

Family I. Chroococcaceae, part 1

Francis Drouet

William A. Daily

Follow this and additional works at: <http://digitalcommons.butler.edu/botanical>

The Butler University Botanical Studies journal was published by the Botany Department of Butler University, Indianapolis, Indiana, from 1929 to 1964. The scientific journal featured original papers primarily on plant ecology, taxonomy, and microbiology.

Recommended Citation

Drouet, Francis and Daily, William A. (1956) "Family I. Chroococcaceae, part 1," *Butler University Botanical Studies*: Vol. 12, Article 7. Available at: <http://digitalcommons.butler.edu/botanical/vol12/iss1/7>

This Article is brought to you for free and open access by Digital Commons @ Butler University. It has been accepted for inclusion in Butler University Botanical Studies by an authorized administrator of Digital Commons @ Butler University. For more information, please contact fgaede@butler.edu.

Butler University
Botanical Studies
(1929-1964)

Edited by

J. E. Potzger

The *Butler University Botanical Studies* journal was published by the Botany Department of Butler University, Indianapolis, Indiana, from 1929 to 1964. The scientific journal featured original papers primarily on plant ecology, taxonomy, and microbiology. The papers contain valuable historical studies, especially floristic surveys that document Indiana's vegetation in past decades. Authors were Butler faculty, current and former master's degree students and undergraduates, and other Indiana botanists. The journal was started by Stanley Cain, noted conservation biologist, and edited through most of its years of production by Ray C. Friesner, Butler's first botanist and founder of the department in 1919. The journal was distributed to learned societies and libraries through exchange.

During the years of the journal's publication, the Butler University Botany Department had an active program of research and student training. 201 bachelor's degrees and 75 master's degrees in Botany were conferred during this period. Thirty-five of these graduates went on to earn doctorates at other institutions.

The Botany Department attracted many notable faculty members and students. Distinguished faculty, in addition to Cain and Friesner, included John E. Potzger, a forest ecologist and palynologist, Willard Nelson Clute, co-founder of the American Fern Society, Marion T. Hall, former director of the Morton Arboretum, C. Mervin Palmer, Rex Webster, and John Pelton. Some of the former undergraduate and master's students who made active contributions to the fields of botany and ecology include Dwight W. Billings, Fay Kenoyer Daily, William A. Daily, Rexford Daudenmire, Francis Hueber, Frank McCormick, Scott McCoy, Robert Petty, Potzger, Helene Starcs, and Theodore Sperry. Cain, Daudenmire, Potzger, and Billings served as Presidents of the Ecological Society of America.

Requests for use of materials, especially figures and tables for use in ecology text books, from the *Butler University Botanical Studies* continue to be granted. For more information, visit www.butler.edu/herbarium.

Angel Maldonado, Dr. G. Evelyn Hutchinson, the late Dr. William R. Maxon, Dr. Fred A. Barkley, Dr. A. U. Däniker, Dr. F. Børgesen, Dr. Ove Sundene, Miss Hilda Harris, Dr. V. J. Chapman, Dr. Herbert Habeeb, Dr. Hao-Jan Chu, Dr. Rimo Bacigalupi, Dr. Rex N. Webster, Dr. J. W. Moore, Dr. C. Mervin Palmer, Dr. Harold C. Bold, Dr. Sidney F. Glassman, Dr. Cesare Trebeschi, Mr. Gianni Trebeschi, Dr. John Thomas Howell, Dr. Achille de Toni, Dr. Nando de Toni, Mr. Norman C. Lahti, Dr. Ralph A. Lewin, Dr. Annetta Carter, Miss Alice Middleton, Dr. G. Beauverd, Dr. Julian A. Steyermark, Mr. Alois Parzak, Dr. Paul C. Silva, Dr. G. M. Smith, the late Dr. N. L. Gardner, Dr. C. V. Morton, the late Dr. Marshall A. Howe, Miss Cécile Lanouette, Miss Nell Horner, Miss Edith Mephram, Miss Filomena Fortich, Dr. George F. Papenfuss, Dr. Walter Kiener, Dr. Lawrence J. King, Dr. Richard I. Evans, Dr. Jacques Rousseau, Dr. Kuno Thomasson, Dr. Stillman Wright, Dr. Ira La Rivers, Dr. Arland T. Hotchkiss, Dr. B. B. McInteer, Dr. Clarence E. Taft, Dr. B. H. Smith, Dr. C. C. Palmiter, Mr. Robert Runyon, Dr. Harold J. Humm, Dr. R. N. Ginsburg, Dr. Lillian Arnold, Dr. John D. Dodd, Dr. Valerie May, Mrs. R. Carala, Dr. Mary A. Pocock, Dr. V. W. Lindauer, Dr. Delzie Demaree, Dr. Albert J. Bernatowicz, Dr. H. L. Blomquist, Dr. Alan J. Brook, Dr. M. S. Markle, Dr. R. L. Caylor, Dr. John L. Blum, Dr. Louis G. Williams, Dr. John Pelton, Dr. G. Haglund, Dr. A. B. Cribb, Dr. Gerald B. Ownbey, Mr. Emil Sella, Dr. M. J. Groesbeck and Dr. Herbert L. Mason.

The cost of publication of this manuscript was met with funds provided by the Richards Foundation of Chicago. A contribution from Eli Lilly and Company, Indianapolis, made possible the engraving of the copper plates for the illustrations.

CRYPTOGAMIC HERBARIUM, CHICAGO NATURAL HISTORY MUSEUM,
AND
HERBARIUM, BUTLER UNIVERSITY

FAMILY I. CHROOCOCCACEAE

Nägeli, Gatt. Einzell. Alg., p. 44. 1849. *Chroococcaceae* Subfam. *Euchroococcaceae* Hansgirg, Notarisia 3: 589. 1888. *Chroococcaceae* Subfam. *Euchroococcaceae* Tribus *Coccineae* Hansgirg, loc. cit. 1888. *Chroococcaceae* III. *Gloeococcaceae-stereometreae* B. *Heterogloaeae* Elenkin, Not. Syst. Crypt. Horti Bot. Petropol. 2: 67. 1923. *Chroococcaceae* III. *Gloeococcaceae-stereometreae* B. *Heterogloaeae* 1. *Tegumentotenuiores* Elenkin, ibid., p. 68. 1923. —Type genus: *Chroococcus* Näg.

Chroococcaceae Subfam. *Euchroococcaceae* Tribus *Phyllothecineae* Hansgirg, Notarisia 3: 589. 1888. *Chroococcaceae* II. *Gloeococcaceae-planimetreae* Elenkin, Not. Syst. Inst. Crypt. Hort. Bot. Petropol. 2: 66. 1923. *Morismopodiaceae* Elenkin, Acta Inst. Bot. Acad. Sci. U. R. S. S., II, 1: 19. 1935. —Type genus: *Morismopodia* Kütz.

Chroococcaceae I. *Cocobactreae* Elenkin, Not. Syst. Crypt. Hort. Bot. Petropol. 2: 65. 1923. —Type genus: *Synechococcus* Näg.

Chroococcaceae III. *Gloeococcaceae-stereometraae* A. *Homoeogloaeae* 2. *Excavatae* Elenkin, Not. Syst.

Inst. Crypt. Horti Bot. Petropol. 2: 67. 1923. *Chroococceae* III. *Gloococceae-stereometresae* A. Hormoogloae 2. *Excusatae* a) *Distantis* Elenkio, loc. cit. 1923. *Gomphosphaeoriaceae* Elenkin, Acta Inst. Bot. Acad. Sci. U. R. S. S., II, 1: 18. 1933. —Type genus: *Gomphosphaeoria* Kütz.
Chroococceae III. *Gloococceae-stereometresae* B. *Heterogloae* 2. *Tegumentocrossiores* Elenkio, Not. Syst. Inst. Crypt. Horti Bot. Petropol. 2: 68. 1923. *Gloocapsaceae* Elenkin, Acta Inst. Bot. Acad. Sci. U. R. S. S., II, 1: 19. 1933. —Type genus: *Gloocapsa* Kütz.
Holopediaceae Elenkin, Acta Inst. Bot. Acad. Sci. U. R. S. S., II, 1: 19. 1933. *Buckiaceae* Elenkio, loc. cit. 1933. —Type genus: *Holopedium* Lagerth.

The following family names have type species of their type genera for which no original specimens have been available to us for study:

Woronichiniaceae Elenkin, Acta Inst. Bot. Acad. Sci. U. R. S. S., II, 1: 18. 1933. —Type genus: *Woronichinia* Elenk.

Coelosphaeoriaceae Elenkio, Acta Inst. Bot. Acad. Sci. U. R. S. S., II, 1: 18. 1933. —Type genus: *Coelosphaeorium* Näg. (= *Coelocystis* Näg.).

Plantae uni—mulri-cellulares, microscopicae vel macroscopicae, forma et magnitudine et ambitu diversae, libere in aqua natantes vel in stratis crescentes, cellulis sphaericis, discoideis, ovoideis, ellipricis, cylindraceis, vel pyriformibus, unaquidque in duas cellulas-filias aequales dividente, unaquidque mox ab aliis cum gelatino vaginale se separante; reproductione a fragmentatione.

Most of the species of *Chroococceae* are capable of developing in various ways: as microscopic or macroscopic globular aquatic plants with homogeneous or lamellose matrices; as aquatic, subaerial, or aerial strata or cushions; or as free single cells where the sheath material has completely hydrolyzed. The cells, their methods of division and regeneration, and the arrangement of the cells in the plant are the chief means of distinguishing genera and species. Division of a cell into two equal daughter-cells is characteristic of the family.

Many of the unornamented coccoid and palmelloid *Chlorophyceae* have been described or transferred into this family at one time or another, even in recent years. *Palmogloea protuberans* (Sm. & Sow.) Kütz. is perhaps the most often placed here by mistake. Palmelloid flagellates and the primordia of *Ulottichaceae*, *Chaetophoraceae*, *Ulvaceae*, and even *Trentepohliaceae*, especially where preserved in liquids, have often been interpreted as *Chroococceae*. The presence of chloroplasts, pyrenoids, starch, and cellulose walls should make the *Chlorophycean* affinities obvious. Likewise, *Porphyridium*, *Asterocystis*, and *Porphyra* spp. are sometimes mistakenly supposed to be *Chroococceae*. Spores of *Nostocaceae* and few-celled hormogonia of the smaller species of *Phormidium*, *Plectonema*, and *Scytonema* have been confused with members of this family. Bacteria and certain spores and cells of fungi also simulate these plants.

The measurements for cells noted in the keys and descriptions here are those generally encountered. Where successive divisions proceed at a rapid rate and enlargement at a slow rate, cells may be found which are smaller than those recorded here. With a reversal of these extremes, the largest measurements could be exceeded.

Key to genera:

1. Cells before division ovoid to cylindrical, longer than broad, each dividing in a plane perpendicular to the long axis 1. COCCOCHLORIS
1. Cells before division spherical, ovoid, discoid, cylindrical, or pyriform, never dividing in planes perpendicular to the long axis 2.

2. Cells before division spherical, irregularly distributed within the gelatinous matrix or arranged more or less regularly in series of rows in three planes perpendicular to each other; cell division proceeding successively in three planes perpendicular to each other2. ANACYSTIS
2. Cells before division discoid, distributed in a single linear series within the gelatinous matrix; division proceeding in a single plane through the diameter of the cell3. JOHANNESBAPTISTIA
2. Cells before division spherical, ovoid, cylindrical, or pyriform, distributed through a flat or curved surface; cell division proceeding successively in two planes perpendicular to each other 3.
3. Plant a flat or curved plate; cells spherical, ovoid, or cylindrical, arranged regularly in series of rows perpendicular to each other.4. AGMENELLUM
3. Plant a flat or curved plate; cells ovoid or cylindrical, irregularly arranged 5. MICROCROCIS
3. Plant spherical or ovoid; cells spherical to ovoid, cylindrical, or pyriform, regularly or irregularly arranged6. GOMPHOSPHERIA

GENUS I. COCCOCHLORIS

Sprengel, Linn. Syst. Vegetabil., ed. 16, 4(1): 314. 1827. *Aphanothece* Sectio *Coccochloris* Sprengel ex Kirchner in Engler & Prantl, Natürl. Pflanzenfam., ed. 1, 1(1a): 55. 1898. *Aphanothece* Subgenus *Coccochloris* Kirchner ex Forti, Syll. Myxophyc., p. 76. 1907. *Microcystis* α *Macroscopicae* Elenkin, Not. Syst. Inst. Crypt. Horti Bot. Petropol. 2: 67. 1923. *Microcystis* α *Macroscopicae* Subgenus *Eucoccochloris* Elenkin, loc. cit. 1923. —Type species: *Coccochloris stagnina* Spreng.

