

CARIBBEAN BRACKISH AND FRESHWATER CYANOPHYCEAE

by

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Among the extensive collections of algae made by Dr P. Wagenaar Hummelinck (Utrecht) in the Antilles and adjacent regions during the years 1930, 1936, 1937, 1948—1949, 1955, a number of chiefly brackish, but also freshwater, Cyanophyceae were incorporated. This collection was kindly committed for study to the author. She is indebted to Dr F. Drouet, who identified part of it. Most of the localities have been amply described by the collector (1940, 1953), who also included pictures of several localities in the same papers.

The map illustrating this paper was drawn by the collector. He also was so kind as to complete the descriptions of the localities in the present paper.

LIST OF THE LOCALITIES AND ANALYSES OF THE SAMPLES

The data concerning the localities sampled in 1930—1949 are derived from Wagenaar Hummelinck (1940, 1953). The localities visited in 1955 will be described and figured in a forthcoming volume of the "Studies on the Fauna of Curaçao and other Caribbean Islands".

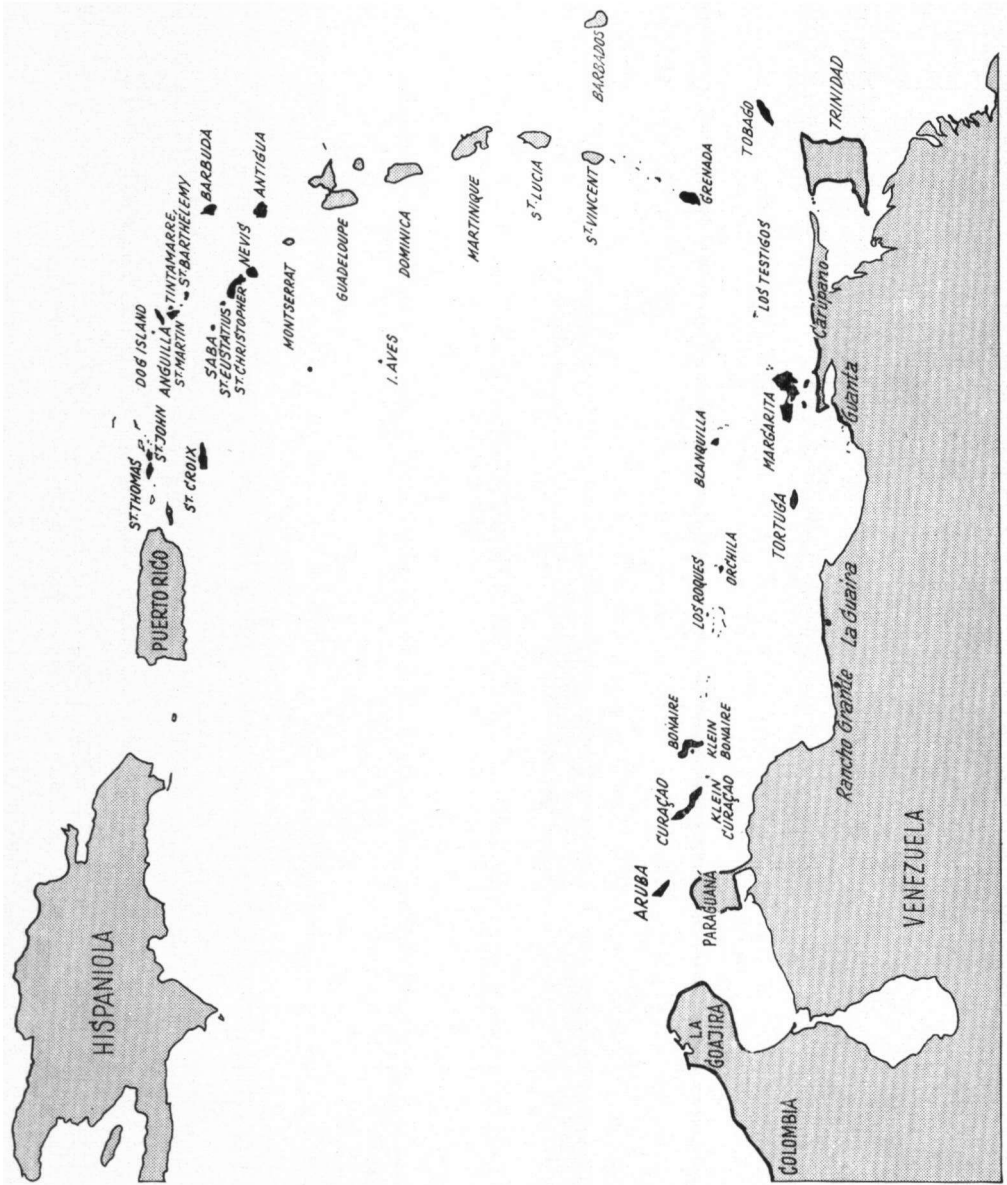
As Redeke's (p. 43) conception of brackish water is followed here, most of the localities concerned are considered brackish. For, that author draws the limit between fresh and brackish water at Cl 100 mg/l, and between brackish and seawater at Cl 17000 mg/l.

No mention has been made, as a rule, of the colour of the algae, since the material was received in formalin or alcohol. It is now preserved as *exsiccatae* in the Rijksherbarium at Leiden.

SOUTH AMERICAN MAINLAND

Colombia

- 114 LAGUNA DEL PÁJARO (La Goajira), very shallow pond, 300 × 200 × 1½ m, clayish mud; water clear, colourless, 26—32°C, HCO₃ 450 mg/l, total hardness 19 Germ.°, Cl 820 mg/l (brackish); 21 I 1937.



Map of the Antilles, with the adjacent part of the South American continent.
(Courtesy of Dr P. Wagenaar Hummelinck)

Gloeotrichia natans (Hedw.) Rabenh. ex Born. & Flah. — det. F. Drouet.

Together with *Oedogonium crispum* (Hass.) Wittr. var. *uruguayense* Magnus & Wille (Van den Hoek, p. 593); *Chara zeylanica* Willd. (Van den Hoek, p. 593), Najas.

Venezuela

553

RANCHO GRANDE (Aragua), Estación Biológico, small spring at Toma de Agua, 1200 m alt., among mosses; water clear, colourless Cl 110 mg/l (brackish); 18 III 1955.

Coccochloris stagnina Spreng., numerous, cells (without sheath) 5 μ diam., 6 μ long — fig. 1.

Coccochloris peniocystis (Kütz.) Drouet & Daily, abundant, cells 2 μ diam., somewhat curved, with rounded ends — fig. 4.

Lyngbya allorgei Frémy, numerous, transverse walls often indistinct, filaments 3 μ diam., cells 5 μ long — fig. 49.

Oscillatoria okenii Ag. ex Gom., fairly numerous, trichomes 6 μ diam., cells 2 μ long — fig. 77.

Together with *Vaucheria* (fairly numerous), Diatomeae (fairly numerous).

s.n.

MORRO DE ESMERARDA, West of Carúpano (Sucre), on moist schists in small cave near sea shore; 10 VI 1936.

Coccochloris elabens (Bréb.) Drouet & Daily (*Synechococcus elongatus* Naeg.), abundant, cells pale blue-green, cylindrical or oblong-elliptic, 2–3 μ diam., 5–10 μ , sometimes 13 μ , 16 μ and 30 μ long — fig. 3.

Entophysalis rivularis (Kütz.) Drouet (*Gloeocapsa dermochroa* Naeg.), abundant, forming irregular cell-rows, sheaths diaphanous, indistinctly lamellate, sometimes thick and asymmetrical, cells blue-green, spherical, sometimes nearly hemispherical or ellipsoid-spherical, with sheaths 5–7 μ diam., without sheaths 3–4 μ , usually 2 μ , sometimes 4 μ diam. Agrees with the type of *Gloeocapsa dermochroa* Naeg. — fig. 14.

Suriname

406

SWAMP AT KRÉPI, near Charlesburg, N of Paramaribo, ? 40 \times 25 \times 1 m, in shell bearing sand, swamp vegetation; water clear, slightly bluish, HCO₃ 30 mg/l, total hardness 3 Germ.^o, Cl 18 mg/l (fresh); 2 VIII 1948.

Tolypothrix lanata (Ag.) Wartm. ex Born. & Flah., abundant, filaments fairly sparsely branched, 12–17 μ diam., trichomes 5–8 (usually 8) μ diam., cells pale blue-green, 6–16 (rarely 22) μ long, heterocysts 1–3 in a row, up to 28 μ long — fig. 22.

Lyngbya aestuarii (Mert.) Liebm. ex Gom., fairly rare, often calcified, filaments 16–18 μ diam., trichomes 13 μ diam., cells 2.5 μ long.

Lyngbya martensiana Menegh. ex Gom., abundant, filaments 8–13 μ diam., sheaths rough at the outside, trichomes more or less

rounded, rarely attenuate-obtuse at the end, 5—6,5 μ diam., cells 3—5 μ long. The trichomes of this species are usually broader (6—10 μ), but from Puerto Rico Gardner has described a variety with 4,8—5 μ thick trichomes — *fig. 56*.

Together with Dinoflagellatae, Diatomeae, Hydrocotyle, Typha, Helicoma, Cyperus.

566

DECAYING PALM AT KABEL, near Suriname River, pool; water of about Cl 110 mg/l (brackish); 2 IX 1955.

Stigonema ocellatum (Dillw.) Thuret ex Born. & Flah., fairly numerous, filaments 27—32 μ diam., cells 16—18 μ diam.. Agrees well with Rabenhorst Alg. n. 2398. *Sirosiphon ocellatus* β *globosus* cited among the synonyms by Bornet & Flahault. These authors yet record thicker filaments for the species: filaments 35—45 μ diam., cells 20—30 μ diam. — *fig. 17*.

Hapalosiphon pumilus (Kütz.) Kirchner ex Born. et Flah., numerous. This material, as well as *Hapalosiphon* from Suriname 642 and 646, agrees with the description of *Hapalosiphon brasiliensis* Borge, which according to Drouet (1938, p. 638) is a synonym of *H. pumilus* (Kütz.) Kirchner ex Born. & Flah..

Scytonema coactile Mont. in Kütz. ex Born. & Flah., numerous, filaments 18—23 μ diam., trichomes 6—9 μ diam., cells usually longer than their diameters, in younger parts as long as or shorter. Bornet & Flahault record for the diameter of the filaments 18—24 μ , for that of the trichomes 12—18 μ . However, in the duplicate of the type in Herb. Kütz. from the Antilles ("in mari") the diameter of the filaments is 10—13 μ , that of the trichomes 7 μ . In *Scytonema coactile* var. *minor* Wille (in *Hedwigia* 53, 1913, p. 145) from Samoa Islands, the diameter of the filaments is 14 μ , that of the trichomes 10 μ . Thus the diameter of the filaments of *Scytonema coactile* seems to vary from 10 to 23 μ , that of the trichomes from 6—18 μ . *Scytonema fritschii* Ghose probably is a synonym of *S. coactile* — *fig. 21*.

Together with Oedogonium (numerous), Bulbochaete (fairly numerous), Spirogyra (numerous).

642

SWAMP OF BERSEBA, at Curupina Creek, Republiek, swamp vegetation on soft mud; water clear, Cl 109 mg/l (brackish); 3 IX 1955.

Hapalosiphon pumilus (Kütz.) Kirchner ex Born. & Flah., numerous, filaments of main axis 9—14 μ diam., of branches 5—6 μ diam., cells of main axis disc- or barrel-shaped or more or less spherical or cylindrical with rounded corners, 8—13 μ diam., 4,5—23 μ long, of the branches cylindrical, 4,5 μ diam., 11—32 μ long, sometimes 7 times as long as the diameter — *fig. 18*.

Lyngbya aestuarii (Mert.) Liebm. ex Gom., fairly numerous, sheaths yellowish brown, filaments 11 μ diam., cells 10 μ diam., 5 μ long.

646

DITCH AT KABEL, near Suriname River, swampy pool along railway with plant decay; water clear, Cl 107 mg/l (brackish); 2 IX 1955.

Hapalosiphon pumilus (Kütz.) Kirch. ex Born. & Flah., abundant, filaments of main axis 9—11 μ diam., of the branches 6—8 μ diam., cells cylindrical with rounded corners, 8 μ diam., 6—14 μ long, of the branches cylindrical, 3—4,5 μ , sometimes at the end up to 7 μ diam., 9—27 μ long, heterocysts 4—6 μ diam., 9—12 μ long — *fig. 19.*

Tolypothrix lanata (Desvaux) Wartm. ex Born. & Flah., not numerous, filaments 13—18 μ diam., trichomes 9—11 μ diam. — *fig. 23.*

Together with Oedogonium, Bulbochaete, Scenedesmus, Pediastrum, Desmidiaceae.

LESSER ANTILLES

Aruba

93b

FONTAINE, artificial pond at spring from cavern water, 20 \times 15 \times 1/2 m, mud, limestone rock and plant decay, with floating algae masses; water clear, colourless, HCO₃ 150 mg/l, total hardness 17 Germ.^o, Cl 460 mg/l (brackish); 30 XII 1948.

Anacystis montana (Lightf.) Drouet & Daily (*Microcystis marginata* (Menegh.) Kütz.), fairly numerous, colony spherical, cells crowded, 3 μ diam..

Anacystis dimidiata (Kütz.) Drouet & Daily (*Chroococcus turgidus* (Kütz.) Naeg.), fairly numerous, cells 18 μ diam.

Agmenellum quadruplicatum (Menegh.) Bréb., numerous, cells 4 μ diam., 4,5 μ long.

Gomphosphaeria aponina Kütz., fairly numerous, cells 6 μ diam., 9,5 μ long.

Oscillatoria limosa Ag. ex Gom., abundant, trichomes blue-green, 18 μ diam..

Spirulina subtilissima Kütz. ex Gom., numerous, windings 2,5 μ wide, not touching each other though very near, filaments 1 μ diam.. Together with *Rhizoclonium riparium* (Roth) Harvey (= *Rh. hieroglyphicum* (Ag.) Kütz., Van den Hoek, p. 593).

102A

POS DI NOORD, slowly flowing small pool at spring among diorite debris, sand and mud; water clear, almost colourless, 27—30°C, pH 8,6—8,8, HCO₃ 950 mg/l, total hardness 60 Germ.^o, Cl 3300 mg/l (brackish); 30 XII 1936.

Anabaena sphaerica Born. & Flah., fairly numerous, trichomes 5 μ diam., cells barrel-shaped, final cell conical, arthrospores elliptic, one on each side of a heterocyst.

Anabaena variabilis Kütz. ex Born. & Flah., abundant, trichomes 4—4,5 μ diam., cells barrel-shaped, final cell conical, arthrospores many in a row, spherical, 6 μ diam., heterocysts subspherical, 5 μ diam. — *fig. 29.*

Lyngbya aestuarii (Mert.) Liebm. ex Gom., abundant, filaments 14 μ diam., sheaths fairly thick, trichomes with rounded tips, cells very short.

Spirulina subsalsa Oersted ex Gom., fairly numerous, windings touching each other, 5 μ wide, filaments 2 μ diam..

Spirulina subtilissima Kütz. ex Gom., numerous, windings 4 μ wide, 2 μ distant, filaments 1 μ diam..
Together with numerous Diatomeae.

- 104 BRON DI ROOI PRINS, some slowly flowing water among rock debris near spring; water clear, colourless, about 29°C., pH 7,5—7,7, HCO₃ 600 mg/l, total hardness 36 Germ.°, Cl 1300 mg Cl/l (brackish); 9 I 1937.

Lyngbya semiplena (Ag.) J. Ag. ex Gom., numerous, filaments 9 μ diam..

Oscillatoria sancta Kütz. ex Gom., numerous, trichomes 10—11 μ diam., final cells sometimes with thickened wall — *fig. 66*.

- 104b Same locality, as before; water Cl 1780 mg Cl/l (brackish); 12 VIII 1955.

Lyngbya semiplena (Ag.) J. Ag. ex Gom., numerous, filaments 7—9 μ diam., cells $\frac{1}{5}$ — $\frac{1}{8}$ times as long as the diameter, final cell rounded — *fig. 50*. This species seems to have stucked to its habitat during 8 $\frac{1}{2}$ years.

Oscillatoria princeps Vauch. ex Gom., numerous, trichomes 32 μ diam., cells 4 μ long — *fig. 71*.

- 104A Same locality, some rapidly flowing water near spring, only several metres from sta. 104; water as in 104 (brackish); 9 I 1937 (Wagenaar Hummelinck, 1953, Pl. VIb).

Lyngbya aestuarii (Mert.) Liebm. ex Gom., numerous, filaments 13 μ diam., trichomes 12 μ diam., final cell rounded.

Lyngbya lutea (Ag.) Gom., numerous, filaments 4 μ diam., trichomes nearly 4 μ diam., cells $\frac{1}{3}$ times as long as the diameter, final cell rounded — *fig. 47*.

Together with numerous Diatomeae.

- 104Ba Same locality, almost stagnant pool, 3 \times 2 \times $\frac{1}{2}$ m, only several metres from sta. 104, mud and sand, leaf decay, many algae; water 28—30°C, Cl about 1000 mg/l (brackish); 4 VII 1930.

Anacystis montana (Lightf.) Drouet & Daily, numerous, cells 3—4 μ diam..

Entophysalis conferta (Kütz.) Drouet & Daily, numerous, on filamentous algae, cells 4—5 μ diam., with sheaths 5—8 μ long.

Lyngbya aestuarii (Mert.) Liebm. ex Gom., numerous, filaments 13—15 μ diam., trichomes 10 μ diam., cells 2,5—3,5 μ long — *fig. 42*.

Lyngbya major Menegh. ex Gom., rare, filaments somewhat constricted at the cell-walls, 28—33 μ diam., sheaths rough outside, trichomes 16—17 μ diam., cells 2,5 μ long — *fig. 60*.

- 104Bb Same locality, same pool, 8 \times 2 \times $\frac{1}{2}$ m; water clear, colourless, Cl about 1350 mg/l (brackish); 26 VIII 1949.

Gomphosphaeria aponina Kütz., few.

Lyngbya semiplena (Ag.) J. Ag. ex Gom., numerous, filaments 9 μ diam..

