NOTES ON JAVANESE CALCICOLE CYANOPHYCEAE

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In West as well as in East Java a *Cyanophyceae* association has been found, that from both localities shows a remarkable similarity in composition. Both were growing on limestone rocks and had the same greyish velvety appearance. The localities are:

West Java, Koeripan near Buitenzorg, alt. ± 200 m (LÜTJEHARMS n. 5461, 4 VII 1936) and

East Java, Malang, South coast, South of Wlingi near kampong Nglijep, alt. 0—500 m (GROENHART s.n., 4 X 1936).

The principal components are: *Scytonema Hofmanni* AG., *Schizothrix chalybea* (KÜTZ.) GOM. and less frequent *Scytonema (Petalonema) crassum* NAEG.

In the association from West Java are mixed: *Schizothrix violacea* GARDN. and in one place *Nostoc commune* VAUCH.

In the association from East Java in one place is found *Gloeocapsa gigas* W. et W. S. WEST and separate from the other species *Gloeocapsa Sibogae* WEB. v. B.

Scytonema Hofmanni AG. is most abundant in the association. The filaments are hardly falsely branched here. The sheath is yellowish brown (sometimes uncoloured) and covered with lime.

The *Scytonema* concerned should be brought to *Scytonema julianum* MENEGH., which, however, is put to the synonyms of *Sc. Hofmanni* AG. by BORNET and FLAHAULT (lit. 1) V, p. 98. According to these authors the lime-covered sheath of *Sc. julianum* MENEGH. cannot be a valuable characteristic, since in the same colony sheaths with and without lime are to be found.

Scytonema Hofmanni Ag. has been collected in East Java before (Geitler und Ruttner, lit. 7, pp. 317, 448). It seems to be cosmopolitan. It is often found growing on limestone and the lime-covered sheaths may be due to this habitat.

Schizothrix chalybea (Kütz.) Gom. Monogr. Oscill., 1892, p. 319 t. IX, f. 3—5, is based on *Symphiosiphon chalybeus* Kütz. The type is preserved in the Rijksherbarium, Leiden. It is collected in Orizaba "inter muscos" and was appearingly growing on calcareous soil. Mixed in the type collection is *Petalonema alatum* Borzi. Gomont's figure (lit. 8) Pl. 9, fig. 3 gives a good impression of the dichotomous branching of the tips of the sheaths. These tips are long and pointed, often empty, which is the cause of the silvery greyish colour of the superior part of the thallus. In the type the bluegreen trichomes mostly occur single, or with two in a sheath. In the Javanese specimens usually one, but sometimes five trichomes are found in a sheath.

The distribution of this species was restricted to Bahamas, Mexico and Panama (together with *Schizothrix violacea* Gardn., acc. to Drouet lit. 2, p. 603). Now that it has been found growing in Java its area is considerably enlarged. All habitats known are on limestone.

Scytonema crassum Naeg. in Kütz. Spec. Alg., 1849, p. 894, Tab. Phyc. II, 1850—1852, T. 26, IV. The type of this species is preserved in the Rijksherbarium, Leiden. It has been collected on a moist rock near Zürich, which proves to be a calcareous substratum. In the original diagnosis Kützing mentions a colourless sheath. Frémy (lit. 4) p. 43 indicates this exterior sheath also. In the type as well as in the Javanese specimens sometimes a more or less alate exterior sheath is seen at the terminal (younger) part of the filamentum, which exterior sheath is hyaline. It is continued along the filamentum, but grows thinner to the lower part of the filamentum. On account of this alate sheath *Scytonema crassum* can be placed in the genus *Petalonema* as well. This has been done by Frémy, who considers *Petalonema* as a section of *Scytonema* moreover.

Upper part of the filamentum of the Javanese specimens to 80 μ broad (as in the type). Trichomes 12—25 (in the type 16—20) μ broad. Cells in the upper part of the filamentum 4—7 (in the type 6—7) μ long.

Scytonema crassum resembles *Scytonema myochrous* (Dillw.) Ag. and is to be distinguished by the broader trichomes and filaments and the shorter cells.

Distribution: Europe (France, Switzerland, Italy), Ceylon, Java, Bahamas.

On the label of the type is written "Scytonema crassum und Scytonema tenuissimum-Zürich". *Scytonema tenuissimum* NAEG. is described in KÜTZ. Spec. Alg., 1849, p. 893. Next to *Scytonema crassum* the type collection contains filaments of a *Scytonema* with trichomes, which are shriveled up to 2—3 μ narrow canals, without a clear cell structure and normal trichomes, which appear to belong to *Scytonema mirabile* (DILLW.) BORN. If the filaments with shriveled trichomes have been described as *Scytonema tenuissimum* KÜTZ., which seems to be the case, this species ought to be put to the synonyms of *Scytonema mirabile* (DILLW.) BORN. Some filaments belonging to *Petalonema alatum* (BORZI) BERK. excepted, no other *Scytonema* has been observed in the type collection of *Scytonema crassum*.

Schizothrix violacea GARDN. emend. DROUET (lit. 2) p. 603. Filaments much twisted, sometimes surrounding filaments of *Schizothrix chalybea*.

This species seems to be a special calcicole plant. DROUET records from both habitats known up to this time its growing on limestone.

Distribution: Panama, Porto Rico, Java.

Nostoc commune VAUCH. Only in one place in the association this species was found. It seems to be an occasional appearance there. Trichomes with large cells, 4½—7 μ in diam.; heterocysts 7—8 μ in diam.

