

Enumeration of the Cyanophyta (blue-green algae) of Japan 1. Chroococcales and Oscillatoriales

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The present contribution is a list of blue-green algae belonging to the orders of Chroococcales and Oscillatoriales recorded from Japan during the past 144 years from 1859 to 1993.

In the Chroococcales 7 families, 40 genera and 160 species are known. The following two species are new combinations. Entophysalidaceae: *Placoma adriatica* (Hauck) comb. nov. (= *Oncobyrsa adriatica* Hauck 1885), *P. micrococca* (Hansg.) comb. nov. (= *Oncobyrsa adriatica* Hauck var. *micrococca* Hansg. 1893). A new name for one species is given. Xenococcaceae: *Xenococcus yonedae* nom. nov.

In the Oscillatoriales the Borziaceae includes 3 genera and 6 species; the Homoeotrichaceae 2 genera and 17 species; the Oscillatoriaceae 5 genera and 31 species; the Phormidiaceae 12 genera and 126 species; the Pseudanabaenaceae 8 genera and 72 species; and the Schizotrichaceae one genus and 15 species.

In the Borziaceae one new combination is reported: *Komvophoron tenuis* (Emoto & Hirose) comb. nov. (= *Oscillatoria constricta* Szaf. var. *tenuis* Emoto & Hirose 1940).

In the Oscillatoriaceae one new combination is given: *Lyngbya anomala* (C. B. Rao) comb. nov. (= *Phormidium anomalum* C. B. Rao 1937).

In the Phormidiaceae 13 new combinations and 3 new names are given: *Phormidium acuminatum* (Gom.) Anagn. & Kom. var. *longe-attenuatum* (Geitl. & Ruttn.) comb. nov. (= *Oscillatoria acuminata* Gom. f. *longe-attenuata* Geitl. & Ruttn. 1935), *P. chalybeum* (Mert. ex Gom.) Anagn. & Kom. var. *depauperatum* (Copel.) comb. nov. (= *Oscillatoria chalybea* Mert. ex Gom. var. *depauperata* Copel. 1936), *P. chlorinum* (Kütz. ex Gom.) comb. nov. (= *Oscillatoria chlorina* Kütz. ex Gom. 1892), *P. foreau* (Frémy) comb. nov. (= *Oscillatoria foreau* Frémy 1942), *P. konstantianum* nom. nov., *P. nemuroense* (Yoneda) comb. nov. (= *Lyngbya nemuroensis* Yoneda 1941), *P. proteus* (Skuja) comb. nov. (= *Oscillatoria proteus* Skuja 1949), *P. puteale* (Mont. ex Gom.) Anagn. & Kom. var. *minor* (Geitl.) comb. nov. (= *Lyngbya putealis* Mont. ex Gom. var. *minor* Geitl. 1933), *P. spirulinoides* (Yoneda) comb. nov. (= *Oscillatoria spirulinoides* Yoneda 1954), *P. subspiroides* (Copel.) comb. nov. (= *Lyngbya subspiroides* Copel. 1936), *P. thwaitesii* nom. nov., *P. yonedae* (Umez.) comb. nov. (= *Oscillatoria yonedae* Umez. 1961), *P. yuichii* nom. nov., *Planktothrix iwanoffiana* (Nyg.) comb. nov. (= *Trichodesmium Iwanoffianum* Nyg. 1926), *P. lacustris* (Kleb.) comb. nov. (= *Trichodesmium lacustre* Kleb. 1895), *P. miyadai* (Negoro) comb. nov. (= *Oscillatoria Miyadai* Negoro 1943).

Fifteen new combinations and one new name are given in the Pseudanabaenaceae: *Geitlerinema peronidum* (Skuja) comb. nov. (= *Oscillatoria peronides* Skuja 1937), *G. splendidum* (Grev. ex Gom.) Anagn. var. *attenuatum* (W. West) comb. nov. (= *Oscillatoria splendida* Grev. ex Gom. var. *attenuata* W. West 1896), *G. splendidum* var. *truncatum* (Emoto & Hirose) comb. nov. (= *Oscillatoria splendida* var. *truncatum* Emoto & Hirose 1940), *G. uncinatum* (Emoto & Hirose) comb. nov. (= *Oscillatoria uncinata* Emoto & Hirose 1940), *G. codii* nom. nov., *Leibleinia pellucida* (Umez.) comb. nov. (= *Lyngbya pellucida* Umez. 1961), *Leptolyngbya cebennensis* (Gom.) comb. nov. (= *Phormidium cebennense* Gom. 1899), *L. desmidiacearum* (Noda) comb. nov. (= *Plectonema desmidiacearum* Noda 1971), *L. notata* Schmidle var. *africana* (Fritsch & Rich) comb. nov. (= *Plectonema notatum* Schmidle var. *africanum* Fritsch & Rich 1925), *L. purpurascens* (Gom.) Anagn. & Kom. var. *elegans* (Drouet) comb. nov. (= *Phormidium purpurascens* Gom. var. *elegans* Drouet 1934), *L. subterranea* (Copel.) comb. nov. (= *Phormidium subterraneum* Copel. 1936), *Planktothrix spirulinoides* (Utermöhl) comb. nov. (= *Lyngbya spirulinoides* Utermöhl 1925), *Jaaginema geminata* (Schwabe ex Gom.) Anagn. & Kom. var. *sulphurea* (Strzesz.) comb. nov. (= *Oscillatoria geminata* Schwabe ex Gom. var. *sulphurea* Strzesz. 1913), *Limnothrix guttulata* (van Goor) comb. nov. (= *Oscillatoria guttulata* van Goor 1918), *L. pseudominima* (Skuja) comb. nov. (= *Oscillatoria pseudominima* Skuja 1955), *L. quasiperforata* (Skuja) comb. nov. (= *Oscillatoria quasiperforata* Skuja 1949).

Key Index Words: blue-green algae, Cyanophyta, Chroococcales, Oscillatoriales, list, Japan

Harvey (1859) described four new marine blue-green algae on the basis of specimens collected by Charles Wright during the North Pacific Exploring Expedition under Captain Rodgers in 1853–1856. These are: *Rivularia opaca* in the Ryukyu Islands (= *Rivularia atra* Roth ex Born. & Flah. 1886), *Lyngbya effusa* Harv. in the Ryukyu Islands (= *Scytonema polycystum* Born. & Flah. 1887), *L. atrovirens* Harv. in the Ryukyu Islands (= *Lyngbya confervoides* C. Ag. ex Gom. 1892), and *L. atropurpurea* Harv. in the Bonin Islands (= *Lyngbya confervoides* C. Ag. ex Gom. 1892). In Harvey's unpublished manuscript written in 1859 and discovered in the Farlow Herbarium at Harvard University by Dawson in 1959, the following additional species are listed: *Rivularia nitida* C. Ag. in the Ryukyu Islands (= *Rivularia nitida* C. Ag. ex Born. & Flah. 1886), *Calothrix rigida* Harv. in the Ryukyu Islands (= *Symploca hydnoidea* Kütz. ex Gom. 1892), *Lyngbya majuscula* Harv. in the Ryukyu Islands (= *Lyngbya majuscula* Harv. ex Gom. 1892), *Oscillatoria indeterminata* (two undetermined forms) in the Ryukyu Islands, and *Nostoc commune* Vauch. in the Ryukyu Islands (= *Nostoc commune* Vauch. ex Born. & Flah. 1888).

Martens (1866) reported the occurrence of two freshwater blue-green algal species, *Nostoc commune* Vauch. (= *Nostoc commune* Vauch. ex Born. & Flah. 1886) at Nagasaki and *Rivularia Lens* Menegh. (= *Gloeotrichia pisum* Thur. ex Born. & Flah. 1886) at Yokohama from specimens collected by the Prussian Expedition.

Suringar (1870) described two new species from the specimens collected by Siebold, Büger, Textor and Bishop in the vicinity of Nagasaki, Kyusyu: *Sirosiphon vermiculare* Suring. [= *Stigonema vermiculare* Forti 1907, or = *Stigonema ocellatum* (Dillw.) Thur. by Drouet 1981] and *Hypheothrix anguina* Suring. [= *Lyngbya (Hypheothrix) anguina* Suring. ex Hansgirg 1892, or = bacteria or fungi according to Drouet 1981, p. 215]. In 1872 Suringar described *Phyllocladum sacrum* Suring. in his "Illustration des algues du Japon" on the basis of dried specimens sent from

Japan. The species name was historically changed to *Nostoc phyllocladum* ("Phyllocladum") (Suring.) Ono (Ono 1904), and *Aphanothece sacra* ("sacrum") (Suring.) Okada (Okada 1953a). Compère (1970), however, identified it as *Aphanothece stagnina* (Spreng.) A. Br. Dickie (1877) reported *Nostoc paludosum* Kütz. (= *Nostoc paludosum* Kütz. ex Born. & Flah. 1886) from near Lake Hakone, collected by H. N. Mosley of H. M. S. Challenger.

In 1894 Heydrich reported *Oscillatoria* sp. ("*Oscillaria*" sp.) and *Spirulina subsalsa* Oerst. (as *Spirulina Thuretii* Crouan) as occurring in Keelung, Formosa. De Toni (1895) listed the following marine species reported by foreign phycologists to occur in Japan: *Lyngbya confervoides* Ag. (syn.: *Lyngbya atrovirens* Harv. 1859; *Lyngbya atropurpurea* Harv. 1859), *Calothrix crustacea* Thur. (syn.: *Leibleinia australis* Kütz. in herb. Grunow), *Spirulina subsalsa* Oerst. (syn.: *Spirulina Thuretii* Crouan 1854 in Heydrich 1894), *Rivularia atra* Roth (syn.: *Rivularia opaca* Harv. 1859), and *Scytonema polycystum* Born. & Flah. (syn.: *Lyngbya effusa* Harv. 1859). Holmes (1895) studying specimens submitted from the environs of Tokyo, listed two marine species already known to the British coast: *Dermocarpa schousboei* Born. ("*Schousboei*") (= *Xenococcus schousboei* Thur. 1880) and *Lyngbya confervoides* C. Ag. (= *Lyngbya confervoides* C. Ag. ex Gom. 1892).

Okamura (1902) listed 23 species reported as occurring in Japan by the foreign phycologists mentioned above. However, only three species were certain to his knowledge: *Clathrocystis aeruginosa* (Harv.) Henfr. (= *Microcystis aeruginosa* Kütz. 1846), *Nostoc Phyllocladum* (Suring.) Ono (syn.: *Phyllocladum Sacrum* Suring. 1872) [= *Aphanothece sacra* (Suring.) Okada 1953a], and *Anabaena Azollae* Strasb. [= *Trichormus azollae* (Strasb.) Kom. & Anagn. 1989]. The same list was followed by Matsumura (1904), who added four species: *Cylindrospermum stagnale* (Kütz.) Born. & Flah., *Microcoleus vaginatus* (Vauch.) Gom., *Nostoc paludosum* Kütz. (in Dickie 1877, p. 272), and *Stigonema ocellatum* (Dillw.) Thur. (in Born. & Flah. 1886, p. 69). Hattori (1908) discovered *Oscillatoria* sp. and *Anabaena*

flos-aquae Bréb. in Lake Suwa.

Katsuyama (1887) was the first to record the existence of blue-green algae such as *Chroococcus* sp. (as *Cosmarium*-like alga) and *Oscillatoria* sp. ("*Oscillaria*") from Jozankei Hot Spring in Hokkaido. Hori (1890) found *Oscillatoria* sp. ("*Oscillaria*") in Tamatsukuri Hot Spring, Tottori Prefecture. Since then, much attention has been focused on thermal blue-green algae in Japan. Molisch's paper (1926), recording numerous eurythermal blue-green algae such as *Synechococcus* spp., *Jaaginema geminata* (as *Oscillatoria geminata*), *Leptolyngbya fragilis* (as *Phormidium fragile*), *L. laminosa* (as *Phormidium laminosum*), *Mastigocladus laminosus*, *Phormidium formosum* (as *Oscillatoria formosa*), *Symploca thermalis*, etc. from 25 thermal areas, marked an epoch in thermal blue-green algal studies in Japan. This paper gave a great impetus to studies of thermal blue-green algae and contributed to the sudden progress of the field in Japan. Of course, freshwater and terrestrial species such as *Aphanothee sacra* ("*sacrum*") (Suring.) Okada 1953a [syn.: *Nostoc Phylloderma* (Suring.) Ono 1904] whose basionym, *Phylloderma Sacrum*, was described by Suringer (1872) on the basis of dried specimens sent from Japan, and *Nostoc commune* and *N. verrucosum* which have been popularly used for food from ancient times in Japan were recorded also. Although many fragmental papers dealing with freshwater, terrestrial and thermal species had been reported, active taxonomic studies in Japan began in 1936 with Negoro's "Planktoncyanophyteen in japanischen Seen und Teichen" (I, 1936; II-III, 1937a), in 1937 with Hirose's "Some cyanophycean algae from Hokkaido" (I-III, 1937; IV-V, 1938), and in 1937 with Yoneda's "Cyanophyceae of Japan" (I, 1937; II, 1938a; III, 1938b; IV, 1939a; V, 1940a; VI, 1941a; VII, 1942a). About eight hundred mineral springs, both hot and cold, are known to exist in Japan (Yoneda 1952a). These afforded a good opportunity for studies on thermal organisms including blue-green algae. Emoto and Hirose (1940a-c, 1941, 1942a-f, 1943a-b, 1949, 1952a-c), Emoto and Yoneda (1940a-b,

1941a-b, 1942), Yoneda (1940a-b, 1941a-c, 1942a-g, 1952a-b) and Mifune et al. (1966) worked actively on the blue-green algae in thermal springs from Hokkaido to Kyushu under the main title "Studies on thermal flora of Japan" (I-XXXIII). These results, excluding Mifune et al. (1966), were reviewed by Yoneda (1952a), enumerating 51 genera and 290 species in accordance with Geitler's classification system (1932). Works on freshwater and terrestrial species were started by Okada (1936) and Negoro (1937a-b), followed by many phycologists (Akiyama, Hirano, Hirose, Hiramatsu, Nakano, M. Watanabe, Yamagishi, Yoneda, and others; see references), while others worked on the planktonic blue-green algae from a limnological view of point. The freshwater, planktonic, terrestrial and thermal species studied by these phycologists were summarized in the class Cyanophyceae by Hirose and Hirano in Hirose, H. and Yamagishi, T. (eds.), "Illustrations of the Japanese fresh-water algae" in 1977.

Okamura (1915) reported the existence of a marine species, *Brachytrichia Quoyi* (C. Ag.) Born. & Flah. [= *Brachytrichia quoyii* (C. Ag.) Born. & Flah. 1886]. In 1916 he listed eleven marine species excluding the species reported by the foreign phycologists mentioned above: *Oncobyrsa adriatica* Hauck? [= *Placoma adriatica* (Hauck) comb. nov.], *Dermocarpa prasina* (Reinsch) Thur. & Born. [= *Cyanocystis prasina* Reinsch] Kom. & Anagn. 1986], *D. Farlowii* Börg. [= *Cyanocystis protea* (Setch. & Gardn.) Kom. & Anagn. 1986. syn. *Dermocarpa protea* Setch. & Gardn., syn. *Dermocarpa farlowii* (non Börg) Yendo in Tokida 1938], *Trichodesmium erythraeum* Ehr. (= *Trichodesmium erythraeum* Ehr. ex Gom. 1892), *T. Thiebautii* Gom. (= *Trichodesmium thiebautii* Gom. 1892), *Richelia intracellularis* J. Schmid, *Calothrix crustacea* Thur. (= *Calothrix crustacea* Schousb. & Thur. ex Born. & Flah. 1886), *C. scopulorum* Ag. [= *Calothrix scopulorum* (Web. & Mohr.) C. Ag. ex Born. & Flah. 1886], *C. aeruginea* Thur. [= *Calothrix aeruginea* (Kütz.) Thur. ex Born. & Flah. 1886], and *Brachytrichia Quoyi* (Ag.) Born. & Flah.

(= *Brachytrichia quojii* (Ag.) Born. & Flah.).

Following this, reports of marine species were fragmental (Tokida 1930, 1938; Yamada and Tanaka 1944; Kobayasi and Watari 1934; Inagaki 1950). Akatsuka (1951) enumerated 5 families, 30 genera, and 139 species in his "Key and illustrations of plankton blue-green algae" of which 21 genera with 94 species are freshwater and 9 genera with 19 species marine. In 1950 Umezaki began to study the marine blue-green algae of Japan and in 1961 he reported a summary of the results from 1950 to 1958. The report enumerated 7 families, 32 genera and 86 species, although the order Chroococcales followed Drouet and Daily's classification (1956).

Species quoted from Akatsuka's (1951), Higashi and Okada's (1927), Hirose's (1965), Kokubo's (1932, 1955), Okada's (1953b), Okamura's (1922, 1930), Yamada's (1935), and Yoneda's (1966) papers, which are textbooks or keys to blue-green algal genera, and species for student training are listed in the present paper.

Japanese phycologists accepted Geitler's classification of Cyanophyceae in 1932 (In: Rabenhorst, Kryptogamen-Flora, Bd. 14, Leipzig) until 1953 when Yoneda (Yoneda 1953a) arranged his species from Oze, central Japan in five orders of Fritsch's system (The structures and reproduction of the algae, vol. 2, 1945, Cambridge). Hirose and Hirano used this system in the class Cyanophyceae (In: Hirose, H. and Yamagishi, T. (eds.), Illustrations of the Japanese fresh-water algae, 1977, Tokyo). Yamagishi and Akiyama (Photomicrographs of the fresh-water algae, vol. 1 (1984)-vol. 10 (1989) used Bourrelly's system of Cyanophyceae (Les algues d' eau douce, tom. III, Paris, 1970). Umezaki (1961) divided the class Cyanophyceae into two orders, the Chroococcales (Wettstein 1924) and the Oscillatoriales (Copeland 1936) (syn.: Hormogonales Geitl. 1942). A system dividing the class into two orders (or two groups) as Coccogoneae and Hormogoneae was proposed by Thuret (1875) and followed by Kirchner (1898), Forti (1907) and Drouet (1981). Diverse classifications dividing the

class into orders, for example, into three orders (Geitler 1932, Frémy 1934, Papenfuss 1955), into four orders (Geitler 1942), or into five orders (Fritsch 1945, Desikachary 1959) have been proposed. There has been no clear system that can offer decisive agreement among students of blue-green algae. The new classification system of cyanophytes proposed by Komárek and Anagnostidis (1986) on the Chroococcales, Anagnostidis and Komárek (1988) on the Oscillatoriales, Komárek and Anagnostidis (1989) on the Nostocales, and Anagnostidis and Komárek (1990) on the Stigonematales was prepared in accordance with modern knowledge for the taxonomy of the Cyanophyceae.

In this paper, 160 species of Chroococcales and 267 species of Oscillatoriales which have been reported as occur so far from Japan are enumerated in accordance with the classification system of Anagnostidis and Komárek mentioned above.