- Oscillatoria bonnemaisonii* Crouan ex Gom., few, trichomes 18—32 μ diam. — *fig. 65*.
 Together with fairly numerous Diatomeae.
- 104Bc Same locality, same pool, 3 \times 2 \times $\frac{1}{2}$ m; water rather clear, almost colourless, Cl 1780 mg/l (brackish); 12 VIII 1955.
Coccochloris stagnina Spreng., fairly numerous.
Agmenellum quadruplicatum Bréb., fairly numerous.
Entophysalis conferta (Kütz.) Drouet & Daily, abundant, on *Lyngbya martensiana*.
Gomphosphaeria aponina Kütz., few.
Lyngbya martensiana Menegh. ex Gom., abundant, filaments 7—12 μ diam., trichomes 5—8 μ diam., final cell obtuse, cells $\frac{1}{4}$ as long as the diameter; hormogonia have been formed, one case of false branching was seen. Gomont (p. 97) has mentioned such occasional phenomena already in *Lyngbya* — *fig. 55*.
- 638 POOL AT EAGLE COLONY, West of Oranjestad, small, cemented pool in garden, 2 \times 1 \times $\frac{1}{2}$ m, crowded with phanerogams; water clear, colourless, Cl 1720 mg/l (brackish); 22 VIII 1955.
Anabaena spec., sterile, few.
Lyngbya aestuarii (Mert.) Liebm. ex Gom., fairly numerous, filaments 20—23 μ diam., sheaths thick, yellowish brown inside, trichomes 12 μ diam. — *fig. 43*.
 Together with Pithophora, *Rhizoclonium riparium* (Roth) Harvey.
- 641 TANKI ANDIOURI, muddy pool, 50 \times 15 \times $1\frac{1}{2}$ m, deepest part in cocos garden, near sea shore; water turbid, Cl 3500 mg/l (brackish); 11 V 1955.
Anabaena spiroides Klebahn, fairly numerous, windings 25—28 μ wide, 18 μ distant, trichomes 7 μ diam., cells with pseudo-vacuoles, heterocysts spherical.
Anabaena spec., sterile, numerous.
Nodularia spumigena Mert. ex Born. & Flah., numerous, trichomes 9 μ diam., arthrospores 4—6 in a row — *fig. 31*.
Lyngbya aestuarii (Mert.) Liebm. ex Gom., abundant, filaments 11—14 μ diam., cells very short.
 Together with Diatomeae.
- C u r a ç a o
- 65A BAK DI HOFJE ARIBA, FUIK, cemented cistern, 4 \times 1 \times $\frac{1}{4}$ m, filled from deep well, many algae; water clear, colourless, 28—36°C, pH 8,6—8,8, HCO₃ 540 mg/l, total hardness 26 Germ.°, Cl 210 mg/l (brackish); 9 IX 1936.
Coccochloris stagnina Spreng. — det. F. Drouet.
Plectonema nostocorum Born. ex Gom. — det. F. Drouet.
 Together with Cosmarium.
- 66 TANKI DI CAS KLEIN St. JORIS, muddy pool, 12 \times 10 \times $1\frac{1}{2}$ m, plant decay; water rather clear, somewhat yellowish brown, 29—34°C, pH 8,5—9, HCO₃ 450 mg/l, total hardness 95 Germ.°, Cl 1980 mg/l (brackish); 6 IX 1936.

Lyngbya diguetii Gom., on *Pithophora oedogonia* (Mont.) Wittr. and sterile *Oedogonium* — det. F. Drouet.

- 68 PUDDLE AT PISCADERA, short-living sheet of rain water on limestone terrace $\frac{1}{4} \times \frac{1}{4} \times \frac{1}{10}$ m; water 29—36°C, pH 8,2—8,4, HCO₃ 190 mg/l, total hardness 8 Germ.°, Cl 40 mg/l (fresh); 10 X 1936.
Nostoc sphaericum Vauch. ex Born. & Flah. — det. F. Drouet.
- 74 BRON CAJOEDA, HATO, rapidly flowing water piped from spring into small basin, $\frac{1}{2} \times \frac{1}{10}$ m; water clear, colourless, 29°C, pH 8,2—8,4, HCO₃ 200 mg/l, total hardness 17 Germ.°, Cl 320 mg/l (brackish); 1 X 1936.
Coccochloris stagnina Spreng. — det. F. Drouet.
Schizothrix heufleri Grun. — det. F. Drouet.
Phormidium papyraceum (Ag.) ex Gom. — det. F. Drouet.
- 75 TANKI MAMAJA, HATO, muddy pond, 40 × 20 × 2 m; water clear, nearly colourless, 27—31°C, pH 8,6—8,8, HCO₃ 230 mg/l, total hardness 13 Germ.°, Cl 450 mg/l (brackish); 6 X 1936.
Anacystis montana (Lightf.) Drouet & Daily — det. F. Drouet.
Hydrocoleum spec. — det. F. Drouet.
Lyngbya aestuarii (Mert.) Liebm. ex Gom. — det. F. Drouet.
Together with *Spirogyra*, *Oocystis eremosphaeria* G. M. Smith, *Sphaerocystis schroeteri* Chodat, *Coelastrum cambricum* Archer, *Gloeotaenium loitlesbergianum* Hansg. (all Van den Hoek, p. 592); *Staurastrum*, *Najas*.
- 75a Same locality, same spot, pond 50 × 25 × 2 m; HCO₃ 225 mg/l, total hardness 12 Germ.°, Cl 380 mg/l (brackish); 11 X 1936.
Anacystis montana (Lightf.) Drouet & Daily — det. F. Drouet.
Together with *Pithophora oedogonia* (Mont.) Wittr., *Chara zeylanica* Willd. (both Van den Hoek, p. 592).
- 76D BRON WANDONGO, HATO, cemented trough with water piped from spring, crowded with leaf decay; water 29½°C, Cl 250 mg/l (brackish); 27 VIII 1955 (Wagenaar Hummelinck, 1940, T. Vb).
Phormidium autumnale (Ag.) ex Gom. — det. F. Drouet.
Oscillatoria splendida Grev. ex Gom., fairly few — det. F. Drouet.
- 79 BRON SAN PEDRO, S., cemented gutter with rapidly flowing water from spring; water clear, colourless, 30°C, pH 7,6—8,2½, HCO₃ 400 mg/l, total hardness 21 Germ.°, Cl 400 mg/l (brackish); 22 X 11936.
Lyngbya martensiana Menegh. ex Gom. — det. F. Drouet.
- 79B Same locality, cemented trough with water from spring, 5 × 1 × 1 m, some plant decay, considerable growth of algae; water clear and colourless, HCO₃ 335 mg/l, total hardness 15 Germ.°, Cl 390 mg/l (brackish); 13 II 1949.
Anacystis montana (Lightf.) Drouet & Daily — det. F. Drouet.
Lyngbya martensiana Menegh. ex Gom. — det. F. Drouet.

- Together with *Spirogyra submarina* (Coll.) Trans. (det. F. Drouet), abundant Diatomeae.
- 80Aa BRON SAN PEDRO, N., leaf decay of *Coccoloba uvifera*, moistened by percolating water from spring; water clear, HCO_3 360 mg/l, total hardness 22 Germ.°, Cl 495 mg/l (brackish); 13 II 1949.
Rivularia haematites (DC.) Ag. ex Born. & Flah. — det. F. Drouet.
- 80Ab Same locality, small basin of sinter near spring, just getting dry, wet mud (brackish); 11 III 1949.
Microcoleus chthonoplastes (Fl. Dan.) Thuret ex Gom. — det. F. Drouet.
- 83 POS ARIBA, DOKTERSTUIN, muddy pool, $15 \times 12 \times ?3$ m, leaf decay and many algae; water clear, dark-brownish-green, 28–33°C, pH 9.0–9.8?, HCO_3 680 mg/l, total hardness 41 Germ.°, Cl 710 mg/l (brackish); 27 X 1936.
Lyngbya martensiana Menegh. ex Gom. — det. F. Drouet.
- 86 POS SORSAKA, Christoffel area, shallow, small pool near spring in diabase debris, water turbid, brownish-yellow, slightly polluted by cattle, about 28°C, HCO_3 500 mg/l, total hardness 49 Germ.°, Cl 600 mg/l (brackish); 10 XI 1936.
Anacystis thermalis (Menegh.) Drouet & Daily — det. F. Drouet.
- 88a POS SJMARRÓN, Bron di Rooi Beroe, Savonet, stagnant pool near spring, among siliceiferous cherts; water clear, yellowish brown, HCO_3 790 mg/l, Cl 1490 mg/l (brackish); 23 XII 1948.
Lyngbya aestuarii (Mert.) Liebm. ex Gom. — det. F. Drouet.
- 89 TANKI DI HOEJE SAVONET, artificial pool, $12 \times 10 \times 1\frac{1}{2}$ m, diabase detritus and brickwork, crowded with algae; water rather clear, somewhat greenish, slightly polluted, 28–34°C, HCO_3 780 mg/l, total hardness 160 Germ.°, Cl 3200 mg/l (brackish); 29 X 1936.
Lyngbya lagerheimii (Moebius) Gom. ex Gom., numerous, filaments 2,6 μ diam., sheaths very thin, cells as long as the diameter or slightly longer — also det. F. Drouet — *fig. 40*.
Lyngbya aestuarii (Mert.) Liebm. ex Gom. — det. F. Drouet.
Lyngbya aerugineo-coerulea (Kütz.) ex Gom., fairly numerous, filaments 5 μ diam., trichomes 4 μ diam., cells pale blue, slightly shorter than the diameter to half as long as the diameter, final cell rounded — *fig. 52*.
The type of *Lyngbya aerugineo-coerulea* (Kütz.) ex Gom. is *Oscillaria aerugineo-coerulea* Kütz. (1843, p. 185). Gomont has studied a "specimen authenticum" in herb. Lenormand. Kützing mentions the trichomes to have a diameter of $\frac{1}{120}$ *linea parisiensis*, which is about 3,4 μ . The trichomes of the type (in Infusionen, Nordhausen), preserved in the Rijksherbarium, Leiden, appear to have a diameter of 4 μ , the filaments of 5 μ , the cells are 1,5–3 μ long. According to Kützing the cells are nearly as long as the dia-

meter: *articulis homogeneis, diametro subaequalibus*.¹ Gomont gives 4–6 μ for the diameter of the trichomes, and nearly as long as or half as long as the diameter for the length of the cell. From Kützing's drawings (1845–1849, T. 39 fig. IX) the cells seem to have a length of $\frac{1}{2}$ – $\frac{2}{3}$ \times the diameter which agrees with the measurements of the type. Kützing recorded the trichomes of *Oscillaria aerugineo-coerulea* to have an acuminate tip: *apiculo acuminato*. When studying the type one finds several trichomes escaped from the sheaths, having attenuate obtuse tips, but those which remained in the sheaths have rounded tips — *fig. 51*.

Oscillatoria limosa Ag. ex Gom., fairly numerous, trichomes 13–20 μ diam., 2,5 μ long.

Oscillatoria princeps Vauch. ex Gom. — det. F. Drouet.

Spirulina subtilissima Kütz. ex Gom., numerous, windings 2 μ wide, 1 μ distant, filaments 0,6 μ diam., cells pale blue.

Spirulina major Kütz. ex Gom., numerous, windings 4 μ wide, 2–3 μ distant, filaments 2 μ diam., cells pale blue — *fig. 78*.

Together with *Oedogonium howardii* West, *Spirogyra fluviatilis* Hilse, *Chara zeylanica* Willd. (all Van den Hoek, p. 592).

- 389 POOL AT CAS CORÁ, Agr. Exp. Station, concrete basin, 5 \times 1 $\frac{1}{2}$ \times 1 m, some plant decay, growth of Nymphaea; water clear, colourless, HCO₃ 480 mg/l, total hardness 340 Germ.°, Cl 690 mg/l (brackish); 11 XII 1948.

Agmenellum quadruplicatum (Menegh.) Bréb., rare, cells 2,5 \times 3 μ .

Schizothrix calcicola (Ag.) ex Gom., abundant, filaments more or less twisting, no branching found, filaments 3–40 μ diam., sheaths lamellate, containing 1–2 (usually 1), sometimes 3 or 4 trichomes, trichomes 1,5–2 μ diam., cells 5–9 μ long, final cell subacute or obtuse — *fig. 36*.

- 391 POOLS NEAR JULIANADORP, from Chinese gardens, concrete basins, 2 \times 1 \times $\frac{1}{2}$ m, some detritus; water rather clear, colourless, Cl estimated 600–1000 mg/l (brackish); leg. J. G. de Jong, 4 I 1950.

Anacystis montana (Lightf.) Drouet & Daily — det. F. Drouet.

Rivularia haematites (DC.) Ag. ex Born. & Flah. — det. F. Drouet.

Calothrix parietina (Naeg.) Thuret ex Born. & Flah. — det. F. Drouet.

Together with *Pithophora aequalis* Wittr., *Pithophora polymorpha* Wittr., *Rhizoclonium riparium* (Roth) Harvey (= *Rh. hieroglyphicum* (Ag.) Kütz.), all Van den Hoek, p. 592.

- 396c TANKI DI TERRA CORÁ, muddy pool, 3 \times 2 $\frac{1}{2}$ \times $\frac{1}{10}$ m; water turbid, greyish, 29–33°C, HCO₃ 240 mg/l, total hardness 15 Germ.°, Cl 480 mg/l (brackish); 11 II 1949.

¹ *dimidiatus*, the following word, may indicate that the cells were measured after division, for, on p. 186 n. 15 of the same book we find: *articulis diametro duplo brevioribus, dimidiatis*, which seems to prove that *dimidiatus* cannot be meant to indicate here half as long as.

- Oscillatoria princeps* Vauch. ex Gom. — det. F. Drouet.
 Together with *Ruppia*, *Spirogyra*, *Chara* (dry in March—August).
- 397a TANKI MARTHA KOOSJE, near Kleine Berg, muddy pool, 35 × 25 × 1½ m, much algae; water slightly turbid, greyish, 27—29°C, pH 9, HCO₃ 305 mg/l, total hardness 8 Germ.°, Cl 125 mg/l (brackish); 1 XII 1948.
Coccochloris stagnina Spreng. — det. F. Drouet.
 Together with *Sphaerocystis Schroeteri* Chodat, *Oedogonium capitellatum* Wittr., *Oed. howardii* G. S. West, *Zygnemopsis americana* Transeau, *Spirogyra nitida* (Dillw.) Link (all Van den Hoek, p. 592), *Najas*.
- 397c Same locality; water 28—29°C, pH 9, HCO₃ 120 mg/l, total hardness 16 Germ.°, Cl 280 mg/l (brackish); 11 II 1949.
Gloeotrichia pisum (Ag.) Thuret ex Born. & Flah. — det. F. Drouet.
 Together with *Oedogonium infinum* Tiffany, *Oed. howardii* G. S. West, *Spirogyra pseudospretiana* Jao, *Sp. fuellebornii* Schmidle (all det. Van den Hoek), *Chara*, *Najas*, *Echinodorus*.
- 398 TANKI NOBO DI MALPAYS, muddy pool, dug a few months ago, 50 × 10 × 1½ m; water turbid, greyish brown, HCO₃ 275 mg/l, total hardness 10 Germ.°, Cl 120 mg/l (brackish); 28 X 1948.
Lyngbya aestuarii (Mert.) Liebm. ex Gom. — det. F. Drouet.
Lyngbya versicolor (Wartm.) ex Gom. — det. F. Drouet.
- 399 POS CAJOEDA, Knip, puddle in dry river bed, 2 × 1½ × 1/5 m, mud, rock debris of siliciferous shales, much leaf decay; water rather clear, greenish, 33°C, HCO₃ 240 mg/l, total hardness 23 Germ.°, Cl 390 mg/l (brackish); 17 VIII 1948.
Amphithrix janthina (Mont.) ex Born. & Flah., numerous — det. F. Drouet.
Oscillatoria limosa Ag. ex Gom., abundant, trichomes 13—16 μ diam., cells brown, 1/4—1/6 × as long as the diameter, final cell rounded, with thickened wall — *fig. 68*.
 Together with *Stigeoclonium*.

Klein Curaçao

- 64 Pos (well), N of lighthouse, basin in limestone, 1 × 1 × 1/2 m; water rather clear, somewhat brownish-green, 28—33°C, pH 7.9—8.2, HCO₃ 430 mg/l, total hardness 19 Germ.°, Cl 530 mg/l (brackish); 29 VIII 1936.
Gomphosphaeria aponina Kütz. — det. F. Drouet.
Lyngbya versicolor (Wartm.) ex Gom. — det. F. Drouet.
- 387 Pos (well), N of lighthouse, basin in limestone, 1½ × 1½ × 1/2 m; considerable growth of algae; water clear, colourless, HCO₃ 305 mg/l, total hardness 17 Germ.°, Cl 725 mg/l (brackish); 1 X 1948.
Lyngbya aestuarii (Mert.) Liebm. ex Gom. — det. F. Drouet.
Lyngbya versicolor (Wartm.) ex Gom. — det. F. Drouet.

Bonaire

- 44 POS BRONSWINKEL, overflowing well, $8 \times 8 \times 2$ m, in porphyrite, rock debris, mud, and leaf decay, crowded with algae; water clear, nearly colourless, $28-30^{\circ}\text{C}$, pH 7.5—8, HCO_3 420 mg/l, total hardness 14 Germ. $^{\circ}$, Cl 530 mg/l (brackish); 27 III 1937.

Lyngbya aestuarii (Mert.) Liebm. ex Gom., numerous.

Lyngbya martensiana Menegh. ex Gom. var. *minor* Gardner, numerous, trichomes 5μ diam., cells $\frac{1}{3}-\frac{1}{8} \times$ as long as the diameter.

Together with *Microspora stagnorum* (Kütz.) Lagerh. (Van den Hoek, p. 591).

- 44b Same locality, as before, crowded with algae and phanerogams; Cl 560 mg/l (brackish); 23 VIII 1955.

Lyngbya aerugineo-coerulea (Kütz.) ex Gom., fairly numerous, filaments 5μ diam., trichomes 4μ diam., cells $1.5-2 \mu$ long, final cell rounded, somewhat thickened — fig. 53.