Synechococcus Nägeli, Gart. Einzell. Alg., p. 56. 1849. *Chroosbece* Sectio *Synechococcus* Nägeli ex Hansgirg, Oesterr. Bot. Zeitschr. 34: 352. 1884. *Synechococcus* Subgenus *Eusynechococcus* Elenkin, Not. Syst. Inst. Crypt. Horti Bot. Petropol. 2: 65. 1923. —Type species: *Synechococcus elongatus* Näg. (= *Protococcus elongatus* Näg.).

Gloeothece Nägeli, Gart. Einzell. Alg., p. 57. 1849. *Gloeothece* Subgenus *Gloeothece* Elenkin, Not. Syst. Inst. Crypt. Horti Bot. Petropol. 2: 69. 1923. —Type species: *Gloeothece linearis* Näg.

Gloeothece Sectio *Rhodocapsa* Hansgirg, Prodr. Algenfl. Böhmen 2: 147. 1892. —Type species: *Gloeothece purpurea* Kütz.

Gloeothece Sectio *Xanthocapsa* Nägeli ex Kirchner in Engler & Prantl, Natürl. Pflanzenfam., ed. 1, 1(1a): 54. 1898. —Type species: *Gloeothece fuscolutea* Näg.

Original specimens of the type species of the following generic and subgeneric names have not been available to us for study:

Aphanothece Nägeli, Gart. Einzell. Alg., p. 59. 1849. *Aphanothece* Sectio *Aphanothece* Nägeli ex Kirchner in Engler & Prantl, Natürl. Pflanzenfam., ed. 1, 1(1a): 55. 1898. *Aphanothece* Subgenus *Aphanothece* Kirchner ex Forti, Syll. Myxophyc., p. 79. 1907. —Type species: *Aphanothece microscopica* Näg.

Rhabdoderma Schmidle & Lauterborn, Ber. Deutsch. Bot. Ges. 18: 148. 1900. *Gloeothece* Subgenus *Rhabdoderma* Elenkin, Not. Syst. Inst. Crypt. Hort. Bot. Petropol. 2: 69. 1923. —Type species: *Rhabdoderma lineare* Schmidle & Lauterb.

Baculteria Borzi, Nuova Notarisa 1905: 21. 1905. —Type species: *B. coerulescens* Borzi.

Rhabdogloea Schröder, Ber. Deutsch. Bot. Ges. 35: 549. 1917. —Type species: *R. elliptoides* Schröder.

Spirillopsis Naumann, K. Sv. Vet.-Akad. Handl. 62(4): 18. 1921. —Type species: *S. irregularis* Naum.

Cyanocloster Kufferath, Ann. Crypt. Exot. 2: 49. 1929. —Type species: *C. muscicola* Kuff.

Krkia Pevalék, Acta Bot. Inst. Bot. Univ. Zagreb. 4: 55. 1929. —Type species: *K. croatica* Peval.

Dxonisia Woronichin, Bull. Jard. Bot. Princip. U. R. S. S. 28: 155. 1929. —Type species: *D. salina* Woronich.

Tottricus Skuja, Acta Horti Bot. Univ. Luv. 7: 46. 1932. —Type species: *T. listeri* Skuja.

Plantae microscopicae vel macroscopicae, 1—pluri-cellulares, cellulis in divisione subsphaericis usque ad cylindraceas, acetate provecta ovoideis usque ad longi-cylindraceas, divisione semper in uno plano ad axem cellulae perpendiculari; gelatino vaginale hyalino vel deinde (in *C. stagnina*) lutescente, homoganeo vel lamelloso.

The mature cells of all the species of *Coccochloris* are characteristically elongate; they divide only at right angles to their long axes. Considerable variation in lengths and diameters of cells of each species should be expected according to the histories of the microenvironments in which the plants were produced.

Subaerial and aerial strata of *Palmogloea protuberans* (Sm. & Sow.) Kürz. are often confused with species here. Likewise, certain bacteria and the one—few-celled hormogonia of *Scytonema* and the smaller species of *Phormidium* and *Plectonema* can be mistaken for species of *Coccochloris*.

Key to species of *Coccochloris*:

Cells before division ovoid to cylindrico-elliptic, 7—45 μ broad, up to 3 times as long as broad 1. *C. AERUGINOSA*

Cells before division ovoid to cylindrico-elliptic, (3—)4—8 μ broad, up to 3 times as long as broad 2. *C. STAGNINA*

Cells before division cylindrical (usually quasi-truncate at the ends), straight, 2—6 μ broad, up to 8 times as long as broad 3. *C. ELABENS*

Cells before division cylindrical (round or tapering at the ends), often curved, 1—3 μ broad, up to 12 times as long as broad 4. *C. PENIOCYSTIS*

1. *COCCOCHLORIS AERUGINOSA* Drouet & Daily, Butler Univ. Bot. Stud. 10: 222. 1952. *Synechococcus aeruginosus* Nägeli, Gatt. Einzell. Alg., p. 56. 1849. —Type from Lucerne, Switzerland (ZT).

Synechococcus major f. *crassior* Lagerheim, Bot. Not. 1886: 50. 1886. *S. major* var. *crassior* Lagerheim ex Hansgirg, Prodr. Algenfl. Böhmen 2: 139. 1892. *S. crassus* f. *crassior* Lagerheim ex Forti, Syll. Myxophyc., p. 27. 1907. *S. aeruginosus* f. *crassior* Lagerheim ex Wille, Nyr Mag. Naturvidenskab. 62: 203. 1925. —Type from Upsala, Sweden (S). FIG. 143.

Synechococcus aeruginosus f. *angustior* West, Proc. Roy. Irish Acad. 31: 40. 1912. —Type from Clare island, Ireland (BIRM).

Original specimens have not been available to us for the following names; their original descriptions are here designated as the Types until the specimens can be found:

Synechococcus crassus Archer, Quart. Journ. Microsc. Sci., N. S. 7: 87. 1867. *S. major* f. *crassus* Elenkin, Monogr. Algar. Cyanophyc., Pars Spec. 1: 35. 1938.

Synechococcus major Schröter, Jahresber. Schles. Ges. Vaterl. Cultur 1883: 188. 1884.

Synechococcus major var. *maximus* Lemmermann, Forschungsber. Biol. Sta. Plön 4: 130. 1896. *S. aeruginosus* var. *maximus* Lemmermann, Krypt.-Pl. Mark Brandenb. 3: 46. 1907; Lemmermann ex Forti, Syll. Myxophyc., p. 27. 1907. *S. major* f. *maximus* Lemmermann ex Elenkin, Monogr. Algar. Cyanophyc., Pars Spec. 1: 35. 1938.

Synechococcus roseo-purpureus G. S. West, Journ. of Bot. 37: 265. 1899. —The original sketch and notes from the West notebooks in the British Museum (Natural History) are reproduced here: FIG. 144.

Synechococcus grandis Playfair, Proc. Linn. Soc. New South Wales 43: 499. 1918.

Synechococcus aeruginosus var. *isalmis* Meyer, Izvest. Gosudarstv. Gidrol. Inst. (Bull. de l'Inst. Hydrol. Russie) 15: 37. 1925.

Synechococcus diachloros Skuja, Acta Horti Bot. Univ. Latv. 11—12: 43. 1939.

Plantae laete aerugineae vel olivaceae, microscopicae, 1—2 cellulares, cellulis in divisione binis truncato-sphaericis usque ad truncato-ovoideas vel truncato-subcylindricas, aetate provecta ovoideo-cylindraces vel cylindrico-ellipticis, diametro 7—45 μ crassis, usque ad 3-plo longiores; gelatino vaginale hyalino, tenue vel omnino diffluente; protoplasmate aerugineo vel olivaceo, saepe sparsim grosse-granuloso. FIGS. 143, 144.

In shallow water and seepage in bogs, ponds, and lakes, seldom found in the plankton, seldom in brackish water. Cells of *Anacystis dimidiata* with the gelatinous matrix almost completely hydrolyzed are often confused with this species. Isolated spores of *Anabaena* and *Cylindrospermum* spp. superficially resemble the cells of *Coccochloris aeruginosa*.

Specimens examined:

FINLAND: in scrobiculis rupium ad Mariehamn, G. Lagerheim, Aug. 1898 (S). NORWAY: prope Molde, N. Wille, Jul. 1919 (S). SWEDEN: in Lassby backar prope Upsaliam, Lagerheim, 18 May 1884 (Type of *Synechococcus major* f. *crassior* Lagerh. in Witt. & Nordst., Alg. Exs. no. 792a. S; isotypes, FC [Fig. 143], L, MIN); in Norby skog prope Upsaliam, Lagerheim, May 1884 (as *S. major* in Witt. & Nordst., Alg. Exs. no. 792b, FC, L, MIN, S); in stagno parvo ad Malmagen Herjedaliae, Lagerheim, 1897 (S); Djuarö, Uplandia, O. Borge, Aug. 1908 (S); Marstrand, Bohuslan, O. Nordstedt, Jun. 1876 (S). GERMANY: Saxon Switzerland: C. A. Hanszsch (FC); aus der Schlucht, die vom Wildenstein (Kuhstall) abwärts nach dem Habichtsgrund führt, auch in grossen Zechand an einer Felswand, C. Biene (as *S. aeruginosus* in Rabenh. Alg. no. 1335, L, NY, UC). CZECHOSLOVAKIA: Bohemia: Dittersbach—Hinter-Dittersbach, A. Hansgirk, Jul. 1889 (FC, W); an einem Felsen bei Dittersbach, Rostok, Jun. 1861 (as *S. aeruginosus* with *Sirospion saxicola* in Rabenh. Alg. no. 1120, FC); mit *Urococcus insignis*, Bielathal, W. Krieger, Aug. 1881 (TA). SWITZERLAND: Luzern, an nassen Felsen, C. von Nägeli, Dec. 1847 (Type of *Synechococcus aeruginosus* Näg., ZT). IRELAND: Clare island (Type of *S. aeruginosus* f. *angustior* West, BIRM). MAINE: sphagnum pool, tableland on south spur of Mt. Kathdin, B. M. Davis 13, Aug. 1902 (FC, MICH). NEW HAMPSHIRE: the Plume, W. G. Farlow (FH); pool near Lake of the Clouds, summit of Mt. Washington, C. Bullard, 13 Sept. 1912 (as *S. crassus* in Coll., Hold., & Setch., Phyc. Bor.-Amer. no. 1951, FC, L, TA). VERMONT: on rocks in cave, Lake Willoughby, W. G. Farlow, Aug. 1880 (FC).

QUEBEC: falaise humide, pic à Rousseau dans les monts Otish, J. Rousseau 389, 10 Aug. 1949 (FC); roche moutonnée, ou suite une source, Rivière Payne, vers 71° 25' long. O., J. Rousseau 1134, 11 Aug. 1948 (FC); mousses d'un étang, embouchure de la Kogaluk, baie d'Hudson, Rousseau 208, 16 Jul. 1948 (FC); sur les pierres, Ile Marie Victorin, Lac Mistassini, J. & E. Rousseau 321a, 14 Jul. 1944 (FC). NORTH CAROLINA: in rock pools, Mt. Whitesides and summit of Yellow Mountain, Jackson county, H. C. Bold H95b, H140, Jun. 1939 (FC). FLORIDA: on roots in dirch near Kissimmee, Osceola county, F. O. Schaller 1853, 1 Mar. 1948 (FC). KENTUCKY: on sandstone overhang, Tight Hollow, Pine Ridge, Wolfe county, W. A. & F. K. Daily 849, 854, 25 May 1941 (DA, FC). TENNESSEE: wet sandstone in Falls Creek Canyon, Van Buren county, H. Silva 675, 4 May 1947 (FC, TENN). WYOMING: drying pool, bottom of small lake near Island lake, Shoshone national forest, Park county, F. H. Rose & F. A. Barkley 4050, 7 Sept. 1940 (FC). MONTANA: shallow pool, Rattlesnake creek, Missouls county, Rose 4063, 10 Oct. 1940 (FC). COLORADO: over mosses on a siliceous rock ledge, South Colony creek, Custer county, W. Kiener 10393a, 9 Jul. 1941 (FC, KI). BRITISH COLUMBIA: in wet moss near Glacier, Kootenay county, W. R. Taylor 10, Aug. 1921 (FH, NY, TA). PUERTO RICO: on shaded rocks at the "Camp", Maricao, N. Wille 1235, Feb. 1915 (NY).

2. *COCCOCHLORIS STAGNINA* Sprengel, Fl. Halens., Mantissa 1: 14. 1807. *Aphanothece stagnina* A. Braun in Rabenhorst, Alg. Eur. 157 & 158: 1572. 1863. —Type from Dieskau near Halle, Germany (FC). FIG. 154.