Cyanophyceae Sachs 1874

I. Chroococcales Wettstein 1924

1. Microcystaceae Elenk. 1933

(1) Aphanotheceidae Kom. & Anagn. 1986

Aphanothece Näg. 1849

A. bullosa (Kütz.) Rabenh. 1865

Ref.: Yoneda 1938b, c, 1952a; Okada 1939b; Emoto and Yoneda 1942

A. castagnei (Kütz.) Rabenh. 1865

Ref.: Yoneda 1938b, c, 1952a, 1953a; Emoto and Hirose 1943a, b; Hirano 1956b, 1960, 1962; Yamagishi 1967

A. elabens (Bréb.) Elenk. 1938

Syn.: *Microcystis elabens* Bréb. in Kütz. 1845
Ref.: Akatsuka 1951

A. longior Naumann 1921

Ref.: Hirano 1962; Hirose and Hirano 1977

A. microscopica Näg. 1849

Ref.: Hirose 1937; Emoto and Hirose 1940c; Fukushima 1952; Yoneda 1952a, 1953a; Negoro 1957, 1973; Mizuno 1964; Mori 1971; M. Watanabe and Niiyama 1990

- A. microspora* (Menegh.) Rabenh. 1863
Ref.: Yoneda 1937; Hirose 1937; Hirano 1962; Yamagishi 1967, 1972; Mori 1971
- A. naegelii* Wartm. in Rabenh. 1861
Ref.: Yoneda 1937; Akiyama 1965b; Hiramatsu 1973
- A. nidulans* P. Richt. in Wittr. & Nordst. 1884
Ref.: Hirose 1937, 1950; Hada 1939; Yoneda 1939a, d, 1952a, 1953a, 1954a, b; Emoto and Hirose 1940b; Akatsuka 1951; Negoro 1954, 1968, 1971; Yamaguti 1960; Imazu and Hirose 1961; Hirano 1962; Ochiai 1962b; Mizuno 1964; Akiyama 1965a, b; Mori 1971; Hirose and Hirano 1977
- A. pallida* (Kütz.) Rabenh. 1863
Ref.: Yoneda 1953a; Hirano 1960, 1962; Hiramatsu 1973; Hirose and Hirano 1977
- A. sacra* (Suring.) Okada 1953a ("sacrum")
Basion.: *Phylloderma sacrum* Suring. 1872
Ref.: Suringar 1872; Okamura 1902, 1930, 1936; Yendo 1911; Higashi 1924, 1933a; Yamada 1933, 1935; Kobayasi and Watari 1934; Okada 1939b, 1953a, b; Ueda et al. 1963; Hirose 1965; Yoneda 1966; A. Watanabe 1970; Compère 1970 (as *Aphanothece stagnina*); Hirose and Hirano 1977; Yasuhara and Arasaki 1979
Syn.: *Nostoc phylloderma* (Suring.) Ono in Matsumura 1904
Ref.: Okamura 1902; Ono 1904
- A. saxicola* Näg. 1849
Ref.: Yoneda 1942c, d, 1952a; Hirano 1962; Mizuno 1964; Yamagishi 1972; Hiramatsu 1973; Hirose and Hirano 1977
- A. stagnina* (Spreng.) A. Br. in Rabenh. 1863
Ref.: Yoneda 1937; Okada 1939b; Fukushima 1952; Yamaguti 1956; Kobayasi et al. 1962; Ochiai 1962b; Akiyama 1965a; Negoro 1973; Hirose and Hirano 1977; Kuriyagawa 1981; Yamagishi 1985
Syn.: *Aphanothece prasina* A. Braun in Rabenh. 1863
Ref.: Negoro 1873

Cyanothece Kom. 1976

- C. aeruginosa* (Näg.) Kom. 1976
Basion.: *Synechococcus aeruginosus* Näg. 1849
Ref.: Yoneda 1937, 1943, 1952a, 1953c; Okada 1939b; Emoto and Yoneda 1941a, 1942; Yamagishi 1967, 1972, 1985; Negoro 1973; Hirose and Hirano 1977
- C. cedrorum* (Sauv.) Kom. 1976
Basion.: *Synechococcus Cedrorum* Sauv. 1892
Ref.: Yoneda 1943, 1952a; Hirose and Hirano 1977
- C. eximia* (Copel.) Kom. 1976
Basion.: *Synechococcus eximius* Copel. 1936
Ref.: Yoneda 1941a, b, 1942g, 1943, 1952a; Emoto and Yoneda 1941b, 1942; Akiyama 1965a; Hirose and Hirano 1977
- C. major* (Schröt.) Kom. 1976
Basion.: *Synechococcus major* Schröt. 1883
Ref.: Hiramatsu 1973
Syn.: *Synechococcus major* f. *crassior* Lagerh. 1886
Ref.: Yoneda 1953a; Hirano 1959a, 1962; Hirose and Hirano 1977
- C. minervae* (Copel.) Kom. 1976
Basion.: *Synechococcus minervae* Copel. 1936
Ref.: Yoneda 1943, 1952a; Hirose and Hirano 1977
Syn.: *Synechococcus minervae* var. *maior* Copel. 1936
Ref.: Emoto and Yoneda 1941a; Yoneda 1941a, 1943, 1952a; Hirose and Hirano 1977

Cyanodictyon Pasch. 1914

- C. reticulatum* (Lemm.) Geitl. 1925
Basion.: *Polycystis (Clathrocystis) reticulata* Lemm. 1898
Syn.: *Coelosphaerium reticulatum* Lemm. 1907
Ref.: Akatsuka 1951; Yamagishi et al. 1982

Gloethece Näg. 1849

- G. confluens* (Kütz.) Näg. 1849
Ref.: Yoneda 1952a; Hirose and Hirano 1977; Mifune and Hirose 1983b
- G. fuscolutea* Näg. 1849
Ref.: Kobayasi 1958; Kobayasi et al. 1962;

- Hiramatsu 1973
G. linearis Näg. 1849
 Ref.: Fukushima 1952, 1954; Yoneda 1953a; Hirano 1962; Ochiai 1962b; Mizuno 1964; Yamagishi 1967; Hirose and Hirano 1977
- G. lunata** W. & G. S. West 1894
 Ref.: Akiyama 1965a
- G. palea** (Kütz.) Näg. 1849
 Ref.: Yoneda 1952a; Hirose and Hirano 1977
- G. rupestris** (Lyngb.) Born. in Wittr. & Norst. 1880
- G. rupestris** var. *rupestris*
 Ref.: Yoneda 1939a, 1952a, 1953c; Emoto and Hirose 1942a, 1943b, 1952a; Fukushima 1952, 1954; Akiyama 1965a; T. Watanabe 1957; Mori 1971; Negoro 1973; Hirose and Hirano 1977
- G. rupestris** var. *tepidariorum* (A. Braun) Hansg. 1892
 Ref.: Yoneda 1937, 1952a
- G. samoensis** Wille in Rechin. 1914
 Ref.: Fukushima 1952, 1954; Hiramatsu 1973; Hirose and Hirano 1977
- Lemmermanniella** Geitl. 1942
 Syn.: *Lemmermannia* Elenk. 1933, nec *Lemmermannia* Chodat 1900, nec *Crucigenia* Morren 1830; nec *Lemmermanniella* Skvortzov 1967, nec *Skvortzoviella* Bourr. 1970
- L. pallida** (Lemm.) Geitl. 1942
 Basion.: *Coelosphaerium pallidum* Lemm. 1898
 Syn.: *Lemmermannia pallida* (Lemm.) Elenk. 1933
 Ref.: Akatsuka 1951; Mizuno 1964
- (2) *Synechococcoideae* Kom. & Anagn. 1986
- Johannesbaptistia** J. De Toni 1934
 Syn.: *Cyanothrix* Gardn. 1927, *Heterohormonium* Copel. 1936
- J. pellucida** (Dick.) Taylor & Drouet in Drouet 1938
 Ref.: Umezaki 1961
- Rhabdoderma** Schmidle & Lauterb. 1900
- R. gorskii** Wolosz. 1917
- R. gorskii** var. *gorskii*
 Ref.: Akatsuka 1951; Akiyama 1965a
- R. gorskii** var. *spirale* Lundb. 1931
 Ref.: Akatsuka 1951
- R. lineare** Schmidle & Lauterb. 1900
- R. lineare** var. *lineare*
 Ref.: Yoneda 1954b; Hirano 1959a; Hirose and Hirano 1977
- R. lineare** var. *compositum* (G. M. Smith) stat. nov.
 Basion.: *Gloeotheca linearis* Näg. var. *composita* G. M. Smith, Bull. Wisconsin Geol. & Nat. Hist. Surv. 57: 46, 1920
 Syn.: *Rhabdoderma lineare* Schmidle & Lauterb. f. *compositum* Hollerb. in Elenkin, Monogr. Algar. Cyanophyc., Pars Spec. 1: 44, 1938
 Ref.: Akatsuka 1951
- R. lineare** var. *minor* Emoto & Hirose 1940a
 Ref.: Emoto and Hirose 1940a
- Rhabdogloea** Schröd. 1917
 Syn.: *Dactylococcopsis* sensu auct. non Hansg. 1888
- R. clathrata** (W. & G. S. West) Kom. 1983
 Basion.: *Aphanothece clathrata* W. & G. S. West 1906
 Ref.: Akatsuka 1951; Negoro 1971; Hirose and Hirano 1977; Yamagishi et al. 1982; Wakabayashi and Ichise 1982
- R. ellipsoidea** Schröd. 1917
 Syn.: *Dactylococcopsis smithii* R. & F. Chodat 1925
 Ref.: Yoneda 1954b; Yamagishi 1967
 Syn.: *Rhabdogloea smithii* (R. & F. Chodat) Kom. 1983
- Synechococcus** Näg. 1848
- S. arcuatus** Copel. 1936
 Ref.: Emoto and Hirose 1940b; Yoneda 1943, 1952a
- S. caldarius** Yon. Okada 1939
 Ref.: Yon. Okada 1939
- S. elongatus** (Näg) Näg. 1849
- S. elongatus** f. *elongatus*
 Ref.: Yoneda 1938b, c, 1939c, 1940b, 1942c, g, 1943, 1952a, 1953a; Emoto and Yoneda 1941b, 1942; Emoto and Hirose 1942a, b, c, d, f; T. Watanabe

- 1957; Fukushima 1963; Akiyama 1965a; Hirose 1966
- S. elongatus* f. *thermalis* Geitl. in Geitl. & Ruttn. 1935
Syn.: *Synechococcus elongatus* (Näg.) Näg. var. *amphigranulatus* Copel. 1936
Ref.: Yoneda 1938b, c, 1939b, c, 1940b, 1941b, c, 1942b, c, d, 1952b, 1954a, 1962a; Emoto and Yoneda 1940b, 1941a, b, 1942; Emoto and Hirose 1940a, c, 1942f; Akiyama 1965a
Syn.: *Synechococcus amphigranulatus* (Copel.) Yoneda 1943
Ref.: Yoneda 1943
Syn.: *Synechococcus elongatus* (Näg.) Näg. f. *indefinitus* Emoto & Hirose 1942b
Ref.: Emoto and Hirose 1942b
Syn.: *Synechococcus elongatus* (Näg.) Näg. var. *vestitus* Copel. 1936
Ref.: Yoneda 1939b, c, 1940b, 1942c, 1943, 1952a; Emoto and Yoneda 1940b; Emoto and Hirose 1940a, b, c, 1942a, e, f, 1943b, 1949
- S. koidzumii* Yoneda 1943 ("Koidzumii")
Ref.: Yoneda 1943
- S. lividus* Copel. 1936
- S. lividus* var. *lividus*
Ref. Yoneda 1938b, c, 1941b, 1942b, d, 1943, 1952a; Ikoma and Doi 1955; Emoto and Hirose 1949, 1952a, b; Emoto and Yoneda 1941b; Akiyama 1965a
Syn.: *Synechococcus lividus* Copel. var. *curvatus* Copel. 1936
Ref.: Yoneda 1938c, 1942b, 1943; Emoto and Hirose 1942c, f
- S. lividus* var. *non-granulatus* Emoto & Hirose 1940b
Ref.: Emoto and Hirose 1940b
- S. minutissimus* Negoro 1944
Ref.: Negoro 1944
- S. praelongus* Emoto & Yoneda 1940b
Ref.: Emoto and Yoneda 1940b
- S. sublividus* Emoto & Yoneda 1940b
Ref.: Emoto and Yoneda 1940b
- S. vescus* Copel. 1936
- S. vescus* var. *vescus*
Ref.: Yoneda 1952a
- S. vescus* var. *non-granulatus* Emoto & Hirose 1940b
Ref.: Emoto and Hirose 1940b
- S. viridissimus* Copel. 1936
Ref.: Yoneda 1943, 1952a; Emoto and Hirose 1941, 1942c, d, f, 1952a, b; Hirose 1966
- S. vulcanus* Copel. 1936
- S. vulcanus* var. *vulcanus*
Ref.: Emoto and Hirose 1940c; Yoneda 1943, 1952a
- S. vulcanus* var. *bacillarioides* Copel. 1936
Ref.: Yoneda 1942b, 1943, 1952a
- (3) Merismopedioideae (Elenk.) Kom. & Anagn. 1986
- Aphanocapsa* Näg. 1849
- A. biformis* A. Br. in Rabenh. 1876
Ref.: Yoneda 1942a, 1953a; Hirano 1953, 1956b, 1959b, 1960, 1962; Mori 1971; Hiramatsu 1973; Hirose and Hirano 1977
- A. concharum* Hansg. 1890
Ref.: Umezaki 1955c
- A. delicatissima* W. & G. S. West 1912
Ref.: Akatsuka 1951
- A. elachista* W. & G. S. West 1894
Ref.: Ueno 1934; Hirose 1937; Yoneda 1938a, 1953a, b, 1954b; Hirano 1956b, 1959a, b, 1960, 1962; Mizuno 1964; Akiyama 1965a; Yamagishi 1972; Negoro 1973; Hirose and Hirano 1977; Wakabayashi and Ichise 1982
Syn.: *Aphanocapsa elachista* W. & G. S. West var. *conferta* W. & G. S. West 1912
Ref.: Negoro 1954, 1956, 1968, 1971; Mizuno 1964; Isoda 1966; T. Watanabe 1968c; Hirose and Hirano 1977; Wakabayashi and Ichise 1982; Yamagishi 1985
Syn.: *Aphanocapsa elachista* W. & G. S. West var. *planctonica* G. M. Smith 1920
Ref.: Hirose 1937; Yoneda 1937, 1953a; Akatsuka 1951; Hada 1958; Hirose and Hirano 1977
- A. endophytica* G. M. Smith 1920
Ref.: Akatsuka 1951
- A. fonticola* Hansg. 1890
Ref.: Yoneda 1953a
- A. fuscolutea* Hansg. 1892

- Ref.: Yoneda 1952a, 1954a
- A. grevillei** (Berk.) Rabenh. 1865
Ref.: Akatsuka 1951
- A. koordersii** Ström 1923
Ref.: Yoneda 1937; Akatsuka 1951; Fukushima 1960b; Hirano 1962; Hirose and Hirano 1977
- A. litoralis** Hansg. 1892
Ref.: Umezaki 1952b, 1953b, 1956c; Noda 1987
Syn.: *Aphanocapsa litoralis* Hansg. var. *macrococca* Hansg. 1892
Ref.: Umezaki 1952a, b, 1955c
- A. montana** Cramer in Wartm. & Schenk 1862
Ref.: Yamagishi 1972
- A. nivalis** Lagerh. 1894
Ref.: Fukushima 1954
- A. pulchra** (Kütz.) Rabenh. 1865
Ref.: Yoneda 1940a, 1953a; Akatsuka 1951; Hirano 1956b, 1962; Mizuno 1964; Isoda 1966; Hirose and Hirano 1977
- A. thermalis** (Kütz.) Brügg. 1863
Ref.: Yoneda 1938b, c, 1942b, c, d, 1952a, b; Emoto and Hirose 1940b; Emoto and Yoneda 1941a; Fukushima 1963; Hirose and Hirano 1977
- Coelosphaerium** Näg. 1849
- C. dubium** Grun. in Rabenh. 1865
Ref.: Yoneda 1938a, 1952a, 1953a; Akatsuka 1951; Mizuno 1964; Hirose and Hirano 1977
- C. kuetzingianum** Näg. in Kütz. 1849
Ref.: Ueno 1933, 1934; Miyauchi 1935; Hirose 1937, 1950; Yoneda, 1937, 1952a, 1953a, b; Emoto and Yoneda 1941b; Kokubo 1944; Akatsuka 1951; Hirano 1960, 1962; Hada 1960; Yamaguti 1960; Iwai 1963; Mizuno 1964; Akiyama 1965a, 1977; Isoda 1966; Negoro 1973; Kurasawa and Okino 1975; Hirose and Hirano 1977; Wakabayashi and Ichise 1982
Syn.: *Coelosphaerium aerugineum* Lemm. 1898
Ref.: Akatsuka 1951; Negoro 1973
- Coelomoron** Buell 1938
- C. pusillum** (van Goor) Kom. 1989
Basion.: *Coelosphaerium pusillum* van Goor 1924
Ref.: Negoro and Aoki 1991
Syn.: *Gomphospaeria pusilla* (van Goor) Kom. 1958
Ref.: Umezaki 1987
- C. subarcticum** Kom. & Kom.-Legner. 1992
Ref.: Komárek and Komárková-Legnerová 1992
- Gomphospaeria** Kütz. 1836
- G. aponina** Kütz. 1836
Ref.: Akatsuka 1951; Yoneda 1953a; Umezaki 1961; Hirose and Hirano 1977; Wakabayashi and Ichise 1982; Yamagishi 1985
- G. multiplex** (Nyg.) Kom. 1989
Basion.: *Gomphospaeria aponina* Kütz. var. *multiplex* Nyg. 1926
Ref.: Okada 1939a
- Snowella** Elenk. 1938
- S. lacustris** (Chodat) Kom. & Hind. 1988
Basion.: *Gomphospaeria lacustris* Chodat 1898
Ref.: Akatsuka 1951; Fukushima 1960b; Hirose and Hirano 1977; Yamagishi 1989
- S. rosea** (Snow) Elenk. 1938
Syn.: *Coelosphaerium roseum* Snow 1903
Ref.: Akatsuka 1951
- Woronichinia** Elenk. 1933
- W. elorantae** Kom. & Kom.-Legner. 1992
Ref.: Komárek and Komárková-Legnerová 1992
- W. naegeliana** (Unger) Elenk. 1933
Basion.: *Coelosphaerium naegelianum* Unger 1854
Ref.: Ueno 1936; Yoneda 1937, 1952a, 1953b; Hirose 1937, 1950; Hada 1938a; Kokubo 1944; Negoro 1937a; Akatsuka 1951; Hirano 1960; Fukushima 1960a; Mizuno 1964; Hada and Kojiro 1966; Hirose and Hirano 1977; Yamagishi et al. 1982; Yamagishi 1985; Komárek and

- Komárková-Legnerová 1992
W. tenera (Skuja) Kom. & Hind. 1988
 Basion.: *Gomphosphaeria tenera* Skuja 1964
 Ref.: Yamagishi et al. 1982
- Merismopedia* Meyen 1839**
- Syn.: *Merismopoedia* Kütz. 1843, *Agmenelum* Bréb. 1839, *Gonidium* Ehrenb. ex Menegh. 1849, *Pseudoholopedia* (Ryppova) Elenk. 1938
- M. convoluta*** Bréb. 1849
 Ref.: Yoneda 1938b, c, 1952a; Yamagishi 1984
 Syn.: *Pseudoholopedia convoluta* (Bréb.) Elenk. 1938
 Ref.: Hirose and Hirano 1977; Akiyama 1977
- M. elegans*** A. Br. in Kütz. 1849
- M. elegans* var. *elegans***
 Ref.: Yoneda 1937, 1953a; Akatsuka 1951; Fukushima 1952, 1954; Umezaki 1953b; Yamaguti 1956, 1960; Negoro 1967, 1968, 1971, 1973; T. Watanabe 1968c; Hiramatsu 1973; Kurasawa and Okino 1975; Hirose and Hirano 1977; Wakabayashi and Ichise 1982
- M. elegans* var. *major*** G. M. Smith 1920
 Ref.: Akatsuka 1951; T. Watanabe 1968c
- M. glauca*** (Ehrenb.) Kütz. 1845
 Ref.: Yoneda 1937, 1952a, 1953a, 1954b; Negoro 1937b, 1973; Hirose 1937; Okada 1939b; Akatsuka 1951; Fukushima 1954; Kobayasi 1958; Hirano 1959a, 1960, 1962; Ochiai 1960, 1962b; Kobayasi et al. 1962; Akiyama 1965a, 1977; Iso-da 1966; Yamagishi 1967, 1984; Imada 1970; Nakano 1970; Hirose and Hirano 1977; Imazu 1979; M. Watanabe and Niiyama 1990
- M. punctata*** Meyen 1839
 Ref.: Yoneda 1937, 1939d, 1953a, b; Hada 1939; Fukushima 1950, 1952, 1954; Akatsuka 1951; Kobayasi 1958; Yamaguti 1960; Kobayasi et al. 1962; Hirano 1962; Iwai 1963; Mori 1963; Akiyama 1965a, 1977; Yamagishi 1967; Horikawa et al. 1969; Imada 1970; Negoro 1973; Negoro and Aoki 1991
- M. warmingiana*** Lagerh. ex Forti 1907
 Syn.: *Merismopedia minima* Beck 1897
 Ref.: Yamagishi 1987
 Syn.: *Merismopedia tenuissima* Lemm. 1898
 Ref.: Yoneda 1938a; Akatsuka 1951; T. Watanabe 1956, 1968a; Hirano 1962; Iwai 1963; Isoda 1966; Yamagishi 1967, 1984; Negoro 1968, 1971, 1973; Hirose and Hirano 1977; Wakabayashi and Ichise 1982; Negoro and Aoki 1991
- Synechocystis* Sauv. 1892**
- Syn.: *Synechococcus* subg. *Synechocystis* (Sauv.) Elenk. 1923
- S. aquatilis*** Sauv. 1892
- S. aquatilis* f. *aquatilis***
 Ref.: Yoneda 1938b, c, 1940b, 1943, 1952a; Emoto and Yoneda 1940b; Emoto and Hirose 1941, 1942a; Negoro 1944, 1962; Hiramatsu 1967; Hirose and Hirano 1977; Mifune and Hirose 1982
- S. aquatilis* f. *salina*** (Wisl.) Kom. 1976
 Basion.: *Synechocystis salina* Wisl. 1924
 Syn.: *Synechocystis aquatilis* Sauv. var. *minor* Geitl. in Geitl. & Ruttn. 1935
 Ref.: Yon. Okada 1939; Negoro 1944, 1962; Yoneda 1952a; Mifune et al. 1959, 1966; Hirose 1966; Hirose and Hirano 1977
- S. crassa*** Woron. 1929
 Ref.: Emoto and Hirose 1942a, 1952a; Yoneda 1952a; Hirose and Hirano 1977
- S. minuscula*** Woron. 1926
 Ref.: Yoneda 1941c, 1952a; Emoto and Hirose 1942c; Negoro 1944, 1962; Hirose and Hirano 1977
- S. pevalekii*** Erceg. 1925
 Ref.: Emoto and Hirose 1943a; Yoneda 1952a
 Syn.: *Synechocystis pevalekii* Erceg. f. *thermalis* Emoto & Hirose in Hirose and Hirano 1977
 Ref.: Hirose and Hirano 1977
- S. primigenia*** Gardn. 1927
 Ref.: Emoto and Hirose 1943b; Hirose and Hirano 1977
- S. sallensis*** Skuja 1929
 Ref.: Yamagishi 1967, 1985
- S. thermalis*** Copel. 1936
 Ref.: Emoto and Yoneda 1940b; Yoneda