Oscillatoria limnetica Lemm., fairly numerous, trichomes 2μ thick, slightly constricted at the cell-walls, cells $5-6 \mu$ long, final cell obtuse — fig. 75.

- 44Aa BRON DI POS BRONSWINKEL, a little water seeping from below pieces of rock and flowing to the Pos (well), muddy sand with sheets of algae; water clear, colourless, Cl about 550 mg/l (brackish); 23 VIII 1955.

Microcoleus cavanillesii Guerrero, numerous, sheaths indistinct, fairly thick, outside rough, trichomes $2-15$ in a sheath, parallel or spirally twisted, 3μ diam., cells $1\frac{1}{2} \times$ as long as the diameter, transverse walls indistinct, final cell long and tapering, very acute — fig. 35. This species is very near *Microcoleus acutissimus* Gardner emend. Drouet, as Guerrero noticed already. In the type the sheaths contain $1-8$ trichomes; in Hummelinck's material from sta. 44Aa $2-15$, and in *M. acutissimus* up to 30. In the type the trichomes are $2.5-3 \mu$ diam., the cells circa $2 \times$ as long as the diameter, in Wagenaar Hummelinck 44Aa the trichomes are 3μ diam., the cells $1\frac{1}{2} \times$ as long as the diameter, and in *M. acutissimus* the trichomes are $1.7-2.3 \mu$ diam., the cells are $2-3\frac{1}{2} \times$ as long as the diameter. The type was found growing in a river, Wagenaar Hummelinck 44Aa was collected in a very small spring, and *M. acutissimus* on walls, rocks, etc..

- 45 DOS POS, rather deep artificial well, $4 \times 3 \times ?5$ m, in non-calcareous rock, frequently stirred; water clear, colourless, $27-30^{\circ}\text{C}$, pH 7.5—7.7, HCO_3 520, total hardness 20 Germ. $^{\circ}$, Cl 450 mg/l (brackish); 27 III 1937.

Anabaena variabilis Kütz. ex Born. & Flah., fairly numerous, cells 4μ diam., arthrospores young — fig. 30.

Lyngbya aestuarii (Mert.) Liebm. ex Gom., numerous.

- 48 BRON FONTEIN, some flowing water in cemented gutter near spring on cavern water, among some leaf decay in the shade; water

clear, colourless, about 28°C, pH about 8,3, HCO₃ 350 mg/l, total hardness 22 Germ.°, Cl 350 mg/l (brackish); 13 XI 1936.

Anacystis montana (Lightf.) Drouet & Daily, abundant, cells with sheath 5—8 μ diam., without sheath 2—4 μ diam. — *fig. 5*.

Anacystis dimidiata (Kütz.) Drouet & Daily, fairly numerous, cells with sheath 16 μ diam., without sheath 10 μ diam. — *fig. 6*.

Johannesbaptistia pellucida (Dickie) W. R. Taylor & Drouet, rare, sheaths indistinct, cells 3—4 μ diam., 1/2 × as long as the diameter — *fig. 9*.

Entophysalis rivularis (Kütz.) Drouet & Daily, fairly numerous, cells usually 2 in a sheath, sometimes single, sometimes 4, globular, with sheath 5 μ diam., without sheath 2—3 μ diam. — *fig. 15*.

Calothrix braunii Born. & Flah., fairly numerous, filaments 16 μ diam. at the base, sheaths golden brown inside, hyaline outside, lamellate especially at the base, trichomes 10 μ diam. at the base, transverse cell-walls indistinct, cells as long as the diameter or somewhat longer or shorter, heterocysts basal, hemispherical, 10—12 μ diam. — *fig. 27*.

Schizothrix lardacea (Ces.) ex Gom., abundant, filaments without branches, containing only one trichome, twisted, intertwined, tapering towards the top, 3—4 μ diam., trichomes usually 2 μ, sometimes 1,5 μ diam., cells 2—3 1/2 × as long as the diameter, final cell slightly attenuate, obtuse — *fig. 37*.

Lyngbya aestuarii (Mert.) Liebm. ex Gom., fairly numerous, filaments 10—13 μ diam., sheaths lamellate, trichomes 6—10 μ diam., cells 3,5 μ long.

52 POS ICH, S of Kralendijk, muddy hole in limestone, 3 × 1 × 1/2 m; water turbid, brownish-yellow, 28—34°C, pH 7,9—8,1, HCO₃ 190 mg/l, total hardness 10 Germ.°, Cl 160 mg/l (brickish); 14 XI 1936.

Nostoc sphaericum Vauch. ex Born. & Flah., trichomes sometimes short, 4 μ diam., cells globular — *fig. 33*.

52d Same locality; HCO₃ 395 mg/l, total hardness 16 Germ.°, Cl 90 mg/l (fresh); leg. Frater Arnoldo, 27 XII 1948.

Schizothrix vaginata (Naeg. in Kütz.) ex Gom., filaments fairly much branched, containing usually one to many trichomes in a broad sheath, sometimes one trichome in a narrow sheath, trichomes 3 μ diam., cells 1—1 1/2 × as long as the diameter, final cell obtuse — *fig. 38*.

52e Same locality; 2 × 1 × 1/3 m; water turbid, greyish brown, slightly polluted, pH about 8,7, HCO₃ 240 mg/l, total hardness 12 Germ.°, Cl 90 mg/l (fresh); 21 II 1949.

Lyngbya kuetzingii Schmidle, abundant, filaments rigid, short, 18—27 μ long, 3 μ diam., cells very short — *fig. 39*.

53c POS BACA, S of Kralendijk, rather artificial hole in limestone, 1 1/2 × 1 1/2 × 1/2 m, rock and black mud, many algae; water clear, slightly greenish, HCO₃ 165 mg/l, total hardness 54 Germ.°, Cl 2580 mg/l (brackish); 16 IX 1948.

Gomphosphaeria aponina Kütz., fairly few.

Entophysalis conferta (Kütz.) Drouet & Daily, numerous, epiphytic on *Rhizoclonium riparium* and *Lyngbya aestuarii*, sparsely or densely growing, cells 4—5 μ diam., 6—18 μ long, exospores 1—4 — fig. 11.

Lyngbya kuetzingii Schmidle, numerous, attached to Spirogyra, filaments 2,5 μ diam., 10—60 μ long, sheaths narrow, cells 1 μ diam..

Lyngbya aestuarii (Mert.) Liebm. ex Gom., fairly numerous, filaments 10—33 μ diam., sheaths yellowish brown, thick, lamellate, rough outside, trichomes 8—12 μ diam., cells 2—3 μ long, final cell with somewhat thickened wall, hormogones formed — fig. 44.

Oscillatoria princeps Vauch. ex Gom., numerous, trichomes 27—44 μ diam., often curved at the top, cells 4—8 diam., $1/4$ — $1/8$ \times as long as the diameter — fig. 72.

Together with *Rhizoclonium implexum* (Dillw.) Kütz. (= *Rh. hieroglyphicum* (Van den Hoek, p. 591).

- 54b POS BACA ЧИКРТОЕ, muddy puddle in sink hole near Pos Baca, $3/4 \times 1/2 \times 1/2$ m; water turbid, greyish, HCO_3 395 mg/l, total hardness 17 Germ. $^\circ$, Cl 230 mg/l (brackish); leg. Frater Arnoldo, 27 XII 1948.

Lyngbya martensiana Menegh. ex Gom., numerous filaments 8—10 μ diam., sheaths rough outside, trichomes 5—7 μ diam., cells slightly shorter than the diameter — fig. 57.

- 57c POS CARANJA, natural hole in limestone with cavern water, $4 1/2 \times 2 \times 1$ (—3) m, tidal movements, rock and soft black mud; water clear, colourless, HCO_3 180 mg/l, total hardness 21 Germ. $^\circ$, Cl 620 mg/l (brackish); 5 IX 1948.

Entophysalis rivularis (Kütz.) Drouet & Daily, numerous, cells 3—4 μ diam..

Lyngbya aerugineo-coerulea (Kütz.) ex Gom., numerous, filaments 6 μ diam., trichomes 4 μ diam., transverse walls often indistinct, cells about as long as diameter.

- 57d Same locality, pH 7,4, Cl 3330 mg/l (brackish); 21 II 1949.

Microcoleus chthonoplastes (Fl. Dan.) Thur. ex Gom., fairly numerous.

- 58b POS FRANCÉS, E of Punt Vierkant, waterhole in limestone, $1/2 \times 1/2 \times 1/4$ m mud; water slightly turbid, Cl 740 mg/l (brackish), 1 IV 1955.

Nostoc spec., very young, rare.

Lyngbya aestuarii (Mert.) Liebm. ex Gom., fairly few, trichomes 8—9 μ diam..

Lyngbya diguetii Gom., numerous, filaments 3 μ diam., sheaths very narrow, cells about as long as the diameter.

Lyngbya aerugineo-coerulea (Kütz.) ex Gom., fairly few, filaments 4,5 μ diam., cells about as long as the diameter.

Oscillatoria okenii Ag. ex Gom., numerous, trichomes 4,5—6 μ diam. (according to Gomont 16, p. 232: 5,5—9 μ , according to Geitler (1932, p. 969) in var. *gracilis* Kütz.: 4—5 μ diam.).

Together with few Diatomeae.

- 58c Same locality, water rather clear, slightly greenish, Cl 1100 mg/l (brackish); 18 VIII 1955.
Lyngbya diguetii Gom., numerous, also growing among *Phormidium tenue* — fig. 48.
Lyngbya martensiana Menegh. ex Gom., numerous, trichomes 5–6 μ diam. (according to Gomont 16, p. 145: 6–10 μ diam.), cells $\frac{1}{4}$ — $\frac{1}{3}$ \times as long as the diameter — fig. 59.
Phormidium tenue (Menegh.) ex Gom., numerous, filaments, 4 μ diam., trichomes 2–3 μ diam., somewhat constricted at the transverse walls, cells somewhat shorter than the diameter to twice as long as the diameter — fig. 62.
- 60b POS LANSBERG, S, waterhole in limestone, 1 \times $\frac{3}{4}$ \times $\frac{1}{10}$ m, soft mud, many algae; water rather clear, colourless, slightly polluted, Cl 8860 mg/l (brackish); 21 IX 1948.
Coccochloris stagnina Spreng., cells 4 μ diam..
Microcoleus chthonoplastes (Fl. Dan.) Thuret ex Gom., abundant, trichomes 4,5 μ diam..
Lyngbya aestuarii (Mert.) Liebm. ex Gom., numerous, trichomes 9 μ diam..
- 378 KRALENDIJK, sheet of water, 3 \times 2 \times $\frac{1}{5}$ m, drying, mud and rock; water turbid, slightly greenish, 31°C, pH about 9, HCO₃ 480 mg/l, total hardness 6 Germ.°, Cl 195 mg/l (brackish); 24 II 1949.
Nostoc sphaericum Vauch. ex Born. & Flah., trichomes short, curved straight, fairly crowded, 5 μ diam., heterocysts 6 μ diam. — fig. 34.
- 379a POS BACA GRANDI, S of Kralendijk, shallow sinkhole in limestone, 8 \times 7 \times $\frac{1}{10}$, clayish mud; water clear, slightly greyish, HCO₃ mg/l, total hardness 34 Germ.°, Cl 1260 mg/l (brackish); 16 IX 1948.
Coccochloris stagnina Spreng., abundant, cells numerous, densely crowded, sheaths often indistinct, cells 3–3,5 μ diam., 4,5–6 μ long — fig. 2.
Agmenellum quadruplicatum Bréb., few.
Anacystis thermalis (Menegh.) Drouet & Daily, numerous.
Lyngbya lagerheimii Gom., abundant.
Lyngbya aerugineo-coerulea (Kütz.) ex Gom., few, filaments 6 μ diam., cells 3 μ long.
Oscillatoria obtusa Gardn., few.
Spirulina subtilissima Kütz. ex Gom., abundant.
 Together with much *Chara zeylanica* Willd. (Van den Hoek, p. 391), much *Eleocharis*, some *Ruppia*.
- 379b Same locality; water clear, HCO₃ 180 mg/l, total hardness 15 Germ.°, Cl 240 mg/l (brackish); leg. M. Arnoldo Broeders, 27 XII 1948.
Coccochloris stagnina Spreng., abundant, cells crowded, sheaths thick, cells 3–3,5 μ diam., 5–6 μ long.
Agmenellum quadruplicatum Bréb., numerous, cells 3 μ diam., 4,5 μ long.

Anacystis dimidiata (Kütz.) Drouet & Daily, numerous, cells without sheaths 22,5 μ diam., 31—36 μ long — *fig. 7*.

Lyngbya lagerheimii Gom., abundant, filaments usually irregularly here and there sparsely twisted, trichomes 2 μ diam., cells 2 \times as long as the diameter; according to Gomont 16, p. 147—148: cells 1,2—3 μ long.

Oscillatoria obtusa Gardn., numerous, trichomes remarkably long, 25 μ diam., cells 4,5 μ long. This species has much similarity with *O. limosa*, but its trichomes are extremely long and 3 μ thicker — *fig. 70*.

Spirulina subtilissima Kütz. ex Gom., few, windings not touching each other, 1 μ distant, 2 μ wide, filaments circa 1 μ diam.. Together with much *Chara zeylanica* Willd. f. *trichacantha* (A. Braun) H. & J. Groves (Van den Hoek, p. 591), much *Eleocharis*, some *Ruppia*.

379c Same locality, almost dry; water clear, HCO₃ 150 mg/l, total hardness 37 Germ.°, Cl 1820 mg/l (brackish); 21 II 1949.

Coccochloris stagnina Spreng., abundant, cells 3 μ diam., 6 μ long.

Lyngbya lagerheimii Gom., numerous also in sheaths of colonies of *Coccochloris stagnina*, irregularly undulate or twisted, filaments 2 μ diam., cells longer than the diameter — *fig. 41*.

Spirulina subtilissima Kütz. ex Gom., fairly numerous, windings not touching each other, 2 μ wide, 0,7 μ diam.. Together with dense growth of *Eleocharis geniculata* (L.) R. & S. (*E. capitata* R. Br.).

Though the salinity of the water of this locality changed from Cl 1260 mg/l to Cl 240 mg/l in two months the algal vegetation did not alter much. Two months later, when the salinity was mounted up to Cl 1820 mg/l again, still three of the original eight species remained: *Coccochloris stagnina*, *Lyngbya lagerheimii*, *Spirulina subtilissima*.

381 POOL NE OF PUNT VIERKANT, sheet of water on limestone, 15 \times 15 \times 175 m, mud and rock; water clear, colourless, HCO₃ 240 mg/l, total hardness 14 Germ.°, Cl 210 mg/l (brackish); 5 IX 1948.

Anacystis montana (Lightf.) Drouet & Daily, few.

Aulosira laxa Kirchn. ex Born. & Flah., abundant, filaments 6,5 μ diam., trichomes 4,5 μ diam., cells 2 to 3 \times as long as the diameter, arthrospores lacking — det. F. Drouet — *fig. 24*.

Nostoc sphaericum Vauch. ex Born. & Flah., fairly numerous, trichomes 14 μ diam.

Microcoleus chthonoplastes (Fl. Dan.) Thuret ex Gom., few, trichomes 10 to numerous in a sheath, sheaths 32 μ diam., trichomes 4 μ diam., cells twice as long as the diameter, cells 2 \times as long as the diameter.

Lyngbya martensiana Menegh. ex Gom., fairly numerous, filaments 12 μ diam., trichomes 7 μ diam., cells 2 μ long.

- 384 POS FLAMBAAL, near Zuidpunt narrow hole in limestone, $\frac{2}{3} \times \frac{2}{3} \times \frac{3}{5}$ m, rock debris with thin coating of algae; water clear, almost colourless, Cl estimated at 1000—1200 mg/l (brackish); 31 IX 1948.

Lyngbya martensiana Menegh. ex Gom., numerous, filaments 9 μ diam., trichomes 8 μ diam., cells 3.5 μ long.

Oscillatoria brevis Kütz. ex Gom., fairly numerous, trichomes 5—6 μ diam..

- 628 TANKI DI SABANA KRALENDIJK, E of Pos Ichi, drying sheet of water on low limestone plateau, about $30 \times 80 \times \frac{2}{5}$ m, among *Conocarpus*; water rather clear, Cl 11200 mg/l (brackish); 16 IV 1955.

Lyngbya aestuarii (Mert.) Liebm. ex Gom., numerous.

Together with *Chara hornemannii* Wallmann (Van den Hoek, p. 591), *Ruppia*, *Eleocharis*.

- 628A Same locality, pool of water, about $20 \times 30 \times \frac{1}{3}$ m; dry a few weeks ago, mud, floating sheets of algae; Cl 11900 mg/l (brackish); 22 VIII 1955.

Anacystis dimidiata (Kütz.) Drouet & Daily, few.

Johannesbaptistia pellucida W. R. Taylor & Drouet, fairly numerous, filaments 7 μ diam., cells 5 μ diam. — *fig. 10*.

Lyngbya aestuarii (Mert.) Liebm. ex Gom., fairly numerous, trichomes 10—14 μ diam., cells 2 μ long.

Lyngbya aerugineo-coerulea (Kütz.) ex Gom., fairly numerous, filaments 5 μ diam., trichomes 4.5 μ diam., cells half as long as the diameter.

Phormidium luridum (Kütz.) ex Gom., abundant, trichomes 1.5—2 μ diam., cells 4.5 μ long — *fig. 64*.

Oscillatoria sancta Kütz. ex Gom., numerous, trichomes constricted at the transverse walls, 9.5—14 μ diam., cells 3 μ long — *fig. 67*. Together with fairly numerous Diatomeae, much *Chara* and *Ruppia*.

Klein Bonaire

- 61b POS DI CAS, cavern water, $6 \times 2 \times 1$ (—2?) m, in sink hole with soft black mud, polluted by goat faeces; water clear, almost colourless, HCO_3 480 mg/l, total hardness 37 Germ.°, Cl 620 mg/l (brackish); 7 IX 1948.

Entophysalis conferta (Kütz.) Drouet & Daily, numerous, epiphytic on *Rhizoclonium implexum* and *Lyngbya aestuarii*, cells more or less globular, with sheaths 5—13 μ diam., sheaths thin, endospores 2.5—4 μ diam. — *fig. 12*.