This cosmopolitan alga had been collected in Java before.

Gloeocapsa gigas W. et G. S. WEST in Journ. Linn. Soc. Bot. 30, 1895, p. 276, Pl. XVI, fig. 11—13 — *Anacystis gigas* GARDN. in Mem. N. Y. Bot. Gard. VII, 1927, p. 15.

According to the diagnosis the Javanese *Gloeocapsa* belongs to this species.

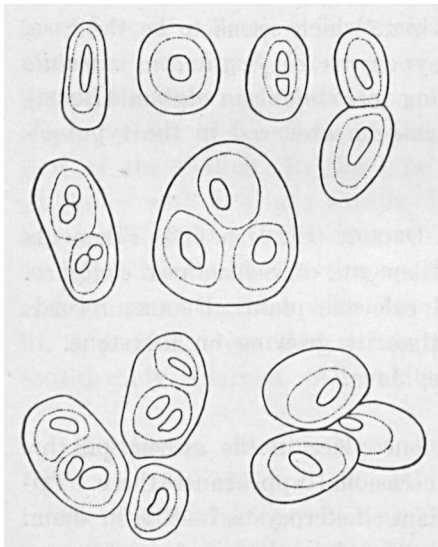
Colonies consisting of 1—50 cells, 14—200 μ in diam. General sheath brownish yellow. Individual sheaths numerous, often very distinct. Cells about 14 μ in diam., cell walls more or less warty, scabrous, cell contents dark bluegreen.

Distribution: Samoa Islands, Panama, Antilles, Java. The habitats known are walls, limestone, a damp rock, an old wood.

Cyanophyceae collections from the travertine hills of Koeripan have been made before by RUTTNER (lit. 7) p. 335, but the association described above was not found.

Gloeocapsa Sibogae WEB. v. B. Liste Alg. Siboga I, 1913, p. 6; GEITLER (lit. 6) p. 189; J. DE TONI, Diagn. Alg. Nov. III, 1938, p. 260. In the association here described the *Gloeocapsa* was growing separately from the rest and purely, without any species mixed. The type of this species, collected on the Siboga expedition, is preserved in the Rijksherbarium, Leiden.

The Javanese specimens are growing in the limestone, below the surface and on it. The bluegreen inside layer of the general colony contains *Gloeocapsa* cells, single or in colonies; colonies 3—25 μ in diam. consisting of 2, 4 or many individuals, more or less globose or ellipsoid. Cells together with the hyaline sheath 4—6 μ in diam., without sheath minute, 1—2 μ in diam. Sheath outside distinctly, inside indistinctly lamellose. Cell contents bluegreen, strongly reflecting the light. The outer layer of the general colony is a vast more or less gelatinose (in dry state cartilagineous) brownish crusty substance. The sheath of the cells are thicker and more turbid here. Cells without the sheath still smaller than those of the inner layer: 1 μ or less in diam. here, sometimes nearly bar-shaped, irregular.



Type of Gloeocapsa Sibogae Web. v. B. × 2500.

Most probably this *Gloeocapsa* penetrates below the surface of the limestone and dissolves lime accumulating it in its sheaths.

Distribution: West New Guinea (Isle of Saboeda, Siboga exp.); East Java, Malang, South Coast, bay of Serang, South of Kesamben, alt. ± 1 m — leg. GROENHART s.n., 24 X 1937; Malang, South Coast, South of Wlingi, near Kampong Nglijep — leg. GROENHART s.n., 4 X 1936. All three habitats are on limestone adjoining the sea.

GEITLER (lit. 6) p. 189 suggests, that *Gloeocapsa Sibogae* belongs to the same species as *Gloeocapsa punctata* NAEG. However, the last species has been found growing on moist inland rocks, whereas *Gloeocapsa Sibogae* has a habitat unusual for a *Gloeocapsa* (adjoining the sea), moreover penetrating the limestone. A sample in the herbarium KÜTZING, collected by NÄGELI near Zürich on wet rocks (proving to be

calcareous) contains *Gloeocapsa punctata* NAEG. mixed with two other species. The label is written by NÄGELI himself and this specimen seems to be the type or from the same collection as the type. *Gloeocapsa punctata* does not show the remarkable and vast gelatinous crust of *Gloeocapsa Sibogae,* purely consisting of the one species only. The cells are globose 1—2.5 μ in diam. without, 2—4 μ with sheath. The cells of *Gloeocapsa Sibogae* are globose to nearly bar-shaped.

PIA (lit. 11) p. 14 enumerates *Gloeocapsa punctata* among the *Cyanophyceae,* which precipitate lime. *Gloeocapsa Sibogae* in the contrary has to be added to the *Cyanophyceae,* which destruct limestone rocks.

New for Java are the following species: *Scytonema crassum* NAEG., *Schizothrix chalybea* (KÜTZ.) GOM., *Schizothrix violacea* GARDN., *Gloeocapsa gigas* W. et W. S. WEST, *Gloeocapsa Sibogae* WEB. v. B.

Probably strictly calcicole are: *Scytonema crassum* NAEG., *Schizothrix chalybea* (KÜTZ.) GOM., *Schizothrix violacea* GARDN., *Gloeocapsa Sibogae* WEB. v. B.

Prefer growing on limestone: *Gloeocapsa gigas* W. et W. S. WEST, *Scytonema Hofmanni* AG.

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