- 1941a, 1952a; Emoto and Hirose 1942c, f, 1952a
- (4) Microcytoideae Kom. & Anagn. 1986
- Eucapsis* Clem. & Shantz 1909
- E. alpina* Clem. & Shantz 1909
Ref.: Akatsuka 1951; Yoneda 1953a, 1954b; Hirano 1962; Yamagishi 1967, 1985; Hirose and Hirano 1977; M. Watanabe and Niiyama 1990
- E. terrestris* Akiyama 1965b
Ref.: Akiyama 1965b
- Gloeocapsa* Kütz. 1843
- G. aeruginosa* Kütz. 1843
Ref.: Imazu 1981
- G. atrata* Kütz. 1843
Ref.: Yoneda 1938a, 1953c; Hirose and Hirano 1977
- G. compacta* Kütz. 1846
Syn.: *Gloeocapsa rupicola* Kütz. 1846
Ref.: Yoneda 1951
- G. conglomerata* Kütz. 1846
Ref.: Fukushima 1952, 1954; Hirose and Hirano 1977
- G. decorticans* (A. Br.) P. Richt. ex Wille 1925
Ref.: Yoneda 1953a; Hiramatsu 1973; Hirose and Hirano 1977
- G. dermochroa* Näg. in Kütz. 1849
Ref.: Yoneda 1938b, c, 1939c, 1942c, d, e, 1952a, 1953c; Emoto and Yoneda 1941a, 1942; Emoto and Hirose 1952a; Nakano 1970; Mori 1971; Yamagishi 1972; Hiramatsu 1973; Negoro 1973; Hirose and Hirano 1977
- G. montana* Kütz. 1843
Syn.: *Gloeocapsa caldariorum* Rabenh. 1865
Ref.: Kobayasi and Watari 1934
- G. punctata* Näg. 1849
Ref.: Emoto and Hirose 1942f
Syn.: *Gloeocapsa gelatinosa* Kütz. 1843
Ref.: Yoneda 1938b, c, 1942b, c, 1952a, 1962a; Emoto and Hirose 1942f
- G. rupestris* Kütz. 1846
Ref.: Emoto and Hirose 1943b; Yoneda 1951
- G. sanguinea* (C. Ag.) Kütz. 1843
- Ref.: Yamagishi 1967
Syn.: *Gloeocapsa alpina* Näg. emend. Brand 1900
Ref.: Yoneda 1939a, 1953c; Negoro 1973
Syn.: *Gloeocapsa magma* (Bréb.) Kütz. 1846
Ref.: Yoneda 1953c; Hirose and Hirano 1977
- G. thermalis* Kütz. 1843
Ref.: Yoneda 1938b
- Microcystis* Kütz. ex Lemm. 1907
Syn.: *Diplocystis* Trevis. 1848, *Anacystis* Menegh. sensu Kütz. 1849, *Polycystis* Kütz. 1849, *Clathrocystis* Henfr. 1856, *Microhaloa* Kütz. sensu Rabenh. 1865
- M. aeruginosa* (Kütz.) Kütz. 1846
Basion.: *Micraloa aeruginosa* Kütz. 1833
Ref.: Yamada 1935; Hirose 1937, 1950; Yoneda 1937, 1966; Okada 1939b, 1953b; Kokubo 1944; Kokubo and Kawamura 1949; Akatsuka 1951; Hirano 1953, 1956b; Yamaguti 1956, 1960; T. Watanabe 1956; Imazu and Hirose 1961; Akiyama 1965a, 1977; Negoro 1967, 1968, 1971, 1973, 1991a; Hada 1967; Murayama and Saisho 1967; Hirose and Hirano 1977; Imazu 1979, 1987; M. Watanabe and Chihara 1980; Yamagishi et al. 1982; M. Watanabe 1984; Y. Watanabe et al. 1986; Komárek 1991; M. F. Watanabe et al. 1991
Syn.: *Clathrocystis aeruginosa* (Kütz.) Henfr. 1856
Ref.: Okamura 1902; Matsumura 1904; Miyauchi 1935
Syn.: *Microcystis pseudofilamentosa* Crow 1923
Ref.: Akatsuka 1951
- M. flos-aquae* (Wittr.) Kirchn. 1898
Basion.: *Polycystis flos-aquae* Wittr. in Wittr. & Nordst. 1879
Ref.: Yoneda 1937, 1952a, 1953a; Hirose 1937; Okada 1939b; Akatsuka 1951; Fukushima 1951, 1960b; Hada 1960; Hirano 1962; Hirose and Hirano 1977; Komárek 1991
Syn.: *Microcystis aeruginosa* (Kütz.) Kütz. f. *flos-aquae* (Wittr.) Elenk 1938
Ref.: M. Watanabe and Chihara 1980;

- M. Watanabe 1984; Y. Watanabe et al. 1986
- M. holsatica* Lemm. 1903
Ref.: Akatsuka 1951; Yoneda 1952a, 1953a; Hirose and Hirano 1977; Yamagishi et al. 1982
- M. ichthyoblabe* Kütz. 1843
Ref.: Fukushima 1948; Akatsuka 1951; Komárek 1991
- M. incerta* Lemm. 1907
Ref.: Mizuno 1964; Akiyama 1977; M. Watanabe 1984
Syn.: *Coelosphaerium natanas* Lemm. 1900
Ref.: Akatsuka 1951
Syn.: *Microcystis pulverea* (Wood) Migula in Lemm. 1907
Ref.: Yoneda 1937, 1952a, 1953a; Akatsuka 1951; Fukushima 1960a; Hirano 1962; Hirose and Hirano 1977
Syn.: *Microcystis pulverea* (Wood) Migula var. *incerta* (Lemm.) Crow 1923
Ref.: Yoneda 1937; Hirano 1962; Hirose and Hirano 1977
Syn.: *Microcystis stagnalis* Lemm. 1903
Ref.: Hirano 1960
Syn.: *Microcystis stagnalis* Lemm. var. *pulchra* Lemm. 1910
Ref.: Hirose 1937
- M. marginata* (Menegh.) Kütz. sensu Kütz. 1846
Ref.: Yoneda 1937, 1952a, 1953a; Hirose 1937; Okada 1939b; Akatsuka 1951; Hirose and Hirano 1977
- M. novacekii* (Kom.) Compère 1974
Basion.: *Diplocystis novacekii* Kom. 1958
Ref.: Komárek 1991
- M. parasitica* Kütz. 1843
Ref.: Yoneda 1937, 1953a; Hirose and Hirano 1977; Negoro and Aoki 1991
- M. protea* Copel. 1936
Ref.: Yoneda 1952a
- M. thermalis* Yoneda 1938b
Non *Microcystis thermalis* Nash 1938
Ref.: Yoneda 1938b, 1952a
- M. viridis* (A. Br.) Lemm. 1903 emend. Kondr. 1975
Basion.: *Polycystis viridis* A. Br. in Rabenh. 1862
Syn.: *Diplocystis viridis* (A. Br. in Rabenh.) Kom. 1958
Ref.: M. Watanabe and Chihara 1980; Yamagishi et al. 1982; M. Watanabe 1984; M. F. Watanabe et al. 1986; Y. Watanabe et al. 1986; Komárek 1991
- M. wesenbergii* (Kom.) Kom. in Kondr. 1968
Syn.: *Diplocystis wesenbergii* Kom. 1958
Ref.: Okada 1939b (as *M. robusta* (Clark) Nyg.); M. Watanabe and Chihara 1980; Yamagishi et al. 1982; Umezaki 1983, 1984, 1987; M. Watanabe 1984; Y. Watanabe et al. 1986; Komárek 1991; Negoro 1991a
2. Chroococcaceae Näg 1849
- Chroococcus* Näg. 1849
- C. cohaerens* Näg. 1855
Ref.: Yoneda 1939a
- C. dispersus* (Keissl.) Lemm. 1904
- C. dispersus* var. *dispersus*
Ref.: Akatsuka 1951; Yoneda 1953a, 1954b; Yamaguti 1956, 1960; Hirano 1959b, 1962; Ochiai 1960; Iwai 1963; Negoro 1967, 1968, 1971; Hada 1967
- C. dispersus* var. *minor* G. M. Smith 1920
Ref.: Emoto and Hirose 1942b; Yoneda 1952a; Ochiai 1962b; Hirose and Hirano 1977
- C. endophyticus* Copel. 1936
Ref.: Emoto and Hirose 1941; Yoneda 1952a
- C. giganteus* W. West 1892
Ref.: Akatsuka 1951; Yamagishi 1967
- C. helveticus* Näg. 1849
Ref.: Emoto and Yoneda 1940a; Yoneda 1941a, 1952a, 1953a
- C. indicus* Zell. 1873
Ref.: Fukushima 1963
- C. limneticus* Lemm. (1898) ex Kom. 1958
Ref.: Hirose 1937; Yoneda 1938a, 1939d, 1953a; Okada 1939b; Akatsuka 1951; Yamaguti 1956; Hirano 1960, 1962; Iwai 1963; Hada 1967; Hirose and Hirano 1977; Imazu 1981
Syn.: *Chroococcus limneticus* Lemm. var. *dis-tans* G. M. Smith 1916
Ref.: Akatsuka 1951; Yoneda 1954b; Yamaguti 1956; Hirano 1960

- Syn.: *Chroococcus limneticus* Lemm. var. *elegans* G. M. Smith 1918
 Ref.: Yoneda 1937; Akatsuka 1951
 Syn.: *Chroococcus limneticus* Lemm. var. *purpurea* (Snow) Tiffn. & Ahlstr. 1931
 Ref.: Akatsuka 1951
- C. membraninus** (Menegh.) Näg. 1849
 Ref.: Yoneda 1938c, 1941c, 1952a
- C. minimus** (Keissl.) Lemm. 1904
 Ref.: Emoto and Hirose 1942c, f, 1943a, b; Yoneda 1952a, 1953a
- C. minutus** (Kütz.) Näg. 1843
 Ref.: Yoneda 1937, 1938c, 1940b, 1941b, c, 1942b, c, d, 1952a, b, 1953a, b, 1954b; Okada 1939b; Emoto and Yoneda 1941a, b, 1942; Emoto and Hirose 1942c, e, 1943b; Fukushima 1952, 1954, 1970b; Hirano 1956b, 1960, 1962; Hada 1958; Ochiai 1960, 1962a, b; Iwai 1963; T. Watanabe 1968a, c; Akiyama 1965a; Yamagishi 1967, 1972; Mori 1971; Hiramatsu 1973; M. Watanabe and Niiyama 1990
 Syn.: *Chroococcus pallidus* (Näg.) Näg. 1849
 Ref.: Yoneda 1941a; Hirano 1962
 Syn.: *Chroococcus minutus* (Kütz.) Näg. var. *carneus* (Chodat) Lemm. 1904
 Ref.: Akatsuka 1951
 Syn.: *Chroococcus minutus* (Kütz.) Näg. var. *thermalis* Copel. 1936
 Ref.: Yoneda 1938c, 1941b; 1952a, 1954a; Emoto and Yoneda 1940b, 1942; Emoto and Hirose 1940a, b, c, 1942a, b, e
- C. turgidus** (Kütz.) Näg. 1849
- C. turgidus** var. *turgidus*
 Ref.: Molisch 1926; Yoneda 1937, 1938b, c, 1939b, c, d, 1940b, 1942c, 1952a, 1953a, c, 1954b, 1966; Hirose 1937, 1957; Emoto and Yoneda 1941b; Negoro 1937b, 1938, 1973; Hada 1938b, 1958, 1960, 1967; Emoto and Hirose 1940a, b, c, 1942c, e, 1943b; Akatsuka 1951; Ichimura and Onuki 1951; Fukushima 1952, 1954, 1960a; Kobayasi 1958; Kobayasi et al. 1962; Hirano 1959a, 1960, 1962; Umezaki 1961; Imazu and Hirose 1961; Ochiai 1962b; Akiyama 1965a; Yamagishi 1967, 1985; T. Watanabe 1968a; Imazu 1979, 1986; Mori 1971; Hirose and Hirano 1977; Horiguchi et al. 1990
- C. turgidus** var. *thermalis* (Menegh.) Rabenh. ex Hansg. 1892
 Ref.: Yoneda 1938c, 1939b, 1942b, 1952a; Emoto and Hirose 1942d, e, 1943b
- C. varius** A. Br. in Rabenh. 1876
 Ref.: Emoto and Hirose 1942c, d; Yoneda 1952a
- Cyanosarcina** Kováčik 1988
- C. burmensis** (Skuja) Kováčik 1988
 Basion.: *Myxosarcina burmensis* Skuja 1949
 Ref.: Hiramatsu et al. 1987
- C. chroococcoides** (Geitl.) Kováčik 1988
 Basion.: *Myxosarcina chroococcoides* Geitl. 1927
 Ref.: Emoto and Hirose 1940c; Yoneda 1941a, b, c, 1942c, d, 1952a, 1953a; Hirose and Hirano 1977
- C. gelatinosa** (Emoto & Yoneda) Kováčik 1988
 Basion.: *Myxosarcina gelatinosa* Emoto & Yoneda 1941b
 Ref.: Emoto and Yoneda 1941b; Yoneda 1952a
- C. spectabilis** (Geitl.) Kováčik 1988
 Basion.: *Myxosarcina spectabilis* Geitl. 1933
 Ref.: Emoto and Hirose 1942a, f, 1943b
- Gloeocapsopsis** Geitl. 1925
- G. dvorakii** (Novác.) Kom. & Anagn. 1986
 Basion.: *Gloeocapsa dvorakii* Novác. 1929
 Ref.: Komárek 1993
- G. magma** (Bréb.) Kom. & Anagn. 1986
 Basion.: *Protococcus magma* Bréb. in Bréb. & Godey 1836
 Syn.: *Gloeocapsa magma* (Bréb.) Kütz. 1846
 Ref.: Yoneda 1953c; Hirose and Hirano 1977
3. Entophysalidaceae Geitl. 1925
- Chlorogloea** Wille 1900
- C. microcystoides** Geitl. 1925
 Ref.: Yoneda 1941a, 1952a; Emoto and Yoneda 1942; Fukushima 1963

Placoma Schousb. & Thur.
in Born. & Thur. 1876

P. adriatica (Hauck) comb. nov.

Basion.: *Oncobyrsa adriatica* Hauck, Meeresalg. Deutsch. u. Österr., p. 515, 1885

Ref.: Okamura 1915, 1930, 1934a, 1936; Kobayasi and Watari 1934; Yamada 1935; Inagaki 1950; Umezaki 1952a, 1955c, 1961; Ueda et al. 1963 (as *Hydrococcus adriatica*)

Colonies and cells with special tegments of *Oncobyrsa adriatica* Hauck 1888 are similar features as *Placoma*.

P. micrococca (Hansg.) comb. nov.

Basion.: *Oncobyrsa adriatica* Hauck var. *micrococca* Hansg., Stizenberger, K. Böhm. Ges. wiss., Math.-Nat. Cl., 1892: 228, 1893

Ref.: Umezaki 1953a

Colonies and cells with surrounding teguments of *Oncobyrsa adriatica* Hauck var. *micrococca* Hansg. 1893 resemble closely those of *Oncobyrsa adriatica*.

4. Chamaesiphonaceae Borzi 1882

Chamaecalyx Kom. & Anagn. 1986

C. clavatus (Setch. & Gardn) Kom. & Anagn. 1986

Basion.: *Chamaesiphon clavatus* Setch. & Gardn. 1930

Syn.: *Dermocarpa clavata* (Setch. & Gardn.) Geitl. 1932

Ref.: Umezaki 1953a, 1955c

C. leibleiniae (Reinsch) Kom. & Anagn. 1986

Basion.: *Dermocarpa Leibleiniae* (Reinsch) Born. in Born. & Thur. 1880

Ref.: Umezaki 1950

Syn.: *Dermocarpa Leibleiniae* (Reinsch) Born. var. *pelagica* Wille in Hansen 1904

Ref.: Akatsuka 1951

Chamaesiphon A. Br. & Grun. 1865

C. confervicola A. Br. in Rabenh. 1865

C. confervicola var. *confervicola*

Ref.: Akatsuka 1951; Yoneda 1953a; Negoro 1973; Hirose and Hirano 1977; M. Watanabe et al. 1984; Ioriya et al. 1984;

M. Watanabe 1989

Syn.: *Chamaesiphon curvatus* Nordst. 1878

Ref.: Yoneda 1938a; Akatsuka 1951; Akiyama 1965a; Yamagishi 1967; Horikawa et al. 1969; Hirose and Hirano 1977; Bando and Nakano 1983

Syn.: *Chamaesiphon incrustans* Grun. var. *elongatus* Starm. 1929

Ref.: Hirose 1937

C. confervicola var. *elongatus* (Nordst.) Kann 1972

Basion.: *Chamaesiphon curvatus* Nordst. f. *elongatus* Nordst. 1878

Ref.: M. Watanabe and Niiyama 1990

C. incrustans Grun. in Rabenh. 1865

Ref.: Yoneda 1938b, c, 1949, 1952a; Emoto and Hirose 1942e, 1952b; Akiyama 1965a; Negoro 1973; Hirose and Hirano 1977; Bando and Nakano 1983

Syn.: *Chamaesiphon cylindricus* Boye-Peters. 1923

Ref.: Emoto and Hirose 1949; Hirose and Hirano 1977

C. minutus (Rostaf.) Lemm. 1910

Ref.: Emoto and Hirose 1940a, b; Yoneda 1941a, 1952a; Emoto and Yoneda 1941a, b; Akiyama 1965a; M. Watanabe 1989; Ioriya et al. 1984

