); Inhaca Island, marine plankton (Silva and Cuamba 1991, as *L. martensiana*); on decomposing tree trunks (Silva 1991b, as *L. martensiana*).

Genus *Spirulina* Turp. ex Gom.
***Spirulina labyrinthiformis* (Menegh.) Gom., *Ann. Sci. Nat.7, Bot.*16: 255. 1892. (Figs 26, 81)**

Description — Trichomes irregularly coiled (1.2–1.3 µm wide). Spirals close to each other (2.1–2.9 µm wide). Protoplast homogeneous, blue-green.

Distribution in Moçambique — Maputo: Inhaca Island, North Coast, marine (Silva 1991a).

Genus *Symploca* Kütz. ex Gom.
***Symploca* sp. (Figs 37–42)**

Description — Filaments in bundles, straight or flexuous, sometimes parallel, agglutinated. Mucilaginous sheaths thin, colourless. Trichomes slightly constricted at the cross-walls, cross-walls not granulated. Cells as long as broad or up to $2\frac{1}{2}$–3 times longer (1.6–2.1 µm wide, 2.1–5.6 µm long), protoplast homogeneous, pale blue-green. Terminal cells rounded, capitate, with a thickened outer membrane.

The material collected in Moçambique resembles *Symploca elegans* Kütz. ex Gom., by the organization of the often agglutinated filaments and the width of cells. However, it differs by usually having thin sheaths and a capitate terminal cell covered by a thickened outer membrane, and by habitat.

Family Pseudanabaenaceae
Genus *Geitlerinema* Anagn.
***Geitlerinema* cf. *exile* (Skuja) Anagn., *Pl. Syst. Evol.* 164: 39. 1989 (Figs. 47–50, 82). Synonym: *Oscillatoria exilis* Skuja, *Nova Acta Reg. Soc. Sci. Upsal. Ser. 4* 18: 51. 1964**

Description — Trichomes single, straight, slightly attenuated at the apices, slightly constricted at the cross-walls, cross-walls not granulated. Cells usually square or oblong (4.3–4.7 µm wide, [2.1–]3.5–5.6[–7.0] µm