Lyngbya aestuarii (Mert.) Liebm. ex Gom., abundant, filaments 12—18 μ diam., trichomes 8—10 μ diam., cells 1—3 μ long, final cell slightly attenuate, rounded — *fig. 45*.

Lyngbya kützingii Schmidle, fairly numerous, epiphytic on *Lyngbya aestuarii*, filaments 2 μ diam., 16—130 μ long, cells about as long as the diameter, transverse walls indistinct.

Oscillatoria princeps Vauch. ex Gom., abundant, trichomes 36—47 μ diam. — *fig. 73*.

Together with *Rhizoclonium implexum* (Dillw.) Kütz. (= *Rh. hieroglyphicum* (Ag.) Kütz., Van den Hoek, p. 591), *Oedogonium*, *Diatomeae*.

- 63c TANKI CALBAS, pool in depression of limestone plateau, $12 \times 5 \times \frac{1}{4}$ m, after rains much larger, with some mud, incrustations; water clear, almost colourless, Cl 12160 mg/l (brackish); 7 IX 1948 (Wagenaar Hummelinck, 1953, Pl. II b).

Anacystis montana (Lightf.) Drouet & Daily, abundant, cells $4,5 \mu$ diam..

Entophysalis deusta (Menegh.) Drouet & Daily, on rock, together with *Rivularia haematites*, cells without sheaths $4-6 \mu$ diam. — *fig. 16*.

Rivularia haematites (DC.) Ag. ex Born. & Flah., on rock, numerous, colonies hemispherical or confluent or extended to a layer, scantily incrustated with lime, zonate (on section), trichomes radiate, $4-5 \mu$ diam., with 2 or 3 basal heterocysts — *fig. 26*. Agrees with Wittrock & Nordstedt Alg. exsicc. n. 1310, except that in that material the trichomes have one basal heterocyst.

Together with *Chara zeylanica* var. *armata* (Meyen) Zanev. and var. *trichacantha* (A. Braun) H. & J. Groves (both Van den Hoek, p. 591), small *Ruppia*.

Bl an qu ill a

- 35 POZO DE VALUCHU, well in coconut grove near shore, $1\frac{1}{2} \times 1\frac{1}{2} \times \frac{1}{2}$ m, debris and muddy sand; water slightly turbid, yellowish-grey, $28-30^\circ$ C, pH 7,5—7,8, HCO_3 500 mg/l, total hardness 47 Germ.°, Cl 1450 mg/l (brackish); 21 VII 1936.

Lyngbya semiplena (Ag.) J. Ag. ex Gom. — det. F. Drouet.

M a r g a r i t a

- 18 LAGUNA HONDA, SE of Juan Griego, shallow pond, $20 \times 30 \times ?1$ m, much larger in rain time, sandy mud, many algae; water slightly turbid, greenish, $26-32^\circ$ C, pH 6,9—7,1, HCO_3 160 mg/l, total hardness 5 Germ.°, Cl 150 mg/l (brackish); 16 V 1936.

Anacystis montana (Lightf.) Drouet & Daily, few.

Aulosira implexa Born. & Flah., numerous, filaments sometimes fasciate, $12-14 \mu$ diam., sheaths usually narrow, trichomes $9-9,5 \mu$ diam., cells 21μ long, younger parts moniliform, cells 6μ long, arthrospores lacking — *fig. 25*. Agrees with Wittrock & Nordstedt Alg. Exsicc. n. 787.

Together with *Chara zeylanica* Willd. (Van den Hoek, p. 591), few *Oedogonium*, *Najas*.

- 19 TOMA DE AGUA DE TACARIGUA, flowing water near source, piped into basin of brickwork; water 26° C, pH 6,4—6,7, HCO_3 395 mg/l, total hardness 4 Germ.°, Cl 80 mg/l (fresh); 11 VIII 1936.

Lyngbya putealis Mont. ex Gom., numerous, filaments 8μ diam., trichomes 7μ diam., constricted at the transverse walls, cells as long as the diameter or somewhat shorter — *fig. 54*.

s.n. CANTARILLA DE SAN JUAN, cemented cistern in town, $7 \times 4 \times 1\frac{1}{2}$ m, scratched from wall; water pumped up from deep well, fairly clear, 28°C (midday), pH 7, fresh to the taste; 16 V 1936.

Anacystis montana (Lightf.) Drouet & Daily, numerous, cells $3-4\ \mu$ diam..

Dichothrix orsiniana (Kütz.) ex Born. & Flah., numerous, filaments $10-11.5\ \mu$ diam., sheaths yellowish brown, trichomes $7-8\ \mu$ diam., cells disc-shaped, $4.5\ \mu$ long — *fig. 28*.

Phormidium tenue (Menegh.) ex Gom., numerous, filaments $1.5-2\ \mu$ diam., slightly constricted at the transverse walls, cells slightly longer than diameter.

Los Testigos

31A POZA DEL PUERTO REAL, TAMARINDO, sheet of water near salina, $10 \times 10 \times \frac{1}{10}$ m, thick mud with coating of algae; water about 35°C ; 15 VI 1936.

Phormidium tenue (Menegh.) ex Gom. — det. F. Drouet.

165 ISLA DE CONEJO, shallow cave in porphyrite, shady, almost no vegetation, among wet rock debris; 17 VI 1936.

Anacystis montana (Lightf.) Drouet & Daily — det. F. Drouet.

Phormidium autumnale (Ag.) ex Gom., some — det. F. Drouet.

T o b a g o

656A LAMBEAU RIVER, near shore, muddy part of rivulet near mouth with many fiddler crabs; water turbid, brownish, 34°C , Cl 1600 mg/l (brackish); 15 I 1955.

Microcoleus chthonoplastes (Fl. Dan.) Thuret ex Gom. — det. F. Drouet.

Microcoleus tenerrimus Gom. — det. F. Drouet.

Lyngbya aestuarii (Mert.) Liebm. ex Gom. — det. F. Drouet.

Lyngbya confervoides Ag. ex Gom. — det. F. Drouet.

Lyngbya semiplena (Ag.) J. Ag. ex Gom. — det. F. Drouet.

Lyngbya putealis Mont. ex Gom. — det. F. Drouet.

N e v i s

500 NELSON'S SPRING, fresh water lagoon, about $200 \times 15 \times 1\frac{1}{2}$ m, clay with swamp deposits, considerable growth of algae; water clear, colourless, pH 8.6, HCO_3 485 mg/l, total hardness 17 Germ. $^{\circ}$, Cl 88 mg/l (fresh); 28 VI 1949 (Wagenaar Hummelinck, 1953, Pl. I b).

Lyngbya aestuarii (Mert.) Liebm. ex Gom., numerous, filaments $17-42\ \mu$ diam., sheaths more or less (in several places densely) incrustated with lime, trichomes $13\ \mu$ diam., cells $3-4\ \mu$ long. Gomont described several formae of this species, but he did not mention this incrustated form; Geitler (1932, p. 1052), however, reported that this species is often encrustated with lime — *fig. 46*.

Together with *Spirogyra distenta* Transeau, *Spirogyra punctiformis* Transeau (both Van den Hoek, p. 593), Najas.

- 501 JONES' RIVER, natural pools in rivulet, narrowly connected by flowing water, (5 ×) 1½ × ½ m, volcanic rock debris and plant decay; water clear, colourless, pH 7.6, HCO₃ 245 mg/l, total hardness 11 Germ.°, Cl 230 mg/l (brackish); 28 VI 1949.

Scytonema coactile Mont. in Kütz. ex Born. & Flah., fairly few, filaments 18 μ diam., trichomes 12 μ diam., cells as long as the diameter, sometimes somewhat shorter or longer — *fig. 20*.

Lyngbya aestuarii (Mert.) Liebm. ex Gom., abundant, filaments 15–21 μ diam., trichomes 13–16 μ diam., cells very short, 2.5–3 μ long.

Lyngbya putealis Mont. ex Gom., numerous, filaments 9 μ diam., trichomes constricted at the transverse walls, cells as long as the diameter, or shorter or longer.

Lyngbya martensiana Menegh. ex Gom., numerous, filaments 12–14 μ diam., sheaths outside rough, trichomes 8 μ diam., cells 2 μ long — *fig. 58*.

Together with Diatomeae.

- 502 HOT SPRING OF BATH, walled in spring of rivulet, ½ × ⅓ m, from weathered volcanic rock, rapidly flowing, sandy bottom with algae; water clear, colourless, about 42° C, pH 7.2, HCO₃ 550 mg/l, total hardness 18 Germ.°, Cl 70 mg/l (fresh); 28 VI 1949.

Lyngbya aestuarii (Mert.) Liebm. ex Gom., numerous, filaments 10 μ diam., cells 2 μ long.

Phormidium tenue (Menegh.) ex Gom., abundant, filaments 2.5 μ diam., cells 6 μ long — *fig. 63*.

Oscillatoria limosa Ag. ex Gom., fairly numerous, trichomes 17 μ diam., cells 2 μ long — *fig. 69*.

Oscillatoria okenii Ag. ex Gom., numerous, trichomes 6–7 μ diam., slightly constricted at the transverse walls, cells 3 μ long — *fig. 76*.

Antigua

- 665 WEIR'S POND, near Gunthorpes, muddy pool, 20 × 10 × ½ m; water rather turbid, brownish, 35° C, Cl 5830 mg/l (brackish); 14 VII 1955.

Phormidium valderianum Gom. — det. F. Drouet.

Together with abundant Chara, some Ruppia.

Barbuda

- 667 BULL HOLE, muddy pool in depression of limestone plateau, 20 × 20 × ⅓ m; water somewhat turbid, brownish, Cl 2200 mg/l (brackish); 9 VII 1955.

Coccochloris elabens (Bréb.) Drouet & Daily — det. F. Drouet.

Plectonema nostocorum Born. ex Gom., in the sheaths of *Coccochloris elabens* — det. F. Drouet.

Spirulina tenerrima Kütz. ex Gom., in the sheaths of *Coccochloris elabens* — det. F. Drouet.

Together with much Chara zeylanica Willd. (Van den Hoek, p. 593), much Najas, some Ruppia.

St. Eustatius

- 505 MANAHEGA CISTERN, DOWNTOWN, collapsed cemented cistern near shore, $6 \times 2\frac{1}{2} \times \frac{1}{8}$ m, muddy debris; water somewhat turbid, greenish yellow, pH abt. 8,5, HCO_3 1000 mg/l, total hardness 55 Germ. $^\circ$, Cl 2300 mg/l (brackish); 7 VII 1949.

Oscillatoria amphibia Ag. ex Gom., forming surface film — det. F. Drouet.

Together with *Euglena*.

- 506 MANAHEGA WELL, NEAR CISTERN, recently constructed well, 2 m deep, $1 \times \frac{2}{3} \times \frac{1}{2}$ m, upper part cemented, rock debris and mud, some coating of algae; water almost clear, greenish yellow, pH 7,9, HCO_3 1090 mg/l, total hardness 95 Germ. $^\circ$, Cl 1665 mg/l (brackish); 7 VII 1949 (Wagenaar Hummelinck, 1953, Pl. IV a).

Cocchochloris stagnina Spreng. — det. F. Drouet.

Lyngbya taylorii Drouet & Strickl., small form — det. F. Drouet.

- 511A KING'S WELL, DOWNTOWN, cemented through near deep well, $2 \times \frac{1}{2} \times \frac{1}{20}$ m, quickly drying, algae; water clear, greyish (brackish); 13 VII 1949.

Anacystis montana (Lightf.) Drouet & Daily — det. F. Drouet.

Plectonema nostocorum Born. ex Gom. — det. F. Drouet.

Calothrix parietina (Naeg.) Thuret ex Born. & Flah. — det. F. Drouet.

Lyngbya versicolor (Wartm.) ex Gom., some — det. F. Drouet.

St. Martin

- 527 MOLLY BEDAY, island, small puddle on top of 25 m high cliff, natural depression in solid andesitic rock, $\frac{1}{5} \times \frac{1}{10} \times \frac{1}{50}$ m, with very thin coating of algae; water clear, colourless, Cl estimated at 800—1000 mg/l (brackish);

Phormidium foveolarum (Mont.) ex Gom., fairly numerous, filaments twisted, trichomes 1,5—2 μ diam., cells somewhat shorter than the diameter — fig. 61.

- 529a OLD BATTERY CISTERN, SE of Philipsburg, remnants of old cistern, 2 m deep, temporarily filled with ground water, $10 \times 2 \times 1$ m, plant debris, dense growth of algae; water clear, Cl estimated at about 200 mg/l (brackish), 17 III 1937.

Nostoc linckia (Roth) Born. ex Born. & Flah., abundant, filaments much twisted, crowded, 4 μ diam., arthrospores 7,5 μ diam. — fig. 32.

Together with *Oedogonium howardii* G. S. West (Van den Hoek, p. 594).

- 530 CRAB HOLE CISTERN, E of Philipsburg, cistern of brick work, $10 \times 6 \times \frac{1}{2}$ m, with some mud and plant decay; water clear, colourless, pH 8,7, Cl 9920 mg/l (brackish); 18 V 1949.

Entophysalis conferta (Kütz.) Drouet & Daily, abundant, cells ellipsoid or clavate, 4—9 μ diam., up to 14—18 μ long — fig. 13.

- Lyngbya aestuarii* (Mert.) Liebm. ex Gom., numerous.
Together with abundant *Rhizoclonium implexum* (Dillw.) Kütz., dense growth of *Ruppia*.
- 531 ROLANDS CANAL, Upstreet, small puddle in old ditch, $5 \times 1 \times \frac{1}{120}$ m, among rock debris and grasses; water clear, yellowish brown, Cl estimated at about 1500 mg/l (brackish); 25 V 1949.
Anacystis montana (Lightf.) Drouet & Daily, numerous, cells 6μ diam..
Nostoc spec., sterile, numerous.
- 538 DOCTOR'S WELL on Rockland, Cul de Sac, artificial well with stone wall, 2 m deep, in pasture, $2\frac{1}{2} \times 2\frac{1}{2} \times 1$ m, mud with plant decay, considerable growth of algae; water clear, colourless, pH 8, HCO_3 1130 mg/l, total hardness 32 Germ. $^\circ$, Cl 355 mg/l (brackish); 24 V 1949.
Lyngbya aestuarii (Mert.) Liebm. ex Gom., abundant, filaments 10—18 μ diam., trichomes 9—11 μ diam..
Together with *Rhizoclonium riparium* (Roth) Harvey (= *Rh. hieroglyphicum* (Ag.) Kütz., Van den Hoek, p. 594), *Pithophora*, *Oedogonium* and *Diatomeae*.
- 538a Same locality, Cl 430 mg/l (brackish); 29 VI 1955.
Lyngbya aestuarii (Mert.) Liebm. ex Gom., abundant.
Together with *Rhizoclonium riparium* (Roth) Harv. (= *Rh. hieroglyphicum* (Ag.) Kütz., Van den Hoek, p. 594), *Pithophora polymorpha* (Van den Hoek, p. 594), *Oedogonium*.
- 538A Same locality, cemented trough, filled from the Doctor's Well, $5 \times 1 \times \frac{1}{2}$ m, some plant decay, coating and flakes of algae; water rather clear, almost colourless, Cl estimated at about 500—700 mg/l (brackish); 24 V 1949.
Anacystis montana (Lightf.) Drouet & Daily, abundant, cells 2—5 diam..
Lyngbya aestuarii (Mert.) Liebm. ex Gom., fairly numerous, filaments 14 μ diam., trichomes 13 μ diam..
Together with *Oedogonium*, *Diatomeae*.
- 539 PUDDLE NEAR DOCTOR'S WELL, very small puddle in artificial depression in marshy part of pasture, trampled by cattle, $\frac{1}{5} \times \frac{1}{10} \times \frac{1}{100}$ m; water slightly turbid and coloured, pH about 8, HCO_3 850 mg Cl/l, total hardness 18 Germ. $^\circ$, Cl 635 mg/l (brackish); 24 V 1949.
Anacystis montana (Lightf.) Drouet & Daily, abundant, cells 3—45 μ diam., 3—5 μ long.
Anacystis dimidiata (Kütz.) Drouet & Daily, few, cells 9 μ diam., 16 μ long — *fig. 8*.
Calothrix parietina Thuret ex Born. & Flah., fairly numerous.
Anabaena spec., sterile.
Lyngbya aestuarii (Mert.) Liebm. ex Gom., fairly numerous, filaments 13—15 μ diam., sheaths thin, trichomes 10—14 μ diam., cells 2 μ long.

Lyngbya martensiana Menegh. ex Gom., fairly numerous, filaments 9—12 μ diam., trichomes 8—9 μ diam., cells 4,5 μ long.

Phormidium tenue (Menegh.) ex Gom., abundant, filaments twisted, sheaths very narrow, trichomes 1,5—2 μ diam., constricted at the transverse walls, cells 3—4 μ long.

Oscillatoria chlorina Kütz. ex Gom., abundant, trichomes fairly short (90 μ) to long, finely transversely striped, cells 3,5—4 μ diam., as long as the diameter or somewhat shorter or longer — fig. 74. Together with *Rhizoclonium riparium* (Koth) Harv. (= *Rh. hieroglyphicum* (Ag.) Kütz., Van den Hoek, p. 594), Oocystis, Oedogonium, Diatomeae.

T i n t a m a r r e

- 526A FLAT ISLAND WELL, concrete trough at deep well, $\frac{1}{2} \times \frac{1}{2} \times \frac{1}{4}$ m, flakes of algae; water clear, somewhat coloured, Cl estimated at about 6000—9000 mg/l (brackish); 20 VI 1949.

Anacystis montana (Lightf.) Drouet & Daily — det. F. Drouet.

Anacystis thermalis (Menegh.) Drouet & Daily — det. F. Drouet.

A n g u i l l a

- 545 SPRING NEAR BEDNEY'S at Maze Bay, overflowing puddle (1 \times $\frac{1}{2} \times \frac{1}{20}$ m, limestone detritus, soft mud with some algae; water clear and colourless, pH 7,7, Cl 4960 mg/l (brackish); 18 VI 1949.

Anacystis montana (Lightf.) Drouet & Daily — det. F. Drouet.

Anacystis thermalis (Menegh.) Drouet & Daily — det. F. Drouet.