Syn.: *Chamaesiphon minutus* (Rostaf.) Lemm. var. *cladophorae* Hirose 1937

Ref.: Hirose 1937

C. polonicus (Rostaf.) Hansg. 1887

Ref.: Yamaguti 1956; T. Watanabe 1968c; Hirose and Hirano 1977

C. rostafinskii Hansg. 1887 ("Rostafinskii")

Ref.: Akiyama 1965a; Hirose and Hirano 1977

Clastidium Kirchn. 1880

C. setigerum Kirchn. 1880

Ref.: M. Watanabe et al. 1984

Cyanophanon Geitl. 1955

C. mirabile Geitl. 1955

Ref.: M. Watanabe et al. 1984; Ioriya et al. 1984; M. Watanabe 1988

Stichosiphon Geitl. 1932

S. sansibaricus (Hieron.) Dr. & Daily 1952

- Syn.: *Stichosiphon regularis* Geitl. 1932
Ref.: Yoneda 1938b, c, 1952a
5. Dermocarpellaceae Ginsb.-Ardré ex Christ. 1980
- Cyanocystis* Borzi 1882
- Syn.: *Dermocarpa* Crouan 1858 sensu auct. post. sine typo, p. p.
C. aquae-dulcis (Reinsch) Kann 1978
Basion.: *Sphaerosiphon aquae-dulcis* Reinsch 1874
Syn.: *Dermocarpa aquae-dulcis* (Reinsch) Geitl. 1925
Ref.: Negoro 1973
C. prasina (Reinsch) Kom. & Anagn. 1986
Basion.: *Sphaerosiphon prasinus* Reinsch 1874
Syn.: *Dermocarpa prasina* (Reinsch) Born. in Born. & Thur. 1880
Ref.: Okamura 1916; Umezaki 1954
C. protea (Setch. & Gardn.) Kom. & Anagn. 1986
Basion.: *Dermocarpa protea* Setch. & Gardn. in Gardn. 1918
Ref.: Yamada and Tanaka 1944; Umezaki 1953b, 1955a, 1956c
Syn.: *Dermocarpa farlowii* (non Börg.) Yendo in Tokida 1938
Ref.: Okamura 1916; Tokida 1930, 1938
C. sphaeroidea (Setch. & Gardn.) Kom. & Anagn. 1986
Basion.: *Dermocarpa sphaeroidea* Setch. & Gardn. in Gardn. 1918
Ref.: Umezaki 1955a
- Dermocarpella* Lemm. 1907
- D. hemisphaerica* Lemm. 1907
Ref.: Umezaki 1953a, b, 1955c
D. gilkeyae (Setch. & Gardn.) Kom. & Anagn. 1986
Basion.: *Xenococcus Gilkeyae* Setch. & Gardn. in Gardn. 1918
Ref.: Umezaki 1952a, b
- Stanieria* Kom. & Anagn. 1986
- S. sphaerica* (Setch. & Gardn.) Anagn. & Pantaz. 1991
Basion.: *Dermocarpa sphaerica* Setch. & Gardn. in Gardn. 1918
- Syn.: *Cyanocystis sphaerica* (Setch. & Gardn.) Kom. & Anagn. 1986
Ref.: Umezaki 1953b, 1955a, c
6. Xenococcaceae Erceg. 1932
- Chroococcidiopsis* Geitl. 1933
- C. thermalis* Geitl. 1933
Ref.: Yoneda 1941c, 1952a, 1954a; Negoro 1973; Hirose and Hirano 1977
Syn.: *Chroococcidiopsis thermalis* Geitl. var. *nipponica* Negoro 1943a
Ref.: Negoro 1943a
C. kashaii Friedm. 1961
Ref.: Hirose 1972
- Chroococcopsis* Geitl. 1925
- C. gigantea* Geitl. 1925
Ref.: T. Watanabe 1957
- Xenococcus* Thur. in Born. & Thur. 1875
- X. chaetomorphae* Setch. & Gardn. in Gardn. 1918 ("*Chaetomorphae*")
Ref.: Umezaki 1953a
X. cladophorae Stech. & Gardn. in Gardn. 1918 ("*Cladophorae*")
Ref.: Hirose 1937, 1957; Umezaki 1956c; Takata and Hirose 1971; Kajimura 1975; Hirose and Hirano 1977
X. kernerii Hansg. 1887
Ref.: Yoneda 1942a, b, c, 1952a, 1962a; Emoto and Hirose 1942b
X. pyriformis Setch. & Gardn. in Gardn. 1918
Syn.: *Dermocarpa pyriformis* (Setch. & Gardn.) Kaas 1985
Ref.: Umezaki 1950, 1953b, 1955c, 1956c
X. schousboei Thur. in Born. & Thur. 1880 ("*Schousboei*")
X. schousboei f. *schousboei*
Ref.: Umezaki 1950, 1953a, 1955c; Yoneda 1952a; Emoto and Hirose 1942c, 1952b; Hirose and Hirano 1977; Mifune and Hirose 1983b
Syn.: *Dermocarpa Shousboei* Born. in Batters 1889
Ref.: Holmes 1895; Matsumura 1904
X. schousboei f. *thermalis* Emoto and Hirose 1942b

- Ref.: Emoto and Hirose 1942b
- X. wille* Gardn. 1927
Ref.: Emoto and Yoneda 1940a; Yoneda 1941a, 1952a; Akiyama 1965a; Hirose and Hirano 1977
- X. yonedae* nom. nov.
Syn.: *Xenococcus violaceus* Yoneda, Acta Phytotax. Geobot. 11: 67, 1942, non *Xenococcus violaceus* Anand., J. Bot. 1937 (Suppl.): 38, 1937
Ref.: Yoneda 1942a
- The following species of the genus *Xenococcus* are uncertain to which genus they belong, because reproductive cells have not been found.
- Xenococcus acervatus* Setch. & Gardn. in Gardn. 1918
Ref.: Emoto and Hirose 1952a; Umezaki 1952a, b; Hagihara et al. 1970; Yoneda 1952a
- X. acervatus* var. *dispersus* Emoto & Hirose 1940a
Ref.: Emoto and Hirose 1940a
- X. alpinus* Emoto & Yoneda 1942
Ref.: Emoto and Yoneda 1942
- X. chroococcoides* Fritsch 1929
Ref.: Yoneda 1950
- X. minima* var. *starmachii* Geitl. 1932
Ref.: Emoto and Yoneda 1941b, 1942; Emoto and Hirose 1940a, 1942c, d, 1949; Yoneda 1952a; Akiyama 1965a
- X. minimus* Geitl. 1922
Ref.: Emoto and Yoneda 1941a; Yoneda 1941a, 1942g, 1952a, 1953a

7. Hydrococcaceae Kütz 1843

Hydrococcus Kütz. 1833

- Syn.: *Oncobyrsa* Menegh. 1842, *Askenasya* Möb. 1887
- H. rivularis* Kütz. 1833
Syn.: *Oncobyrsa rivularis* (Kütz.) Menegh. 1943
Ref.: Yoneda 1938b, c, 1949, 1952a; Emoto and Yoneda 1940a; Hirose and Hirano 1977
- Hyella* Born. & Flah. 1888
- H. balanii* Lehmann 1903

- Ref.: Umezaki 1952a
- H. caespitosa* Born. & Flah. 1888
Ref.: Umezaki 1954, 1955c, 1956c; Kurogi and M. M. Watanabe 1973
- H. fontana* Huber & Jadin 1892
Ref.: Nakano 1970; Negoro 1973

Myxohyella Geitl. 1925

- M. socialis* (Setch. & Gardn.) Geitl. 1925
Basion.: *Hyella socialis* Setch. & Gardn. in Gardn. 1918
Ref.: Umezaki 1952a, b, 1955a, c

Pleurocapsa Thur. ex Hauck 1885

- P. concharum* Hansg. 1890
Ref.: Emoto and Hirose 1941, 1952b
- P. fluviatilis* Lagerh. 1888
Ref.: Emoto and Hirose 1940a, b, 1942c, e, 1943a, b; Emoto and Yoneda 1940b; Yoneda 1941a, 1942c, 1952a, 1954a; Hirose and Hirano 1977
- P. fuliginosa* Hauck 1885
Ref.: Umezaki 1953a, 1955c, 1956c
- P. minor* Hansg. 1890
Ref.: Yoneda 1941a, 1942c, 1952a, 1953a; Emoto and Yoneda 1941a, b, 1942; Ikoma and Doi 1955; Akiyama 1965a; Negoro 1973; Mifune and Hirose 1983a
- P. minuta* Geitl. 1932
Ref.: Umezaki 1952a, 1955c

Nomina excludenda

The following species are excluded from the blue-green algae.

- Aphanocapsa rivularis* (Carm.) Rabenh. 1865 (Hada 1960) = *Palmogloea protuberans* (Sm. & Sow.) Kütz. 1843 (Drouet and Daily 1956, p. 138). *Aphanothece clathrata* W. & G. S. West (Hirose and Hirano 1977; Negoro 1968) = bacteria (Drouet and Daily 1956, p. 143). *Chroococcidium* Geitler (Arch. f. Hydrobiol., Suppl. XII, 4: 624, 1933. Type: *C. gelatinosum* Geitl., ibid. 1933, Emoto and Hirose 1942d; Yoneda 1952a; Hirose and Hirano 1977) = palmelloid flagellata (Drouet and Daily 1956, p. 146). *Dactylococcopsis fascicularis* Lemm. 1898 (Hirose 1937; Mizuno 1964; Hirose and Hirano 1977) = *Ankistrodes-*

mus falcatus (Corda) Ralfs 1848 (Drouet and Daily 1956, p. 149) or to *Ankistrodesmus tortus* Kom. & Comas 1982 (syn.: *Dactylococcopsis fasciculatus* Lemm. 1898; = *Ankistrodesmus spiralis* (Turn.) Lemm. 1908) (Komárek and Comas 1982). *Pelodictyon Lauterbornii* Geitl. in Pascher 1925 (Hada 1960) = bacteria (Drouet and Daily 1956, p. 143). *Tetrapedia Reinschiana* Archer 1872 (Fukushima 1960b, 1963) = *Tetraedron* sp. (Drouet and Daily 1956, p. 166) or = *Tetraedron minimum* var. *tetralobulatum* (Reinsch) Claus (Claus 1963).

II. Oscillatoriales Elenk. 1934

1. Borziaceae Borzi 1914

Borzia Cohn ex Gom. 1892

B. endophytica (W. & G. S. West) Anagn. & Kom. 1988

Basion.: *Aphanothece nidulans* var. *endophytica* W. & G. S. West 1912

Ref.: Emoto and Hirose 1941; Yoneda 1953b; Hirose and Hirano 1977

B. trilocularis Cohn ex Gom. 1892

Ref.: Hirose and Hirano 1977

Komvophoron Anagn. & Kom. 1988

K. constrictum (Szaf.) Anagn. & Kom. 1988

Basion.: *Oscillatoria constricta* Szaf. 1911
Syn.: *Anabaena constricta* (Szaf.) Geitl. 1925
Ref.: Yoneda 1953a
Syn.: *Anabaena geitleri* J. De Toni 1934
Ref.: Yoneda 1942c, d, 1952a

K. tenuis (Emoto & Hirose) comb. nov.

Basion.: *Oscillatoria constricta* Szaf. var. *tenuis* Emoto & Hirose, Bot. & Zool. (Tokyo) 8: 1883, 1940

Ref.: Emoto and Hirose 1940c

Komvophoron tenuis differs from *K. constrictum* in having conical apical cells and little slender trichomes.

K. jovis (Copel.) Anagn. & Kom. 1988

Basion.: *Oscillatoria jovis* Copel. 1936
Ref.: Yoneda 1942b, 1952a, 1954a; Hirose and Hirano 1977
Syn.: *Oscillatoria jovis* Copel. var. *acuta* Emoto & Yoneda 1940
Ref.: Emoto and Yoneda 1940a

Yonedaella Umezaki 1962

Syn.: *Sphaeronema* Umezaki 1961, non *Sphaeronema* ("Sphaeronaema") Fries 1823

Y. lithophila (Erceg.) Umezaki 1962

Basion.: *Isocystis lithophilum* Erceg. 1932 ("lithophila")

Syn.: *Sphaeronema lithophila* (Erceg.) Umezaki 1961

Ref.: Umezaki 1961, 1962

2. Homoeotrichaceae Elenk. 1934

(1) Homoeotrichoideae (Elenk.) Anagn. & Kom. 1988

Heteroleibleinia (Geitl.) Hoffm. 1985

Basion.: *Lyngbya* Gom. Sect. *Heteroleibleinia* Geitl. 1932

H. affixa (Yoneda) Anagn. & Kom. 1988

Basion.: *Lyngbya affixa* Yoneda 1938b
Ref.: Yoneda 1938b

H. distincta (Nordst. ex Schmidle) Anagn. & Kom. 1988

Basion.: *Lyngbya Martensiana* Menegh. var. *distincta* Nordst. ex Schmidle 1897
Syn.: *Lyngbya distincta* Schmidle 1897
Ref.: Hirose and Hirano 1977

H. erecta (Schwabe) Anagn. & Kom. 1988

Basion.: *Lyngbya erecta* Schwabe 1943, non *Lyngbya erecta* Setch. & Gardn. 1930
Ref.: Mifune et al. 1966

H. infixa (Frémy) Anagn. & Kom. 1988

Basion.: *Lyngbya infixa* Frémy 1932
Ref.: Umezaki 1955a, 1961; Noda 1974, 1987

H. kuetzingii (Schmidle) Compère 1985

Basion.: *Lyngbya kuetzingii* Schmidle 1897
Ref.: Yoneda 1938b, c, 1939c, 1952a, 1953a; Umezaki 1951, 1952a; Hirose and Hirano 1977; Ioriya et al. 1984

H. penicillata (Gom.) Anagn. & Kom. 1988

Basion.: *Schizothrix penicillata* Gom. 1892
Ref.: Yoneda 1938b, c, 1939c, 1941b, 1952a; Akiyama 1961, 1965a, b; Hirano 1962; Mifune et al. 1966; Hiramatsu 1967; Negoro 1973; Hirose and Hirano 1977

H. pithophorae (Yoneda) Anagn. & Kom.

- 1988
 Basion.: *Lyngbya Pithophorae* Yoneda 1938b
 Ref.: Yoneda 1938b, 1952a
- H. pusilla** (Hansg.) Compère 1985
 Basion.: *Lyngbya pusilla* (Rabenh.) Hansg.
 ex Hansg. 1892
 Ref.: Hirano 1962; Hirose and Hirano
 1977
- H. rigidula** (Kütz. ex Hansg.) Hoffm. 1985
 Basion: *Lyngbya rigidula* Kütz. ex Hansg.
 1892
 Ref.: M. Watanabe and Niiyama 1990
- Homoethrix*** (Thur. ex Born. & Flah.)
 Kirchn. 1898
 Syn.: *Amphithrix* Kütz. ex Born. & Flah.
 1886, *Tapinothrix* Sauv. 1892
- H. balearica** (Born. & Flah.) Lemm. 1907
 (1910)
 Basion.: *Calothrix balearica* Born. & Flah.
 1886
 Ref.: Fukushima 1949, 1951
- H. bornetti** (Sauv.) Mabilie 1954
 Basion.: *Tapinothrix Bornetti* Sauv. 1892
 Ref.: Fukushima 1951, 1960a
- H. endophytica** (Lemm.) Lemm. 1907 (1910)
 Basion.: *Calothrix endophytica* Lemm. 1896
 Ref.: Kobayasi 1958; Kobayasi et al. 1962
- H. hansgirgii** (Schmidle) Lemm. 1907 (1910)
 Basion.: *Calothrix Hansgirgii* Schmidle 1900
 Ref.: Horikawa et al. 1969; Hirose and
 Hirano 1977
- H. janthina** (Born. & Flah.) Starm. 1959
 Basion.: *Amphithrix janthina* Born. & Flah.
 1886
 Ref.: T. Watanabe 1968c; Fukushima
 1970a, b, 1971; Ioriya et al. 1984; M.
 Watanabe et al. 1984
- H. juliana** (Menegh.) Kirchn. 1900
 Basion.: *Calothrix juliana* (Menegh.) Born.
 & Flah. 1886
 Ref.: Horikawa et al. 1969; Hirose and
 Hirano 1977
- H. thermalis** Emoto & Hirose 1940
 Ref.: Emoto and Hirose 1940c; Hirose and
 Hirano 1977
- H. varians** Geitl. 1927
 Syn.: *Homoeothrix simplex* Woron. 1932,
Homoeothrix simplex Woron. var. *elegans*
 Woron. 1932, *Homoeothrix simplex* (Wo-
 ron.) Elenk. 1949
 Ref.: Yoneda 1942a; Bando and Nakano
 1983
3. Oscillatoriaceae (S. F. Gray) Harv. ex
 Kirchn. 1898
- (1) Hormoscolloideae Anagn. & Kom. 1988
- Katagnymene*** Lemm. 1899
- K. pelagica** Lemm. 1899
 Ref.: Akatsuka 1951; Motoda and Maru-
 mo 1963
 Syn.: *Katagnymene pelagica* Lemm. var. *ma-
 jor* Wille in Hensen 1904
 Ref.: Akatsuka 1951; Marumo 1966
- K. spiralis** Lemm. 1899
 Ref.: Akatsuka 1951; Motoda and Maru-
 mo 1963; Marumo 1966
 Syn.: *Katagnymene spiralis* Lemm. var. *cap-
 itata* Wille in Hensen 1904
 Ref.: Akatsuka 1951
- (2) Oscillatorioideae Gom. 1892
- Blennothrix*** Kütz. ex Anagn. & Kom. 1988
- B. cantharidosma** (Mont. ex Gom.) Anagn. &
 Kom. 1988
 Basion.: *Hydrocoleum cantharidosmum* (Mont.)
 Gom. 1892
 Ref.: Umezaki 1955a, 1961; Hiramatsu
 1967; Funahashi 1967; Noda 1974, 1987
- B. lyngbyacea** (Kütz. ex Gom.) Anagn. &
 Kom. 1988
 Basion.: *Hydrocoleum lyngbyaceum* Kütz. ex
 Gom. 1892
 Ref.: Umezaki 1955a, 1961; Hiramatsu
 1967; Noda 1974, 1987
- Oscillatoria*** Vauch. ex Gom. 1892
- O. anguina** (Bory) Gom. 1892
- O. anguina** var. *anguina*
 Ref.: Yoneda 1938b, c, 1939b, 1942b,
 1952a, b, 1962a; Emoto and Yoneda
 1941a, b, 1942; Hirose and Hirano 1977
- O. anguina** var. *tenella* Yoneda 1941c
 Ref.: Yoneda 1941c, 1942a, b, 1952a; Hiro-
 se and Hirano 1977
- O. bonnemaisonii** Crouan ex Gom. 1892

- ("Bonnemaisonii")
 Ref.: Akatsuka 1951; Umezaki 1961; Marumo 1966
- O. curviceps* Ag. ex Gom. 1892
 Ref.: Emoto and Hirose 1942e; Yoneda 1952a; Ikoma and Doi 1955; Hiramatsu 1967; Hirose and Hirano 1977; Imazu 1979; Mifune and Hirose 1982, 1983b
 Syn.: *Oscillatoria curviceps* Ag. var. *minor* Emoto & Hirose 1940a
 Ref.: Emoto and Hirose 1940a, 1943a, b, 1952a; Yoneda 1942b, 1952a; Ikoma and Doi 1955; Hirose and Hirano 1977; Mifune and Hirose 1983a
- O. fracta* Carls 1913
 Ref.: Hirano 1962
- O. kawamurae* Negoro 1943b ("Kawamurae")
 Ref.: Hirose et al. 1960; Akiyama 1965a; Yoneda 1966; Hirose and Hirano 1977; Negoro 1973, 1991a
- O. limosa* (Dillw.) Ag. ex Gom. 1892
 Ref.: Ueda and Okada 1934; Miyauchi 1935; Hada 1937; Yoneda 1937, 1938c, 1942c, d, 1952a, 1966; Hirose 1938, 1950; Emoto and Yoneda 1940a; Emoto and Hirose 1940c; Hirano 1956b, 1960, 1962, 1963; Kobayasi 1958; Hada 1960; Kobayasi et al. 1962; Akiyama 1965a; Mifune et al. 1966; Hiramatsu 1967, 1973; T. Watanabe 1968a, c; Nakano 1970; Negoro 1973; Hirose and Hirano 1977; Imazu 1979, 1987; M. Watanabe and Niiyama 1990
- O. margaritifera* (Kütz.) Gom. 1892
 Syn.: *Arthrospira breviararticulata* Setch. & Gardn. in Gardn. 1918, *Spirulina breviararticulata* (Setch. & Gardn.) Geitl. 1932
 Ref.: Akatsuka 1951; Umezaki 1961
- O. princeps* Vauch. ex Gom. 1892
 Ref.: Molisch 1926; Kobayasi and Watari 1934; Hirose 1938; Yoneda 1938b, c, 1942b, 1952a, 1954a, 1966; Emoto and Yoneda 1940a; Emoto and Hirose 1940b, 1941, 1942b, d, 1952c; Yamaguti 1955; Kobayasi 1958; Kobayasi et al. 1962; Hiramatsu 1967; Horikawa et al. 1969; Nakano 1970; Negoro 1973; Hirose and Hirano 1977; Mifune and Hirose 1982; Yamagishi 1985
- Syn.: *Oscillatoria princeps* Vauch. var. *minor* Emoto & Yoneda 1941a
 Ref.: Emoto and Yoneda 1941a; Ikoma and Doi 1955; Hiramatsu 1967; Hirose and Hirano 1977; Mifune and Hirose 1982, 1983a, b
- Syn.: *Oscillatoria princeps* Vauch. var. *tenella* Copel. 1936
 Ref.: Yoneda 1939b, c, 1940b, 1941b, 1942a, b, c, 1952a; Emoto and Yoneda 1940a, b; Emoto and Hirose 1942e; Hirose and Hirano 1977
- O. proboscidea* Gom. 1892
- O. proboscidea* var. *proboscidea*
 Ref.: Molisch 1926; Yoneda 1941a, b, 1952a; Negoro 1973; Hirose and Hirano 1977
- O. proboscidea* var. *westii* Forti 1907
 Ref.: Yoneda 1952a
- O. sancta* Kütz. ex Gom. 1892
 Ref.: Molisch 1926; Yoneda 1938b, c, 1952a; Emoto and Hirose 1940b, 1942e; Fukushima 1952; Negoro 1973; Hirose and Hirano 1977
- O. subbrevis* Schmidle 1901
- O. subbrevis* var. *subbrevis*
 Ref.: Yoneda 1940a, 1942c, g, 1952a; Hiramatsu 1967; Nakano 1970; Hirose and Hirano 1977; Ioriya et al. 1984
- O. subbrevis* var. *major* (G. S. West) stat. nov.
 Basion.: *Oscillatoria subbrevis* Schmidle f. *major* G. S. West, J. Linn. Soc. Bot. 38: 178, 1907
 Ref.: M. Watanabe and Niiyama 1990
- O. subspiroides* Yoneda 1942b
 Ref.: Yoneda 1942b, 1952a; Hirose and Hirano 1977
- Lyngbya* Ag. ex Gom. 1892
- L. aestuarii* (Mert.) Lyngb. ex Gom. 1892
 Ref.: Molisch 1926; Yoneda 1938c, 1942a, b, 1952a, 1953a; Emoto and Yoneda 1942; Emoto and Hirose 1952c; Fujiyama and Kabuto 1956; Umezaki 1955a, 1961; Ochiai 1926b; Hiramatsu 1967; Negoro 1973; Hirose and Hirano 1977; Noda 1987
- L. anomala* (C. B. Rao) comb. nov.