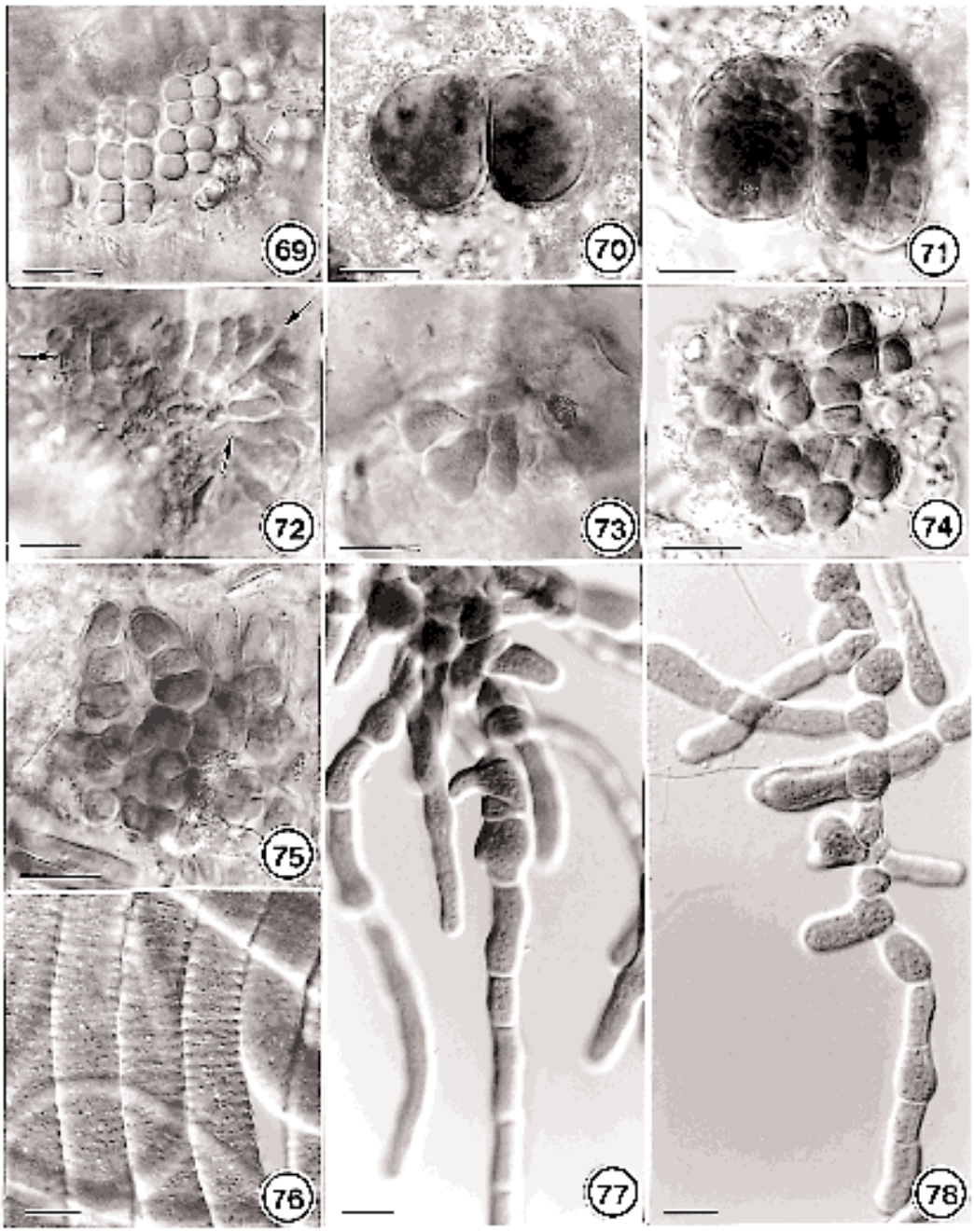


Fig. 69: *Merismopedia glauca*. Fig. 70: *Stanieria* cf. *cyanosphaera*. Fig. 71: *Myxosarcina concinna*. Figs 72–73: *Hydrococcus rivularis* (72: general aspect of epiphytic pseudofilaments, arrows; 73: detail of pseudofilaments). Figs 74–75: *Pleurocapsa* cf. *minuta*. Fig. 76: *Oscillatoria* cf. *curviceps*. Figs 77–78: *Hyella caespitosa* (detail of young organisms). Scale bar = 10 µm