Palmeilla rupestris Lyngbye, Tent. Hydrophyt. Dan., p. 207. 1819. *Coccochloris rupestris*

Sprengel, Linn. Syst. Vegetab., ed. 16, 4(1): 373. 1827. *Microcystis rupestris* Kützing, Linnæa 8: 374. 1833. *Protococcus rupestris* Corda in Sturm, Deutschl. Fl., Abt. 2, 6: 45. 1833. *Microbalon rupestris* Kützing, Phyc. Gener., p. 169. 1843; Linnæa 17: 84. 1843. *Haematococcus rupestris* Hassall, Hist. Brit. Freshw. Alg. 1: 326. 1845. *Microloa rupestris* Kützing ex Trevisan, Sagg. Monogr. Alg. Coccol., p. 38. 1848. *Bichatia rupestris* Trevisan, ibid. p. 62. 1848. *Gloeocapsa rupicola* Kützing, Sp. Algar., p. 221. 1849. *Gloeocystis rupestris* Rabenhorst, Fl. Eur. Algar., 3: 30. 1868. *Gloeotheca rupestris* Bornet in Witrock & Nordstedt, Alg. Exs. 8: 399. 1880. *Bichatia rupicola* Kuntze, Rev. Gen. Pl. 2: 886. 1891. *Gloeocapsa rupestris* Dalla Torre & Sarnthein, Fl. Tirol 2: 157. 1901. *Anacyctis rupestris* Drouet & Daily in Daily, Amer. Midl. Nat. 27: 650. 1942. *Coccoloboris stagnina* f. *rupestris* Drouet & Daily, Lloydia 11: 78. 1948. —Type from Nass, Norway (C), FIG. 148.

Palmella obscura Sommerfelt, Suppl. Fl. Lappon., p. 203. 1826. —Type from Saaldal, Norway (C).

Palmella bullosa Kützing, Alg. Aq. Dulc. Dec. 16: 154. 1836. *Microcystis bullosa* Meneghini, Consp. Algol. Eug., p. 324. 1837. *Bichatia bullota* Trevisan, Nomencl. Algar. 1: 60. 1845. *Cagniardia bullota* Trevisan, Sagg. Monogr. Alg. Coccol., p. 49. 1848. *Aphanotheca bullota* Rabenhorst, Fl. Eur. Algar., 2: 65. 1865. *Coccoloboris bullota* Kuntze, Rev. Gen. Pl. 3(2): 546. 1898. *Gloeocystis bullota* Wille, Nyt Mag. Naturvidensk. 56(1): 38. 1918. —Type from Battaglia, Italy (L).

Microcystis gelatinosa Meneghini, Consp. Algol. Eug., p. 324. 1837. —Type from the Euganean springs, Italy (FI).

Palmella Mooreana Harvey, Man. Brit. Alg., p. 178. 1841. *Coccoloboris Mooreana* Hassall, Hist. Brit. Freshw. Alg. 1: 316. 1845. *Palmogloia Mooreana* Crouan fr., Fl. du Finistère, p. 110. 1867. *Aphanotheca Mooreana* Lagerheim, Öfvers. K. Sv. Vet.-Akad. Forh. 30(2): 44. 1883. —Type from near Lough Neagh, Ireland (K), FIG. 158.

Microcystis paroliniana Meneghini, Mem. R. Accad. Torino, ser. 2, 5(Sci. Fis. & Mat.): 78. 1843. *Bichatia paroliniana* Trevisan, Nomencl. Algar. 1: 61. 1845. *Gloeocapsa paroliniana* Brébisson in Kützing, Tab. Phyc. 1: 25. 1846. *Gloeocystis paroliniana* Nägeli, Gatt. Einzell. Alg., p. 65. 1849. —Type from Oliero, Italy (FI), FIG. 152.

Microcystis microspora Meneghini, Mem. R. Accad. Torino, ser. 2, 5(Sci. Fis. & Mat.): 80. 1843. *Bichatia microspora* Trevisan, Nomencl. Algar. 1: 61. 1845. *Palmella microspora* Kützing, Tab. Phyc. 1: 11. 1846. *Aphanotheca microspora* Rabenhorst, Krypt.-Fl. Sachsen 1: 76. 1863. *Palmogloia microspora* Crouan fr., Fl. du Finistère, p. 110. 1867. —Type from the Euganean springs (FI).

Protococcus minus Kützing, Phyc. Gener., p. 168. 1843. *Plenrococcus minus* Trevisan, Sagg. Monogr. Alg. Coccol., p. 33. 1848. *Cbrococcus minus* Nägeli, Gatt. Einzell. Alg., p. 46. 1849. *Protococcus minus* var. *caerulescens* Brébisson in Rabenhorst, Alg. Eur. 201-204: 2035. 1867. *Gloeocapsa minuta* Hollerbach in Elenkin, Monogr. Algar. Cyanophyc., Pars Spec. 1: 233. 1938. —Type from Nordhausen, Germany (L), FIG. 145.

Gloeocapsa thermalis Kützing, Phyc. Gener., p. 173. 1843. *Bichatia thermalis* Trevisan, Nomencl. Algar. 1: 62. 1845. —Type from Battaglia, Italy (L).

Gloeocapsa gelatinosa Kützing, Phyc. Gener., p. 174. 1843. *Palmella gelatinosa* Meneghini pro synon. in Kützing, loc. cit. 1843. *Bichatia gelatinosa* Trevisan, Sagg. Monogr. Alg. Coccol., p. 63. 1848. *Gloeocapsa gelatinosa* α *olivacea* Kützing, Sp. Algar., p. 219. 1849. —Type from Battaglia, Italy (L), FIG. 163.

Palmella pallida Kützing, Phyc. Germ., p. 149. 1845. *Cagniardia pallida* Trevisan, Sagg. Monogr. Alg. Coccol., p. 49. 1848. *Aphanotheca pallida* Rabenhorst, Krypt.-Fl. Sachsen 1: 76. 1863. *Polycystis pallida* Thuret ex Farlow in Farlow, Anderson & Eaton, Alg. Exs. Amer. Bor. 4: 179. 1881. *Microcystis pallida* Lemmermann, Krypt.-Fl. Mark Brandenb. 3: 77. 1907. —Type from the Harz mountains, Germany (L).

Coccoloboris cystifera Hassall, Hist. Brit. Freshw. Alg. 1: 441. 1845. *Bichatia cystifera* Trevisan, Sagg. Monogr. Alg. Coccol., p. 66. 1848. *Gloeotheca cystifera* Rabenhorst, Fl. Eur. Algar. 2: 61. 1865. —Type from Bristol, England (BM).

Protococcus julianus Kützing, Tab. Phyc. 1: 5. 1846. *P. Kuetzingianus* Trevisan, Sagg. Monogr. Alg. Coccol., p. 26. 1848. *Gloeocapsa fulva* Kützing, Sp. Algar., p. 224. 1849. *Bichatia fulva* Kuntze, Rev. Gen. Pl. 2: 886. 1891. —Type from Abano, Italy (L).

Coccoloboris stagnina β *cuprina* Kützing, Sp. Algar., p. 216. 1849. *Palmella cuprina* Agardh pro synon. ex Kützing, loc. cit. 1849. *Aphanotheca stagnina* β *cuprina* Kützing ex Forti, Syll. Myxophyc., p. 77. 1907. —Type from Scania, Sweden (FI).

Gloeocapsa gelatinosa β *aeruginosa* Kützing, Sp. Algar., p. 219. 1849. *Gloeotheca palea* var. *aeruginosa* Hansgirg, Physiol. & Algol. Stud., p. 140. 1887. *G. palea aeruginosa* Hansgirg ex Gardner, New York Acad. Sci., Sci. Surv. Porto Rico 8: 259. 1932. *Gloeocapsa gelatinosa aeruginosa* Kützing ex Gardner, loc. cit. 1932. —Type from Abano, Italy (L).

Gloeocapsa fuscolutea Nägeli in Kützing, Sp. Algar., p. 224. 1849. *G. fuscolutea* α *acbroa*

- Kützing, loc. cit. 1849. *Gloeobacca fuscolutea* Nägeli, Gatt. Einzell. Alg., p. 57. 1849. —Type from Küsnacht, Zürich, Switzerland (L).
- Gloeocapsa fuscolutea* β *bolochroa* Kützing, Sp. Algar., p. 224. 1849. *Gloeobacca fuscolutea* var. *bolochroa* Kützing ex Wartmann & Winter, Schweiz. Krypt. no. 847. —Type from Küsnacht, Zürich, Switzerland (L).
- Gloeocapsa fuscolutea* γ *hemichroa* Kützing, Sp. Algar., p. 224. 1849. —Type from Küsnacht, Zürich, Switzerland (L).
- Gloeocapsa Kuetzingiana* Nägeli in Kützing, Sp. Algar., p. 224. 1849; Nägeli, Gatt. Einzell. Alg., p. 51. 1849. *Bicbatia Kuetzingiana* Kuntze, Rev. Gen. Pl. 2: 886. 1891. —Type from Küsnacht, Zürich, Switzerland (L). FIG. 159.
- Gloeobacca dovia* Nägeli, Gatt. Einzell. Alg., p. 58. 1849. —Type from Lucerne, Switzerland (ZT).
- Gloeocapsa tepidarium* A. Braun in Rabenhorst, Alg. Sachs. 23 & 24: 221. 1852. *Gloeobacca tepidarium* Lagerheim, Öfvers. K. Sv. Vet.-Akad. Forh. 40(2): 44. 1883. *G. rufesstris* var. *tepidarium* Hansgirg, Sitzungsber. K. Böhm. Ges. Wiss., Math.-Nat. Cl., 1891(1): 354. 1891. *Bicbatia tepidarium* Kuntze, Rev. Gen. Pl. 2: 886. 1891. *Gloeobacca rufesstris* b. *tepidarium* Hansgirg, Prodr. Algenfl. Böhmen 2: 136. 1892. —Type from Berlin, Germany (L). FIG. 157.
- Gloeocapsa aurata* Stützenberger in Rabenhorst, Alg. Sachs. 61 & 62: 607. 1857. *Bicbatia aurata* Kuntze, Rev. Gen. Pl. 2: 886. 1891. —Isotypes from Constanza, Germany (FC, L, MIN, PC, TA, UC).
- Aphanobacca Naegeli* Wartmann in Rabenhorst, Alg. Sachs. 109-110: 1093. 1861. —Type from St. Gallen, Switzerland (ZT). FIG. 147.
- Palmella heterococca* Kützing, Osterprogramm d. Realschule zu Nordhausen, p. 6. 1863; Hedwigia 2: 86. 1863. —Type from Vera Cruz, Mexico (L). FIG. 153.
- Gloeocystis rufesstris* Rabenhorst, Krypt.-Fl. Sachsen 1: 128. 1863. —Type from Planitz, Germany (FC).
- Aphanobacca (stagnina var.) prasina* A. Braun in Rabenhorst, Alg. Sachs. 57 & 58: 1572. 1863. *Coccolobis stagnina* var. *prasina* A. Braun ex Richter, Hedwigia 25: 254. 1886. *C. stagnina* b. *prasina* Richter ex Hansgirg, Prodr. Algenfl. Böhmen 2: 141. 1892. *Aphanobacca stagnina* f. *prasina* Elenkin, Monogr. Algar. Cyanophyc., Pars Spec. 1: 144. 1938. *Anacystis rufesstris* var. *prasina* Drouet & Daily in Daily, Amer. Midl. Nat. 27: 651. 1942. —Type from Berlin, Germany (FC). FIG. 161.
- Gloeobacca carpathica* Grunow in Rabenhorst, Fl. Eur. Algar. 2: 63. 1865. —Type from Wallendorf, Slovakia (W).
- Gloeobacca Heuffleri* Grunow in Rabenhorst, Fl. Eur. Algar. 2: 63. 1865. —Type from Kiodberg, Syria (W).
- Aphanobacca (stagnina var.) coeruleascens* A. Braun in Rabenhorst, Alg. Sachs. 157 & 158: 1572. 1863; A. Braun in Rabenhorst, Fl. Eur. Algar. 2: 66. 1865. —Type from Pillnitz, Germany (L).
- Palmella Jensenii* Wood, Proc. Amer. Philos. Soc. 11: 134. 1869. —Type from Philadelphia, Pennsylvania (in herb. Princeton University in NY).
- Gloeobacca decipiens* A. Braun in Wittrock & Nordstedt, Alg. Exs. 12: 594. 1883. —Type from Berlin, Germany (L). FIG. 149.
- Chroococcus montanus* Hansgirg, Notarisia 3: 400. 1888. —Type from Lihsic, Bohemia (W). FIG. 150.
- Polycystis litoralis* Hansgirg in Foslie, Contrib. Knowl. Mar. Alg. Norway 1: 169. 1890. *Microcystis litoralis* Forti, Syll. Myxophyc., p. 89. 1907. —Isotype from Bugönes, Norway (L).
- Gloeobacca samoensis* f. *major* Wille in Reching, Bot. & Zool. Ergebn. Samoa & Salomoninseln, Süswasseralg., p. 7. 1914. —Type from Upolu, Samoa (O).
- Gloeocapsa luteo-luica* Martens ex Wille, Nyt Mag. Naturvid. 62: 191. 1925. —Type from Pegu, Burma (LD).
- Aphanobacca gelatinosa* Gardner, Univ. Calif. Publ. Bot. 14: 2. 1927. *A. Gardneri* J. de Toni, Noet. di Nomencl. Algol. VIII. 1936. —Type from Fukien province, China (FH).
- Aphanocapsa Richteriana* var. *major* Gardner, Mem. New York Bot. Gard. 7: 4. 1927. *A. Richteriana major* Gardner, New York Acad. Sci., Sci. Surv. Porto Rico 8: 253. 1932. —Type from Palmer, Puerto Rico (NY).
- Aphanobacca conferta* var. *brevis* Gardner, Mem. New York Bot. Gard. 7: 5. 1927. *A. conferta brevis* Gardner, New York Acad. Sci., Sci. Surv. Porto Rico 8: 254. 1932. —Type from Maricao, Puerto Rico (NY). FIG. 160.
- Aphanobacca microscopica* var. *granulosa* Gardner, Mem. New York Bot. Gard. 7: 5. 1927. *A. microscopica granulosa* Gardner, New York Acad. Sci., Sci. Surv. Porto Rico 8: 254. 1932. —Type from Penuelas, Puerto Rico (NY). FIG. 151.
- Gloeocapsa quaternata* var. *major* Gardner, Mem. New York Bot. Gard. 7: 12. 1927. *G. quaternata major* Gardner, New York Acad. Sci., Sci. Surv. Porto Rico 8: 258. 1932. —Type from San Juan, Puerto Rico (NY). FIG. 146.