- Basion.: *Phormidium anomalum* C. B. Rao, Proc. Indian Acad. Sci. 6(6): 371, 1937 ("anomala")
- Ref.: M. Watanabe and Niiyama 1990 (as *Lyngbya anomala* C. B. Rao)
- Phormidium anomalum* C. B. Rao belongs to *Lyngbya* in having discoid cells and distinct sheaths.
- L. birgei** G. M. Smith 1916 ("Birgei")
- Ref.: Hirose 1938; Akatsuka 1951; T. Watanabe 1968c; Hirose and Hirano 1977; Imazu 1981
- L. confervoides** C. Ag. ex Gopm. 1892
- Ref.: De Toni 1895; Okamura 1902, 1916; Matsumura 1904; Tanaka 1956; Hirose 1957, 1958; Dawson 1959 (Harvey's manuscript); Umezaki 1961; Imazu and Hirose 1961; Hiramatsu 1967; Hagihara et al. 1970; Takata and Hirose 1971; Noda 1974, 1987; Hirose and Hirano 1977
- Syn.: *Lyngbya atropurpurea* Harv. 1859
- Ref.: Harvey 1859; Dawson 1959 (Harvey's manuscript)
- Syn.: *Lyngbya atrovirens* Harv. 1859
- Ref.: Harvey 1859
- L. hieronymusii** Lemm. 1905 ("Hieronymusii")
- L. hieronymusii** var. *hieronymusii*
- Ref.: Yoneda 1937; Akatsuka 1951; Hirano 1956b; Nakano 1970
- L. hieronymusii** var. *crassi-vaginata* Ghose 1927
- Ref.: Akiyama 1965b
- L. major** Menegh. ex Gom. 1892
- Ref.: Yoneda 1938b, c, 1943a, 1952a; Emoto and Hirose 1942e, 1943a, 1952a; T. Watanabe 1957; Negoro 1973; Hirose and Hirano 1977; Imazu 1979
- L. majuscula** (Dillw.) Harv. ex Gom. 1892
- Ref.: Yoneda 1938a, 1949, 1952a; Emoto and Yoneda 1940a, 1941a; Emoto and Hirose 1943b, 1952c; Tanaka 1956; Dawson 1959 (Harvey's manuscript); Umezaki 1951 (as *Lyngbya majuscula* var. *spongiphila* Weber v. Bosse), 1961; Hiramatsu 1967; Hagihara et al. 1970; Takata and Hirose 1971; Noda 1974, 1987; Hirose and Hirano 1977; Mifune and Hirose 1982
- L. nigra** Ag. ex Gom. 1892
- Ref.: Yoneda 1938c, 1941c, 1942b, 1952a; Emoto and Yoneda 1940b, 1941b; Hirose and Hirano 1977
- L. semiplena** (C. Ag.) J. Ag. ex Gom. 1892
- Ref.: Yoneda 1940a, 1942c, 1952a; Umezaki 1951, 1955a, 1961; Hiramatsu 1967; Hagihara et al. 1970; Takata and Hirose 1971; Noda 1974, 1987; Hirose and Hirano 1977
- L. subconfervoides** Borge 1918
- Ref.: Emoto and Hirose 1940b; Yoneda 1952a; Hirose and Hirano 1977; M. Watanabe and Niiyama 1990
- L. thermalis** Kütz. ex Gom. 1892
- Syn.: *Lyngbya thermalis* f. *Kuetzingii* Rabenh. ex Forti 1907
- Ref.: Mifune et al. 1959; Akiyama 1965a
- (3) Plectonematoideae (Elenk.) Anagn. & Kom. 1988
- Plectonema** Thur. ex Gom. 1892
- P. tomasinianum** (Kütz.) Gom. 1892 ("Tomasinianum")
- Ref.: Hiramatsu 1967; Negoro 1973
4. Phormidiaceae Anagn. & Kom. 1988
- (1) Phormidioideae Anagn. & Kom. 1988
- Phormidium** Kütz. ex Gom. 1892
- Subg. *Gomontinema* Anagn. & Kom. 1988
- P. acuminatum** (Gom.) Anagn. & Kom. 1988
- Basion.: *Oscillatoria acuminata* Gom. 1892
- P. acuminatum** var. *acuminatum*
- Ref.: Yoneda 1939a, c, 1940b, 1941c, 1942b, c, 1954a; Emoto and Yoneda 1940b; Emoto and Hirose 1943a, b; Ikoma and Doi 1955; Hirose and Hirano 1977
- P. acuminatum** var. *longe-attenuatum* (Geitl. & Ruttn.) comb. nov.
- Basion.: *Oscillatoria acuminata* Gom. f. *longe-attenuata* Geitl. & Ruttn, Arch. f. Hydrobiol., Suppl. 14: 462, 1935
- Ref.: Emoto and Hirose 1942e; Yoneda 1952a; Hirose and Hirano 1977
- P. acuminatissimum** Emoto & Hirose 1942f
- Ref.: Emoto and Hirose 1942f, 1943b; Yoneda 1952a; Hirose and Hirano 1977

***P. amoenum* Kütz. 1843**Syn.: *Oscillatoria amoena* Gom. 1892

Ref.: Yoneda 1938a, 1942e; Emoto and Yoneda 1940a; Hiramatsu 1967; T. Watanabe 1968c; Nakano 1970; Yamagishi 1972; Hirose and Hirano 1977

***P. animale* (Ag. ex Gom.) Anagn. & Kom. 1888**Basion.: *Oscillatoria animalis* Ag. ex Gom. 1892

Ref.: Molisch 1926; Yoneda 1937, 1938c, 1939b, 1940b, 1941c, 1942b, c, d, 1962a, 1966; Ueda 1939; Emoto and Yoneda 1940a, b, 1941a, 1942; Fukushima 1950, 1952, 1954, 1963; Mizuno 1964; Akiyama 1965b; Hirose and Hirano 1977

***P. beggiatoiforme* (Gom.) Anagn. & Kom. 1888**Basion.: *Oscillatoria beggiatoiformis* Gom. 1892

Ref.: Hirose and Hirano 1977

***P. beppuense* Yoneda 1938b ("*beppuensis*")**

Ref.: Yoneda 1938b, c, 1952a; Ikoma and Doi 1955; Hirose and Hirano 1977

***P. breve* (Kütz. ex Gom.) Anagn. & Kom. 1888**Basion.: *Oscillatoria brevis* Kütz. ex Gom. 1892

Ref.: Yoneda 1937, 1938c, 1939b, c, 1942c, d, 1962a; Ueda 1939; Emoto and Yoneda 1940a, b, 1941b; Emoto and Hirose 1941, 1942e, 1943a; Akatsuka 1951; Hirano 1962; Akiyama 1961; Hiramatsu 1967; Hirose and Hirano 1977

P. chalybeum* (Mert. ex Gom.) Anagn. & Kom. 1888**Basion.: *Oscillatoria chalybea* Mert. ex Gom. 1892P. chalybeum* var. *chalybeum***

Ref.: Yoneda 1940a, b, 1941c, 1952a; Umezaki 1961; Ochiai 1962b; Mizuno 1964; T. Watanabe 1968c; Negoro 1973; Hirose and Hirano 1977; Noda 1987

***P. chalybeum* var. *anguina* Gom. 1892**

Ref.: Umezaki 1952b, 1955a

***P. chalybeum* var. *depauperatum* (Copel.) comb. nov.**Basion.: *Oscillatoria chalybea* Mert. var. *depauperata* Copel., Ann. New York Acad.

Sci. 36: 157, 1936

Ref.: Emoto and Hirose 1943a, 1949; Yoneda 1952a; Hirose and Hirano 1977

***P. chlorinum* (Kütz. ex Gom.) comb. nov.**Basion.: *Oscillatoria chlorina* Kütz. ex Gom., Ann. Sci. Nat. VII. Bot. 16: 223, 1892

Ref.: Negoro 1973; Hirose and Hirano 1977

***P. cortianum* (Menegh. ex Gom.) Anagn. & Kom. 1888**Basion.: *Oscillatoria Cortiana* Menegh. ex Gom. 1892

Ref.: Yoneda 1938b, c, 1939c, 1940b, 1941c, 1942b, c, 1952a, 1954a; Emoto and Hirose 1940c, 1942b, c, d, e, 1952c; Emoto and Yoneda 1941a, b; Fukushima 1950; Ikoma and Doi 1955; Hirose and Hirano 1977; Mifune and Hirose 1983a

***P. corallinae* (Kütz. ex Gom.) Anagn. & Kom. 1888**Basion.: *Oscillatoria Corallinae* (Kütz.) Gom. 1892Syn.: *Spirulina attenuata* Umez. 1952b

Ref.: Umezaki 1952b, 1961

***P. feldmannii* Frémy in Feldmann 1937 ("*Feldmannii*")**

Ref.: Umezaki 1961

***P. foreaui* (Frémy) comb. nov.**Basion.: *Oscillatoria foreaui* Frémy, Blumea, Suppl. 2: 23, 1942

Ref.: Hiramatsu 1967

The characteristics of *Oscillatoria foreaui* Frémy agree well with the diagnosis of subg. *Gomontinema*.***P. formosum* (Bory ex Gom.) Anagn. & Kom. 1888**Basion.: *Oscillatoria formosa* Bory ex Gom. 1892

Ref.: Molisch 1926; Yoneda 1938b, c, 1939b, c, d, 1941c, 1942b, c, d, e, f, 1952a, b, 1953a, 1954a; Okada 1939b; Ueda 1939; Emoto and Yoneda 1940a, 1941a, b, 1942; Emoto and Hirose 1941, 1942f, 1949; Fukushima 1948, 1952, 1954, 1960b; Kobayasi 1958; Imazu and Hirose 1961; Kobayasi et al. 1962; Hirano 1962; Ochiai 1962b; Mizuno 1964; Akiyama 1965a; T. Watanabe 1968c; Hiramatsu 1967, 1973; Negoro 1973;

- Hirose and Hirano 1977; Imazu 1979; Umezaki 1987
- P. grunowianum*** (Gom.) Anagn. & Kom. 1988
 Basion.: *Oscillatoria Grunowiana* Gom. 1892
 Syn.: *Oscillatoria grunowiana* Gom. var. *maior* Emoto & Yoneda, 1941a
 Ref.: Emoto and Yoneda 1941a; Yoneda 1942a, 1952a; Hirose and Hirano 1977
- P. hamelii*** (Frémy) Anagn. & Kom. 1988
 Basion.: *Oscillatoria Hamelii* Frémy 1930
 Ref.: T. Watanabe 1968c; Hirose and Hirano 1977
- P. ibusukiense*** (Emoto & Yoneda) Anagn. & Kom. 1988
 Basion.: *Oscillatoria ibusukiensis* Emoto & Yoneda 1940b
 Ref.: Emoto and Yoneda 1940b; Yoneda 1941a, 1942b, 1952a; Hirose and Hirano 1977
- P. irriguum*** (Kütz. ex Gom.) Anagn. & Kom. 1988
 Basion.: *Oscillatoria irrigua* Kütz. ex Gom. 1892
 Ref.: Yoneda 1939a, 1952a; Hirano 1956b, 1962, 1963; Hirose and Hirano 1977
- P. konstantinosum*** nom. nov.
 Syn.: *Oscillatoria tenuis* Ag. ex Gom., Ann. Sci. Nat. VII. Bot. 16: 220, 1892, *Phormidium tenue* (Ag. ex Gom.) Anagn. & Kom., Arch. Hydrobiol., Suppl. 80, 1-4 (Algol. Stud. 50-53): 406, 1988, nec *Phormidium tenue* (Menegh.) Gom., Ann. Sci. Nat. VII. Bot. 16: 169, 1892, nec *Phormidium tenue* Rabenh. ex Forti, Syll. Algar. 5: 227, 1907
 Ref.: Hada 1938b; Yoneda 1938b, c, 1939b, d, 1941a, b, c, 1942d, 1954a, 1966; Yon. Okada 1939; Emoto and Hirose 1940c, 1942b, 1952c; Emoto and Yoneda 1941a, b; Fukushima 1952, 1954, 1960b; Kobayasi 1958; Hirano 1959a, 1962; Imazu and Hirose 1961; Kobayasi et al. 1962; Iwai 1963; Ochiai 1962a; Mizuno 1964; Akiyama 1965a; Hiramatsu 1967; Negoro 1968, 1971, 1973, 1991a; T. Watanabe 1968a, c; Yamagishi 1972; Kurasawa and Okino 1975; Hirose and Hirano 1977; Imazu 1979, 1981, 1987; Yamagishi et al. 1982; Mifune and Hirose 1982, 1983a; Wakabayashi and Ichise 1982
- Syn.: *Oscillatoria tenuis* Ag. var. *asiatica* Wille 1922
 Ref.: Yoneda 1940a; Hirose and Hirano 1977
- Syn.: *Oscillatoria natans* Kütz. ex Gom. 1892, *Oscillatoria tenuis* Ag. var. *natans* (Kütz.) Gom. 1892
 Ref.: Molisch 1926; Yoneda 1953a; T. Watanabe 1968a
- Syn.: *Oscillatoria tenuis* Ag. var. *tergestina* (Kütz.) Rabenh. ex Gom. 1892, *Phormidium tergestinum* (Kütz.) Anagn. & Kom. 1988
 Ref.: Molisch 1926; Emoto and Hirose 1940b, 1942a, 1949, 1952c; Emoto and Yoneda 1940b; Yoneda 1941a, 1942b, c; Ikoma and Doi 1955; Mifune et al. 1966; T. Watanabe 1968c; Hirose and Hirano 1977; Mifune and Hirose 1983b
- P. laetevirens*** (Crouan ex Gom.) Anagn. & Kom. 1988
 Basion.: *Oscillatoria laetevirens* Crouan ex Gom. 1892
 Ref.: Umezaki 1961
- P. lapideum*** Geitl. var. *amorphum* Emoto & Hirose 1941
 Ref.: Emoto and Hirose 1941; Yoneda 1952a; Hirose and Hirano 1977
- P. molle*** (Kütz.) Gom. 1892
 Ref.: Yoneda 1942a, b, 1952a; Hirano 1962; Hiramatsu 1967; Hirose and Hirano 1977
- P. nigro-viridis*** (Thw. ex Gom.) Anagn. & Kom. 1988
 Basion.: *Oscillatoria nigro-viridis* Thw. ex Gom. 1892
 Ref.: Yoneda 1940a; Emoto and Yoneda 1940b; Akatsuka 1951; Umezaki 1961; Hiramatsu 1967; Takata and Hirose 1971; Noda 1974, 1987; Hirose and Hirano 1977
- P. nigrum*** (Vauch. ex Gom.) Anagn. & Kom. 1988
 Basion.: *Oscillatoria nigra* Vauch. ex Gom. 1892
 Ref.: Hirose 1938; Hirose and Hirano

- 1977
P. okenii (Ag. ex Gom.) Anagn. & Kom. 1988
 Basion.: *Oscillatoria okenii* Ag. ex Gom. 1892
 Ref.: Molisch 1926; Yoneda 1938b, c, 1939c, 1940b, 1941c, 1942c, 1952a; Emoto and Hirose 1942d, e; Emoto and Yoneda 1940b, 1941b; Hirose and Hirano 1977
- P. ornatum** (Kütz. ex Gom.) Anagn. & Kom. 1988
 Basion.: *Oscillatoria ornata* Kütz. ex Gom. 1892
 Ref.: Yoneda 1942b, 1952a; Hirose and Hirano 1977; Yamagishi et al. 1982
- P. penicillatum** Gom. 1893
 Ref.: Umezaki 1955a, 1961
- P. proteus** (Skuja) comb. nov.
 Basion.: *Oscillatoria proteus* Skuja, N. Acta R. Soc. Sci. Upsal., ser. 4, 14(5): 48, 1949
 Ref.: Akiyama 1965b
 The characteristics of *Oscillatoria proteus* Skuja agree well with the diagnosis of subg. *Gomontinema*.
- P. pseudopriestleyi** Anagn. & Kom. 1988
 Syn.: *Oscillatoria Priestleyi* W. & G. S. West 1911
 Ref.: Yoneda 1942c, 1952a; Hirose and Hirano 1977
- P. rupicolum** (Hansg. ex Gom.) Anagn. & Kom. 1988
 Basion.: *Oscillatoria rupicola* Hansg. ex Gom. 1892
 Ref.: M. Watanabe and Niiyama 1990
- P. sakashitae** (Yoneda) Anagn. & Kom. 1988
 Basion.: *Oscillatoria Sakashitae* Yoneda 1938b
 Ref.: Yoneda 1938b, 1952a; Hirose and Hirano 1977
- P. simplicissimum** (Gom.) Anagn. & Kom. 1988
 Basion.: *Oscillatoria simplicissima* Gom. 1892
 Ref.: Yoneda 1942e, 1952a; T. Watanabe 1956; Kobayasi 1958; Kobayasi et al. 1962; Yamagishi 1967, 1972; Hirose and Hirano 1977
- P. spirulinoides** (Yoneda) comb. nov.
 Basion.: *Oscillatoria spirulinoides* Yoneda, Bull. Jap. Soc. Phycol. 2: 9, 1954, non *Oscillatoria spirulinoides* Woron. 1932
 Ref.: Yoneda 1954a
Oscillatoria spirulinoides Yoneda is nearer to *Phormidium* subg. *Gomontinema* than *Tychonema* Anagn. & Kom.
- P. subtruncatum** Woron. 1930
 Ref.: Ioriya et al. 1984
- P. tambii** (Woron.) Anagn. & Kom. 1988
 Basion.: *Oscillatoria Tambii* Woron. 1926
 Ref.: Emoto and Hirose 1942b; Yoneda 1952a; Hirose and Hirano 1977
- P. tanganyikae** (G. S. West) Anagn. & Kom. 1907
 Basion.: *Oscillatoria tanganyikae* G. S. West 1907
 Ref.: Akatsuka 1951
- P. terebriformes** (Ag. ex Gom.) Anagn. & Kom. 1988
 Basion.: *Oscillatoria terebriformis* Ag. ex Gom. 1892
 Ref.: Molisch 1926; Yoneda 1937, 1938c, 1939b, 1940b, 1941b, 1952a; Emoto and Yoneda 1941b; Emoto and Hirose 1942e, 1943a, 1952a; Imazu and Hirose 1961; Akiyama 1965a; Hirose and Hirano 1977
- P. thwaitesii** nom. nov.
 Syn.: *Oscillatoria subuliformis* Thw. ex Gom., Ann. Sci. Nat. VII, Bot. 16: 226, 1892, *Phormidium subuliforme* (Thw. ex Gom.) Anagn. & Kom., Arch. Hydrobiol., Suppl. 80(1-4) (Algol. Stud. 50-53): 406, 1988, non *Phormidium subuliforme* Gom., Ann. Sci. Nat. VII, Bot. 16: 169, 1892
 Ref.: Yoneda 1940a, 1942c, 1952a; Emoto and Yoneda 1941b; Emoto and Hirose 1952c; Hirose and Hirano 1977
- P. tortuosum** (Gardn.) Anagn. & Kom. 1988
 Basion.: *Oscillatoria tortuosa* Gardn. 1927
 Ref.: Yoneda 1940a, 1952a; Hirose and Hirano 1977
- P. willei** (Gardn.) Anag. & Kom. 1988
 Basion.: *Oscillatoria Willei* Gardn. 1927
 Ref.: Akiyama 1965b
- P. yonedae** (Umezaki) comb. nov.
 Basion.: *Oscillatoria yonedae* Umezaki, Mem. Coll. Agr., Kyoto Univ. 83: 72, 1961