Plectonema nostocorum Born. ex Born. & Flah. — det. F. Drouet.

Scytonema myochrous (Dillw.) Ag. ex Born. & Flah., some — det. F. Drouet.

Calothrix parietina (Naeg.) Thuret ex Born. & Flah. — det

F. Drouet.

Together with Chara.

S t. T h o m a s

- 687 BROOKMAN RIVER, at bridge, very small pools in rivulet, narrowly connected by flowing water, rock debris, concrete, plant decay, much Enteromorpha and other algae; water clear, colourless, 28°C, Cl 510 mg/l (brackish); 17 VI 1955.

Nostoc linckia (Roth) Born. ex Born. & Flah. — det. F. Drouet.

Lyngbya aestuarii (Mert.) Liebm. ex Gom. — det. F. Drouet.

Oscillatoria princeps Vauch. ex Gom. — det. F. Drouet.

B A H A M A S

N e w P r o v i d e n c e

- 547 PALL'S WATERWORKS, W of Nassau, trench in weathered limestone and sandy debris, $100 \times 1\frac{1}{5} \times 1\frac{1}{5}$ m, filled by water pumped from deep wells, thick masses of algae; water clear, colourless, HCO₃ 305 mg/l, total hardness 15 Germ.°, Cl 300 mg/l (brackish); 23 VIII 1949.

Scytonema myochrous (Dillw.) Ag. ex Born. & Flah. — det. F. Drouet.

Scytonema mirabile (Dillw.) Born. — det. F. Drouet.
Together with *Utricularia*.

South Bimini

- 549 'FOUNTAIN OF YOUTH', muddy hole in limestone, $1 \times 1 \times \frac{1}{100}$ m, $1\frac{1}{2}$ m deep, thick layer of mud with leaf decay; water rather clear, almost colourless, HCO_3 510 mg/l, total hardness 14 Germ.°, Cl 475 mg/l (brackish); 20 VIII 1949.
Oscillatoria okenii Ag. ex Gom. — det. F. Drouet.

LIST OF THE SPECIES WITH NOTES ON THEIR ECOLOGY AND DISTRIBUTION

CHROOCOCCALES R. v. Wettstein

CHROOCOCCACEAE Naeg.

Coccochloris Sprengel

Coccochloris stagnina Spreng.; Drouet & Daily (p. 15) — *Aphanothece stagnina* (Spreng.) A. Braun — fig. 1—2.

Ecology: see Drouet & Daily (p. 19).

Distribution: cosmopolitan (Drouet & Daily, p. 19—28); *Antilles and adjacent regions*: Venezuela (553), Aruba (104Bc), Curaçao (65A, 74, 397a), Bonaire (60b, 379a, 379b, 379c), St. Eustatius (506); Brazil, Puerto Rico, Jamaica, Florida, Guatemala, Honduras, Nicaragua, Panama (Drouet & Daily, p. 23—26); St. Croix (Frémy, 1939, p. 7).

Coccochloris elabens (Bréb.) Drouet & Daily (p. 28) — *Microcystis elabens* (Bréb.) Kütz. — fig. 3.

Ecology: see Drouet & Daily (p. 29).

Distribution: cosmopolitan (Drouet & Daily, p. 29—31); *Antilles and adjacent regions*: Venezuela (s.n.), Barbuda (667); Brazil, Bonaire, Klein Bonaire, Puerto Rico, Jamaica, South Caicos, New Providence, Florida (Drouet & Daily, p. 30—31).

Coccochloris peniocystis (Kütz.) Drouet & Daily (p. 31) — *Aphanothece saxicola* Naeg. — fig. 4.

Ecology: see Drouet & Daily (p. 33).

Distribution: cosmopolitan (Drouet & Daily, p. 33—34); *Antilles and adjacent regions*: Venezuela (553); St. Vincent, Puerto Rico, Great Bahama, Florida, Honduras (Drouet & Daily, p. 33—34).

Anacystis Menegh.

Anacystis montana (Lightf.) Drouet & Daily (p. 45) — *Gloeocapsa rupestris* Kütz. — *Gloeocapsa punctata* Naeg. — fig. 5.

Ecology: see Drouet & Daily (p. 52).

Distribution: cosmopolitan (Drouet & Daily, p. 53—66); *Antilles and adjacent regions*: Aruba (93b, 104Ba), Curaçao (75, 75a, 79B,

391), Bonaire (48, 381), Klein Bonaire (63c), Margarita (18, s.n.), Los Testigos (165), St. Eustatius (511A), St. Martin (531, 538A, 539), Tintamarre (526A), Anguilla (545); Brazil, Venezuela, St. Vincent, Dominica, Guadeloupe, Puerto Rico, Jamaica, Andros, New Providence, Florida, Honduras, El Salvador, Nicaragua, Costa Rica, Panama, (Drouet & Daily, p. 59—65); St. Croix (Frémy, 1939, p. 7).

Anacystis dimidiata (Kütz.) Drouet & Daily (p. 70) — *Chroococcus turgidus* (Kütz.) Naeg. — *fig. 6—8*.

Ecology: see Drouet & Daily (p. 71).

Distribution: cosmopolitan (Drouet & Daily, p. 72—75); *Antilles and adjacent regions*: Aruba (93b), Bonaire (48, 379b, 628A), St. Martin (539); Brazil, Venezuela, Puerto Rico, Jamaica, South Caicos, Andros, Bimini, Florida, Guatemala, Costa Rica, Panama (Drouet & Daily, p. 73—75); Guadeloupe (Feldmann, p. 28).

Anacystis thermalis (Menegh.) Drouet & Daily (p. 77) — *Chroococcus cohaerens* (Bréb.) Naeg. — *Chroococcus pallidus* Naeg..

Ecology: see Drouet & Daily, p. 79.

Distribution: cosmopolitan (Drouet & Daily, p. 79—83); *Antilles and adjacent regions*: Curaçao (86), Bonaire (379a), Tintamarre (526A), Anguilla (545); Brazil, Venezuela, Puerto Rico, Florida, Honduras, Nicaragua, Panama (Drouet & Daily, p. 80—82).

Johannesbaptistia J. de Toni

Johannesbaptistia pellucida (Dickie) W. R. Taylor & Drouet; Drouet & Daily (p. 85) — *fig. 9—10*.

Ecology: see Drouet & Daily (p. 85).

Distribution: Europe, America, Malay Archipelago (Drouet & Daily, p. 85—86); *Antilles and adjacent regions*: Bonaire (48, 628A); Brazil, Virgin Islands, Puerto Rico, South Caicos, New Providence, Florida, Costa Rica (Drouet & Daily, p. 86).

Agmenellum de Brébisson

Agmenellum quadruplicatum (Menegh.) Bréb.; Drouet & Daily (p. 86) — *Merismopedia punctata* Meyen — *Merismopedia glauca* (Ehrenb.) Kütz..

Ecology: see Drouet & Daily (p. 88).

Distribution: cosmopolitan (Drouet & Daily, p. 88—89); *Antilles and adjacent regions*: Aruba (93b, 104Bc), Curaçao (389), Bonaire (379a, 379b); Brazil, Venezuela, Puerto Rico, Andros, Florida (Drouet & Daily, p. 88—89).

Gomphosphaeria Kütz.

Gomphosphaeria aponina Kütz.; Drouet & Daily (p. 98).

Ecology: see Drouet & Daily (p. 98).

Distribution: cosmopolitan (Drouet & Daily, p. 99—100); *Antilles and adjacent regions*: Aruba (93b, 104Bb, 104Bc), Klein Curaçao (64), Bonaire (53c); Brazil (Möbius, p. 311); Jamaica, Florida, Guatemala (Drouet & Daily, p. 99).

CHAMAESIPHONACEAE Borzi

Entophysalis Kütz.

Entophysalis deusta (Menegh.) Drouet & Daily (p. 103) — *fig. 16*.

Ecology: see Drouet & Daily (p. 105).

Distribution: cosmopolitan (Drouet & Daily, 105—110); *Antilles and adjacent regions*: Bonaire (53c), Klein Bonaire (63c); Colombia, Venezuela, Bonaire, Klein Bonaire, Guadeloupe, Puerto Rico, Jamaica, South Caicos, Mariguana, Berry Islands, Atwood, Bimini Islands, Florida, Costa Rica, Panama (Drouet & Daily, p. 108—109); St. Croix (Frémy, 1939, p. 6, 9).

Entophysalis conferta (Kütz.) Drouet & Daily (p. 111) — *fig. 11—13*.

Ecology: see Drouet & Daily (p. 113).

Distribution: cosmopolitan (Drouet & Daily, p. 114—119); *Antilles and adjacent regions*: Aruba (104Ba, 104Bc), Bonaire (53c), Klein Bonaire (61b), St. Martin (530); Brazil, Barbados, Virgin Islands, Puerto Rico, Jamaica, Berry Islands, Florida, Guatemala, Panama (Drouet & Daily, p. 116—118); Guadeloupe (Feldmann, p. 28); St. Thomas, St. Croix (Frémy, 1939, p. 8—11).

Entophysalis rivularis (Kütz.) Drouet; Drouet & Daily (p. 119) — *Gloeocapsa dermochroa* Naeg. — *Xenococcus rivularis* (Hansg.) Geitler — *fig. 14—15*.

Ecology: see Drouet & Daily (p. 122).

Distribution: cosmopolitan (Drouet & Daily, p. 122—126); *Antilles and adjacent regions*: Venezuela (s.n.), Bonaire (48, 57c); Venezuela, Puerto Rico, Florida, Guatemala, Honduras, El Salvador (Drouet & Daily, p. 124—125).

HORMOGONALES Atkinson

STIGONEMATACEAE Kirchner

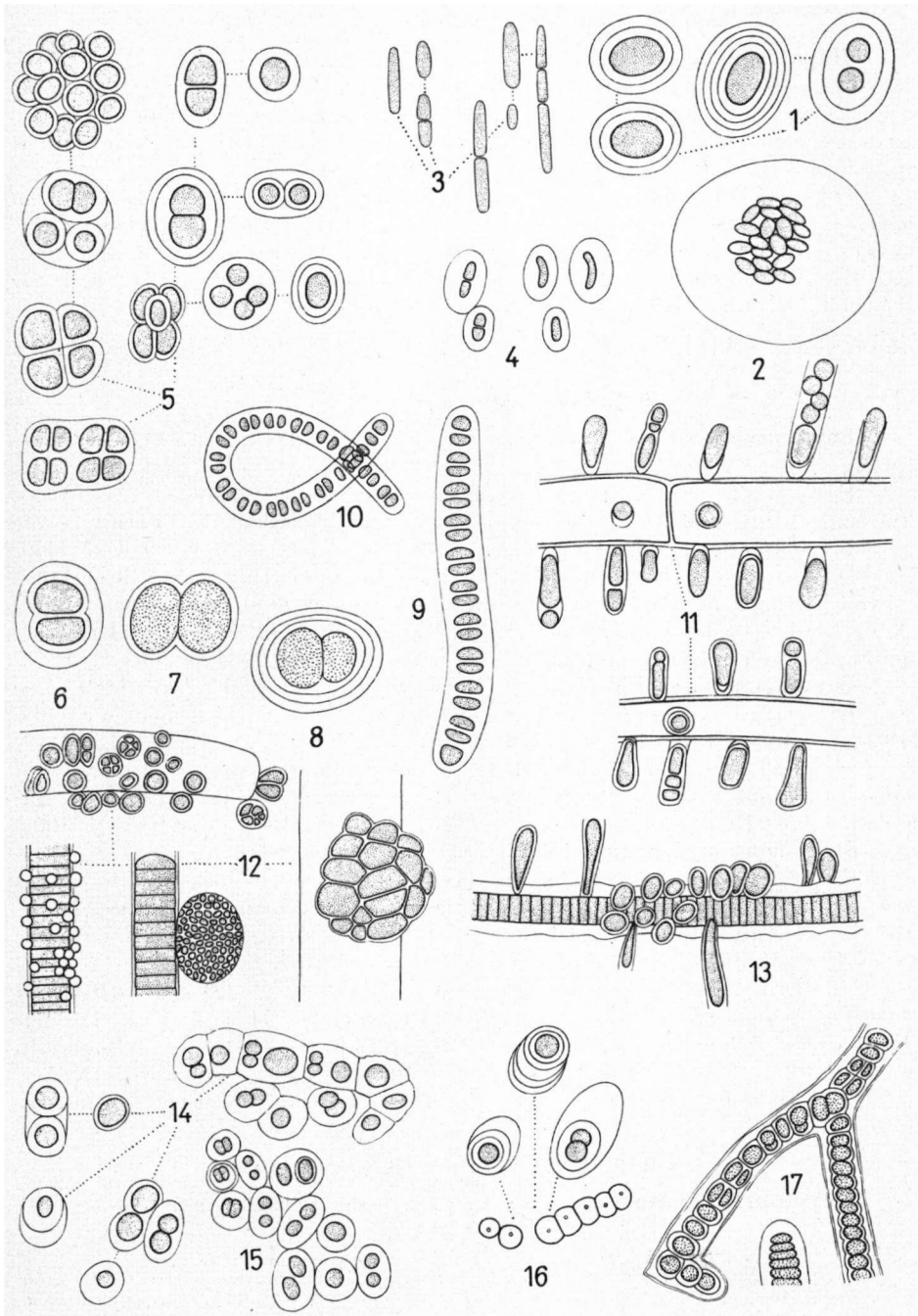
Stigonema Ag. ex Born. & Flah.

Stigonema ocellatum (Dillw.) Thur. ex Born. & Flah. (5, 1887, p. 69) — *fig. 17*.

Ecology: stagnant water, pools, lakes, among mosses on moist soil, attached or floating, acidiphilous (Frémy, 1930, p. 402; Duvigneaud & Symoens, p. 77, Nielsen, 1956, p. 431).

Distribution: cosmopolitan (Frémy, 1930, p. 402); *Antilles and adjacent regions*: Suriname (566); Venezuela (Taylor, 1942, p. 70; Drouet, 1957, p. 684); Guadeloupe (Bourrelly & Manguin, p. 148); Florida (Branon, p. 72; Nielsen, 1956, p. 431).

Fig. 1—17: 1—2. *Coccochloris stagnina*, 1 from Venezuela (553), 2 from Bonaire (379a); 3. *Coccochloris elabens* from Venezuela (s.n.); 4. *Coccochloris peniocystis* from Venezuela (553); 5. *Anacystis montana* from Bonaire (48); 6—8. *Anacystis dimidiata*, 6 from Bonaire (48), 7 from Bonaire (379b), 8 from St. Martin (539); 9—10. *Johannesbaptistia pellucida*, 9 from Bonaire (48), 10 from Bonaire (628A); 11—13. *Entophysalis conferta*, 11 from Bonaire (53c), 12 from Klein Bonaire (61b), 13 from St. Martin (530); 14—15. *Entophysalis rivularis*, 14 from Venezuela (s.n.), 15 from Bonaire (48); 16. *Entophysalis deusta* from Klein Bonaire (63c); 17. *Stigonema ocellatum* from Suriname (566).



Hapalosiphon Naeg. in Kütz. ex Born. & Flah.

Hapalosiphon pumilus (Kütz.) Kirchner ex Born. & Flah. (5, 1887, p. 61) — *Hapalosiphon fontinalis* Born. — fig. 18—19.

Ecology: stagnant or slowly streaming water, peat-bogs, thermal springs, attached on aquatic plants, wood, rocks, or floating (Frémy, 1930, p. 426; Geitler, 1931, p. 535; Drouet, 1942, p. 108).

Distribution: cosmopolitan (Frémy, 1930, p. 426); *Antilles and adjacent regions:* Suriname (566, 642, 646); Brazil (Drouet, 1959, p. 2); Venezuela (Drouet, 1957, p. 684); Guadeloupe (Bourrelly & Manguin, 1952, p. 147); Puerto Rico (Nielsen, 1956, p. 431); Jamaica (Drouet, 1942, p. 108); Florida (Brannon, 1952, p. 71; Nielsen, 1956, p. 430).

SCYTONEMATACEAE Rabenh. ex Born. & Flah.

Scytonema Ag. ex Born. & Flah.

Scytonema coactile Mont. in Kütz. ex Born. & Flah. (5, 1887, p. 90) — fig. 20—21.

Ecology: stagnant and streaming water, ponds, lakes, rivers, brooks, thermal springs, 36° C, at first attached, afterwards floating (Frémy, 1930, p. 300; Bourrelly & Manguin, 1952, p. 149; Nielsen & Madsen, 1956, p. 117).

Distribution: Equatorial Africa, Réunion, India, Antilles, Brazil (Frémy, 1930, p. 300); *Antilles and adjacent regions:* Suriname (566), Nevis (501); Guadeloupe (Bourrelly & Manguin, p. 149), Florida (Brannon, p. 74; Nielsen & Madsen, p. 117); Panama (Drouet, 1937, p. 602).

Scytonema mirabile (Dillw.) Born. in Bull. Soc. Fr. 36, 1889, 155.

Ecology: stagnant water, moist rocks and soil, peat-moor (Frémy, 1930, p. 318; Geitler, 1932, p. 776).

Distribution: cosmopolitan (Frémy, 1930, p. 318); *Antilles and adjacent regions:* New Providence (547); Brazil (Drouet, 1957, p. 2); Guadeloupe (Bourrelly & Manguin, p. 151); Puerto Rico (Gardner, p. 300).

Scytonema myochrous (Dillw.) Ag. ex Born. & Flah. (5, 1887, p. 104).