Gloeobacca interspersa Gardner, Mem. New York Bot. Gard. 7: 13. 1927. —Type from Santurce, Puerto Rico. (NY). FIG. 155.

Anacyssis cylindracea Gardner, Mem. New York Bot. Gard. 7: 19. 1927. —Type from near Utuado, Puerto Rico (NY). FIG. 156.

Aphanobacca bullosa var. *minor* Geitler, Arch. f. Hydrobiol., Suppl. XII, Trop. Binnengew. 4: 622. 1933. *A. bullosa* var. *major* Geitler, ibid. Suppl. XIV, 6: 374. 1935. —Type from Bukit Kili, Sumatra (in the collection of L. Geitler).

Gloeobacca rupestris var. *major* Geitler, Arch. f. Hydrobiol., Suppl. XII, 4: 622. 1933. —Type from Panjogahan, Sumatra (in the collection of L. Geitler).

Cyanosylvou banyolemsis Margalef, Publ. Inst. Biol. Aplic. Barcelona 1: 60. 1946. —Type from Lago de Bañolas, Gerona, Spain (D).

Original specimens have not been available to us for the following names; their descriptions are here designated as the Types until the specimens can be found:

Gloeocapsa polyzonica Perty, Bewegung Durch Schwingende Mikroskop. Organe, p. 39. 1848. *G. polydermatica* b. *polyzonica* Perty ex Rabenhorst, Fl. Eur. Algar. 2: 37. 1865. *G. polydermatica* f. *polyzonica* Perty ex Forti, Syll. Myxophyc., p. 52. 1907.

Aphanobacca microscopica Nägeli, Gatt. Einzell. Alg., p. 59. 1849. —No specimens labeled thus appear to be present in the Nägeli collections of either the Staatssammlung at Munich or the Institut für Spezielle Botanik, Eidgenössische Technische Hochschule at Zürich. The original notes and sketches of Nägeli in the Pflanzenphysiologisches Institut of the latter institution are reproduced here: FIG. 162.

Gloeobacca nigrescens Rabenhorst, Krypt.-Fl. v. Sachsen 1: 76. 1863.

Aphanobacca pallida var. *micrococca* Brügger, Jahresber. Naturf. Ges. Graubündens, N. F. 8: 245. 1863. *Aphanocapsa pallida* var. *micrococca* Brügger ex Rabenhorst, Hedwigia 1863: 181. 1863.

Aphanobacca pallida b. *micrococca* Brügger ex Rabenhorst, Fl. Eur. Algar. 2: 65. 1865.

Gloeocapsa aurata var. *alpicola* Brügger, Jahresber. Naturf. Ges. Graubündens, N. F. 8: 247. 1863; Hedwigia 1863: 181. 1863. *G. aurata* b. *alpicola* Brügger ex Rabenhorst, Fl. Eur. Algar. 2: 47. 1865.

Polycystis piscinalis Brügger, Jahresber. Naturf. Ges. Graubündens, N. F. 8: 249. 1863; Hedwigia 1863: 181. 1863. *Microcystis piscinalis* Forti, Syll. Myxophyc., p. 90. 1907.

Polycystis piscinalis var. *Microcystis* Brügger, Jahresber. Naturf. Ges. Graubündens, N. F. 8: 249. 1863; Hedwigia 1863: 181. 1863.

Gloeocapsa sparsa Wood, Proc. Amer. Philos. Soc. 11: 123. 1869.

Gloeobacca ambigua A. Braun, Sitzungsber. Ges. Naturf. Fr. Berlin 1875: 99. 1875.

Gomphosphaeria anomala Bennett, Journ. Roy. Microsc. Soc. London, ser. 2, 8: 3. 1888. *Cosio-sphaerium anomalum* de Toni & Levi, Notarisia 3: 528. 1888.

Chroococcus conociatus Hariot, Bull. Soc. Bot. France 38: 416. 1891.

Microcystis maxima Bernard, Protococc. & Desmid. d'Eau Douce, p. 49. 1908.

Chroococcus Rochei Vitruvius, Soc. d'Hist. Nat. Doubs 21: 51. 1911.

Aphanobacca prasina f. *minor* Wille, Deutsche Südpolar-Exped. 1901—03, 8: 414. 1928.

Microcystis kerguelensis Wille, Deutsche Südpolar-Exped. 1901—03, 8: 416. 1928.

Gloeocapsa rupestris var. *achroa* Beck-Mannagetta, Lotos 77: 99. 1929.

Aphanobacca stagnina var. *nemalibacca* Frémy, Arch. de Bot. Caen 3 (Mém. 2): 26. 1930.

Aphanocapsa rivularis f. *major* Petkoff, Bull. Soc. Bot. Bulgarie 4: 104. 1931.

Gloeobacca rupestris var. *chalybea* Krieger, Hedwigia 70: 151. 1931.

Aphanobacca pallida f. *minor* Dixit, Proc. Indian Acad. Sci. 3: 95. 1936.

Chroococcus minimus var. *crassus* B. Rao, Proc. Indian Acad. Sci. 3: 166. 1936.

Gloeocapsa stegophila var. *crassa* B. Rao, Proc. Indian Acad. Sci. 6: 344. 1937.

Chroococcus montanus var. *hyalinus* B. Rao, Proc. Indian Acad. Sci. 6: 345. 1937.

Gloeobacca rupestris var. *minor* Jao, Sinensia 10: 178. 1939.

Gloeobacca fuscolutea var. *unilamellaris* Chu, Ohio Journ. Sci. 52: 96. 1952.

Aphanobacca Lemnae Chu, Ohio Journ. Sci. 52: 96. 1952.

Plantae aeruginæae, olivaceae, luteolae, brunneae, roseae, violaceae, vel nigrae, microscopicæ vel macroscopicæ, (1—)pluri—multi-cellulares, cellulis in divisione binis truncato-hemisphaericis usque ad truncato-ovoideas, ætate provecta ovoideis, ellipticis, vel raro elliptico-cylindraceis, diametro (3—)4—8 μ crassis, usque ad 3-plo longiores; gelatino vaginale primum hyalino deinde lutescente vel brunnescente, homogæneo vel sæpe conspicue lamelloso, nonnumquam omnino diffluente;

protoplasmate aerugineo, olivaceo, luteolo, roseo, vel violaceo, plerumque homogenero. FIGS. 145—163.

Commonly found on soil, rocks, and wood in aerial and subaerial situations and in shallow fresh (occasionally in brackish and marine) waters, or free-floating in lakes and ponds. These plants grow equally well and rapidly in and out of the water through a wide range of environmental conditions. Dissociated spores and vegetative cells of *Nostoc* spp. in old natural and laboratory cultures often resemble cells of this species superficially. Subaerial and aerial growth-forms of *Palmogloea protuberans* (Sm. & Sow.) Kütz. are often mistaken for plants of *Coccolobis stagnina*.

Specimens examined:

NORWAY: (in a lagoon at high water mark) Bugönaes in Sydvaranger, *M. Patlie* (isotype of *Polycystis litoralis* Hansg., L.); Gudbrandsdalen, *N. Wille*, Sept. 1916 (S); Valdres, in rupibus ad Skogstad, *Wille*, 31 Jul. 1879 (D, S); in rupibus udis ærundenique fissuris ad Nass, *H. C. Lyngbye*, 4 Jul. 1816 (Type of *Palmella rupestris* Lyngb., C; isotypes, FC [Fig. 148], FI); Saltdal, Nordland, *C. Sommerfelt* (Type of *P. obscura* Sommerf., C; isotype "e Norvegia", PC). SWEDEN: in turfosis Scaniae, *J. Agardh* (Type of *Coccolobis stagnina* β *caprina* Kütz., FI; isotype, PC); in stagno ad Qvikjock in Lapponia Lulea, *G. Lagerheim*, Jul. 1883 (as *C. stagnina* in Wittr., Nordst., & Lagerh., Alg. Exs. no. 1595a, L); in lacu Laagen in Nericia, *O. Borge*, Jul. 1898 (as *C. stagnina* in Wittr., Nordst., & Lagerh., Alg. Exs. no. 1595b, L); in amne Fyrisan in Ultruna, Uplandia, *C. Johansson & G. Lagerheim*, Nov. 1882 (as *Aphanothece Mooreana* in Wittr. & Nordst., Alg. Exs. no. 695, FC, L, NY, S); in stagno Marestrand, *O. Nordstedt*, Aug. 1876 (as *Coccolobis prasina* in Aresch., Alg. Scand. Exs., Ser. Nov., no. 427, FC, L, S); Lurbo, par. Näs, Uppland, *V. Wittrock*, Jul. 1876 (D, S); Säbra, *H. W. Arnell*, Aug. 1877 (S); Stockholm, *S. Aresteboug*, May 1868 (S); Haparanda, *T. Krok*, Jul. 1868 (S); in stagno ad Bara Scaniae, *H. G. Simmons*, Sept. 1897 (S); in palude ad Kungsmarken prope Lund, *Simmons*, Jun. 1897 (S); Varberg, Halland, *D. E. Hylmø*, Apr. 1928, 1929 (S); Scania, *J. Agardh*, 1843 (DT); in insula Vermåd Uplandiae, *E. Warming & N. Wille*, Jul. 1883 (as *C. tuberculosa* in Wittr., Nordst., & Lagerh., Alg. Exs. no. 1599, NY); in spelunca "Silfvergröten" montis Skullen Scaniae, *Simmons*, Jul. 1897 (NY); Upsala, in aquario, *Lagerheim*, Mar. 1882 (S); Transtrand, Dalarne, *Borge*, Jun. 1916 (S); ad marginem aquarii in caldario horti botanici Upsaliensis, *Lagerheim*, Mar. 1892 (as *Gloeotheca repidiariorum* in Wittr., Nordst., & Lagerh., Alg. Exs. no. 1544a, L). POLAND: Silesia: in fossa ad Tschichwitz prope Vratislaviam, *B. Schröder*, Sept. 1895 (as *Coccolobis stagnina* in Wittr., Nordst., & Lagerh., Alg. Exs. no. 1596, L); in einem Teiche an der Steinau bei Tillowitz, *O. Kirchner*, 4 Jul. 1875 (as *Aphanothece prasina* in Rabenh. Alg. no. 2442, FC, L, TA, UC); in einem Erdaussicht bei Bischwitz bei Breslau, *Hilse*, Sept. 1864 (as *A. pallida* in Rabenh. Alg. no. 1831, FC, FH, NY, UC); an einem feuchten, grasigen Wege im Steinbruche auf dem Gaigenberge bei Strehlen, *Hilse*, 1862 (as *Palmella testacea* in Rabenh. Alg. no. 1524, FC, L). ROMANIA: Chitila, in palude riv. Colintina, distr. Ilfov, *E. C. Teodorescu* 1319, 9 May 1903 (FC, W).