- Ref.: Umezaki 1961
- P. yuhuense* (Yoneda) Anagn. & Kom. 1988
Basion.: *Oscillatoria yuhuensis* Yoneda 1938b
Ref.: Yoneda 1938b, 1952a; Hirose and Hirano 1977
- Subg. *Hansgirgia* Anagn. & Kom. 1988
- P. aerugineo-caeruleum* (Gom.) Anagn. & Kom. 1988
Basion.: *Lyngbya aerugineo-caerulea* Gom. 1892
Ref.: Yoneda 1942a, b, 1949, 1950, 1952a, 1953a; Emoto and Yoneda 1942; Emoto and Hirose 1942d, 1943a, 1952b; Akiyama 1965a; T. Watanabe 1968c; Hirose and Hirano 1977
- P. allorgei* (Frémy) Anagn. & Kom. 1988
Basion.: *Lyngbya Allorgei* Frémy 1929
Ref.: Emoto and Hirose 1952a; Hirose and Hirano 1977; Ioriya et al. 1984
- P. calcicola* Gardn. 1927
Ref.: Hiramatsu 1967
- P. diguetii* (Gom.) Anagn. & Kom. 1988
Basion.: *Lyngbya Diguettii* Gom. in Hariot 1895
Ref.: Yamagishi et al. 1982
- P. nemuroense* (Yoneda) comb. nov.
Basion.: *Lyngbya nemuroensis* Yoneda. Acta Phytotax. Geobot. 10: 167, 1941
Ref.: Yoneda 1941b
- P. puteale* (Mont. ex Gom.) Anagn. & Kom. 1988
Basion.: *Lyngbya putealis* Mont. ex Gom. 1892 ("*putalis*")
- P. puteale* var. *puteale*
Ref.: Yoneda 1938b, c, 1942c, d, 1952a; Fukushima 1950; Akiyama 1965a; Hiramatsu 1973; Hirose and Hirano 1977
- P. puteale* var. *minor* (Geitl.) comb. nov.
Basion. *Lyngbya putealis* Mont. var. *minor* Geitl., Arch. Hydrobiol., suppl. 12: 633, 1933, non *Lyngbya putealis* var. *minor* Thomas & Gonzalves, Hydrobiol. 26: 53, 1965
Syn.: *Lyngbya putealis* Mont. var. *Geitleri* J. De Toni, Archivio Bot. 15(3-4): 290, 1939
Ref.: Yoneda 1942a, g, 1952a; Hirose and Hirano 1977
- P. schmidlei* Anagn. & Kom. 1988
Syn.: *Lyngbya Usterii* Schmidle 1904, *Phormidium Usterii* Schmidle 1904
Ref.: Hiramatsu 1967
- P. subspiroides* (Copel.) comb. nov.
Basion.: *Lyngbya subspiroides* Copel., Ann. New York Acad. Sci. 36: 193, 1936
Ref.: Yoneda 1939c, 1940a, b, 1952a; Emoto and Yoneda 1940a, b, 1941a; Hirose and Hirano 1977
- P. yuichii* nom. nov.
Syn.: *Lyngbya subcapitata* Yoneda, Acta Phytotax. Geobot. 9: 47, 1940
Ref.: Yoneda 1940a; Hirose and Hirano 1977
- Subg. *Phormidium*
- P. ambiguum* Gom. 1892
- P. ambiguum* var. *ambiguum*
Ref.: Yoneda 1937; Emoto and Hirose 1941, 1952c; Hiramatsu 1967; T. Watanabe 1968c; Hirose and Hirano 1977; Mifune and Hirose 1983a, b; M. Watanabe et al. 1984; Ioriya et al. 1984
- P. ambiguum* var. *majus* Lemm. 1910 ("*major*")
Ref.: Emoto and Hirose 1942e; Hirose and Hirano 1977; Mifune and Hirose 1983b
Syn.: *Lyngbya bourrellyana* f. *major* (Lemm.) Compère, Bull. Jard. Bot. Nat. Belg. 44: 17, 1974
- P. autumnale* (Ag.) Gom. 1892
Ref.: Molisch 1926; Hirose 1938; Yoneda 1939a, 1941c, 1952a; Emoto and Yoneda 1942; Emoto and Hirose 1949, 1952c; Hiramatsu 1967, 1973; Hirose and Hirano 1977; Mifune and Hirose 1983b; M. Watanabe et al. 1984; Ioriya et al. 1984
Syn.: *Phormidium calidum* Gom. 1892
Ref.: Emoto and Hirose 1943b; Hirose and Hirano 1977
Syn.: *Phormidium favosum* (Bory) Gom. 1892
Ref.: Yoneda 1942a, 1952a, 1966; Emoto and Hirose 1942e, 1949; Fukushima 1951; Hiramatsu 1967; T. Watanabe 1968c; Horikawa et al. 1969; Negoro 1973; Hirose and Hirano 1977; Bando and Nakano 1983
Syn.: *Phormidium Setchellianum* Gom. 1892

- Ref.: Hirose 1938; Hirose and Hirano 1977
 Syn.: *Phormidium uncinatum* Gom. 1892
 Ref.: Molisch 1926; Yoneda 1938a, 1942b, 1952a, 1966; Emoto and Yoneda 1941b; Akiyama 1965b; Hirose 1966; T. Watanabe 1968c; Hiramatsu 1967; Hirose and Hirano 1977
- P. corium*** (Ag.) Kütz. ex Gom. 1892
 Ref.: Molisch 1926; Yoneda 1938b, c, 1939d, 1940b, 1941c, 1942b, c, e, 1952a, b, 1954a, 1962a; Emoto and Yoneda 1940a, b, 1941b; Emoto and Hirose 1940a, b, 1942d, e, 1943a, b, 1949, 1952a; Ikoma and Doi 1955; Umezaki 1955a; Kobayasi 1958; Kobayasi et al., 1962; Hirano 1962; Akiyama 1965a; Iso-da 1966; Hiramatsu 1967; T. Watanabe 1968c; Hirose and Hirano 1977; Mifune and Hirose 1983b; Ioriya et al. 1984; M. Watanabe and Niiyama 1990
- P. incrustatum*** (Näg.) Gom. 1892
 Ref.: Emoto and Hirose 1942d; Yoneda 1952a; T. Watanabe 1968c; Hirose and Hirano 1977
 Syn.: *Phormidium subincrustatum* Fritsch & Rich 1929
 Ref.: Akiyama 1965b; Hiramatsu 1967; Hirose and Hirano 1977
- P. inundatum*** Kütz. ex Gom. 1892
 Ref.: Hirose 1938; Yoneda 1942a, e, 1952a; Hiramatsu 1967; T. Watanabe 1968c; Nakano 1970; Hirose and Hirano 1977; Imazu 1987
- P. jadinianum*** Gom. in Jadin 1893 ("*Jadinianum*")
 Ref.: Fukushima 1954; Hiramatsu 1967
- P. lucidum*** (Ag.) Kütz. ex Gom. 1892
 Ref.: Yoneda 1942b, 1952a; Hirose and Hirano 1977
- P. pachydermaticum*** Frémy 1929
 Ref.: T. Watanabe 1968c; Hiramatsu 1973; Hirose and Hirano 1977
- P. papyraceum*** (Ag.) Gom. 1892
 Ref.: Yoneda 1937, 1949; Emoto and Yoneda 1941b; Akiyama 1965a; Hiramatsu 1967, 1973; Hirose and Hirano 1977
- P. retzii*** (Ag.) Gom. 1892 ("*Retzii*")
 Ref.: Yoneda 1937, 1949, 1952a; Emoto and Yoneda 1942; T. Watanabe 1957; Hiramatsu 1967, 1973; Hirose and Hirano 1977; M. Watanabe and Niiyama 1990
- P. rubriterricola*** Gardn. 1927
 Ref.: Akiyama 1965a; Hirose and Hirano 1977
- P. stagninum*** C. B. Rao 1938 ("*stagnina*")
 Ref.: Hiramatsu 1967
- P. subfuscum*** Kütz. ex Gom. 1892
- P. subfuscum* var. *subfuscum***
 Ref.: Yoneda 1940a; Hirano 1960; T. Watanabe 1968c; Hirose and Hirano 1977
 Syn.: *Phormidium subfuscum* Kütz. var. *joanianum* (Kütz.) Gom. 1892
 Ref.: Fukushima 1952, 1954; Bando and Nakano 1983
- P. subfuscum* var. *inaequale*** Näg. ex Forti 1907
 Ref.: Hirose 1966
- P. submembraneum*** (Ard. & Atraff.) Gom. 1892
 Ref.: Umezaki 1961; Hiramatsu 1967
- P. subuliforme*** Gom. 1892
 Ref.: Emoto and Yoneda 1941b; Yoneda 1942a, 1952a; Emoto and Hirose 1943a, 1952c; Akiyama 1965a; Hirose and Hirano 1977
- P. tinctorium*** Kütz. ex Gom. 1892
 Ref.: Hirose 1938; Fukushima 1951, 1954; Hiramatsu 1973; Hirose and Hirano 1977
- P. viscosum*** Lemm. 1910
 Ref.: Emoto and Hirose 1940c, 1942a, f; Yoneda 1952a; Hirose and Hirano 1977; Mifune and Hirose 1982
- Planktothrix*** Anagn. & Kom. 1988
 Syn.: *Oscillatoria* sect. *Prolificae* Gom. 1892
- P. agardhii*** (Gom.) Anagn. & Kom. 1988
 Basion.: *Oscillatoria Agardhii* Gom. 1892
 Ref.: Yoneda 1939b, 1952a; Emoto and Yoneda 1941a, b, 1942; Akatsuka 1951; Hirano 1962; Mizuno 1964; Akiyama 1965b; Yamagishi 1967, 1972; Imada 1970; Hirose and Hirano 1977; M. Watanabe and Chihara 1980 (as *O. mougeotii*), M. Watanabe 1989 (as *O. mougeotii*);

- Umezaki 1987
- P. iwanoffiana*** (Nyg.) comb. nov.
 Basion.: *Trichodesmium Iwanoffianum* Nag.,
 Vidensk. Medd. Dansk Naturh. Fören.
 82: 21, 1926
 Syn.: *Oscillatoria Iwanoffiana* (Nyg.) Geitl. in
 Rabenh., Kryptogamen-F1. 14: 956,
 1932, *Skujaella Iwanoffiana* (Nyg.) J. De
 Toni, Archivio Bot. 20(1/4): 3, 1946
 Ref.: Yamaguti 1955; Hirano 1956a, b;
 Hirose and Hirano 1977; Yamagishi et
 al. 1982
Trichodesmium Ehrenb. ex Gomont 1892 is a
 marine genus to produce red tides in the
 pelagic sea. *Trichodesmium Iwanoffiana*
 Nyg. 1926 and *T. lacustris* Kleb. 1895,
 both of which are freshwater planktonic
 species, should be combined in
Planktothrix.
- P. lacustris*** (Kleb.) comb. nov.
 Basion.: *Trichodesmium lacustre* Kleb., Flora
 80: 271, 1895
 Syn.: *Oscillatoria lacustris* (Kleb.) Geitl. in
 Pascher, Süßwasser-F1. 12: 362, 1925
 Ref.: Ueno 1933; Akatsuka 1951; Mizuno
 1964; T. Watanabe 1968a
- P. miyadaii*** (Negoro) comb. nov.
 Basion.: *Oscillatoria Miyadaii* Negoro, Sci.
 Rep. Tokyo Bunrika Daigaku, Sect. B.
 No. 94: 80, 1943
 Ref.: Negoro and Aoki 1991
- P. mougeotii*** (Bory ex Gom.) Anagn. & Kom.
 1988
 Basion.: *Oscillatoria Mougeotii* Bory ex Gom.
 1892
 Ref.: Emoto and Hirose 1943a, 1952a;
 Yoneda 1952a; Hirano 1962; Hirose and
 Hirano 1977; M. F. Watanabe 1979;
 Negoro and Aoki 1991
- P. perornata*** (Skuja) Anagn. & Kom. 1988
 Basion.: *Oscillatoria perornata* Skuja 1949
 Ref.: Hiramatsu 1973; Yamagishi et al.
 1982
- P. prolifica*** (Grev. ex Gom.) Anagn. & Kom.
 1988
 Basion.: *Oscillatoria prolifica* (Grev.) Gom.
 1892
 Ref.: Akatsuka 1951; Negoro 1973
- P. raciborskii*** (Wolosz.) Anagn. & Kom. 1988
 Basion.: *Oscillatoria Raciborskii* Wolosz. 1912
 Ref.: Akatsuka 1951; M. Watanabe and
 Chihara 1980; M. Watanabe 1989
- P. rubescens*** (De Candolle ex Gom.) Anagn. &
 Kom. 1988
 Basion.: *Oscillatoria rubescens* De Candolle
 ex Gom. 1892
 Ref.: Akatsuka 1951; Negoro 1973
- Porphyrosiphon*** Kütz. ex Gom. 1892
- P. lutea*** (Ag. ex Gom.) Anagn. & Kom. 1988
 Basion.: *Lyngbya lutea* (Ag.) Gom. 1892
 Ref.: Yoneda 1938b, c, 1939d, 1940b,
 1942c, 1952a, 1953a, 1954a; Hirose
 1938; Emoto and Yoneda 1940b, 1941a,
 b; Emoto and Hirose 1952c; Fukushima
 1952; Ikoma and Doi 1955; Umezaki
 1951, 1961; Akiyama 1965a; Noda 1974,
 1987; Hirose and Hirano 1977
- P. martensianus*** (Menegh. ex Gom.) Anagn.
 & Kom. 1988
 Basion.: *Lyngbya Martensiana* Menegh. ex
 Gom. 1892
 Ref.: Hirose 1938; Yoneda 1938b, c,
 1939d, 1940b, 1942c, 1952a, b, 1953a,
 1962a; Emoto and Yoneda 1941b; Fuku-
 shima 1952, 1954; T. Watanabe 1957,
 1968c; Kobayasi 1958; Imazu and Hiro-
 se 1961; Kobayasi et al. 1962; Hirano
 1962; Iwai 1963; Mizuno 1964; Yama-
 gishi 1972; Negoro 1973; Hiramatsu
 1973; Hirose and Hirano 1977; Imazu
 1987
- P. notarisii*** Kütz. ex Gom. 1892 ("*Notarisii*")
 Ref.: Higashi 1934; Hiramatsu 1967,
 1973; Hirose and Hirano 1977
- Pseudophormidium*** (Forti)
 Anagn. & Kom. 1988
- P. radiosum*** (Gom.) Anagn. & Kom. 1988
 Basion.: *Plectonema radiosum* Gom. 1892
 Ref.: Negoro 1973
- Symploca*** Kütz. ex Gom. 1892
- S. cartilaginea*** (Mont.) Gom. 1892
 Ref.: Yoneda 1938b, c, 1952a; Hirano
 1962; Hirose and Hirano 1977
- S. hydroides*** Kütz. ex Gom. 1892
 Ref.: Tanaka 1956; Hirose 1957, 1958;

- Umezaki 1961; Hiramatsu 1967; Noda 1974, 1987
 Syn.: *Calothrix rigida* Harv. ex Gom., pro
 synonym. 1892
 Ref.: Dawson 1959 (Harvey's manuscript)
- S. laete-viridis** Gom. 1892
 Ref.: Hirose and Hirano 1977
- S. muralis** Kütz. ex Gom. 1892
 Ref.: Emoto and Hirose 1952b; Negoro
 1973; Hirose and Hirano 1977
- S. muscorum** (Ag.) Gom. 1892
- S. muscorum** var. *muscorum*
 Ref.: Yoneda 1937, 1952a; Emoto and
 Hirose 1940a, 1941; Fukushima 1951;
 Hirano 1962; Hiramatsu 1967; Nakano
 1970; Hirose and Hirano 1977
- S. muscorum** var. *caldariorum* Lemm. 1910
 Ref.: Emoto and Hirose 1942a; Yoneda
 1952a; Hirose and Hirano 1977
- S. nasuensis** Emoto & Hirose 1940
 Ref.: Emoto and Hirose 1940a; Yoneda
 1952a; Hirose and Hirano 1977
- S. thermalis** (Kütz.) Gom. 1892
- S. thermalis** var. *thermalis*
 Ref.: Molisch 1926; Yoneda 1938b, c,
 1941b, 1942f, 1952a; Emoto and Hirose
 1940a, 1942c, d, 1952b; Emoto and
 Yoneda 1941b; Fukushima 1963; Ne-
 goro 1973; Hirose and Hirano 1977
- S. thermalis** var. *longiarticulata* (Emoto &
 Hirose) stat. nov.
 Basion.: *Symploca thermalis* (Kütz.) Gom. f.
longiarticulata Emoto & Hirose, Bot.
 Mag. Tokyo 56: 39, 1942
 Ref.: Emoto and Hirose 1942a; Hirose and
 Hirano 1977
- Trichodesmium** Ehrenb. ex Gom. 1892
 Syn. *Xanthotrichum* Wille in Schütt 1892,
Heliotrichum Wille in Schütt 1892,
Haliarachne Lemm. 1899, *Pelagothrix*
 Johs.-Schmidt 1901, *Skujaella* J. De Toni
 1938
- T. clevei** (J. Schmidt) Anagn. & Kom. 1988
 Basion.: *Pelagothrix Clevei* J. Schmidt 1901
 Ref.: Akatsuka 1951; Marumo 1966
- T. contortum** Wille 1903
 Syn.: *Skujaella contorta* (Wille) J. De Toni
 1939
- Ref.: Akatsuka 1951; Marumo 1966;
 Yamaji 1984
- T. erythraeum** Ehrenb. ex Gom. 1892
 Syn.: *Oscillatoria erythraea* (Ehrenb.) Geitl.
 1932, *Skujaella erythraea* (Ehrenb.) J. De
 Toni 1938
 Ref.: Okamura 1907; Higashi 1933b; Aka-
 tsuka 1951; Tsujita 1956; Umezaki
 1961, 1987; Motoda and Marumo 1963;
 Marumo 1966; Nagasawa and Marumo
 1967; Yamaji 1984
- T. hildebrandtii** Gom. 1892 ("*Hildebrandtii*")
 Syn.: *Oscillatoria Hildebrandtii* (Gom.) Geitl.
 1932, *Skujaella Hildebrandtii* (Gom.) J. De
 Toni 1939
 Ref.: Akatsuka 1951; Umezaki 1961; Maru-
 mo 1966; Yamaji 1984
- T. lenticulare** (Lemm.) Anagn. & Kom. 1988
 Basion.: *Haliarachne lenticularis* Lemm. 1899
 Ref.: Akatsuka 1951
- T. radians** (Wille) Golubić 1977
 Basion.: *Trichodesmium tenue* Wille 1904
 Syn.: *Skujaella tenue* (Wille) J. De Toni 1939
 Ref.: Akatsuka 1951
- T. thiebautii** Gom. 1892 ("*Thiebautii*")
 Syn.: *Oscillatoria Thiebautii* (Gom.) Geitl.
 1932, *Skujaella Thiebautii* (Gom.) J. De
 Toni 1939
 Ref.: Okamura 1907, 1916; Kokubo 1932;
 Akatsuka 1951; Umezaki 1961; Motoda
 and Marumo 1963; Marumo 1966;
 Yamaji 1984
 The habit of trichomes of *Haliarachne pacifi-
 ca* figured by Akatsuka (1951, pl. 11, f. 7) is
 nothing but those of *Trichodesmium thiebautii*.
- Tychonema** Anagn. & Kom. 1988
- T. bornetii** (Zukal) Anagn. & Kom. 1988
 Basion.: *Lyngbya Bornetii* Zukal 1894
 Syn.: *Oscillatoria Bornetii* (Zukal) Forti 1907
 Ref.: Akiyama 1965a
- T. granulatum** (Gardn.) Anagn. & Kom.
 1988
 Basion.: *Oscillatoria granulata* Gardn. 1927
 Ref.: Kobayasi 1958; Kobayasi et al. 1962;
 Imazu 1987

(2) Microcoleoideae Hansg. 1892

Hydrocoleum Kütz. ex Gom. 1892Syn.: *Polychlamydom* W. & G. S. West 1897*H. coccineum* Gom. 1892

Ref.: Umezaki 1961

H. confluens (Setch. & Gardn.) Drouet 1942Basion: *Microcoleus confluens* Setch. & Gardn. in Gardn. 1918

Ref.: Umezaki 1961

H. glutinosum (Ag.) Gom. 1892

Ref.: Umezaki 1961

H. homoeotrichum Kütz. ex Gom. 1892

Ref.: Negoro 1973

Microcoleus Desm. ex Gom. 1892*M. chthonoplastes* (Mert.) Zanard. ex Gom. 1892

Ref.: Emoto and Hirose 1952c; Umezaki 1961; Imazu and Hirose 1961; Mifune et al. 1966; Hirose and Hirano 1977

M. paludosus (Kütz.) Gom. 1892

Ref.: Yoneda 1938a, 1966; Akiyama 1965a; Hiramatsu 1967; Hirose and Hirano 1977

M. sanctae-crucis Frémy 1939

Ref.: Umezaki 1961

M. sociatus W. & G. S. West 1897

Ref.: Yoneda 1939b, c, 1940a, 1952a, 1962a; Emoto and Hirose 1943a; Hiramatsu 1967, 1973; Hirose and Hirano 1977