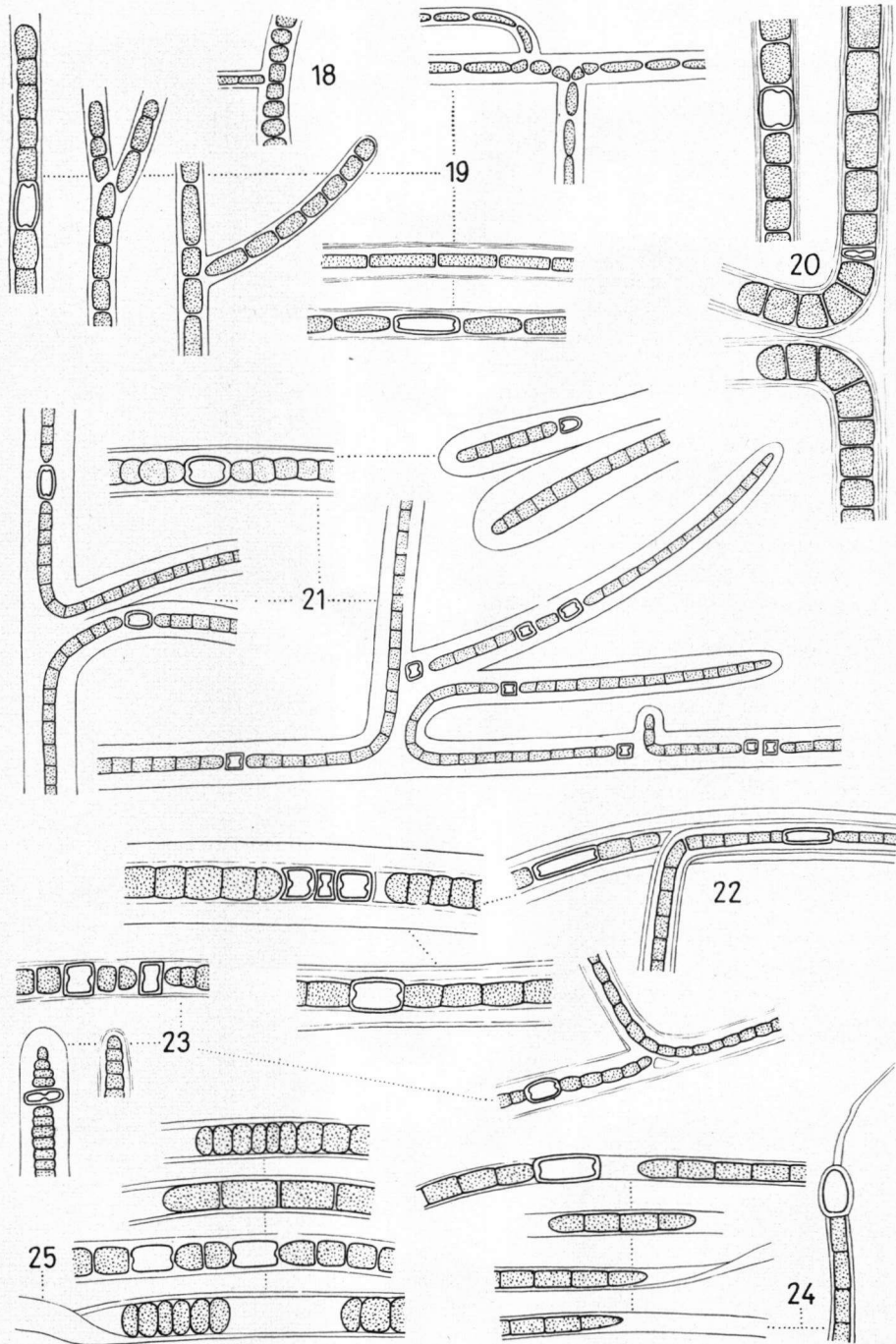
Ecology: rivers, creeks, ravines, swamps, moist rocks, walls, stones and soil, on limestone and dry sand, lake of weak brine on leaves, 32° C, pH 4.8 (Frémy, 1930, p. 321; 1941, p. 148; Bourrelly & Manguin, p. 151; Nielsen & Madsen, p. 123).

Distribution: cosmopolitan (Frémy, 1930, p. 321); *Antilles and adjacent regions:* Anguilla (545); New Providence (547); Brazil (Drouet, 1957, p. 2); Klein Bonaire (Frémy, 1941, p. 148); Guadeloupe (Bourrelly & Manguin, p. 151); Puerto Rico (Gardner, p. 300); Jamaica (Drouet, p. 111); Bahama Islands (Collins, p. 625); Florida (Nielsen & Madsen, p. 123).

Tolypothrix Kütz. ex Born. & Flah.

Tolypothrix lanata (Ag.) Wartm. ex Born. & Flah. (5, 1887, p. 120) — fig. 22—23.

Fig. 18—25: 18—19. *Hapalosiphon pumilus*, 18 from Suriname (642), 19 from Suriname (646); 20—21. *Scytonema coactile*, 20 from Nevis (501), 21 from Suriname (566); 22—23. *Tolypothrix lanata*, 22 from Suriname (406), 23 from Suriname (646); 24. *Aulosira laxa* from Bonaire (381); 25. *Aulosira implexa* from Margarita (18).



Ecology: stagnant, rarely streaming waters, ponds, lakes, pools, brooks, on immersed stones and roots of trees, borders of fountains, at first attached, afterwards floating (Frémy, 1930, p. 242; Geitler, 1932, p. 717; Brannon, p. 72; Nielsen & Madsen, p. 197).

Distribution: cosmopolitan (Geitler, 1932, p. 717); *Antilles and adjacent regions:* Suriname (406, 646); Puerto Rico (Gardner, p. 303); Florida (Brannon, p. 72; Nielsen & Madsen, p. 197).

Plectonema Thuret ex Bornet

Plectonema nostocorum Born. ex Gom. (16, 1892, p. 102).

Ecology: in sheaths of most gelatinous algae (Drouet, p. 117), pools, lakes, rivers, moist soil, rocks and walls, greenhouses, on limestone and sand (Brannon, p. 77; Nielsen, 1955, p. 87).

Distribution: cosmopolitan (Frémy, 1930, p. 178); *Antilles and adjacent regions:* Curaçao (65A), Barbuda (667), St. Eustatius (511A), Anguilla (545); Venezuela (Drouet, 1957, p. 682); Jamaica (Drouet, p. 117); New Providence (Collins, p. 622); Florida (Brannon, p. 77; Nielsen, 1955, p. 87).

MICROCHAETACEAE Lemmermann

Aulosira Kirchner ex Born. & Flah.

Aulosira laxa Kirchner ex Born. & Flah. (7, 1888, p. 256) — *fig. 24.*

Ecology: stagnant water (Geitler, 1932, p. 675).

Distribution: Europe, India, Java (Geitler, 1932, p. 675); *Antilles and adjacent regions:* Bonaire (381).

Aulosira implexa Born. & Flah. (7, 1888, p. 257) — *fig. 25.*

Ecology: stagnant water, pools, on floating phanerogams (Frémy, 1930, p. 382; Brannon, p. 73).

Distribution: S. America, S. Asia, Madagascar (Frémy, 1930, p. 382); *Antilles and adjacent regions:* Margarita (18); Florida (Brannon, p. 73). This species seems to be restricted to tropical regions.

RIVULARIACEAE Rabenh.

Gloeotrichia J. Ag. ex Born. & Flah.

Gloeotrichia pisum (Ag.) Thur. ex Born. & Flah. (4, 1886, 366).

Ecology: stagnant, sometimes streaming waters, on phanerogams or floating (Frémy, 1930, p. 273; Geitler, 1931, p. 634).

Distribution: cosmopolitan (Frémy, 1930, p. 273); *Antilles and adjacent regions:* Curaçao (397c); Brazil (Drouet, 1957, p. 2).

Gloeotrichia natans (Hedw.) Rabenh. ex Born. & Flah. (4, 1886, p. 369).

Ecology: stagnant, also slightly brackish waters, culvert, attached on leaves or floating (Frémy, 1930, p. 278; Geitler, 1931, p. 639; Brannon, p. 73).

Distribution: cosmopolitan (Frémy, 1930, p. 278); *Antilles and adjacent regions:* Colombia, La Goajira (114); Brazil (Drouet, 1957, p. 2); Jamaica (Drouet, 1942, p. 110); Florida (Brannon, p. 73).

Rivularia (Roth) Ag. ex Born. & Flah.

Rivularia haematites (DC.) Ag. ex Born. & Flah. (4, 1886, p. 350) — *fig. 26.*

Ecology: stagnant, less common streaming waters, on limestone rocks, on banks of lakes (Geitler, 1931, p. 653).

Distribution: Europe, Algeria, N. America, Ecuador (Gauthier-Lièvre, p. 230; Geitler, 1931, p. 654); *Antilles and adjacent regions:* Curaçao (80Aa, 391), Klein Bonaire (63c).

Calothrix Ag. ex Born. & Flah.

Calothrix parietina (Naeg.) Thur. ex Born. & Flah. (3, 1886, p. 366).

Ecology: moist soil, stones and wood, rocks in the upper part of the intertidal zone; basins of fountains, sometimes epiphytic on aquatic plants or endophytic in other algae (Fan, p. 159).

Distribution: cosmopolitan (Fan, p. 161—168); *Antilles and adjacent regions:* Curaçao (391), St. Eustatius (511A), St. Martin (539), Anguilla (545); Aruba, Curaçao (Frémy, 1941, p. 147); Brazil, Barbados, Puerto Rico, Haiti, Jamaica, Bimini, Florida, Guatemala, Honduras, El Salvador, Nicaragua, Costa Rica, Panama (Fan, p. 161—168).

Calothrix braunii Born. & Flah. (3, 1886, 368) — *fig. 27.*

Ecology: stagnant and streaming waters, on stones, immersed wood, shells and aquatic phanerogams (Frémy, 1930, p. 257; Geitler, 1931, p. 606).

Distribution: Europe, Africa, N. America (Frémy, 1930, p. 257); *Antilles and adjacent regions:* Bonaire (48); Klein Bonaire (Frémy, 1941, p. 147); Puerto Rico (Gardner, p. 305).

Dichothrix Zanard. ex Born. & Flah.

Dichothrix orsiniana (Kütz.) ex Born. & Flah. (3, 1886, p. 376) — *fig. 28.*

Ecology: on stones and rocks in rapidly streaming water, less common in stagnant waters, moist rocks (Frémy, 1930, p. 270; Geitler, 1931, p. 588).

Distribution: Europe, Africa, Central Asia, India, N. America (Frémy, 1930, p. 270); *Antilles and adjacent regions:* Margarita (s.n.).

Amphithrix Born. & Flah.

Amphithrix janthina (Mont.) ex Born. & Flah. (3, 1886, p. 344).

Ecology: streaming water, brooks, border of fountain, on immersed stones (Frémy, 1930, 242).

Distribution: Europe, Africa, N. America (Frémy, 1930, p. 242); *Antilles and adjacent regions:* Curaçao (399); Brazil (Drouet, 1957, p. 1).

NOSTOCACEAE Kirchner

Anabaena Bory ex Born. & Flah.

Anabaena variabilis Kütz. ex Born. & Flah. (7, 1888, p. 226) — *fig. 29—30.*

Ecology: stagnant, also brackish waters, moist soil, decayed wood, attached or floating (Frémy, 1930, p. 361, Brannon, p. 72).

Distribution: cosmopolitan (Frémy, 1930, p. 361); *Antilles and adjacent regions*: Aruba (102A), Bonaire (45); Florida (Brannon, p. 72).

Anabaena sphaerica Born. & Flah. (7, 1888, p. 228).

Ecology: stagnant waters (Frémy, 1930, p. 361).

Distribution: Europe, W. Africa, Java, New-Guinea, N. America (Frémy, 1930, p. 361); *Antilles and adjacent regions*: Aruba (102A); Florida (Brannon, p. 72).

Anabaena spiroides Klebahn in Flora, 89, 1805, 268.

Ecology: stagnant waters, planctonic (Frémy, 1930, p. 361).

Distribution: Europe, Equatorial Africa, India, N. America (Frémy, 1930, p. 361); *Antilles and adjacent regions*: Aruba (641); Florida (Brannon, p. 72).

Nodularia Mertens ex Born. & Flah.

Nodularia spumigena Mertens ex Born. & Flah. (7, 1888, 245) — *fig. 31*.

Ecology: stagnant, also brackish waters, decayed wood, attached or floating (Geitler, 1932, p. 866; Brannon, p. 72).

Distribution: cosmopolitan (Geitler, 1932, 866); *Antilles and adjacent regions*: Aruba (641); Florida (Brannon, p. 72).

Nostoc Vaucher ex Born. ex Flah.

Nostoc linckia (Roth) Born. & Flah. (7, 1888, p. 192) — *fig. 32*.

Ecology: stagnant, also brackish waters, attached at first, afterwards floating (Frémy, 1930, p. 34).

Distribution: cosmopolitan (Frémy, 1930, p. 334); *Antilles and adjacent regions*: St. Martin (529a), St. Thomas (687); Bonaire, Klein Bonaire (Frémy, 1941, p. 149); Guadeloupe (Bourrelly & Manguin, p. 155); Florida (Brannon, p. 73).

Nostoc sphaericum Vauch. ex Born. & Flah. (7, 1888, p. 208) — *fig. 33—34*.

Ecology: among mosses on moist rocks and stumps, sometimes in stagnant waters, on aquatic plants (Frémy, 1930, p. 345; Geitler, 1932, p. 850).

Distribution: cosmopolitan (Frémy, 1930, p. 345); *Antilles and adjacent regions*: Curaçao (68); Bonaire (52, 378, 381); Bonaire (Frémy, 1941, p. 149); Puerto Rico (Gardner, p. 293).

OSCILLATORIACEAE Kirchner

Microcoleus Desmazières ex Gom.

Microcoleus chthonoplastes (Fl. Dan.) Thur. ex Gom. (15, 1892, p. 353).

Ecology: brackish waters and soil, lakes and pools of weak brines, of concentrated seawater, and of oversalted seawater, seashores, tidal flats, calcareous sand, sometimes in freshwater (Frémy, 1930, p. 781; 1941, p. 139; Drouet, 1942, p. 117; Geitler, 1932, p. 1133; Taylor, 1942, p. 71).

Distribution: cosmopolitan (Frémy, 1930, p. 781); *Antilles and adjacent region*: Curaçao (80 A b), Bonaire (57d, 60b, 381), Tobago (656 A); Brazil (Gomont, p. 354; Möbius, p. 312), Aruba (Taylor, 1942, p. 71); Bonaire, Klein Bonaire (Frémy, 1941, p. 139); Guadeloupe (Bourrelly & Manguin,

p. 156; Feldmann, p. 28); St. Croix (Frémy, 1939, p. 16); Jamaica (Drouet, 1942, p. 117); Cuba (Montagne, p. 8); Panama (Taylor, 1942, p. 72).

Microcoleus tenerrimus Gom. (15, 1892, p. 355).

Ecology: seashores, rock-pools, inland salt-marshes, brines, roots of *Rhizophora* (Geitler, 1932, p. 1135; Frémy, 1941, p. 139; Feldmann, p. 28).

Distribution: Europe, N. Africa, Malay Archipelago, Australia, N. America (Geitler, 1932, p. 1135); *Antilles and adjacent regions*: Tobago (656 A); Bonaire (Frémy, 1941, p. 139); Guadeloupe (Feldmann, p. 28); St. Croix (Frémy, 1939, p. 15).

Microcoleus cavanillesii Guerrero in An. Jard. Bot. Madrid 6 (1945) 1946, p. 270 — *fig. 35*.

Ecology: salines (Guerrero l. c.).

Distribution: Spain (Guerrero l. c.); *Antilles and adjacent regions*: Bonaire (44 A a).

Schizothrix Kütz. ex Gom.

Schizothrix calcicola (Ag.) ex Gom. (15, 1892, p. 307) — *fig. 36*.

Ecology: moist rocks and walls, thermal springs, greenhouses (Geitler, 1932, p. 1084).

Distribution: cosmopolitan (Geitler, 1932, p. 1084); *Antilles and adjacent regions*: Curaçao (389); Venezuela (Drouet, 1957, p. 682); Florida (Brannon, p. 78).

Schizothrix lardacea (Ces.) ex Gom. (15, 1892, p. 311) — *fig. 37*.

Ecology: moist rocks, walls, stones and soil, springs, sometimes in brackish water (Frémy, 1930, p. 92; 1941, p. 140).

Distribution: cosmopolitan (Frémy, 1930, p. 92); *Antilles and adjacent regions*: Bonaire (48); Curaçao (Frémy, 1941, p. 140); Guadeloupe (Bourrelly & Manguin, p. 157).

Schizothrix heufleri Grun. ex Gom. (15, 1892, p. 325).

Ecology: moist rocks (Geitler, 1932, p. 1106).

Distribution: Tirol, Iceland (Geitler, 1932, p. 1106); *Antilles and adjacent regions*: Curaçao (74).

Schizothrix vaginata (Naeg. in Kütz.) ex Gom. (15, 1892, p. 302) — *fig. 38*.

Ecology: fresh and brackish, stagnant and streaming waters, moist stones (Frémy, 1930, p. 96; Geitler, 1932, p. 1091).

Distribution: Europe, Equatorial Africa, Malay Archipelago, India, Oceania (Frémy, 1930, p. 96; Geitler, 1932, p. 1091); *Antilles and adjacent regions*: Bonaire (52d); New Providence, Caicos Islands (Collins, p. 623).

Lyngbya Ag. ex Gom.

Lyngbya kuetzingii Schmidle in Allg. Bot. Zeitschr. 1897, 58 — *fig. 39*.

Ecology: stagnant waters, on filamentous algae (Frémy, 1930, p. 195).

Distribution: cosmopolitan (Frémy, 1930, p. 195); *Antilles and adjacent regions*: Bonaire (52e, 53c), Klein Bonaire (61b); Klein Bonaire (Frémy, 1941, p. 143); Puerto Rico (Gardner, p. 273).

Lyngbya lagerheimii (Möbius) ex Gom. (16, 1892, p. 147) — *fig. 40-41*.

Ecology: stagnant waters, lakes, ponds, on aquatic plants and rocks, planctonic (Frémy, 1930, p. 202; Nielsen, 1955, p. 109).

Distribution: Europe, Africa, Java, N. and S. America (Frémy, 1930, p. 202; Geitler, 1932, p. 1044); *Antilles and adjacent regions:* Curaçao (89), Bonaire (379c, 379b, 379e); Brazil (Gomont, p. 148); Barbados (West, p. 291); Puerto Rico (Gardner, p. 275); Florida (Nielsen, 1955, p. 109); Caicos Islands (Collins, p. 622); Guatemala (Taylor, 1939, p. 115); Panama (Drouet, 1937, 604).