DENMARK: ad parietes calceos internos caldarii Orchidearum horti botanici bauniensis, *O. Nordstedt*, 21 Oct. 1878 (as *Gloeotheca rupestris* in Wittr. & Nordst., Alg. Exs. no. 399, FC, L, NY, PC, S); Köpenhaven, *Nordstedt*, Oct. 1878 (S); Lyngby sp. Selandiae, *L. K. Rosenvinge*, Sept. 1882 (S), Jun. 1881 (as *Coccolobis stagnina* in Wittr., Nordst., & Lagerh., Alg. Exs. no. 1597a, L). GERMANY: Baden: an den Speichen eines Wasserrades bei Constanz, *E. Sizenberger*, Aug. 1857 (isotypes of *Gloeocapsa aurata* Steiznb. in Rabenh. Alg. no. 607, FC, L, MIN, PC; and in Jack, Lein., & Steiznb., Krypt. Badens no. 1, TA, UC). Bavaria: an der Wand des feuchten Gewölbes der über den Rödelheim führenden Brücke des Donau-Mainkanals bei Erlangen, *P. Reinsch*, 26 Mar. 1864 (as *G. atrata* in Rabenh. Alg. no. 1914, FC, L, S); Kersbach bei Erlangen, *Glück*, Sept. 1890 (L, NY, S), *Reinsch* (D, L). Brandenburg: an einer feuchten Mauer im Warmhaus des Oberhofbuchdruckers Decker zu Berlin, *A. Braun*, Jul., Oct. 1852 (Type of *G. repidiariorum* A. Br. in Rabenh. Alg. no. 221, L; isotypes, FC [Fig. 157], PC, TA), Aug. 1852 (PC); in Warmhaus des Universitätsgartens zu Berlin, *Braun*, Oct. 1875 (Type of *Gloeotheca decipiens* A. Br. in Rabenh. Alg. no. 2456, L; isotypes, FC, PC, S, TA); im Berliner botanischen Garten, *Braun*, Aug. 1852 (L), Jan. 1855 (L), Jan. 1875 (L), Apr. 1875 (as *G. decipiens* in Rabenh. Alg. no. 2456b, FC [Fig. 149], L, FC, S, TA), May 1875 (S), May 1879 (S), *P. Hennings*, Apr., May 1892 (as *G. decipiens* in Heen., Phyk. March. no. 45, L); Berliner Treibhäuser, *Anon.*, Aug. 1863 (FH, S); im Tümpeln bei Weissensee unweit Berlin, *Braun*, Aug. 1863 (Type of *Aphanothece prasina* A. Br. in Rabenh. Alg. no. 1572, FC [Fig. 161]), *A. de Bary*, Aug. 1851 (as *Coccolobis stagnina* in Rabenh. Alg. Suppl. no. 3, I), *Bauer*, Aug. 1854 (FH, L); Berlin, *A. Braun*, Aug. 1851 (L, NY), Aug. 1863 (L, S); Berliner bot. Garten, *P. Magnus*, Jun. 1896 (S); Tümpel bei Schönborn, *A. Jenks*, Aug. 1892 (TA); Friedrichsfelde,

Jahn, Jul. 1856 (TA); Halensee und Hundekohlensee im Grunewald, *P. Hennings*, May, Jun. 1892 (as *C. stagnina* var. *pratensis* in Heno., Phyk. March. no. 42, FH, L); HESSE: Bessungen bei Darmstadt, *G. Mariens* (L); fontaine du jardin grandducal à Darmstadt, *Mariens* (L); im Schlossgarten zu Darmstadt, *A. Braun* 23, Sept. 1853 (L); Darmstadt, *Braun*, 1851 (L). Mecklenburg (Pomerania): Wolgast, *M. Marison* (NY). Saxony: Leipzig, *Rosner* (NY, UC); bei Auerbach in Voigtländer, *P. Richter* (UC); in Tümpeln bei Riesigk, Wörlitz (Anhalt), *R. Haritz*, Jun. 1890 (S); in piscinis ad Lipsiam et Dresdam, *Wolwitsch* (S); in einem Teiche um Lübschütz bei Wurzen unweit Leipzig, *H. Reichelt*, Jun. 1886 (as *C. stagnina* var. *pratensis* in Hauck & Richt., Phyk. Univ. no. 91, L, MICH, MIN, S); Nordhausen, *F. T. Kützing* (Type of *Prolococcus minutus* Kütz., L [Fig. 145]; isotype, UC); an nassen Felsen des Innerstedthales im Oberharze, *Römer* 154 (Type of *Palmella pallida* Kütz., L; isotype, UC); Halle, *Kützing* (D, L); in stehenden Wässern bei Halle, *Kützing* (as *Coccolobris stagnina* in Kütz., Alg. Ag. Dulc. Dec., no. 29, FC, L, NY, UC); (in lacubus ad Dieckau) *K. Sprengel* (Type of *C. stagnina* Spreng., FC [Fig. 154]); Dresden, an der Wand eines Gewächshauses in Prinz Georg's Garten, *C. A. Hantsch* (as *Gloeocephala murarii* in Rahenh. Alg. no. 1216, FC, L, PC); Pillnitz, *Wolwitsch* (BUT); im Schlossgarten bei Pillnitz, *L. Rabenhorst* (Type of *Aphanotheca coeruleascens* A. Br., as *Coccolobris stagnina* in Rabenh. Alg. no. 3, L; isotypes, FC, TA, UC); Mauerwände in einem Warmhause, *Connewitz*, Leipzig, *P. Richter*, Apr. 1879 (FC); ad parietes caldarum in Connewitz prope Lipsiam, *Richter*, 21 Apr. 1880 (as *Gloeothece decipiens* in Witr. & Nordst., Alg. Exs. no. 594, D, FC, L, S); an feuchten Wänden eines Gewächshauses, Anger bei Leipzig, *Richter* (FC, S), Feb. 1884 (as *Gloeocephala atrovirens* in Hauck & Richt., Phyk. Univ. no. 42, L, FC), 12 Apr. 1881 (as *G. decipiens* with *Chroococcus varius* in Witr. & Nordst., Alg. Exs. no. 600, FC); an dem Mauerwerk der Treibgärtnerei, Planitz, *G. Kreisbar* (designated as Type of *Gloeocephala rubestris* Rabenh. in Rabenh. Alg. no. 1790, FC; isotype, PC). Schleswig-Holstein: ex lacu prope Slesviciam, *J. N. Sahr*, 26 May 1846 (FC, S); ad Slesviciam, *C. Jesson* (FC, L, S); Megger Koog in Schleswig, *Jesson* (FC, FH, L, S); in Torfgruben bei Waldhausen unfern Lübeck, *R. Häcker* (as *Coccolobris stagnina* in Rabenh. Alg. Suppl. no. 3, L, UC). Thuringia: an feuchten Felsen oberhalb des Breitengscheid, Eisenach, *W. Migula*, Sept. 1905 (as *Gloeothece rubestris* in Mig., Crypt. Germ., Austr., & Helv. Exs., Alg. no. 99, MICH, NY, TA); an feuchten Felsen an der Strasse nach der hohen Sonne, Eisenach, *Migula*, 26 Sept. 1924 (as *Aphanotheca Naugolii* in Mig., Crypt. Germ., Austr., & Helv. Exs., Alg. no. 179, FC, TA); an feuchten Felsen in der Ludwigsklamm, Eisenach, *Migula*, July, 1932 (as *A. Castagnei* in Mig., Krypt. Germ., Austr., & Helv. Exs., Alg. no. 278, FC, TA).

CZECHOSLOVAKIA: Moravia: kultura na agaru, Trebic, *F. Nováček*, 7 Oct. 1928 (FC); serpentin, roklet, Mohelno, *Nováček*, 10 Mar. 1926 (PC). Slovakia: in einem feuchten Sandsteinfels in Wallendorfer Wald, *C. Kalkbrenner* (Type of *Gloeothece carpatica* Grun., W); murs humides, Wallendorf, *Kalkbrenner* (as *Gloeocephala nigra* in Roumegeüre, Alg. de Fr. no. 1041, L). Bohemia: Arnou, *A. Hansgirk*, Jul. 1885 (FC, W); Bystric nächst Benešchau, *Hansgirk*, Aug. 1884 (FC, W); Chotouiny u Táboru, *Hansgirk*, Aug. 1888 (FC, W); Labská Tynice, *Hansgirk*, 1891 (FC, W); in saxis madidis ad Libšic, *Hansgirk*, Oct. 1886 (Type of *Chroococcus montanus* Hansg., W; isotype, FC [Fig. 150]); in lacu silvatico prope Neu-Strežmir ad Stupic, *C. Hansgirk*, 10 Sept. 1884 (as *Aphanotheca stagnina* in Witr. & Nordst., Alg. Exs. no. 794, FC, L, S, UC); and in Kerner, Fl. Exs. Austro-Hung. no. 2000, L, MO, S); Praha, Spolec, Zahrada, *Hansgirk*, Dec. 1883 (FC, W); ad Slichov prope Pragam, *Hansgirk*, May 1885 (FC, W); Horus Bonanicus, Smichow, *Hansgirk*, Dec. 1883, Jan. 1884, Feb. 1884, Jul. 1886 (FC, W); skaly grou, Srbsku u Berouna, *Hansgirk*, Aug. 1884 (FC, W); Stechovic nächst Prag, *Hansgirk*, Apr. 1887 (FC, UC); in ripibus subhumidis ad St. Kilian prope Stechovic, *Hansgirk* (as *A. pallida* in Kerner, Fl. Exs. Austro-Hung. no. 1999, L, MO, S); Strežmir u Supšice, *Hansgirk*, Aug. 1884 (FC, W); Steinkirchen ad Budweis, *Hansgirk*, Aug. 1888 (FC, W). AUSTRIA: Lower Austria: in ripibus humidis prope Frankenfels, *S. Stockmayer* (as *Gloeothece fusco-lutea* in Mus. Vindob. Krypt. Exs. no. 148, FC, L, S); Tümpel in den Auer bei Marchegg, *G. de Beck*, Aug. 1887 (FC, W); Wien, in tepidariis hori botanici universitatis, *K. Reehinger* (as *G. tepidariorum* in Mus. Vindob. Krypt. Exs. no. 2138, S). Styria: an Moosen in einem Mühlgange der Mürz in Kindberg, *C. Heußler*, 11 Jul. 1856 (Type of *Gloeothece Heußleri* Grun., W); Judendorf-Grarwein prope Graz, *A. Hansgirk*, Sept. 1890 (FC, W). Carinthia: Kalkfelsen, Vorrnach, Kreuzeckgebiet, *H. Simmer*, May 1898 (S); Klagenfurt, *Hansgirk*, Sept. 1889 (FC, W); Feldkirchen prope Villach, *Hansgirk*, Sept. 1889 (FC, W). Tyrol: Brixlegg, *Hansgirk*, 1891 (FC, W). HUNGARY: Budapest, in vitrinis caldariorum hori botanici, *F. Filáriszky* (as *Gloeocephala Jenestralis* in Mus. Vindob. Krypt. Exs. no. 433, FC, L, S, Z). JUGOSLAVIA: Slovenia: St. Georgen—Pölschach, Podnart, and Krainburg, *Hansgirk*, Aug. 1889 (FC, W); Marburg, Cilli, and Steinbrück, *Hansgirk*, Aug. 1890 (FC, W). TRIESTE: Zaule—Capo d'Istria, *Hansgirk*, Aug. 1889 (FC, W).

SWITZERLAND: an nassen Felsen, Luzern, *C. von Nägeli*, Dec. 1847 (Type of *Gloeothece devia* Näg., with *Scytonema* sp., ZT); Dübendorf, auf dem Grunde in wenig tiefen Gruben, *Nägeli*, Feb. 1849 (ZT); Thalwerk, *C. Cramer*, Apr. 1863 (ZT); St. Gallen (MICH); auf Moosen, Zweibrücker-Tobel bei St. Gallen, *B. Wartmann* (as *G. fuscolutea* var. *holobroda* in Wartm. & Wint., Schweiz.