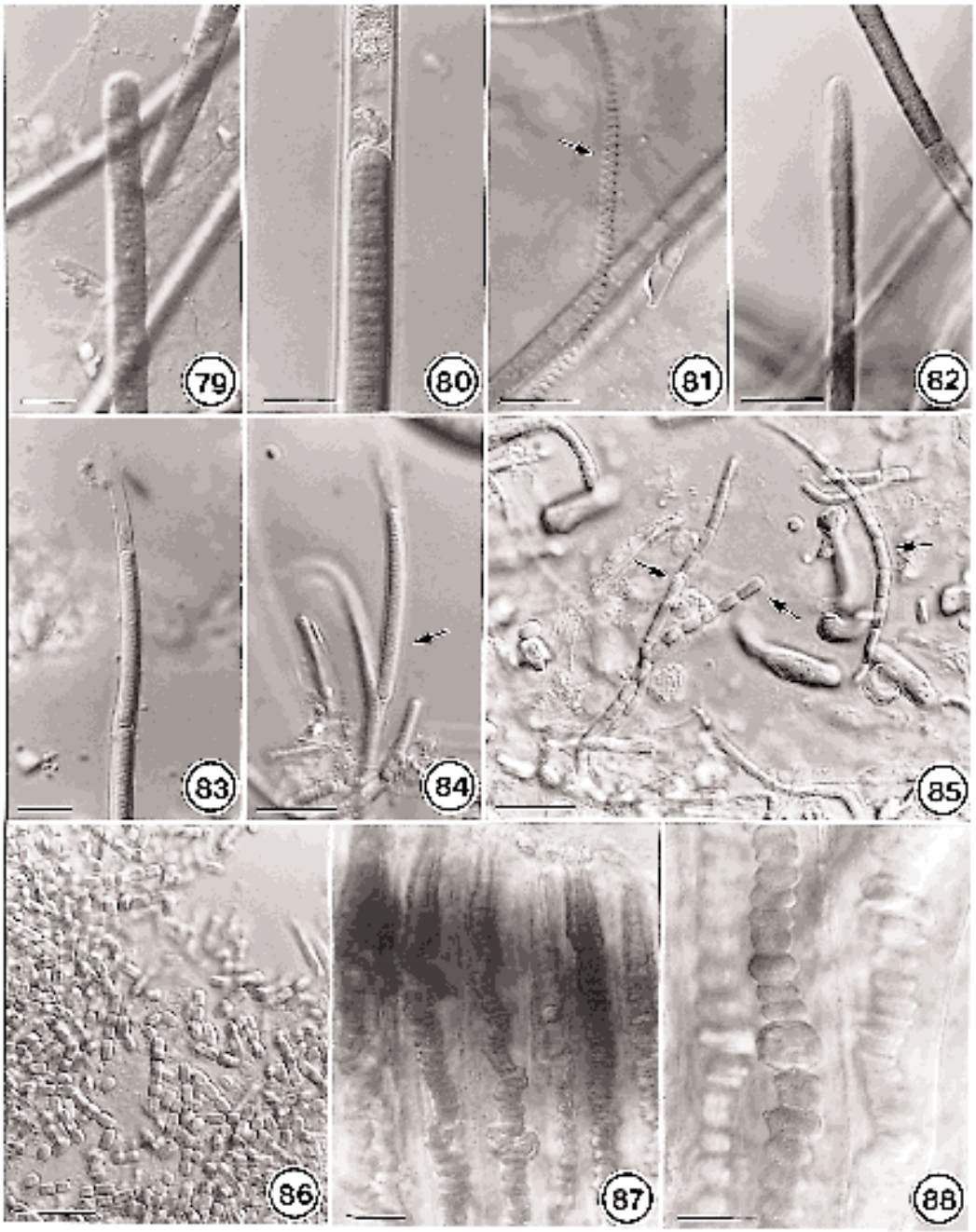


Fig. 79: cf. *Phormidium ambiguum*. Fig. 80: *Porphyrosiphon martensianus*. Fig. 81: *Spirulina labyrinthiformis* (arrow). Fig. 82: *Geitlerinema* cf. *exile*. Figs 83–84: *Leptolyngbya golenkiniana* (83: apex of a filament; 84: detail of a single branch, arrow). Fig. 85: *L. perelegans* (arrows). Fig. 86: *Pseudanabaena* sp. Figs 87–88: *Kyrtuthrix maculans* (87: general aspect of filaments; 88: detail of an intercalary heterocyte). Scale bar = 10 µm

long), protoplast homogeneous, blue-green. Terminal cells conical rounded, bent.

Distribution in Moçambique — First record of occurrence of the genus.

The material from Moçambique is similar to *Geitlerinema exile* (Skuja) Anagn, with the exception of the habitat and slightly wider cells than the type species. *Oscillatoria exilis* was first described by Skuja in 1964 (cited by Anagnostidis 1989) from Sweden, found growing between *Sphagnum* and bryophytes. In Moçambique, the material was found between sand grains and mollusc shells in the intertidal zone.

Genus *Jaaginema* Anagn *et* Kom.
cf. *Jaaginema pseudogeminatum* (Schmid) Anagn. *et* Kom., *Arch. Hydrobiol.* Suppl. 80, 1–4; *Algol. Stud.* 50–53: 393. 1988 (Figs 27–29). Synonym: *Oscillatoria pseudogeminata* Schmid, *Ber. dt. Bot. Ges.* 32: 124. 1914

Description — Trichomes entangled, straight or somewhat flexuous, not attenuated at the apices, not constricted at the cross-walls. Cross-walls not granulated. Cells usually as wide as long (2.8–3.8 µm wide, [1.6–] 2.4–4.6[–5.4] µm long), protoplast homogeneous, blue-green.

Distribution in Moçambique — Without precise location (Rino 1979, as *Oscillatoria pseudogeminata* Schmid).

The genus *Jaaginema* Anagn. *et* Kom. was recently proposed (Anagnostidis and Komárek 1988) to group several species of *Oscillatoria* Vaucher ex Gom. According to Anagnostidis and Komárek (1988), the taxonomy of this species is still unclear. The specimens under study had wider and longer cells than the type species (Geitler 1932: 1.3–2.2 µm wide, 2.6 µm long).