M. steenstrupii Boye-Peters. 1923 ("*Steenstrupii*")

Ref.: Emoto and Yoneda 1941b; Yoneda 1942a, b, c, 1952a; Emoto and Hirose 1942e; Hirose and Hirano 1977

M. subtorulosus (Bréb.) Gom. 1892

Ref.: Hirose 1938; Yoneda 1939a; Hirano 1962; Hiramatsu 1967; Hirose and Hirano 1977

M. tenerrimus Gom. 1892Syn.: *Microcoleus tenerrimus* Gom. var. *longus* Umez. 1952a

Ref.: Umezaki 1952a, b, 1955a, 1961

M. vaginatus (Vauch.) Gom. 1892

Ref.: Emoto and Yoneda 1942; Yoneda 1942a, 1952a; Akiyama 1965a; Hiramatsu 1967, 1973; Negoro 1973; Hirose

and Hirano 1977

M. voukii Frémy 1932 ("*Voukii*")

Ref.: Umezaki 1961

M. wuitneri Frémy 1932 ("*Wuitneri*")

Ref.: Umezaki 1961; Hirose and Kajimura 1973

Sirocoleum Kütz. ex Gom. 1892Syn.: *Dasygloea* Thw. ex Gom. 1892*S. amorphum* (Thw. ex Gom.) comb. nov.Basion.: *Dasygloea amorphum* Thw. ex Gom., Ann. Sci. Nat. VII. Bot. 15: 347, 1892
Ref.: Fukushima 1952, 1954; Hirano 1962; Hirose and Hirano 1977*S. kurzii* (Zell.) Gom. 1892Syn.: *Microcoleus Weeksii* Setch. & Gardn. in Gardn. 1918, *Hydrocoleum Boergesenii* Gardn. 1932, *Microcoleus Boergesenii* Frémy 1939

Ref.: Umezaki 1952a, b, 1955c, 1956c, 1961

(3) Spirulinoideae Forti 1907

Arthrospira Stizenb. ex Gom. 1892*A. fusiformis* (Voron.) Kom. & Lund 1990Basion.: *Spirulina fusiformis* Voron. 1934
Ref.: M. M. Watanabe and Ichimura 1977 (as *Spirulina platensis*)*A. jenneri* Stizenb. ex Gom. 1892 ("*Jenneri*")

Ref.: Kobayasi and Watari 1934; Akatsuka 1951

Syn.: *Spirulina jenneri* (Stizenb.) Geitl. 1925

Ref.: Emoto and Hirose 1941; Hirano 1962; Mizuno 1964; Negoro 1973; Hirose and Hirano 1977

Spirulina Turp. ex Gom. 1892*S. gigantea* Schmidle 1902

Ref.: Akiyama 1965a; Hirose and Hirano 1977

S. laxa G. M. Smith 1916

Ref.: Akatsuka 1951; Akiyama 1965a; Hirose and Hirano 1977

S. laxissima G. S. West 1907

Ref.: Akatsuka 1951

S. major Kütz. ex Gom. 1892*S. major* var. *major*

Ref.: Yoneda 1940a, 1952a, 1966; Aka-

- tsuka 1951; Umezaki 1961; Hiramatsu 1967, 1973; Hirose and Hirano 1977
- S. major** var. *constans* Emoto & Hirose 1952b
Ref.: Emoto and Hirose 1952b
- S. nordstedtii** Gom. 1892 ("Nordstedtii")
Ref.: Mizuno 1964
- S. princeps** W. & G. S. West 1902
Ref.: Akatsuka 1951; Hirose et al. 1960; Akiyama 1965a; Hirose and Hirano 1977; Yamagishi 1989
- S. pseudovacuolata** Utermöhl ex Koppe 1924
Ref.: Akatsuka 1951
- S. subsalsa** Oersted ex Gom. 1892
Ref.: Yoneda 1938b, c, 1952a, 1954a; Emoto and Yoneda 1940b, 1941b; Umezaki 1961; Hirose and Kajimura 1973; Hirose and Hirano 1977
- S. subtilissima** Kütz. ex Gom. 1892
Ref.: Yoneda 1939b, 1940a, 1952a; Hirose and Hirano 1977
Syn.: *Spirulina labyrinthiformis* Gom. 1892
Ref.: Yoneda 1939c, 1940a, 1952a; Umezaki 1961; Hirose and Kajimura 1973; Noda 1987
- S. tenerrima** Kütz. ex Gom. 1892
Syn.: *Spirulina socialis* Gardn. 1932
Ref.: Umezaki 1952a, b, 1955a, c, 1961
5. Pseudanabaenaceae Anagn. & Kom. 1988
(1) Leptolyngbyoideae Anagn. & Kom. 1988
- Geitlerinema** (Anagn. & Kom.)
Anagn. 1989
- G. acutissimum** (Kuffer) Anagn. 1989
Basion.: *Oscillatoria acutissima* Kuffer 1914
Syn.: *Phormidium acutissimum* (Kuffer)
Anagn. & Kom. 1988
Ref.: Hirose 1938; Yoneda 1952a; Hirose and Hirano 1977
- G. amphibium** (Ag. ex Gom.) Anagn. 1989
Basion.: *Oscillatoria amphibia* Ag. ex Gom. 1892
Syn.: *Phormidium amphibium* (Ag. ex Gom.)
Anagn. & Kom. 1988
Ref.: Molisch 1926; Yoneda 1938b, c, 1939b, c, 1940b, 1941b, c, 1942b, c, d, 1952a, b, 1962a; Yon. Okada 1939; Okada 1939b; Emoto and Yoneda 1940a, b; Emoto and Hirose 1941; Kobayasi 1958; Hirano 1960, 1962; Kobayasi et al. 1962; Mizuno 1964; Akiyama 1965a; Iso-da 1966; Hiramatsu 1967; T. Watanabe 1968c; Hirose and Kajimura 1973; Hirose and Hirano 1977; Umezaki 1987
- G. claricentrosom** (Gardn.) Anagn. 1989
Basion.: *Oscillatoria claricentrosa* Gardn. 1927
Syn.: *Phormidium claricentrosom* (Gardn.)
Anagn. & Kom. 1988
Ref.: Hiramatsu 1967
- G. codii** nom. nov.
Syn.: *Arthrospira miniata* f. *acutissima* Umezaki, Mem. Coll. Agr., Kyoto Univ. 83: 64, 1961
Ref.: Umezaki 1961
- G. jatorvense** (Vouk) Anagn. 1989
Basion.: *Oscillatoria jatorvensis* Vouk 1919
Syn.: *Phormidium jatorvense* (Vouk) Anagn. & Kom. 1988
Ref.: Emoto and Yoneda 1940b; Yoneda 1941a, 1952a, b; Hirose and Hirano 1977
- G. lemmermannii** (Wolosz.) Anagn. 1989
Basion.: *Oscillatoria Lemmermannii* Wolosz. 1911
Syn.: *Jaaginema Lemmermannii* (Wolosz.)
Anagn. & Kom. 1988
Ref.: Yoneda 1938b, c, 1952a; Akatsuka 1951; Hirose and Hirano 1977
- G. peronidum** (Skuja) comb. nov.
Basion.: *Oscillatoria peronides* Skuja in Handel-Mazzetti, Symb. Sinicae 1: 37, 1937
Ref.: Emoto and Hirose 1940b; Yoneda 1952a; Hirose and Hirano 1977
The characteristics of *Oscillatoria peronides* Skuja except its diameter which is a little thicker agree well with the diagnosis of *Geitlerinema*.
- G. splendidum** (Grev. ex Gom.) Anagn. 1989
Basion.: *Oscillatoria splendida* Grev. ex Gom. 1892
Syn.: *Phormidium splendidum* (Grev. ex Gom.) Anagn. & Kom. 1988
- G. splendidum** var. *splendidum*
Ref.: Molisch 1926; Ueda 1939; Yoneda 1940a, 1942b, c, 1952a, 1954a; Emoto and Yoneda 1940a, 1941a; Emoto and Hirose 1942b, e, 1949, 1952a, c; Ikoma

- and Doi 1955; Fukushima 1952, 1954; Kobayasi 1958; Kobayasi et al. 1962; Mizuno 1964; Akiyama 1965a; T. Watanabe 1956; Hiramatsu 1967; Negoro 1973; Hirose and Hirano 1977; Mifune and Hirose 1983a; Negoro and Aoki 1991
- G. splendidum** var. *attenuatum* (W. West) comb. nov.
Basion.: *Oscillatoria splendida* var. *attenuata* W. West, J. Roy. Microsc. Soc. London 1896: 165, 1896
Ref.: Yoneda 1952a
- G. splendidum** var. *truncatum* (Emoto & Hirose) comb. nov.
Basion.: *Oscillatoria splendida* var. *truncatum* Emoto and Hirose, Bot. & Zool. (Tokyo) 8: 395, 1940
Ref.: Emoto and Hirose 1940a; Yoneda 1942a; Hirose and Hirano 1977
- G. uncinatum** (Emoto & Hirose) comb. nov.
Basion.: *Oscillatoria uncinata* Emoto & Hirose, Bot. & Zool. (Tokyo) 8: 396, 1940, non *Oscillatoria uncinata* Agardh ex Gom. 1892
Ref.: Emoto and Hirose 1940a, 1952b; Yoneda 1952a; Hirose and Hirano 1977
The characteristics of *Oscillatoria uncinata* Emoto & Hirose agree well with the diagnosis of *Geitlerinema*.
- Leibleinia** (Gom.) L. Hoffm. 1985
Syn.: *Lyngbya* Ag. ex Gom. subg. *Leibleinia* Gom. 1892
- L. akkeshiensis** (Hirose) Anagn. & Kom. 1988
Basion.: *Lyngbya akkeshiensis* Hirose 1938
Ref.: Hirose 1938; Hirose and Hirano 1977
- L. angusta** (Yoneda) Anagn. & Kom. 1988
Basion.: *Lyngbya angusta* Yoneda 1941a
Ref.: Yoneda 1941a; Hirose and Hirano 1977
- L. baculum** (Gom.) L. Hoffm. 1985
Basion.: *Lyngbya Baculum* Gom. 1892
Ref.: Umezaki 1961
- L. epiphytica** (Hieron. ex Kirchn.) Compère 1985
Basion.: *Lyngbya epiphytica* Hieron. ex Kirchn. in Engl. & Prantl 1900
Ref.: Yoneda 1940a, 1952a, 1953a; Emoto and Yoneda 1940a, 1941a, b, c, 1942; Emoto and Hirose 1940a, 1942a, c; Umezaki 1955a, 1961; Takata and Hirose 1971; Hirose and Hirano 1977
- L. gracilis** Menegh. 1844
Syn.: *Lyngbya gracilis* Rabenh. ex Gom. 1892
Ref.: Umezaki 1961; Hirose and Kajimura 1973
- L. nordgaardii** (Wille) Anagn. & Kom. 1988
Basion.: *Lyngbya Nordgaardii* Wille 1918
Syn.: *Lyngbya epiphytica* Wille 1913, *Lyngbya Willei* Setch. & Gardn. in Gardn. 1918
Ref.: Umezaki 1951, 1961; Hiramatsu 1973
- L. pellucida** (Umezaki) comb. nov.
Basion.: *Lyngbya pellucida* Umez., Bot. Mag. Tokyo 68: 68, 1955
Ref.: Umezaki 1955a, 1961
- L. polychroa** Menegh. 1844
Syn.: *Leibleinia sordida* (Zanard. ex Gom.) Umez. & Lewmanom. 1991, non *Leibleinia sordida* Kütz. 1849.
Syn.: *Lyngbya sordida* (Zanard.) Gom. 1892, non *Lyngbya sordida* Crouan in Mazé & Schramm (1870) ex Gom. 1892.
Ref.: Umezaki 1961; Noda 1974
- L. polysiphoniae** (Frémy) Compère 1985
Basion.: *Lyngbya Polysiphoniae* Frémy 1929
Ref.: Emoto and Hirose 1942e; Yoneda 1952a, 1962a; Hirose and Hirano 1977
- Leptolyngbya** Anagn. & Kom. 1988
- L. angustissima** (W. & G. S. West) Anagn. & Kom. 1988
Basion.: *Phormidium angustissimum* W. & G. S. West 1897
Ref.: Molisch 1926; Yoneda 1939c, 1940a, b, 1941b, 1952a; Emoto and Yoneda 1941a; Hirose and Hirano 1977; Bando and Nakano 1983
- L. calothrichoides** (Gom.) Anagn. & Kom. 1988
Basion.: *Plectonema calothrichoides* Gom. 1899
Ref.: Umezaki 1961, 1965
- L. cebennensis** (Gom.) comb. nov.

- Basion.: *Phormidium cebennense* Gom., Bull. Bot. Fr. 46: 38, 1899
 Ref.: Emoto and Hirose 1952c; Hirose and Hirano 1977
Phormidium cebennense Gom. is near to *Lep- tolyngbya* except that apical cells have calyptra.
- L. crosbyana** (Tild.) Anagn. & Kom. 1988
 Basion.: *Phormidium Crosbyanum* Tild. 1909
 Ref.: Umezaki 1961
- L. desmidiacearum** (Noda) comb. nov.
 Basion.: *Plectonema desmidiacearum* Noda, J. Fac. Sci. Niigata Univ., ser. D (Biol.), no. 8: 61, 1971
 Ref.: Noda 1971
- L. distincta** (Nordst.) Anagn. & Kom. 1988
 Basion.: *Lynghya Martensiana* var. *distincta* Nordst. ex Schmidle 1897
 Ref.: Ueda and Okada 1934
- L. ectocarpii** (Gom.) Anagn. & Kom. 1988
 Basion.: *Phormidium Ectocarpii* Gom. 1899
 Ref.: Umezaki 1961
- L. foveolarum** (Rabenh. ex Gom.) Anagn. & Kom. 1988
 Basion.: *Phormidium foveolarum* (Rabenh.) Gom. 1892
 Ref.: Ueda and Okada 1934; Hada and Kusuki 1938; Yoneda 1938b, c, 1952a; Emoto and Yoneda 1941b; Emoto and Hirose 1943a; Akiyama 1965a; Mifune et al. 1966; Hiramatsu 1967, 1973; Nakano 1970; Negoro 1973; Hirose and Hirano 1977
- L. fragilis** (Menegh. ex Gom.) Anagn. & Kom. 1988
 Basion.: *Phormidium fragile* (Menegh.) Gom. 1892
 Ref.: Molisch 1926; Yoneda 1938c, 1939a, 1940b, 1941b, c, 1942b, c, d, 1952a, 1954a, 1962a; Emoto and Yoneda 1940b, 1941b; Emoto and Hirose 1949; Akiyama 1965a; Hirose 1966; Hiramatsu 1967; Hirose and Hirano 1977; Handa and Nakano 1988
- L. lagerheimii** (Gom.) Anagn. & Kom. 1988
 Basion.: *Lynghya Lagerheimii* Gom. 1892
 Ref.: Yoneda 1938b, c, 1952a, 1962a; Emoto and Yoneda 1940a, b, 1941b; Akatsuka 1951; Hirose and Hirano 1977
- L. laminosa** (Ag. ex Gom.) Anagn. & Kom. 1988
 Basion.: *Phormidium laminosum* Ag. ex Gom. 1892
 Ref.: Molisch 1926; Yoneda 1938b, c, 1939b, c, 1940b, 1941b, c, 1942b, c, d, 1952a, b, 1954a, 1962a; Emoto and Yoneda 1940b, 1941b, 1942; Emoto and Hirose 1940a, 1942b, c, f, 1943b; Ikoma and Doi 1955; Akiyama 1965a; Hirose 1966; Hiramatsu 1973; Negoro 1973; Hirose and Hirano 1977; Mifune and Hirose 1983a, b
- L. lurida** (Kütz ex Gom.) Anagn. & Kom. 1988
 Basion.: *Phormidium luridum* Kütz. ex Gom. 1892
 Ref.: Molisch 1926; Yoneda 1938b, c, 1942b, d, 1952a, 1954a, 1962a; Emoto and Hirose 1940a, b, c, 1942a, c, d, e, 1943b, 1949, 1952a, b; Emoto and Yoneda 1940b, 1941b, 1942; Ikoma and Doi 1955; Hiramatsu 1967, 1973; Negoro 1973; Hirose and Hirano 1977; Mifune and Hirose 1983b
- L. norvegica** (Gom.) Anagn. & Kom. 1988
 Basion.: *Plectonema norvegicum* Gom. 1892
 Ref.: Umezaki 1956b, 1961
- L. nostocorum** (Born. ex Gom.) Anagn. & Kom. 1988
 Basion.: *Plectonema Nostocorum* Born. ex Gom. 1892
 Ref.: Emoto and Hirose 1942c, e, 1943a, b; Yoneda 1952a; Umezaki 1956b, 1961; Hirose and Hirano 1977; Mifune and Hirose 1983a
- L. notata** var. *africana* (Fritsch & Rich) comb. nov.
 Basion.: *Plectonema notatum* Schmidle var. *africanum* Fritsch & Rich, Trans. R. Soc. South Africa 18: 90, 1929
 Ref.: Hirose and Hirano 1977
- L. orientalis** (G. S. West) Anagn. & Kom. 1988
 Basion.: *Phormidium orientale* G. S. West 1902
 Ref.: Yoneda 1938b, c, 1952a; Emoto and Hirose 1941; Hirose and Hirano 1977
- L. perelegans** (Lemm.) Anagn. & Kom. 1988

- Basion.: *Lyngbya perelegans* Lemm. 1899
Ref.: Hiramatsu 1973
- L. purpurascens** (Kütz. ex Gom.) Anagn. & Kom. 1988
Basion.: *Phormidium purpurascens* (Kütz.) Gom. 1892
- L. purpurascens** var. *purpurascens*
Ref.: Yoneda 1938b, c, 1940b, 1941b, 1942b, 1952a; Emoto and Hirose 1940b, 1942b, c, d, 1943a, 1949; Emoto and Yoneda 1941a, b; Akiyama 1965a; T. Watanabe 1968c; Hiramatsu 1973; Hirose and Hirano 1977
- L. purpurascens** var. *elegans* (Drouet) comb. nov.
Basion.: *Phormidium purpurascens* (Kütz.) Gom. var. *elegans* Drouet, Bot. Gaz. 95: 696, 1934
Ref.: Emoto and Hirose 1940a; Hirose and Hirano 1977
Var. *elegans* has a little thicker trichomes (3–3.5 μm) than var. *purpurascens* (1.5–2.5 μm).
- L. ramosa** (Boye-Peters.) Anagn. & Kom. 1988
Basion.: *Phormidium ramosum* Boye-Peters. 1928
Ref.: Yoneda 1952a
- L. rivulariarum** (Gom.) Anagn. & Kom. 1988
Basion.: *Lyngbya Rivulariarum* Gom. 1892
Ref.: Umezaki 1961
- L. scottii** (Fritsch) Anagn. & Kom. 1988
Basion.: *Lyngbya Scottii* Fritsch 1912
Ref.: Fukushima 1950; Hirose and Hirano 1977
- L. subterranea** (Copel.) comb. nov.
Basion.: *Phormidium subterraneum* Copel., Ann. New York Acad. Sci. 36: 188, 1936
Ref.: Yoneda 1942c, 1952a; Emoto and Hirose 1942e, 1943a, 1952b; Mifune and Hirose 1983b
Syn.: *Phormidium subterranea* Copel. var. *cras-sum* Emoto & Hirose, J. Chosen Nat. Hist. Soc. 9: 141, 1942
Ref.: Emoto and Hirose 1942f, 1952a; Hirose and Hirano 1977
- L. tenuis** (Menegh. ex Gom.) Anagn. & Kom. 1988
Basion.: *Phormidium tenue* (Menegh.) Gom. 1892
Ref.: Molisch 1926; Yoneda 1937, 1938c, 1940b, 1941b, c, 1942b, d, 1952a, b; Emoto and Yoneda 1940b; Emoto and Hirose 1940a, b, c, 1942a, b, 1943a, b, 1949; Fukushima 1950, 1954, 1963; Umezaki 1961; Ochiai 1962b; Iwai 1963; Mizuno 1964; Akiyama 1965b; Hiramatsu 1967; T. Watanabe 1968c; Nakano 1970; Negoro 1973; Hirose and Hirano 1977
Syn.: *Phormidium tenue* (Menegh.) Gom. var. *granuliferum* Copel. 1936
Ref.: Molisch 1926; Emoto and Yoneda 1940, 1941b, 1942; Yoneda 1942a, 1952a; Akiyama 1965a
Syn.: *Phormidium tenue* (Menegh.) Gom. f. *non-constrictum* Emoto & Hirose 1942a
Ref.: Emoto and Hirose 1942a
- L. terebrans** (Born. & Flah. ex Gom.) Anagn. & Kom. 1988
Basion.: *Plectonema terebrans* Born. & Flah. ex Gom. 1892
Ref.: Umezaki 1961; Noda 1987
- L. treleasei** (Gom.) Anagn. & Kom. 1988
Basion.: *Phormidium treleasei* Gom. 1892
Ref.: Emoto and Hirose 1941, 1942d, e, f, 1943a, 1952b; Yoneda 1952a; Hirose and Hirano 1977; Mifune and Hirose 1983b
- L. truncata** (Lemm.) Anagn. & Kom. 1988
Basion.: *Phormidium truncatum* Lemm. 1911
Ref.: Fukushima 1951
- L. valderiana** (Gom.) Anagn. & Kom. 1988
Basion.: *Phormidium valderianum* Gom. 1892
Ref.: Yoneda 1938b, c, 1939c, 1940b, 1941b, 1942c, d, 1952a, 1954a; Emoto and Yoneda 1941a, b, 1942; Fukushima 1950, 1951, 1952, 1954; T. Watanabe 1957; Hirano 1963; Hiramatsu 1967
Syn.: *Phormidium valderianum* Gom. var. *tenue* Woron. 1923 ("tenuis")
Ref.: Emoto and Hirose 1942a, d, e, f, 1943a, 1952a, c; Mifune and Hirose 1983b
- Planktolyngbya** Anagn. & Kom. 1988
Syn.: *Lyngbya* subg. *Limneticae* Forti 1907