Krypt., no. 847, ZT). 15 Jul. 1860 (Type of *Aphanobacca Naegeli* Wartm. in Wartm. & Schenk, Schweiz. Krypt. no. 36, ZT; isotypes in Rabenh. Alg. no. 1093, FC [Fig. 147], FH); an Nagelfluhfeisen der Bernegg bei St. Gallen, *Wartmann* (as *Gloeobacca rupestris* in Wartm. & Wint., Schweiz. Krypt. no. 846, ZT); feuchte Felsen, Küsnacht, Zürich, *Nägeli* 368, Nov. 1847 (Type of *Gloeocapsa fuscolutea* α *achroa* Näg., β *holobocroa* Näg., and γ *bemichroa* Näg., L; isotypes, M, ZT); ad terram inter muscos, Zürich, *G. Wint.*, May 1878 (TA); Küsnachter Wasserfall um Zürich, *Nägeli* (PC); feuchte Felsen, Küsnacht, Zürich, *Nägeli* 258 (Type of *G. Kuetszingiana* Näg., L; isotypes, M, O, UC), Nov. 1847 (FC [Fig. 159], M); Küsnacht bei Zürich, *B. Wartmann*, 28 Jul. 1856 (as *G. Kuetszingiana* in Rabenh. Alg. no. 630, FC, L, M, PC, and in Wartm. & Schenk, Schweiz. Krypt. no. 133, M, Z). ITALY: Sagrado prope Görz, *A. Hamsig*, 1891 (FC, W); sui muri delle serre dell'Orto Botanico di Pisa, *A. Mori* (as *G. muralis* in Erb. Crit. Ital., ser. II, no. 1245, FC, PC); Ojiero, ex herb. Zanardini (Type of *Microcystis paroliniana* Menegh., FI [Fig. 152]; isotype, PC); margine della fontana di Viali in Euganeis, *G. Meneghini*, Aug. 1841 (Type of *Microcystis microspora* Menegh., FI; isotypes, L, S, UC); St. Elena prope Battaglia, *Meneghini* (Type of *Gloeocapsa thermalis* Kütz., L); with *Scytonema thermale*, Abano, in herb. Kützing (Type of *Protococcus julianus* Kütz., L); in canali-bus ubi effluit aqua calida thermaum ad Battaglia, *F. T. Kützing*, May 1835 (Type of *Palmella bullata* Kütz., L; isotypes in Kütz., Alg. Aq. Dulc. Dec. no. 154, L, UC); Abano, *G. Meneghini* (Type of *Gloeocapsa gelatinosa* β *aeruginosa* Kütz., L; isotypes, S, UC); in aqua thermali, Battaglia, *Meneghini* (Type of *G. gelatinosa* Kütz., L [Fig. 163]; isotypes, S, UC); in aquis thermalibus Apuní, *Meneghini* (Type of *Microcystis gelatinosa* Menegh., FI; isotypes, PC, UC).

NETHERLANDS: Goes, *van den Bosch* 365 (UC); den Haag, in Slotte, *Vrijdagslijnen* (L); Delft, warme kas van het Laboratorium voor Technische Botanica, *A. J. Meeuwse*, Apr. 1943 (L); Delft, culturuin, *G. van Rossum*, Oct. 1942 (L); Borsbol bij Abcoude, *V. Weisb.*, Jul., Aug. 1944 (L); Heemstede, Groenendaal, *P. Leenmans*, May 1937 (L); Groeneveld, *A. Weber-van Bosse* 1216, Apr. 1893 (L); Nieuwkoop, verbinding van Oosthout van de Wijde met Kaarwetering, *Weisb.* 96, Sept. 1943 (L); plassen van Brenkleeven en Tienhoven, *W. Vorvoort*, May 1942 (L); Westbroek, in Sloop, *R. A. Maas Geesteranus* & *Weisb.* 2762, Aug. 1943 (L), *Maas Geesteranus* 2764 (L); Kaloot near Borsele, Zeeland, *W. G. Boelink*, 2 Aug. 1950 (PC); Hortus Botanicus, Leiden, *J. T. Koster* 19, 24 Oct. 1935 (D, L). BELGIUM: dans les fossés le long de la route de Gand à Tronchiennes, *Scheidweiler* (as *Coccolobis stagnina* in Westend. & Wall., Herb. Crypt. Belg. no. 1099, NY, UC); Jardin Botanique de Bruxelles, *E. de Wildeman*, Jun. 1888 (as *Gloeocapsa polydormatica* in Roumeguère, Alg. de Fr. no. 1015, L). FAEROES ISLANDS: *H. C. Lyngbye* (PC). BRITISH ISLES: Scotland: in the bottom of Dunmore loch near Pitlochry, Perthshire, *A. J. Brook*, 5 Jan. 1954 (D). England: near Bristol, 2 Sept. 1847, herb. *Thuaisier* (Type of *Coccolobis cystifera* Hass., BM); Sutton Park, Warwickshire, *G. S. West*, 6 May 1908 (FC, UC); in small pond near River Coln at Fairford, Gloucestershire, *W. L. Tolsted* 8487, 1 Oct. 1944 (FC). Ireland: boggy hole by Shane's Castle near Lough Neagh, county Antrim, *D. Moore* (Type of *Palmella Mooreana* Harv., K [Fig. 158]; isotype, BM); in brackish pool, Clare island, *A. D. Cotton*, May 1911 (NY). FRANCE: Aisne: sur un mur de casemate, Berthenicourt-par-Moy, *J. Mabillo* 4, May 1952 (FC); forêt de St. Gobain, *Mabillo*, Jul., Aug. 1952 (FC). Alpes Maritimes: Antibes, *E. Bornes*, Mar. 1874 (FH), Jan. 1875 (NY); fond d'un ruisseau à Menton, *G. Thuret* (as *Aphanocapsa Roeseana* with *A. membranacea* in Roumeguère, Alg. de Fr. no. 827, L). Alsace: jardin botanique de Strasbourg, *A. Braun* (as *Gloeobacca descriptans* in Roumeguère, Alg. de Fr. no. 520, L); fossés, St. Marie aux Mines, *Caspary* (as *Aphanocapsa stagnina* in Roumeguère, Alg. de Fr. no. 728, L); fossés aux environs de Colmar, herb. *Buchinger* (as *Aphanocapsa Roeseana* in Roumeguère, Alg. de Fr. No. 516, L). Calvados: Vire, herb. *Lenormand* (FC, D, L, S), *Chaivin* (L); anciennes carrières d'Allemagne, Caen, *P. Frémy* 737, Apr. 1924 (DT). Hérault: St. Pons, *C. Flabault* 396, May 1882 (L, S). Manche: Carentan (S); ad muros, Saint Lô, *Frémy* 319, Feb. 1921 (NY); ad rupes, Agneaux, *Frémy*, Jun. 1927 (NY); mare de Vauville, *Frémy*, 21 Aug. 1931 (as *Aphanobacca stagnina* in Hamel, Alg. de Fr. no. 152, FC). Maine et Loire: rochers de Murs, *F. Hy*, 10 Nov. 1890, Nov. 1892 (PC), Mar. 1894 (as *Gloeobacca Rabenhorstii* in Witr., Nordst., & Lagerh., Alg. Exs. no. 1543, L, NY), Jul. 1894 (as *G. lepidurium* in Witr., Nordst., & Lagerh., Alg. Exs. no. 1544b, L); in stagno prope St. Georges sur Loire, *Hy*, Jul. 1891 (as *Coccolobis stagnina* in Witr., Nordst., & Lagerh., Alg. Exs. no. 1596b, L). Nord: in canalibus Flandriae litoralis prope Dunkerque, *C. Flabault*, 14 Aug. 1885 (as *Polycystis aeruginosa* in Witr., Nordst., Alg. Exs. no. 795, FC, L, S); in fossis prope Bourbourg, *Flabault*, Aug. 1886 (as *Coccolobis stagnina* in Witr., Nordst., & Lagerh., Alg. Exs. no. 1597, L). Seine et Marne: ad parietes aquaeductus, Meloduno, *Roussel*, 21 Jul. 1851 (FI). SPAIN: sobre piedras y tallos, 30 cm. de profundidad, Lago de Bañolas, prov. Gerona, *R. Margalef*, 7 Jul. 1944 (isotype of *Cyanotylon banyolenis* Margal., D).

CANARY ISLANDS: Funchal, *C. Lindman*, 7 Jan. 1885 (D, S). ICELAND: in stagnant water in a branch to Grimsá, Vallanes, East Iceland, *J. Boye Peterson*, 26 Jun. 1914 (FC). BERMUDA: on ground near the seashore, Hamilton, *W. G. Farlow* (FC, UC); on ground, Spanish Point, *Farlow*, Jan. 1900 (S); as *Gloeobacca rupestris* in Coll., Hold., & Snch., Phyc. Bor-Amer. no. 703, FC, L, MICH, TA); on rocks near shore, *F. S. Collins* 7002, Apr. 1912 (FH); in a freshwater pool near Old Ferry

Road, Collins, 9 Aug. 1913 (as *G. ruspessis* in Coll., Hold., & Setch., Phyc. Bor.-Amer. no. 2154, FC, D, MICH, L). NEW BRUNSWICK: Island Lake, 40-50 miles due south of Dalhousie, M. L. Mesurier 3, Aug. 1953 (FC); wet ground, ledges, etc., Grand Falls, H. Habuab 10063, 10206, 10378, 10844, Jul. Aug. 1947, Jul., Sept. 1948 (FC, HA). MAINE: Fox island, Hunnewell's Point, mouth of the Kennebec river, F. S. Collins, Aug. 1880 (FC, FH, UC); lagoons, Eagle island, Collins 2954, Jul. 1894 (NY); on cliffs of Pisquamquis river, Dover, Collins, 8 Jul. 1897 (FC, UC). NEW HAMPSHIRE: alpine cascade, Gorham, W. G. Farlow, Sept. 1887 (FH). MASSACHUSETTS: in greenhouse, Biological Institute, Harvard University, Cambridge, R. M. Whelden & G. D. Darker 6457, 23 Sept. 1937 (D, FH); on flower pots, Botanic Garden, Cambridge, H. M. Richards, 18 Feb. 1895 (as *Aphanobece microscopica* in Coll., Hold., & Setch., Phyc. Bor.-Amer. no. 552, FC, L, TA); in salt water kept in the laboratory more than a year, Farlow, Feb. 1911 (FC, FH); Nahant, B. M. Davis, May 1893 (FH); wet rocks, Pine Banks park, Melrose, Collins 3591, Apr. 1899 (FH, UC); cliffs, Eastero Head, Gloucester, Farlow, Jul. 1902 (FH); on the ground beyond the guano factory, Woods Hole, Farlow, Jul. 1889 (FH); shore of Herring pond, Eastham, Collins 5894, 5896, 5897, Aug. 1908 (NY); pond, Eastham, Collins 5900, Sept. 1907 (NY); Jemima pond, Eastham, Collins, Aug. 1908 (NY); Fay's ditch, Woods Hole, F. Drouet 1876, 12 Jul. 1936 (D, NY); salt marsh pools, Pasque island, Gosnold, W. R. Taylor, 5 Jul. 1932 (D, TA); rocks, Essex street, Saugus, Collins 1696, Jun. 1890 (UC); Tashmoo pond, Marthas Vineyard, G. T. Moore, Sept. 1907 (FH); Naushon island, Taylor, Jul. 1917 (TA); Salt pond, Falmouth, H. T. Crossdale, Jul. 1935 (TA); pond southeast of Oyster pond, Falmouth, Taylor, Jul. 1925 (TA); Fresh pond, Cambridge, W. Trelease, Oct. 1881 (MO); Stony Brook pond, G. T. Moore, Oct. 1895 (MO). RHODE ISLAND: W. J. V. Osterhout, 1894 (FH).

CONNECTICUT: shore of Fresh pond, Stratford, I. Holden 729, Sept. 1892 (UC); Norwich, W. A. Satchell, 2 Sept. 1892 (as *Aphanobece prasinus* in Coll., Hold., & Setch., Phyc. Bor.-Amer. no. 251, FC, L, TA, UC); in a small pond, Norwich, Satchell 31, Jul. 1885 (UC); in a pool on Derby avenue, New Haven, Satchell 574, 1 Oct. 1892 (UC); Tyler lake, Litchfield county, H. K. Phinney 1122, 4 Sept. 1946 (FC, PH1); in a temporary pool at the head of the lake in the Yale bird preserve, New Haven, Phinney 1074, 28 Jul. 1946 (FC, PH1); in pond, New Haven, D. C. Eaton, Oct. 1880 (D, YU); in a jar in the laboratory, Yale University, New Haven, Satchell 737, 10 Nov. 1893 (FC, UC). QUEBEC: Grenville, Argeoteuil county, J. Brunel 304, 25 Jun. 1931 (FC); Rawdon, Montcalm county, S. M. J. Eudes 253-7 (FC); on wet calcareous cliff on Mount Royal, Montreal, Brunel 457, 18 Sept. 1937 (FC); Ile du Large dans le fleuve St. Laurent entre Longueuil et Boucherville, J. Brunel 64, 11 Sept. 1930 (FC, D); in an aquarium, McGill University, Montreal, R. D. Gibbs, Oct. 1950 (FC); sur rocher humide, embouchure de la Kogaluk, baie d'Hudson, J. Rousseau 209, 16 Jul. 1948 (FC). NEW YORK: in the greenhouse, Barnard College, New York City, H. C. Bold 823, Feb. 1941 (FC); on rocks and walls, Felter's Glen and gorge below Rensselaerville, M. S. Markle 16, 30, 28 Jul. 1946, Jul. 1947 (EAR, FC); Queechy lake, Canaan, E. S. Dorey, 7 Jun. 1937 (D, DT, NY, S); in Hidden lake, Indian Falls, Genesee county, J. Blum 127, 4 Oct. 1948 (FC); in Hundred Acre pond, Mendon Ponds, Monroe county, Blum 407, 15 Oct. 1949 (FC); on dripping rocks along Genesee river, Glen Iris, north of Portageville, Wyoming county, Blum 296, 1 Jun. 1949 (FC). PENNSYLVANIA: [prope Philadelphia] "coll. Dr. Wood misit Billings" (Type of *Palmella Jensenii* Wood in herb. Princeton University, NY); greenhouses [Bethlehem?], F. Wolfe (NY); aquarium, greenhouse, University of Pennsylvania, Philadelphia, F. R. Fosberg & Drouet 2199, Mar. 1938 (D); on wet rocks, Silverthread falls, Dingmans Ferry, Drouet & H. Herpers 3670, 16 Jul. 1941 (FC). MARYLAND: in rock pool, Plummers island in the Potomac river near Cabin John, Montgomery county, E. C. Leonard 3071, 1 Nov. 1953 (FC, US); pool, Cove Point, Calvert county, H. C. Bold 8, 1936 (FC).