***Lyngbya aestuarii* (Mert.) Liebm. ex Gom. (16, 1892, p. 127) — fig. 42—46.**

Ecology: brackish and less commonly freshwater, tidal flats, thermal waters, shores, lakes of weak or rather strong brine, of oversalted seawater, on logs, stones, coral debris, roots of *Rhizophora*, attached or floating, 30°C. (Frémy, 1930, p. 183; 1941, p. 141; Geitler, 1932, p. 1052; Drouet, 1942, p. 118; Brannon, p. 74).

Distribution: cosmopolitan (Frémy, 1930, p. 183); *Antilles and adjacent regions:* Suriname (406, 642), Aruba (102 A, 104 A, 104 B a, 638, 641), Curaçao (75, 88a, 89, 398), Klein Curaçao (64, 387), Bonaire (44, 45, 48, 53c, 58b, 60b, 628, 628 A), Klein Bonaire (61b), Tobago (656 A), Nevis (500, 501, 502), St. Martin (530, 538, 538a, 538 A, 539), St. Thomas (687); Venezuela (Drouet, 1957, p. 681); Aruba, Curaçao, Bonaire, Klein Bonaire (Frémy, 1930, p. 141); Barbados (West, p. 291); Guadeloupe (Bourrelly & Manguin, p. 157; Feldmann, p. 31); St. John, St. Thomas, St. Croix (Frémy, 1939, p. 27); Puerto Rico (Gardner, p. 26); Jamaica (Drouet, 1942, p. 118); Exuma Chain (Collins, p. 622); Florida (Brannon, p. 74); Panama (Taylor, 1942, p. 73).

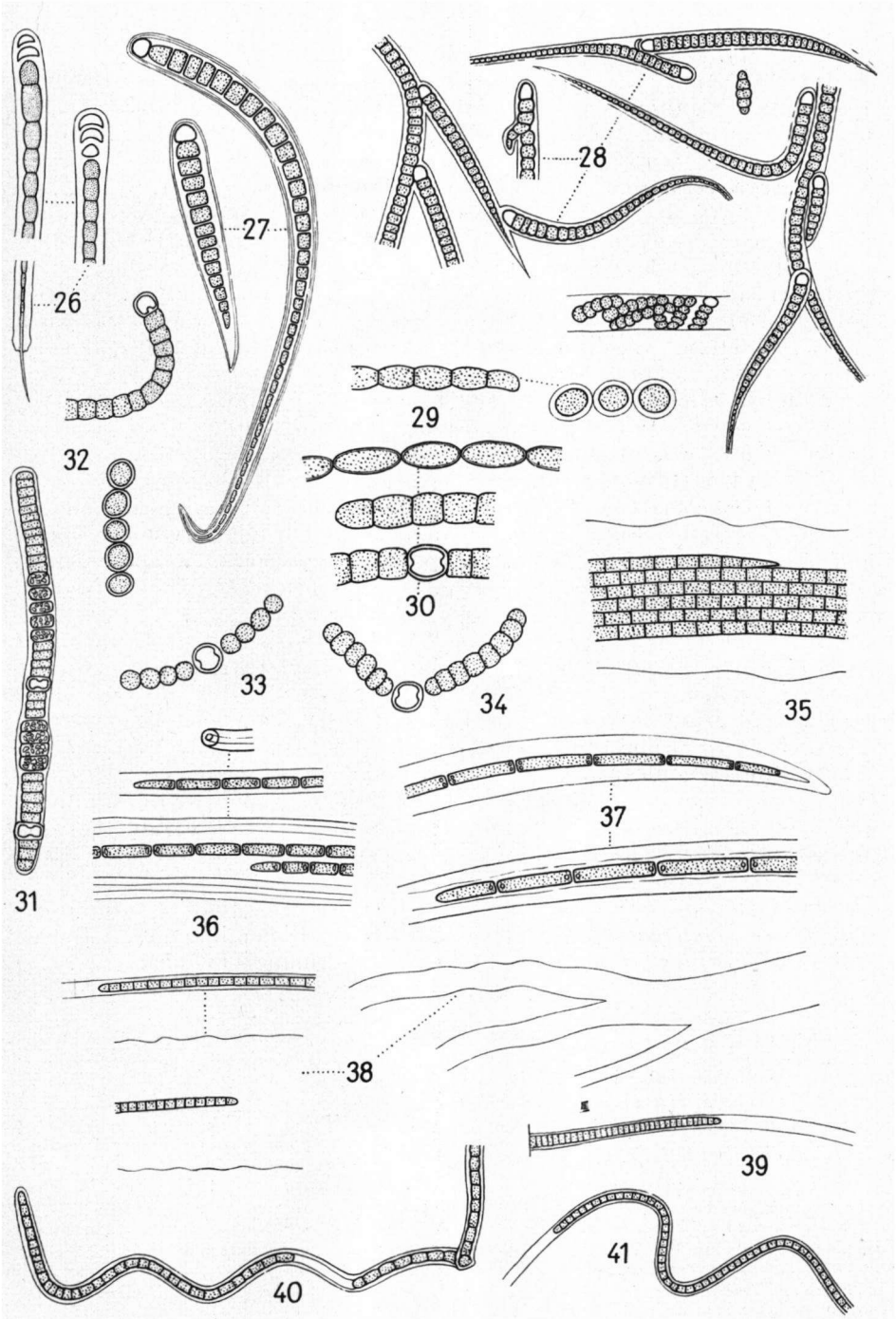
***Lyngbya lutea* (Ag.) ex. Gom. (16, 1892, p. 141) — fig. 47.**

Ecology: brackish and thermal waters, pools, ponds, bays, rivers, estuaries, swamps, rock springs, sulphur spring, lakes of weak or rather strong brine, seawater streaming into lake, very concentrated salt-pan, between corals on tidal flats, on submerged limestone, on roots of mangroves, on rocks and wood wet by freshwater (West, p. 291; Frémy, 1930, p. 189; 1941, p. 142; Nielsen, 1955, p. 107).

Distribution: Europe, N. Africa, Madagascar, N. America (Frémy, 1930, p. 189); *Antilles and adjacent regions:* Aruba (104 A); Aruba, Curaçao, Bonaire (Frémy, 1941, p. 142); Guadeloupe (Feldmann, p. 31); St. Thomas, St. Croix (Frémy, 1939, p. 30); Puerto Rico (Gardner, p. 275); Florida (Nielsen, 1955, p. 107).

***Lyngbya diguetii* Gom. in Harriot in Journ. de Bot. 9, 1895, p. 169 — fig. 48.**

Fig. 26—41: 26. *Bivularia haematites* from Klein Bonaire (63c); 27. *Calothrix braunii* from Bonaire (48); 28. *Dichothrix orsiniana* from Margarita (s.n.); 29—30. *Anabaena variabilis*, 29 from Aruba (102A), 30 from Bonaire (45); 31. *Nodularia spumigena* from Aruba (641); 32. *Nostoc unckia* from St. Martin (529a); 33—34. *Nostoc sphaericum*, 33 from Bonaire (52), 34 from Bonaire (378); 35. *Microcoleus cavanillesii* from Bonaire (44Aa); 36. *Schizothrix calcicola* from Curaçao (389); 37. *Schizothrix lardacea* from Bonaire (48); 38. *Schizothrix vaginata* from Bonaire (52d); 39. *Lyngbya kuetzingii* from Bonaire (52e); 40—41. *Lyngbya lagerheimii*, 40 from Curaçao (89), 41 from Bonaire (379c).



Ecology: stagnant waters, on immersed plants and insects (Frémy, 1930, p. 197).

Distribution: Sweden, Equatorial Africa, California, Uruguay (Frémy, 1930, p. 197); *Antilles and adjacent regions:* Curaçao (66), Bonaire (58b, 58c); Curaçao, Bonaire (Frémy, 1941, p. 142); Florida (Brannon, p. 75).

Lyngbya versicolor (Wartm.) ex Gom. (16, 1892, p. 147).

Ecology: stagnant fresh and brackish waters, creeks, lakes, aquarium, basin of fountain, bird bath, water reservoir (Frémy, 1930, p. 198; Drouet, 1942, p. 119; Nielsen, 1955, p. 108).

Distribution: Europe, Africa, Ceylon, Australia, N. America (Frémy, 1930, p. 198); *Antilles and adjacent regions:* Curaçao (398), Klein Curaçao (387), St. Eustatius (511 A); Barbados (West, p. 291); Jamaica (Drouet, 1942, p. 119); Florida (Nielsen, 1955, p. 108).

Lyngbya allorgei Frémy (1930, p. 189) — *fig. 49.*

Ecology: stagnant waters (Frémy, 1930, p. 190); *Antilles and adjacent regions:* Venezuela (553).

Lyngbya confervoides Ag. ex Gom. (16, 1892, p. 136).

Ecology: harbours, shores, tide pools, lakes of weak brine and of oversalted seawater, seawater flowing into lake, intertidal on stones, rocks, sand, wood, jetties and breakwaters, at high tide mark, on oyster-shells, on sandy coral-debris (Frémy, 1941, p. 142; Drouet, 1942, p. 119; Nielsen, 1955, p. 101).

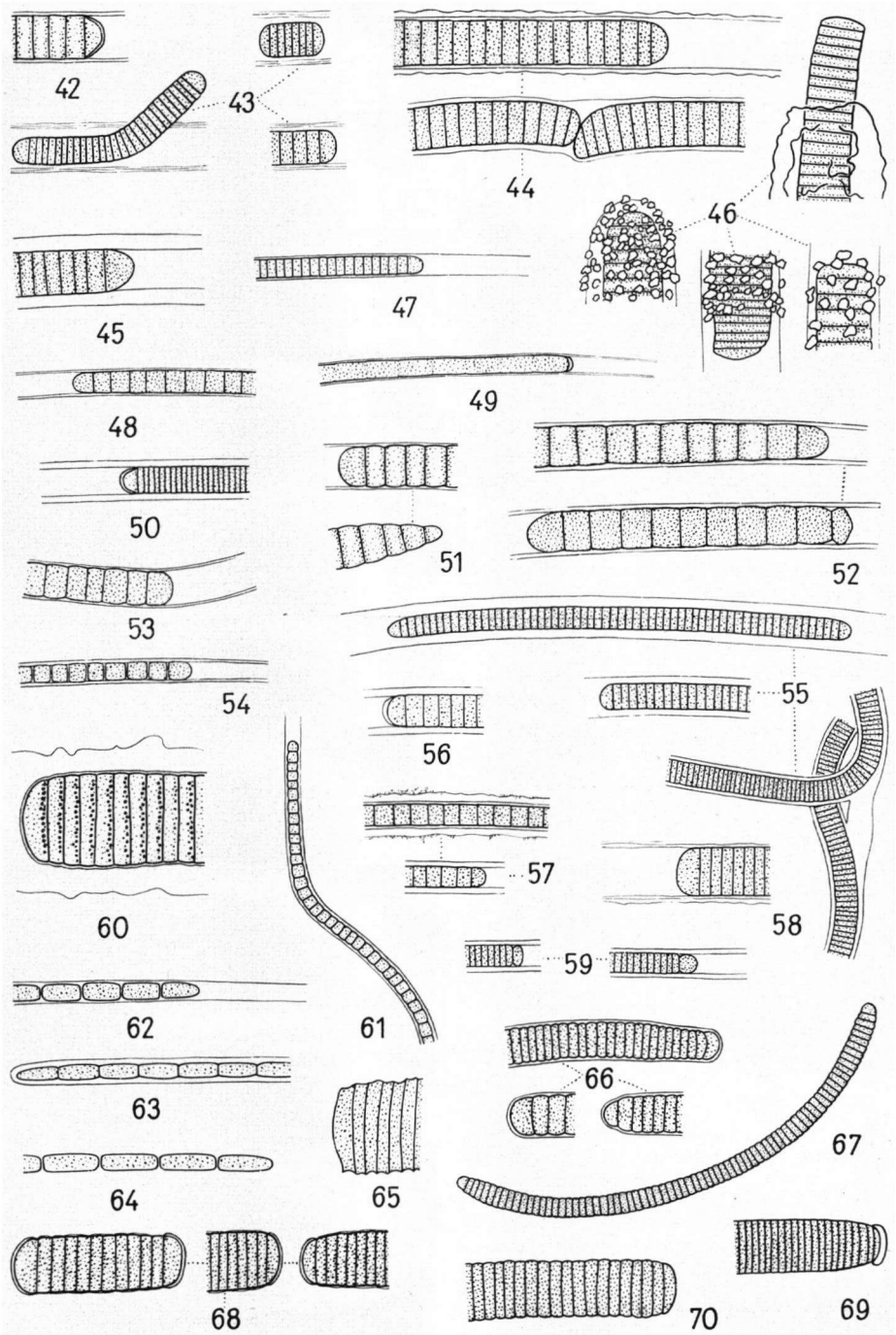
Distribution: cosmopolitan (Geitler, 1932, 1061); *Antilles and adjacent regions:* Tobago (656 A); Bonaire (Frémy, 1942, p. 142); Guadeloupe (Feldmann, p. 32); St. Croix (Frémy, 1939, p. 29); Puerto Rico (Gardner, p. 275); Jamaica (Drouet, 1942, p. 119); Bahama Islands (Collins, p. 622); Florida (Nielsen, 1955, p. 101).

Lyngbya semiplena (Ag.) J. Ag. ex Gom. (16, 1892, p. 138) — *fig. 50.*

Ecology: intertidal on rocks, bridges, shores, mangrove-roots, pilings, mud-flats and jetties, in salt-marshes, seawater streaming into lake, on *Juncus*, 29°, 30°C. (Frémy, 1941, p. 142; Brannon, p. 75; Nielsen, 1955, p. 102).

Distribution: cosmopolitan (Geitler, 1932, p. 1061); *Antilles and adjacent regions:* Aruba (104, 104b, 104 B b), Blanquilla (35); Tobago (656 A); Bonaire (Frémy, 1941, p. 142); Guadeloupe (Feldmann, p. 32);

Fig. 42—70: 42—46. *Lyngbya aestuarii*, 42 from Aruba (104Ba), 43 from Aruba (638), 44 from Bonaire (53c), 45 from Klein Bonaire (61b), 46 from Nevis (500); 47. *Lyngbya lutea* from Aruba (104A); 48. *Lyngbya diguetii* from Bonaire (58c); 49. *Lyngbya allorgei* from Venezuela (553); 50. *Lyngbya semiplena* from Aruba (104b); 51—53. *Lyngbya aerugineo-coerulea*, 51. *type* (*Oscillatoria aerugineo-coerulea* Kütz.), 52 from Curaçao (89), 53 from Bonaire (44b); 54. *Lyngbya putealis* from Margarita (19); 55—59. *Lyngbya martensiana*, 55 from Aruba (104Bc), 56 from Suriname (406), 57 from Bonaire (54b), 58 from Nevis (501), 59 from Bonaire (58c); 60. *Lyngbya major* from Aruba (104Ba); 61. *Phormidium foveolarum* from St. Martin (527); 62—63. *Phormidium tenue*, 62 from Bonaire (58c), 63 from Nevis (502); 64. *Phormidium luridum* from Bonaire (628A); 65. *Oscillatoria bonnemaisonii* from Aruba (104Bb); 66—67. *Oscillatoria sancta*, 66 from Aruba (104), 67 from Bonaire (628A); 68—69. *Oscillatoria ümosa*, 68 from Curaçao (399), 69 from Nevis (502); 70. *Oscillatoria obtusa* from Bonaire (379b).



St. John, St. Thomas, St. Croix (Frémy, 1939, p. 29); Puerto Rico (Gardner, p. 276); Bahama Islands (Collins, p. 622); Florida (Brannon, 1952, p. 75; Nielsen, 1955, p. 102).

Lyngbya aerugineo-coerulea (Kütz.) ex Gom. (16, 1892, p. 146) — *fig. 51–53*.

Ecology: stagnant and streaming waters (Geitler, 1932, p. 1062).

Distribution: cosmopolitan (Frémy, 1930, p. 190); *Antilles and adjacent regions*: Curaçao (89), Bonaire (44b, 57c, 58b, 379a, 628 A); Curaçao, Klein Bonaire (Frémy, 1941, 142); Puerto Rico (Gardner, p. 274).

Lyngbya putealis Mont. ex Gom. (16, 1892, p. 143) — *fig. 54*.

Ecology: stagnant fresh, also thermal waters, lakes, ponds, pools, gutters, on mud and stones, border of brooks and fish-ponds, cold spring, pH 7.5 (Frémy, 1930, p. 194; Bourrelly & Manguin, p. 158; Brannon, p. 75).

Distribution: England, Equatorial Africa, Réunion, Madagascar, Ceylon, S. America (Frémy, 1930, p. 194); *Antilles and adjacent regions*: Margarita (19), Tobago (656 A), Nevis (501); Brazil (Drouet, 1957, p. 2); French Guyana (Gomont, p. 144); Guadeloupe (Bourrelly & Manguin, p. 158; Jamaica (Drouet, 1942, p. 119); Florida (Brannon, p. 75).

Lyngbya martensiana Menegh. ex Gom. (16, 1892, p. 145) — *fig. 55–59*.

Ecology: stagnant and streaming, also thermal waters, very rarely marine on shells and Corallinaceae (Frémy, 1930, p. 192; Geitler, 1932, p. 1064).

Distribution: cosmopolitan (Geitler, 1932, p. 1064); *Antilles and adjacent regions*: Suriname (406), Aruba (104 B c), Curaçao (79, 79 B, 83), Bonaire (44, 54b, 58c, 381, 384), Nevis (501), St. Martin (539); Paraguana, Curaçao, Bonaire, Klein Bonaire, Blanquilla, Los Testigos (Frémy, 1941, p. 142); Barbados (West, p. 291); Guadeloupe (Gomont, p. 146); Puerto Rico (Gardner, p. 274).

Lyngbya major Menegh. ex Gom. (16, 1892, p. 144) — *fig. 60*.

Ecology: stagnant, also thermal waters, on mud (Geitler, 1932, p. 1066).

Distribution: Europe, Algeria (Geitler, 1932, p. 1066; Gauthier-Lièvre, p. 227); *Antilles and adjacent regions*: Aruba (104 B a); Barbados (West, p. 291).

Lyngbya taylorii Drouet & Strickland in Amer. Journ. Bot. 27, 1940, p. 631.