Genus *Leptolyngbya* Anagn. *et* Kom.
***Leptolyngbya golenkiniana* (Gom.) Anagn. *et* Kom., *Arch. Hydrobiol.* Suppl. 80; *Algol. Stud.* 50–53: 391. 1988 (Figs 58–61, 83–84). Synonym: *Plectonema golenkiniana* Gom., *Bull. Soc. Bot. Fr.* 46: 35. 1899**

Description — Filaments long, flexuous, branches single or geminate. Mucilaginous sheaths firm, thin, colourless, sometimes indistinct. Trichomes not constricted at the cross-walls. Cells up to three times wider than long (2.0–2.8 µm wide, 0.8–1.2 µm long), protoplast homogeneous, pale pink. Terminal cells rounded. Homogonia usually short, up to six cells.

Distribution in Moçambique — First record of occurrence of the species.

***L. perelegans* (Lemm.) Anagn. *et* Kom., *Arch. Hydrobiol.* Suppl. 80; *Algol. Stud.* 50–53: 392. 1988 (Figs 43–46, 85). Synonym: *Lyngbya perelegans* Lemm., *Abh. nat. Ver. Bremen* 16: 355. 1899**

Description — Filaments entangled, straight or flexuous, not attenuated at the apices, not constricted at the cross-walls. Cross-walls with a single granule on either sides. Cells up to $3\frac{1}{2}$ times longer than wide (1.6–2.0 µm wide, 3.4–6.2 µm long), protoplast homogeneous, pale olive-green. Terminal cells rounded.

Distribution in Moçambique — First record of occurrence of the species.

Genus *Pseudanabaena* Lauterb.
***Pseudanabaena* sp. (Figs 25, 86)**

Description — Trichomes short (up to 29.6 µm long), straight or somewhat flexuous. Cells square or up to $1\frac{1}{2}$ times longer (1.6–2.0 µm wide, 2.0–3.8 µm long), protoplast homogeneous, blue-green. Terminal cells conical, with rounded apices. Aerotopes terminal and intercalary.

Three species of the genus *Pseudanabaena* Lauterb. have already been described from Moçambique by Rino (1972, 1979), namely *P. catenata* Lauterb., *P. constricta* (Szafer) Lauterb. [=*Komvophoron constrictum* (Szafer) Anagn. *et* Kom.] and *P. papillaterminata* (Kispelev) Kukk. The specimens from Moçambique can be classified as belonging to the subgenus *Ilyonema* Anagn. *et* Kom., by the presence of terminal and intercalary aerotopes. The specimens resemble *P. biceps* Böcher. However, the type species has wider and longer cells and reddish disks at the cross walls (Böcher 1946). This is the first reference of *Pseudanabaena* from a marine habitat in Moçambique.

NOSTOCALES
Family Scytonemataceae
Genus *Kyrtuthrix* Erceg.
***Kyrtuthrix maculans* (Gom.) Umez., *Mem. Coll. Agric., Kyoto Univ. Fish. Ser.* 64. 1958 (Figs 68, 87–88)**

Description — Thallus caespitose, dark brown. Mucilaginous sheaths homogeneous, dark yellow in older parts, otherwise colourless. Filaments usually parallel (15.0–22.5 µm wide, up to 400 µm long). Cells transversally elliptic or oblong, usually wider than long (4.2–10.0 µm wide, 2.4–5.8 µm long), protoplast granular, blue-green. Heterocytes intercalary, square or subspheric (8.3–8.7 µm wide,

5.8–8.7 µm long). Hormogonia not observed.

Distribution in Moçambique — First record of the occurrence of the genus.

The material of *Kyrtuthrix maculans* Erceg. from Moçambique is very similar to those described by Le Campion-Alsumard (1979) and Komárek and Anagnostidis (1989).

SUMMARY

In all, 16 taxa constitute new records to Moçambique: eight at the generic level (*Geitlerinema, Hyella, Jaaginema, Kyrtuthrix, Leptolyngbya, Pleurocapsa, Porphyrosiphon* and *Stanieria*) and eight at the specific level (*Aphanothece* cf. *nidulans, Leptolyngbya golenkiniana, L. perelegans, Myxosarcina* cf. *concinna, Oscillatoria* cf. *curviceps*, cf. *Phormidium ambiguum, P.* cf. *cebennense,* and *P. okeni*). Endolithic cyanophytes have never been reported from Moçambican waters. Two genera, *Hyella* and *Kyrtuthrix,* were found growing in mollusc shells in the intertidal zone in Maputo. In Moçambique, *Phormidium formosum* and *Pseudanabaena* sp. have only been found in freshwater habitats.

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