VIRGINIA: on dripping rocks by spring northeast of Warm Springs, Bath County, E. S. Luttrell & J. C. Strickland 942, 26 Jul. 1941 (FC, ST); on wet soil near railroad at Ivey road west of Charlottesville, B. F. D. Runk & Strickland 560, 13 Nov. 1939 (FC, ST); on rocks in stream below cave at Goodman's Ferry, Giles county, Strickland 527, 16 Aug. 1939 (FC, ST); concrete spring mask, Old Mill near Newport, Giles county, H. Silva 2776, 26 Jun. 1953 (FC, TENN); dripping sandstone in woods west of Fredericksburg, H. H. Iltis V2, 26 Dec. 1947 (FC, TENN); in pool and on wet soil, Back Bay national wild-life refuge, Princess Anne county, H. A. Bailey, Luttrell, & Strickland 782, 784, 1 Jul. 1941 (FC, ST). WEST VIRGINIA: on cliff east of Stollings, Logan county, A. T. Cross, 14 Nov. 1943 (FC); stepage from a limestone quarry near Athens, Mercer county, E. M. McNeill 216, 9 Nov. 1944 (FC). NORTH CAROLINA: on wood flume of waterwheel, Cherokee, Swain county, H. Silva 1713, 13 Aug. 1949 (FC, TENN); freshwater pond on Shackelford Banks, Beaufort, H. J. Hamm 5, 11 Sept. 1947 (FC); outlet draining a salt marsh, Hawceras, Dare county, L. G. Williams 2a, 12 Jul. 1949 (FC); on moist soil at 924 Urban avenue, Durham, F. A. Wolf, 1 Oct. 1946 (FC); on wet cliffs, Jackson county, H. C. Bold H29, 7 May 1939 (FC); on rocks, White Oak and Otter creeks, Macon county, Bold H204a, H209, 27 Jun. 1939 (FC); on overhanging rocks below Dry Falls, Highlands, Macon county, Bold H219, 29 Jun. 1939 (FC). SOUTH CAROLINA: Easttoe river, Pickens county, Bold H261, H271, Jul.

1939 (FC); Walthalla tunnel, Walthalla, Oconee county, *Bold* H126, H126b, 12 Jun. 1939 (FC). GEORGIA: on wet rocks, Tallulah Gorge, Rabun county, *Bold* H296, 5 Jul. 1939 (FC). FLORIDA: Gainesville, M. A. Brannon T, 369, 384, 399, Jul.—Oct. 1946, 1947 (FC, PC); mangrove swamp south of South lake, Hollywood, Broward county, F. Drouet 10302, 29 Dec. 1948 (FC); in a depression in sand dunes west of Eastpoint, Franklin county, Drouet & C. S. Nielsen 10960, 16 Jan. 1949 (FC, T); wall of canyon, Aspalaga, Gadsden county, J. E. Harmon 7, 4 Nov. 1950 (FC, T); Florida Caverns state park, Florida State University class, 28 Jul. 1952 (FC, T); Deep Lake, Lee county, R. Patrick 10, 31 Dec. 1937 (D, FH, PENN, UC); region of Hendry Creek about 10 miles south of Fort Myers, P. C. Standley 73187, 73448, 73467, 73481, Mar. 1940 (FC); Bonita Beach, Lee county, Standley 92791, 10 Mar. 1946 (FC); limestone, Jackson Bluff, Leon county, C. Jackson, 9 Nov. 1950 (FC, T); Natural Well, northeast of Woodville, Leon county, Nielsen, G. C. Madsen, & D. Crowson 590, 30 Oct. 1948 (FC, T); pool, Teatable Key, L. B. Itham 19, 1 Jul. 1952 (FC); Everglades national park, Itham 12, 1952 (FC); hammock 1 mile northeast of Bear Lake trail, Everglades national park, D. Blake & R. Hauke, 3 Feb. 1953 (FC, T); burtonwood swamps north-west and northeast of Inn, Big Pine key, Monroe county, E. P. Killip 41684, 41931, 41944, Jan.-Feb. 1952 (FC, US); depression in sand dunes east of Pensacola Beach, Drouet, Nielsen, Madsen, Crowson, & A. Faes 10594, 8 Jan. 1949 (FC, T); in the lane leading to the wharf in St. Marks river, Port Leon, Wakulla county, Drouet & E. M. Atwood 11452, 26 Jan. 1949 (FC, T).

ONTARIO: on wet stonework in greenhouse, University of Toronto, W. R. Watson (FH), in a culture jar, Oct. 1937 (FH). OHIO: Adams county: on wet cliff, Beaver pond, L. Lillick & I. Leo 88, 29 Apr. 1933 (FC, DA). Athens county: state hospital ponds, Athens, A. H. Blicke, 3 Oct. 1940 (FC, DA); near Canaanville, Blicke, Jul. 1941 (FC, DA); sandstone on Wilson's Farm near Athens, W. A. Daily 130, 7 Oct. 1939 (FC, DA). Coshocton county: rocks at Butternut falls, North Appalachian Experimental Watershed, L. J. King 718, 1027, 1037, 26 Aug. 1942, 30 May 1943 (EAR, FC). Cuyahoga county: sandstone cliff, Olmsted falls, Olmsted, W. A. & F. K. Daily 564—566, 568—572, 26 Jul. 1940 (FC, DA). Erie county: quarry pool, Kelley's Island, L. H. Tiffany, 18 Jun. 1931 (D); on soil, Kelley's Island, C. E. Talt (FC, DA). Fairfield county: on sandstone at "B. I. S.", J. Wolfe, 20 Oct. 1935 (FC, DA). Greene county: on moist limestone cliff, Clifton Gorge, M. Britton, 3 Apr. 1937 (FC, DA). Hamilton county: soil near pond, Addyston, W. A. & F. K. Daily 167, W. A. Daily 171, 345, 346, 19 Oct. 1939, 20 Jun. 1940 (DA, FC); wet stone wall under bridge near Addyston, J. H. Hoskins 705, 23 Sept. 1933 (DA, FC); greenhouse, University of Cincinnati, L. Lillick 605, Mar. 1934 (DA, FC), Daily 735—739, 9 Sept. 1940 (DA, FC); on flower pot in Lakeview greenhouse, Cincinnati, Daily 435, 8 Jul. 1940 (DA, FC); cement wall, Peterson's greenhouse, Cincinnati, Daily 285, 439, 443, 444, 847, 23 Apr., 9 Jul. 1940, 11 Jan. 1941 (DA, FC); Burnet Woods, Cincinnati, Daily 105, 306, Daily & R. Kosanke 342, 1 Oct. 1939, 7 & 19 Jun. 1940 (DA, FC); rocks in Eden Park conservatory, Cincinnati, Daily 180, 183, 24 Oct. 1939 (DA, FC); on ground and cement walls, reservoir, Eden Park, Cincinnati, Daily 411, 413, 414, 3 Jul. 1940 (DA, FC). Highland county: on rock, Cave canyon, Seven Caves, Paint, W. A. & F. K. Daily 315, 16 Jun. 1940 (DA, FC). Hocking county: sandstones, Old Man's Cave state park, W. A. & F. K. Daily 515, 531, 542, 551, 27 Jul. 1940 (DA, FC); sandstone overhang, Cantwell Cliffs, W. A. & F. K. Daily 689, 31 Aug. 1940 (DA, FC). Ottawa county: quarry near Marblehead, Cacawba island, W. A. & F. K. Daily 577, 591, 25 Jul. 1940 (DA, FC). Vinton county: cliffs 5 miles east of McArthur, Daily 121, 7 Oct. 1939 (DA, FC), Blicke & Kosanke, 10 Jun. 1940 (DA, FC).

KENTUCKY: jar of water and flowerpot in greenhouse, Lexington, B. B. Melmoer 1043, 1136, 19 Sept. 1939, 26 Sept. 1940 (DA, FC); on rock ledge, Natural Bridge, Powell county, Daily 272, 14 Apr. 1940 (DA, FC); limestone, Slade, Fowell county, Daily, A. T. Cross, & Tucker 744—746, 748—753, 755, 757, 760, 5 Sept. 1940 (DA, FC); at and near Sky Bridge, Fowell county, Daily, Cross & Tucker 823, 827, 829, 830, 834, 836, 6 Sept. 1940 (DA, FC); sandstone, Torrent, Wolfe county, W. A. & F. K. Daily & R. Kosanke 477, 487, 14 Jul. 1940 (DA, FC); sandstone, Tight Hollow near Pine Ridge, Wolfe county, Daily, Cross, & Tucker 782, 6 Sept. 1940 (DA, FC), Daily 839a, 5 Oct. 1940 (DA, FC). TENNESSEE: in microcosm, aquarium, and greenhouse, University of Tennessee, Knoxville, H. Silva 1708, 1709, 2346b, 11 Aug. 1949, 9 Sept. 1950 (FC, TENN); rocks around spring, Summertown, Lawrence county, Silva 1066, 29 Jun. 1949 (FC, TENN); Dossiers Cave no. 2 and Bellamy Cave, Montgomery county, Silva 1401a, 1868, 15 Jul. 1949 (FC, TENN); wet dam wall, Cumberland Springs, Moore county, Silva 1034, 29 Jun. 1949 (FC, TENN); mud by roadside slough west of Union City, Obion county, Silva 2248, 14 Jun. 1950 (FC, TENN); wet rocks, Greenbrier Cove and Ramsey Cascade, Sevier county, Silva 358, 413, 24 Nov., 29 Dec. 1946 (FC, TENN); aquarium, State Teachers College, Johnson City, Washington county, Silva 458, 14 Jan. 1947 (FC, TENN); Little River Gorge, Sevier county, A. J. Sharp 4115, 4116, 8 Sept. 1941 (FC, TENN); on dripping rocks near Gatlinburg, R. F. Smart, 21 Aug. 1938 (FC, ST); greenhouse, Vanderbilt University, Nashville, H. C. Bold 9, 5 Oct. 1936 (FC). MICHIGAN: on *Stereodon* sp., Mackinac island, G. E. Nichols, 9 Aug. 1930 (D, NY, YU); on ground, Warren Dunes, Berrien county, G. E. Scharf, 12 Oct. 1946 (FC); Sodon lake west of Bloomfield

Hills, Oakland county, *S. A. Cain*, 9 Dec. 1947 (FC); Lake Ann Louise on highway M77, Schoolcraft county, *H. K. Pbinney 9m41/16-1*, 19 Jul. 1941 (FC, PHI); roadside ditch 1.5 miles north of Mackinaw City, Cheboygan county, *W. L. Culbertson 830*, 9 Jul. 1951 (FC); Mud lake, Yankee Springs, Hastings, *G. T. Velasquez 14*, 4 Aug. 1936 (D); Walnut lake, Oakland county, *T. L. Hankinson*, 6 May 1906 (as *Applanobacca stagnina* in Coll., Hold., & Serch., Phyc. Br.-Amer. no. 1302, FC, L, TA).