Ecology: ponds, lakes, hot springs, ditch in salt-marsh, pilings of bridge, running water, on aquatic plants, rocks and wood, sometimes floating (Strickland, p. 631; Brannon, p. 75; Nielsen, 1955, p. 107).

Distribution: N. America (Strickland, p. 631); *Antilles and adjacent regions*: St. Eustatius (506); Florida (Brannon, p. 75; Nielsen, 1955, p. 107), Guatemala (Strickland, p. 631).

Phormidium Kütz. ex Gom.

Phormidium foveolarum (Mont.) ex Gom. (16, 1892, p. 164) — *fig. 61*.

Ecology: moist soil, stones and calcareous rocks (Frémy, 1930, p. 140; Geitler, 1932, p. 999).

Distribution: Europe, Africa, N. America (Frémy, 1930, p. 140);

Antilles and adjacent regions: St. Martin (527); Puerto Rico (Gardner, p. 278).

Phormidium tenue (Menegh.) ex Gom. (16, 1892, p. 169) — *fig. 62–63*.

Ecology: stagnant, also cold and thermal waters, pools, lakes, gutters, springs, sulphur spring, lakes of weak and of rather strong brine, seawater streaming in lake, moist soil (Frémy, 1930, p. 148; 1941, p. 141; Geitler, 1932, p. 1005; Brannon, p. 77; Nielsen, 1955, p. 180).

Distribution: cosmopolitan (Frémy, 1930, p. 148); *Antilles and adjacent regions*: Bonaire (58c), Margarita (s. n.), Los Testigos (31 A), Nevis (502), St. Martin (539); Venezuela (Drouet, 1957, p. 681); Bonaire (Frémy, 1941, p. 141); Barbados (West, p. 292); Guadeloupe (Bourrelly & Manguin, p. 163); Florida (Brannon, p. 77; Nielsen, 1955, p. 180).

Phormidium luridum (Kütz.) ex Gom. (16, 1892, p. 165) — *fig. 64*.

Ecology: stagnant, also thermal waters, on colonies of *Nostoc* (Geitler, 1932, p. 1010; Bourrelly & Manguin, p. 162).

Distribution: cosmopolitan (Geitler, 1932, p. 1010); *Antilles and adjacent regions*: Bonaire (628 A); Dominica (West, p. 291); Guadeloupe (Bourrelly & Manguin, p. 162); Puerto Rico (Gardner, p. 278).

Phormidium valderianum Gom. (16, 1892, p. 167).

Ecology: stagnant and streaming, also brackish and thermal waters, lages, rivers, sulphur spring, submerged lock, rarely on moist rocks (Frémy, 1930, p. 144; Bourrelly & Manguin, p. 163; Nielsen, 1955, p. 180).

Distribution: cosmopolitan (Frémy, 1930, p. 144); *Antilles and adjacent regions*: Antigua (665); Guadeloupe (Bourrelly & Manguin, p. 163); Puerto Rico (Gardner, p. 279); Jamaica (Drouet, 1942, p. 120); New Providence, North Cat Cay, Walting's Island (Collins, p. 621); Florida Brannon, p. 77; Nielsen, 1955, p. 120).

Phormidium papyraceum (Ag.) ex Gom. (16, 1892, p. 173).

Ecology: stagnant and streaming, also thermal waters, seashores, springs run, on moist soil, walls, stones and wood, salt pond (Frémy, 1930, p. 151; Geitler, 1932, p. 1020; Brannon, p. 77; Frémy, 1939, p. 25).

Distribution: cosmopolitan (Frémy, 1930, p. 151); *Antilles and adjacent regions*: Curaçao (74); Brazil (Drouet, 1957, p. 2); St. Croix (Frémy, 1939, p. 25); Jamaica (Drouet, 1942, p. 120); Florida (Brannon, p. 77; Nielsen, 1955, p. 182); Panama (Drouet, 1937, p. 604).

Phormidium autumnale (Ag.) ex Gom. (16, 1892, p. 187).

Ecology: moist soil, stones, rocks and submerged (also intertidal) woodwork, springs, ponds, swiftly running water, greenhouse, nitrophilous (Frémy, 1930, p. 164; Brannon, p. 77; Nielsen, 1955, p. 185).

Distribution: cosmopolitan (Frémy, 1930, p. 164); *Antilles and adjacent regions*: Curaçao (76 D), Los Testigos (165); Venezuela (Drouet, 1954, p. 681); Florida (Brannon, p. 77; Nielsen, 1955, p. 185).

Oscillatoria Vauch. ex Gom.

Oscillatoria bonnemaisonii Crouan ex Gom. (16, 1892, p. 215) — *fig. 65*.

Ecology: brackish and almost marine waters, shallow pool of concentrated seawater, on walls and rocks on seashores, on roots of *Rhizophora*.

on muddy bottom below mangroves, on sandy coral debris, 30° C. (Geitler, 1932, p. 942; Frémy, 1939, p. 31; 1941, p. 144).

Distribution: Europe, Algeria, Polynesia, N. America (Gauthier-Lièvre, p. 227; Geitler, 1932, p. 942); *Antilles, and adjacent regions:* Aruba (104 B b); Curaçao, Bonaire, Klein Bonaire (Frémy, 1941, p. 144); St. Croix (Frémy, 1939, p. 31); Puerto Rico (Gardner, p. 271); Jamaica (Drouet, 1942, p. 121).

***Oscillatoria sancta* Kütz. ex Gom. (16, 1892, p. 209) — fig. 66—67.**

Ecology: stagnant and streaming, also thermal waters, on moist soil, rocks and walls, greenhouses, attached or floating (Frémy, 1930, p. 211; Geitler, 1932, p. 943; Nielsen, 1954, p. 362).

Distribution: Europe, Africa, Australia, N. and S. America, Antarctica (Frémy, 1930, p. 211); *Antilles and adjacent regions:* Aruba (104), Bonaire (628 A); Barbados (West, p. 292); Guadeloupe (Bourrelly & Manguin, p. 161); Puerto Rico (Gardner, p. 267); Atwood Cay (Collins, p. 620); Florida (Nielsen, 1954, p. 362).

***Oscillatoria limosa* Ag. ex Gom. (16, 1892, p. 210) — fig. 68—69.**

Ecology: stagnant or slowly streaming, also brackish and polluted waters, ponds, springs, rivers, harbours, on mud, attached or floating (Frémy, 1930, p. 212; Geitler, 1932, p. 944, Brannon, p. 76).

Distribution: cosmopolitan (Frémy, 1930, p. 212); *Antilles and adjacent regions:* Aruba (93b), Curaçao (89, 399), Nevis (502); Barbados (West, p. 292); Puerto Rico (Gardner, p. 267); Florida (Brannon, p. 76; Nielsen, 1954, p. 359).

***Oscillatoria obtusa* Gardn. (p. 267) — fig. 70.**

Ecology: stagnant and streaming waters (Gardner, p. 267).

Distribution: *Antilles and adjacent regions:* Bonaire (379a, 379b); Puerto Rico (Gardner, p. 267).

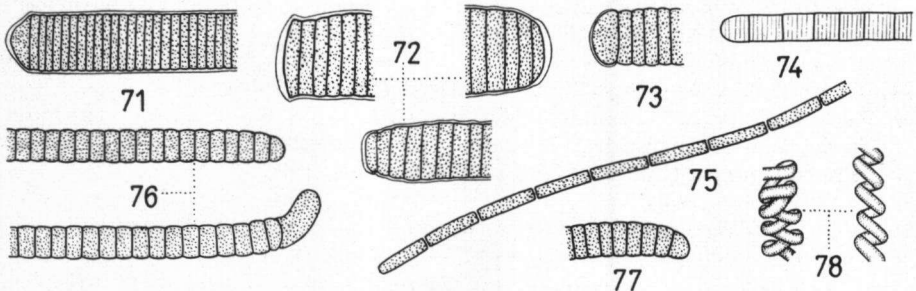


Fig. 71—78: 71—73. *Oscillatoria princeps*, 71 from Aruba (104b), 72 from Bonaire (53c), 73 from Klein Bonaire (61b); 74. *Oscillatoria chlorina* from St. Martin (539); 75. *Oscillatoria limnetica* from Bonaire (44b); 76—77. *Oscillatoria okenii*, 76 from Nevis (502), 77 from Venezuela (553); 78. *Spirulina major* from Curaçao (89).

***Oscillatoria princeps* Vauch. ex Gom. (16, 1892, p. 206) — fig. 71—73.**

Ecology: stagnant and slowly streaming, also thermal waters, pools, ponds, rivers, sulphur spring, at first attached on the bottom, afterwards floating (Frémy, 1930, p. 209; Nielsen, 1954, p. 361).

Distribution: cosmopolitan (Frémy, 1930, p. 209); *Antilles and adjacent regions:* Aruba (104b), Curaçao (89, 396c), Bonaire (53c, 61b), St. Thomas (687); Brazil (Gomont, p. 207); Curaçao, Bonaire, Klein Bonaire (Frémy, 1941, p. 144); Barbados (West, p. 292); Guadeloupe (Bourrelly & Manguin, p. 161); Puerto Rico (Gardner, p. 267); Jamaica (Drouet, 1942, p. 121); Florida (Brannon, p. 76; Nielsen, 1954, p. 361).

Oscillatoria chlorina Kütz. ex Gom. (16, 1892, p. 223) — *fig. 74.*

Ecology: stagnant, also brackish and thermal waters, pools, on mud, also floating (Frémy, 1930, p. 215; Geitler, 1932, p. 952; Brannon, p. 76).

Distribution: Europe, Equatorial Africa, N. America, Antarctica (Frémy, 1930, p. 215); *Antilles and adjacent waters:* St. Martin (539); Puerto Rico (Gardner, p. 268); Florida (Brannon, p. 76).

Oscillatoria limnetica Lemmermann in Ber. deutsch Bot. Ges. 18, 1900, p. 310 — *fig. 75.*

Ecology: stagnant, often polluted waters, planctonic, on mud in ponds (Frémy, 1930, p. 220).

Distribution: Europe, Equatorial Africa (Frémy, 1930, p. 220); *Antilles and adjacent regions:* Bonaire (44b).

Oscillatoria amphibia Ag. ex Gom. (16, 1892, p. 221).

Ecology: stagnant and slowly streaming, also brackish and thermal waters, lakes, rivers, creeks, alkaline lake, rock-pool, thermal spring with high salinity, 50—60° C, pH 7,5—8 (Frémy, 1930, p. 213; 1941, p. 144; Bourrelly & Manguin, 1952, p. 159; Brannon, p. 76).

Distribution: cosmopolitan (Frémy, 1930, p. 213); *Antilles and adjacent regions:* St. Eustatius (505); Curaçao (Frémy, 1941, p. 144); Guadeloupe (Bourrelly & Manguin, p. 159); St. Croix (Frémy, 1939, p. 32); Florida (Brannon, p. 76).

Oscillatoria okenii Ag. ex Gom. (16, 1892, p. 232) — *fig. 76—77.*

Ecology: cold and thermal waters, cascade, thermal spring with a high salinity, dripping slope, 50—60° C, pH 6,5 (Frémy, 1930, p. 227; Bourrelly & Manguin, p. 161).

Distribution: Europe, Africa, Madagascar, N. America (Frémy, 1930, p. 22); *Antilles and adjacent regions:* Venezuela (553), Bonaire (58b), Nevis (502), Bimini (549); Guadeloupe (Bourrelly & Manguin, p. 161).

Oscillatoria splendida Grev. ex Gom. (16, 1892, p. 224).

Ecology: stagnant, also brackish, thermal and polluted waters, creeks, pools, sulphur spring, on moist soil and walls, on submerged stones (Frémy, 1930, p. 222; Geitler, 1932, p. 972; Bourrelly & Manguin, p. 161; Brannon, 76; Nielsen, 1954, p. 363).

Distribution: cosmopolitan (Frémy, 1930, p. 222); *Antilles and adjacent regions:* Curaçao (76 D); Guadeloupe (Bourrelly & Manguin, p. 161); Florida (Brannon, p. 97; Nielsen, 1954, p. 363).

Oscillatoria brevis Kütz. ex Gom. (16, 1892, p. 229).

Ecology: stagnant fresh and brackish waters, on moist walls, sand and mud, beach, intertidal (Frémy, 1930, p. 224; Geitler, 1932, p. 977; Nielsen, 1954, p. 356).

Distribution: cosmopolitan (Frémy, 1930, p. 224); *Antilles and adjacent regions:* Bonaire (384); Barbados (West, p. 292); St. Croix (Frémy, 1939, p. 33); Puerto Rico (Gardner, p. 269); Florida (Nielsen, 1954, p. 356).

Spirulina Turpin ex Gom.

Spirulina subsalsa Oersted ex Gom. (16, 1892, p. 253).

Ecology: stagnant fresh and brackish, also thermal, waters, sea-water, rivers, ditches, thermal spring, peat-moor, lakes of weak brine and of oversalted seawater, on roots of *Rhizophora*, among corals on a tidal flat, 30° C (Frémy, 1930, p. 236; 1941, p. 146; Geitler, 1932, p. 927; Bourrelly & Manguin, p. 164).

Distribution: cosmopolitan (Frémy, 1930, p. 236): *Antilles and adjacent regions*: Aruba (102 A); Aruba, Curaçao, Bonaire (Frémy, 1941, p. 146); Guadeloupe (Bourrelly & Manguin, p. 164); Puerto Rico (Gardner, p. 272); Florida (Nielsen, 1954, p. 367).

Spirulina subtilissima Kütz. ex Gom. (16, 1892, p. 252).

Ecology: stagnant, also thermal, rarely cold, often polluted waters, sulphur spring, rock-pool, weak brine, on stones and dead roots (Frémy, 1930, p. 234; 1941, p. 145; Geitler, 1932, p. 926).

Distribution: cosmopolitan (Frémy, 1930, p. 234); *Antilles and adjacent regions*: Aruba (93b, 102 A), Curaçao (89), Bonaire (379a, 379b, 379c); Aruba, Curaçao, Bonaire, Klein Bonaire (Frémy, 1941, p. 145); Florida (Nielsen, 1954, p. 367).

Spirulina tenerrima Kütz. ex Gom. (16, 1892, p. 252).

Ecology: brackish and marine waters, on moist sand and stones (Frémy, 1930, p. 233; Drouet, 1942, p. 122).

Distribution: Europe, Equatorial Africa, N. America (Frémy, 1930, p. 233); *Antilles and adjacent regions*: Curaçao (389), Barbuda (667); Jamaica (Drouet, 1942, p. 122).

Spirulina major Kütz. ex Gom. (16, 1892, p. 251) — *fig. 78*.

Ecology: stagnant, also brackish and thermal waters, springs, sulphur spring, coral rocks in littoral zone (Frémy, 1930, p. 234; Nielsen, 1954, p. 367; Frémy, 1939, p. 33).

Distribution: cosmopolitan (Frémy, 1930, p. 234); *Antilles and adjacent regions*: Curaçao (89); St. Croix (Frémy, 1939, p. 33); Puerto Rico (Gardner, p. 272); Florida (Nielsen, 1954, p. 367).

Conclusion

In the present collection 76 species have been found, among which 45 cosmopolitan, as a great many of the Cyanophyceae are, and 22 have such an extended distribution that they may be expected to prove to be cosmopolitan too, after a more thorough exploration of the Cyanophycan flora in many so far neglected areas. Among the 9 remaining species, *Hapalosiphon pumilis*, *Scytonema coactile*, *Aulosira implexa*, *Lyngbya allorgei* and *Oscillatoria obtusa* have a tropical, in some cases, as far as known, very restricted distribution. The following species have also more or less restricted areas: *Microcoleus cavanillesii* (Spain), *Schizothrix heufleri* (Tirol, Iceland), *Lyngbya major* (Europe, Algeria) and *Lyngbya taylorii* (N. America, Guatemala).

The following species from this collection have been found growing in fresh (Cl < 100 mg/l) or nearly fresh water only: *Coccochloris peniocyctis*,

Stigonema ocellatum, *Hapalosiphon pumilus*, *Tolypothrix lanata*, *Aulosira implexa*, *Dichothrix orsiniana*, *Schizothrix vaginata*, *Lyngbya allorgei*.

Remarkable is the abundant occurrence of *Lyngbya aestuarii* and in a lesser degree of *Lyngbya martensiana*. Though in extreme cases these two species can easily be distinguished, this is not always so. According to Gomont (p. 129) the diameter of the trichomes of *Lyngbya aestuarii* is 8–24 μ , the cells are $\frac{1}{3}$ – $\frac{1}{6}$ \times as long as the diameter, and the sheaths can be hyaline when young or when immersed to a certain depth. In *Lyngbya martensiana*, according to Gomont (p. 145–146), the diameter of the trichomes is 6–10 μ , the cells are $\frac{1}{2}$ – $\frac{1}{4}$ \times as long as the diameter, and the sheaths are always hyaline. *Lyngbya aestuarii*, though mostly growing in brackish water and even in strong brines, occurs in fresh water too; *Lyngbya martensiana* is chiefly a fresh-water species, though it has been found growing very rarely in marine habitats. In the present collection *Lyngbya aestuarii* was found 26 times in brackish and 5 times in fresh or nearly fresh water, *Lyngbya martensiana* was found growing 11 times in brackish and once in fresh water. The tips of the trichomes are described for *Lyngbya aestuarii* as slightly attenuate-capitate, truncate (Gom., p. 129, Pl. 3, fig. 2), for *Lyngbya martensiana* as rotund (Gom., p. 146, pl. 3, fig. 17). Thus, specimens growing in fresh water, with hyaline sheaths and having trichomes of a diameter of 8–10 μ , and with cells $\frac{1}{3}$ – $\frac{1}{4}$ \times as long as the diameter can only be recognized by the tips of the trichomes. Here, experiments may show whether or not that is a reliable character.

No new taxa have been found in this collection. Also from Frémy's work on Cyanophyceae from the Wagenaar Hummelinck collection from the Leeward Antilles (1941, p. 151), though he described one new species and four new formae, a lack of new entities is evident. For his new species, *Aphanothece minor*, was brought to the synonymy of *Coccochloris elabens* (Bréb.) Drouet & Daily (p. 28), and formae, especially those concerning the diameter of the cells and the colour, can hardly be considered of much interest in a group like the Cyanophyceae where so little about the influence of the environments is known.

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