- P. bipunctata** (Lemm.) Anagn. & Kom. 1988
 Basion.: *Lyngbya bipunctata* Lemm. 1899
 Ref.: Akatsuka 1951
- P. circumcreta** (G. S. West) Anagn. & Kom. 1988
 Basion.: *Lyngbya circumcreta* G. S. West 1907
 Ref.: Akatsuka 1951; T. Watanabe 1956
- P. contorta** (Lemm.) Anagn. & Kom. 1988
 Basion.: *Lyngbya contorta* Lemm. 1898
 Syn.: *Spirocoleus contortus* (Lemm.) Compère 1985
 Ref.: Negoro 1936, 1973; Akatsuka 1951; Hirano 1956b; Yamaguti 1956; Mizuno 1964; Akiyama 1965a; Imada 1970; Kurasawa and Okino 1975; Hirose and Hirano 1977; T. Watanabe 1956; Yamagishi 1985
- P. holsatica** (Lemm.) Anagn. & Kom. 1988
 Basion.: *Lyngbya holsatica* Lemm. 1904
 Ref.: Akatsuka 1951
- P. limnetica** (Lemm.) Kom.-Legner. & Cronb. 1992
 Basion.: *Lyngbya limnetica* Lemm. 1898
 Syn.: *Planktolyngbya subtilis* (W. West) Anagn. & Kom. 1988 sine typo
 Ref.: Hada 1937; Yoneda 1938b, c, 1953a; Hirose 1950; Akatsuka 1951; T. Watanabe 1956; Hirano 1956b, 1962; Negoro 1959, 1967, 1968, 1973; Mizuno 1964; Hirose and Hirano 1977; Wakabayashi and Ichise 1982; Negoro and Aoki 1991
- P. nyassae** (Schmidle) Anagn. & Kom. 1988
 Basion.: *Lyngbya Nyassae* Schmidle 1902
 Ref.: Akatsuka 1951
- P. spirulinoides** (Utermöhl) comb. nov.
 Basion.: *Lyngbya spirulinoides* Utermöhl, Arch. f. Hydrobiol., Suppl. 5: 288, 1925, non *Lyngbya spirulinoides* Gom. J. de Bot. 4: 355, 1890. Ann Sci. Nat. VII, Bot. 16: 146, 1892
 Syn.: *Lyngbya pseudospirulina* Geitl. in Pascher, Süßwasser-Fl. 12: 446, 1925
 Ref.: Akatsuka 1951
 The characteristics of *Lyngbya spirulinoides* Utermöhl agree with the diagnosis of *Planktolyngbya*.
- (2) **Limnotrichoideae** Anagn. & Kom. 1988
Jaaginema Anagn. & Kom. 1988
- J. angustissima** (W. & G. S. West) Anagn. & Kom. 1988
 Basion.: *Oscillatoria angustissima* W. & G. S. West 1897
 Ref.: Molisch 1926; Yoneda 1939b, c, 1940a, 1942c, d, 1952a; Emoto and Hirose 1941; Hirano 1962; Hiramatsu 1973; Hirose and Hirano 1977
- J. geminata** (Menegh. ex Gom.) Anagn. & Kom. 1988
 Basion.: *Oscillatoria geminata* Menegh. ex Gom. 1892
- J. geminata** var. *geminata*
 Ref.: Molisch 1926; Yoneda 1938b, c, 1939b, 1940b, 1941b, 1942b, c, d, f, 1952a, 1962a; Yon. Okada 1939; Okada 1939b; Ueda 1939; Emoto and Yoneda 1941a, b, 1942; Akiyama 1965a; Hirose and Hirano 1977
- J. geminata** var. *sulphurea* (Strzesz.) comb. nov.
 Basion.: *Oscillatoria geminata* Menegh. var. *sulphurea* Strzesz., Bull. Inst. Acad. Sci. Cracovie, Cl. Sci. Math. & Nat., ser. B, 6: 323, 1913
 Ref.: Yoneda 1939c, 1952a; Emoto and Hirose 1942d, 1943b, 1952b, c; Hirose 1966; Hirose and Hirano 1977
- J. homogeneous** (Frémy) Anagn. & Kom. 1988
 Basion.: *Oscillatoria homogenea* Frémy 1929
 Ref.: Yoneda 1942b, c, 1952a; Hirose and Hirano 1977
- J. kuetzingianum** (Näg. in Kütz.) Anagn. & Kom. 1988
 Basion.: *Oscillatoria Kuetzingiana* Näg. in Kütz. ex Gom. 1892
 Ref.: Ioriya et al. 1984
- J. minimum** (Gickl.) Anagn. & Kom. 1988
 Basion.: *Oscillatoria minima* Gickl. 1921
 Ref.: Akatsuka 1951
- J. neglectum** (Lemm.) Anagn. & Kom. 1988
 Basion.: *Oscillatoria neglecta* Lemm. 1910, nec *Oscillatoria neglecta* Wood ex De Toni, 1892, nec *Porphysiphon notarisii* f. *neglectus* Born. in De Toni, 1892

- Ref.: Yoneda 1942a, 1952a; Emoto and Yoneda 1942; Emoto and Hirose 1941; Hirose and Hirano 1977
- J. *profundum*** (Schröt. & Kirchn.) Anagn. & Kom. 1988
 Basion.: *Oscillatoria profunda* Schröt. & Kirchn. 1896
 Ref.: Hirano 1960; Hirose and Hirano 1977
- J. *pseudogeminata*** (Schmid) Anagn. & Kom. 1988
 Basion.: *Oscillatoria pseudogeminata* Schmid 1914
 Ref.: Yamagishi et al. 1982
- J. *subtilissimum*** (Kütz. ex Forti) Anagn. & Kom. 1988
 Basion.: *Oscillatoria subtilissima* Kütz. ex Forti 1907
 Ref.: Emoto and Hirose 1943a, 1949; Fukushima 1950; Yoneda 1952a; Kobayasi et al. 1962; Hirose and Hirano 1977
- Limnothrix* Meffert 1988**
- L. *amphigranulata*** (van Goor) Meffert 1987
 Basion.: *Oscillatoria amphigranulata* van Goor 1918
 Ref.: Hiramatsu 1967
- L. *guttulata*** (van Goor) comb. nov.
 Basion.: *Oscillatoria guttulata* van Goor, Rev. Trav. Bot. Neerl. 15: 255, 1918
 Ref.: Yon. Okada 1939; Emoto and Yoneda 1941b; Yoneda 1942a; Hirose and Hirano 1977; Mifune and Hirose 1982
 The characteristics of *Oscillatoria guttulata* van Goor agree well with the diagnosis of *Limnothrix*.
- L. *planctonica*** (Wolosz.) Meffert 1988
 Basion.: *Oscillatoria planctonica* Wolosz. 1917
 Ref.: Akatsuka 1951; Yoneda 1952a; Hirano 1962; Hirose and Hirano 1977
- L. *pseudominima*** (Skuja) comb. nov.
 Basion.: *Oscillatoria pseudominima* Skuja, N. Acta R. Soc. Sci. Upsal., ser. 4, 16(3): 60, 1956
 Ref.: Negoro and Aoki 1991
 The characteristics of *Oscillatoria pseudominima* Skuja agree well with the diagnosis of *Limnothrix*, except that the cells do not produce gas vesicles.
- L. *quasiperforata*** (Skuja) comb. nov.
 Basion.: *Oscillatoria quasiperforata* Skuja, Acta Horti Bot. Univ. Latv. 11/12: 49, 1949
 Ref.: Emoto and Hirose 1940c
 Syn.: *Oscillatoria quasiperforata* var. *crassa* Emoto & Hirose in Hirose and Hirano (without Latin diagnosis), Illust. Jap. Fresh-Water Alg., p. 114, 1977
 Ref.: Hirose and Hirano 1977
 The characteristics of *Oscillatoria quasiperforata* Skuja agree well with the diagnosis of *Limnothrix*.
- (3) Pseudanabaenoideae Anagn. & Kom. 1988
- Pseudanabaena* Lauterb. 1916**
- P. *catenata*** Lauterb. 1916
 Ref.: Ioriya et al. 1984
- P. *galeata*** Böch. 1949
 Ref.: Umezaki 1987 (partis)
- P. *limnetica*** (Lemm.) Kom. 1974
 Basion.: *Oscillatoria limnetica* Lemm. 1900
 Ref.: Yoneda 1938b, c, 1940b, 1941c, 1942b, c, g, 1952a, 1954a; Emoto and Yoneda 1940b, 1942; Akatsuka 1951; Akiyama 1977; Hirose and Hirano 1977; Yamagishi 1972; Imazu 1987
- P. *mucicola*** (Naum. & Huber-Pest.) Bourr. emend. Chang, Köst & Wanner 1985
 Basion.: *Phormidium mucicola* Naum. & Huber-Pestl. in Huber-Pestl. & Naum. 1929
 Ref.: Yoneda 1953b; Mizuno 1964; Negoro 1973; Kurasawa and Okino 1975; Ioriya et al. 1984; Umezaki 1987; Yamagishi et al. 1982; Yamagishi 1985
 Syn.: *Lynghya endophytica* Elenk. & Hollerb. 1923
 Ref.: Akatsuka 1951
- P. *tenuis*** Koppe 1924
 Ref.: Maruyama 1961
- Romeria* Koczw. in Geitl. 1932**
- Syn.: *Raciborskia* Koczw. 1928, *Amalia* J. De Toni 1934
- R. *elegans*** Wolosz. ex Koczw. in Geitl. 1932

Basion.: *Raciborskia elegans* Wolosz. 1928
 Syn.: *Amalia elegans* J. De Toni 1934,
Synechococcus elegans (Wolosz.) Kom. 1970
 Ref.: Negoro 1988; Negoro and Aoki 1991

S. vaginata (Näg.) Gom. 1892
 Ref.: Yoneda 1953a

Remarks

6. Schizotrichaceae Elenk. 1934

Schizothrix Kütz. ex Gom. 1892

- S. arenaria* (Berk.) Gom. 1892
 Ref.: Hiramatsu 1973
- S. cuspidata* (W. & G. S. West) W. & G. S. West 1896
 Ref.: Fukushima 1970a, 1971
- S. fragilis* (Kütz.) Gom. 1892
 Ref.: Yoneda 1938b, c, 1941c, 1942f, 1952a; Emoto and Yoneda 1941; Akiyama 1965a; Mifune et al. 1966; Hirose and Hirano 1977
- S. friesii* (Ag.) Gom. 1892 ("*Friesii*")
 Ref.: Yoneda 1939a; Hiramatsuo 1967; Nakano 1971; Hirose and Hirano 1977
- S. giuseppei* Drouet 1942 ("*Giuseppei*")
 Syn.: *Microcoleus sociatus* var. *minor* Gardn. 1927
 Ref.: Yoneda 1952a
- S. heufleri* Grun. ex Gom. 1892
 Ref.: Hirano 1962; Hirose and Hirano 1977
- S. lacustris* A. Br. ex Gom. 1892
 Ref.: Umezaki 1961
- S. lamyi* Gom. 1892 ("*Lamyi*")
 Ref.: Hirano 1959a, 1962; Hiramatsu 1967, 1973; Yamagishi 1967; Hirose and Hirano 1977
- S. maritima* Yoneda 1939a
 Ref.: Yoneda 1939a
- S. muelleri* Næg. ex Gom. 1892 ("*Muelleri*")
 Ref.: Hirano 1962; Ochiai 1962b; Horikawa et al. 1969; Hiramatsu 1967; Nakano 1971; Hirose and Hirano 1977
- S. naegeli* (Kütz.) Geitl. 1925 ("*Naegeli*")
 Ref.: Fukushima 1960b
- S. parcircamosa* (Gardn.) Geitl. 1932
 Ref.: Hirose 1938
- S. purpurascens* (Kütz.) Gom. 1892
 Ref.: Hiramatsu 1967, 1973
- S. tinctoria* (Ag.) Gom. 1892
 Ref.: Horikawa et al. 1969; Negoro 1973; Hirose and Hirano 1977

Oscillatoria angusta Koppe 1924 (Imazu and Hirose 1961; Hirose and Hirano 1977) is identified as bacteria by Drouet (1968, p. 319). *Schizothrix fragilis* (Kütz.) Gom. 1892 is doubt to occur in hot springs (Yoneda 1938b, c, 1941, 1942f, 1952a; Emoto and Yoneda 1941b; Akiyama 1965a; Mifune et al. 1966; Hirose and Hirano 1977). *Phormidium boryanum* Kütz. ex Geitl. 1925 (Fukushima 1951) [non *Phormidium boryanum* (Bory ex Gom.) Anagn. & Kom. 1988] is a synonym of *Phormidium setchellianum* Gom. (1892, p. 190).

The following species without Latin diagnosis and other descriptions are listed in Yoneda's paper (Yoneda, Y.: A general consideration of the thermal Cyanophyceae of Japan. Mem. Coll. Agr., Kyoto Univ. 62: 1-20, 1952). Homoeotrichaceae: *Ammatoidea* ("*Hammatoida*") *multispora* Yoneda nom. nud., *A. olivacea* Yoneda nom. nud. Oscillatoriaceae: *Oscillatoria pseudosanta* Yoneda nom. nud., *O. olivacea* Yoneda nom. nud., *O. sublimosa* Yoneda nom. nud., *O. vialacea* Yoneda nom. nud., *O. yezoensis* Yoneda nom. nud. Phormidiaceae: *Phormidium tepidariorum* Yoneda nom. nud.

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梅崎 勇*・渡辺真之**：日本産藍藻類目録 1. クロオコックス目及びユレモ目

1853-1856年の米国北太平洋探検隊によって横浜その他から採集された海藻標品の中から W. H. Harvey が 1859年に藍藻類の4新種を発表したのが、日本における藍藻類の最初の報告である。本報告は、それ以後現在に至るまでの外国人及び日本人によって日本より記録された藍藻類のクロオコックス目とユレモ目に属する種類をリストしたものである。なお、分類群(属から目にいたる)の配列は、クロオコックス目については Anagnostidis and Komárk (1986) の、ユレモ目については Komárek and Anagnostidis (1988) の分類に従った。

クロオコックス目には7科40属160種がリストされた。エントフィザイリス科に2新組合せ種が、キセノコックス科に1新名種がつけられた。エントフィザイリス科：*Placoma adriatica* (Hauck) comb. nov. (= *Oncobrysa adriatica* Hauck 1885), *P. micrococca* (Hansg.) comb. nov. (= *Oncobrysa adriatica* Hauck var. *micrococca* Hansg. 1893); キセノコックス科：*Xenococcus yonedae* nom. nov.

ユレモ目には、ボルジア科に3属6種、ホモエオスリックス科に2属17種、ユレモ科に5属29種、ナガレクダモ科に12属126種、シュウドアナベナ科に8属72種、エダウチクダモ科に1属15種がリストされた。ボルジア科とユレモ科にそれぞれ1新組合せ種がつけられた。ボルジア科：*Komvophoron tenuis* (Emoto & Hirose) comb. nov. (= *Oscillatoria constricta* Szaf. var. *tenuis* Emoto & Hirose 1940); ヌレモ科：*Lyngbya anomala* (C. B. Rao) comb. nov. (= *Phormidium anomalum* C. B. Rao 1937)。ナガレクダモ科に13新組合せ種と3新名種がつけられた。*Phormidium acuminatum* var. *longe-attenuatum* (Geitl. & Ruttn.) comb. nov. (= *Oscillatoria acuminatum* Gom. f. *longe-attenuata* Geitl. & Ruttn. 1935), *P. chalybeum* var. *depauperatum* (Copel.) comb. nov. (= *Oscillatoria chalybea* Mert. var. *depauperata* Copel. 1936), *P. chlorinum* (Kütz.) comb. nov. (= *Oscillatoria chlorina* Kütz. ex Gom. 1892), *P. foreau* (Frémy) comb. nov. (= *Oscillatoria foreau* Frémy 1942), *P. konstantianum* nom. nov., *P. nemuroense* (Yoneda) comb. nov. (= *Lyngbya nemuroensis* Yoneda 1941), *P. proteus* (Skuja) comb. nov. (= *Oscillatoria proteus* Skuja 1949), *P. puteale* var. *minor* (Geitl.) comb. nov. (= *Lyngbya putealis* Mont. var. *minor* Geitl. 1933), *P. spirulinoides* (Yoneda) comb. nov. (= *Oscillatoria spirulinoides* Yoneda 1954), *P. subspiroides* (Copel.) comb. nov. (= *Lyngbya subspiroides* Copel. 1936), *P. thwaitesii* nom. nov., *P. yonedae* (Umez.) comb. nov. (= *Oscillatoria Yonedae* Umez. 1961), *P. yuichii* nom. nov., *Planktothrix iwanoffiana* (Nyg.) comb. nov. (= *Trichodesmium Iwanoffianum* Nyg. 1926), *P. lacustris* (Kleb.) comb. nov. (= *Trichodesmium lacustre* Kleb. 1895), *P. miyadaii* (Negoro) comb. nov. (= *Oscillatoria Miyadaii* Negoro 1943)。シュウドアナベナ科には15新組合せ種と1新名種がつけられた。*Geitlerinema peronidum* (Skuja) comb. nov. (= *Oscillatoria peronides* Skuja 1937), *G. splendidum* var. *attenuatum* (W. West) comb. nov. (= *Oscillatoria splendida* Grev. var. *attenuata* W. West 1896), *G. splendidum* var. *truncatum* (Emoto & Hirose) comb. nov. (= *Oscillatoria splendida* Grev. var. *truncatum* Emoto & Hirose 1940), *G. uncinatum* (Emoto & Hirose) comb. nov. (= *Oscillatoria uncinata* Emoto & Hirose 1940), *G. codii* nom. nov., *Leibleinia pellucida* (Umez.) comb. nov. (= *Lyngbya pellucida* Umez. 1961), *Leptolyngbya cebennense* (Gom.) comb. nov. (= *Phormidium cebennense* Gom. 1899), *L. desmidiacearum* (Noda) comb. nov. (= *Plectonema desmidiacearum* Noda 1971), *L. notata* var. *africana* (Fritsch & Rich) comb. nov. (= *Plectonema notatum* Schmidle var. *africanum* Fritsch & Rich 1929), *L. purpurascens* var. *elegans* (Drouet) comb. nov. (= *Phormidium purpurascens* (Kütz.) Gom. var. *elegans* Drouet 1934), *L. subterranea* (Copel.) comb. nov. (= *Phormidium subterraneum* Copel. 1936), *PlanktoLyngbya spirulinoides* (Utermöhl) comb. nov. (= *Lyngbya spirulinoides* Utermöhl 1925), *Jaaginema geminata* var. *sulphurea* (Strzesz.) comb. nov. (= *Oscillatoria geminata* Menegh. var. *sulphurea* Strzesz. 1913), *Limnothrix guttulata* (van Goor) comb. nov. (= *Oscillatoria guttulata* van Goor 1918), *L. pseudominima* (Skuja) comb. nov. (= *Oscillatoria pseudominima* Skuja 1955), *L. quasiperforata* (Skuja) comb. nov. (= *Oscillatoria quasiperforata* Skuja 1949)。(*917 小浜市学園町1-1 福井県立大学生物資源学部海洋生物資源学科, **305 つくば市天久保4-1-1 国立科学博物館植物研究部)

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