INDIANA: limestone cliff, Clifty Falls state park, Jefferson county, *W. A. & F. K. Daily 669*, 4 Aug. 1940 (DA, FC); on rock below dam in Muscatateuck river at North Vernon, Jennings county, *P. K. & W. A. Daily 911*, 23 May 1942 (DA, FC); Nicolson Quarry pond southwest of Alexandria, Madison county, *P. K. & W. A. Daily 2655*, 23 Aug. 1953 (DA, FC); in jar, Butler University, Indianapolis, *C. M. Palmer 98*, 8 Dec. 1926 (DA, FC), *Daily 235*, 24 Nov. 1939 (DA, FC); Riverside fish hatchery ponds, Indianapolis, *Palmer 72*, 4 Aug. 1931 (D, DA, FC), *P. K. & W. A. Daily 1570*, 18 Aug. 1946 (DA, FC); in Lost lake, Culver, Marshall county, *P. K. & W. A. Daily 1514*, 1522, 1523, 3 July 1946 (DA, FC); stone tank in greenhouse, Bloomington, *Palmer 150*, Jan. 1934 (D); Cree lake, 4 miles north of Hendersonville, Noble county, *P. K. & W. A. Daily 1913*, 11 Sept. 1947 (DA, FC); at falls, McCormicks Creek state park, Owen county, *P. K. & W. A. Daily 1831*, 1833—1835, 10 Aug. 1947 (DA, FC); Turkey Run state park, Parke county, *Palmer 12*, 25 Jul. 1931 (DA, FC), *P. Drouot & D. Richards 2469*, 16 Jun. 1939 (FC), *F. K. & W. A. Daily & G. Plummer 1868*, 1875, 16 Aug. 1947 (DA, FC); wet limestone in quarry, St. Paul, Shelby county, *P. K. & W. A. Daily 1171*, 3 Oct. 1943 (DA, FC); Lime lake, adjacent to Lake Gage, 8.5 miles northwest of Angola, Steuben county, *P. K. & W. A. Daily 2468*, 18 Jun. 1951 (DA, FC); in aquaria and laboratory jars, Terre Haute, *B. H. Smith 4*, 25, 26, 93, 96, 228, 229, Apr. 1928—Dec. 1929 (DA, FC); laboratory cultures, Earlham College, Richmond, *M. S. Markle 2*, 3, 5a (DA, EAR, FC), 1947 (FC), *L. J. King 2326*, 2327, Aug. 1944 (EAR, FC); in School street gravel pit west of Richmond, *King 12*, 9 Jul. 1940 (EAR, FC); moist rock under Elk falls near Richmond, *King 209*, 8 Sept. 1940 (EAR, FC).

WISCONSIN: slough, Arbor Vitae lake, Vilas county, *G. W. Prescott 2W254*, 9 Jul. 1937 (D), *Prescott 3W25*, 8 Aug. 1938 (FC); Mountain lake, *C. Juday 3W1*, 31 Jul. 1938 (FC); wet soil in swamp, Two Rivers, Manitowoc county, *H. C. Benke 6295*, 15 Sept. 1944 (FC). ILLINOIS: greenhouse, Northwestern University, Evanston, *K. Damann*, 12 Mar. 1939 (FC), *H. K. Pbinney*, Nov. 1943 (FC, PHI); tank in greenhouse, University of Chicago, *L. J. King*, 20 Jan. 1941 (FC), *K. C. Pan 10600*, 27 Aug. 1954 (D); tanks in greenhouse, Garfield park, Chicago, *J. A. Steyermark, C. Sboop, & Drouot 2444*, 30 Oct. 1938 (FC); culture in Chicago Natural History Museum, *P. A. Barkley 15115*, 24 Aug. 1945 (FC); on clam shells in a field west of Fox river in the north part of Geneva, Kane county, *Drouot & H. B. Louderback 5405*, 24 Jun. 1944 (FC); in a depression in the sand dunes, Dunes state park, Lake county, *Drouot, P. C. Stendley, & Steyermark 3515*, 14 Jun. 1940 (FC, FH); pond, Charleston, Coles county, *E. N. Tremseau*, Nov. 1910 (NY). MISSISSIPPI: wet ground beside the freshwater reservoir in the western part of Gulfport, Harrison county, *Drouot & R. L. Caylor 9943*, 12 Dec. 1948 (FC). MINNESOTA: on cement wall, Minnehaha creek, Minneapolis, *K. Damann*, 28 Aug. 1936 (FC); Itasca state park, *R. Staub*, 5 July 1954 (D), *K. C. Pan 10255*, *Drouot & Pan 11878*, *Drouot, T. Morley & Pan 11896*, *Drouot 12045*, 12074, Jun. 1954 (D, MIN); in tank, University of Minnesota, Minneapolis, *J. E. Tilden*, Mar. 1909 (as *Glossocapsa arenaria* in Tild., Amer. Alg. no. 650, FC). MISSOURI: in Chian's lake, 17 miles west of Columbia, in Howard county, *J. R. Hurt Cl*, 1939 (FC); on mud in small pool by stream, Thayer, Oregon county, *N. L. Gardner 1410*, Jul. 1904 (FC, UC). LOUISIANA: in ditch, Louisiana State University campus, Baton Rouge, *G. W. Prescott Ls13*, 18 Jun. 1938 (FC); barren ground behind Broussard's Beach on the Gulf of Mexico east of Cameron, *Drouot 8823*, 8881, Nov. 1948 (FC); in a drying pool on a road-embankment in the marsh between the arms of the Calcasieu river west of Cameron, *Drouot 8866*, 3 Nov. 1948 (FC); Jefferson Island, Iberia parish, *R. P. Ehrhardt & Drouot 28*, 12 Nov. 1948 (FC); on a shell ridge between Leville and Chenier Caminada, Lafourche parish, *Drouot & P. Viores Jr. 9447*, 26 Nov. 1948 (FC); pool at "Singing Waters", Holden, Livingston parish, *L. H. Flint*, 4 Oct. 1946 (FC); on an embankment, U. S. highway no. 90 east of the road to Chalmette, Orleans parish, *Drouot & Viores 9350*, 24 Nov. 1948 (FC); in a pond, Little Lake Club, Plaquemines parish, *J. N. Gowanloch*, Sept. 1944 (FC); in a ditch entering Bayou du Large just north of Theriot, Terrebonne parish, *Drouot 9287*, 22 Nov. 1948 (FC).

NEBRASKA: low ground, Beeken lake south of Arthur, Arthur county, *W. Kiener 21030*, 5 Jul. 1946 (FC, KI); culture from floodplain pond of Platte river south of Kearney, Buffalo county, *Kiener 16496d*, 6 Nov. 1945 (FC, KI); sandy soil, Platte river floodplain north of David City, Butler county, *Kiener 21575*, 8 Nov. 1946 (FC, KI); soil in grassland west of Champion, Chase county, *Kiener 10620*, 31 Jul. 1941 (FC, KI); in Dewey lake, Cherry county, *B. Palmatier & T. R. Porter 13774a*, 28 Jun. 1936 (FC, KI); soil at edge of gravel pit, Fremont, Dodge county, *Kiener 23919*, 1 Jul. 1948 (FC, KI); wet sand, sand pit lakes, Fremont, *Kiener 13930a*, 14648, 14650, 23 Apr., 23 Jul. 1943 (FC, KI), and laboratory culture, *Kiener 21475b*, 15 Feb. 1947 (FC, KI); Twin

lakes, northwest of Benkelman, Dundy county, *Kiener* 21224, 30 Jul. 1946 (FC, KI); grassland 5 miles north of Haigler, Dundy county, *Kiener* 10498, 25 Jul. 1941 (FC, KI); wet ground near Grand Island, *Kiener* 15123, 28 Aug. 1943 (FC, KI); wet meadow, Palisade, Hayes county, *Kiener* 10828, 5 Aug. 1941 (FC, KI); bank of Elkhorn river west of O'Neill, Holt county, *Kiener* 11210, 21 Aug. 1941 (FC, KI); culture from spring, Lonergan creek, Lemmyne, Keith county, *Kiener* 23075a, 20 Aug. 1948 (FC, KI); low ground, Lincoln, *Kiener* 9734, 11 Dec. 1940 (FC, KI); on limestone, University greenhouse, Lincoln, *Kiener* 13627, 16 Jan. 1943 (FC, KI); swampy soil 10 miles north of North Platte, *Kiener* 17525, 1 Sept. 1944 (FC, KI); cultures from creek south of Gretsa, Sarpy county, *Kiener* 13686, 13686c, 16 Jul. 11 Aug. 1944 (FC, KI). TEXAS: Clear lake, Harris county, *H. K. Pbinney* 4T41/5b, 3 Sept. 1941 (FC, PHI); on sand at Blind bayou, Galveston island, *Pbinney* 2T41/2, 30 Aug. 1941 (FC, PHI); moist sinkhole, Granite mountain, 2 miles north of Marble Falls, Burnet county, *P. A. Barkley & H. V. Copeland* 8, 25 Jul. 1946 (FC, TEX); permanent pool, Austin, *Barkley* 44alg23, 25 Jul. 1944 (FC, TEX). WYOMING: in swamp near Towner lake, Albany county, *W. G. Solboim* 24, 13 Jul. 1940 (FC). COLORADO: in Lily lake near Estes Park, Larimer county, *W. Kiener* 13175, 22 Sept. 1942 (FC, KI); Hoosier Pass, Park county, *Kiener* 6705a, 1 Sept. 1938 (FC, KI). UTAH: dripping cliffs, Mount Timpanogos, Utah county, *A. O. Garrett* 46, 25 Jul. 1925 (FC, UC). ARIZONA: on rocks in spray from Havamu falls, Coconino county, *E. U. Clover*, 28 Sept. 1940 (FC, MICH). ALASKA: Pt. Barrow (FH); lakes, Mileposts 70 and 127 (from Anchorage), Glenallen highway, *D. K. Hilliard* 34, 57, Sept. 1953 (FC); Mileposts 220 and 248 (from Anchorage), Richardson highway, *Hilliard* 24, 26, 6 Sept. 1953 (FC). WASHINGTON: Friday Harbor, *J. H. Hoskins*, Summer 1921 (DA, FC). OREGON: in aquarium, Lewis and Clark College, Portland, *S. B. Plins* 3, 21 Nov. 1947 (FC). CALIFORNIA: *W. J. V. Osterhout* 1777, 7 Jul. 1906 (FC, UC). Alameda county: on dripping boards, Lake Chabot, San Leandro, *Osterhout & N. L. Gardner*, 14 Jun. 1902 (as *Gloeobacca cystifera* in Coll., Hold., & Setch., Phyc. Bor.-Amer. no. 1204, FC, L, TA); spring on hillside, Arroyo Mocho, Mt. Hamilton range, *Gardner & A. Carter* 8006, 22 Nov. 1936 (FC, UC); cultures in the botanical laboratory, University of California, Berkeley, *Gardner* 1462 (UC), 2251 (UC), 6572, 6726, 6953, 7143, 7197, 7390, 7808, 1905—1933 (FC, UC); on soil and in rice culture, Agricultural greenhouse, University of California, Berkeley, *Gardner* 7194, 7209, Mar. 1933 (FC, UC); on flowerpots in the greenhouse, Department of Botany, University of California, Berkeley, *Gardner* 7171, 7366a, 15 Jan., 3 Sept. 1933 (FC, UC); in a flowerpot and cultivated in a hothouse in the courtyard of the Life Sciences Building, Berkeley, *Gardner* 6951, 7023, Jan. 1932 (FC, UC). Contra Costa county: culture from shaded ditch by mud-bath house, Byron Hot Springs, *Gardner* 7715, 11 Apr. 1933 (FC, UC). Humboldt county: culture from Eureka collected by H. E. Parks, *Gardner* 6728a, 7152, 17 Jan. 1932, 8 Jan. 1933 (FC, UC). Inyo county: Nevares spring near Cow creek, Death Valley, *G. J. Hollenberg* 2279, 7 Apr. 1937 (D). Los Angeles county: Pasadena, *A. J. McCluschie* 1090 (UC); Puddingstone creek and dam, La Verne, *Hollenberg* 1614a, 19 Dec. 1933 (FC, UC), *M. Kneeland* 1664, 9 Dec. 1936 (FC, UC); culture, University of Southern California, Los Angeles, *G. R. Johnstone*, 27 Jan. 1940 (FC); on wet concrete, dam in San Dimas canyon near La Verne, *Hollenberg* 2077A, 20 Apr. 1934 (D, NY). Marin county: *V. Duran* 6670, 6946, Jan. 1931, 1932 (FC, UC); culture from Almoente and Alto collected by H. E. Parks, *Gardner* 6566, 6570, 13 Jan. 1931 (FC, UC); on moist soil, Lake Lagunitas, *Osterhout*, Jul. 1906 (as *Aphanothece microscopica* in Coll., Hold., & Setch., Phyc. Bor.-Amer. no. 1702c, FC, L, TA), *W. A. Setchell & Osterhout*, 23 Sept. 1908 (UC), *Setchell* 6429a, 1908 (FC, UC); on dripping rocks, Mill Valley works, *Gardner*, 20 Jul. 1906 (as *Gloeobacca rupestris* in Coll., Hold., & Setch., Phyc. Bor.-Amer. no. 1703b, FC, MICH, TA), *Gardner* 1791 (TA, UC); Mill Valley, *Gardner* 4185, Mar. 1918 (UC), *Osterhout*, Nov. 1906 (UC); on dripping rocks, Mt. Tamalpais, *Osterhout & H. D. Densmore*, 4 Jul. 1906 (as *G. rupestris* in Coll., Hold., & Setch., Phyc. Bor.-Amer. no. 1703a, FC, L, MICH, TA), *Gardner* 1775, 4 Jul. 1906 (FC, UC), *Gardner* 3113, May 1916 (UC). Riverside county: dripping rocks, Palm Canyon, *Hollenberg* 1632, 29 Mar. 1935 (FC, UC). San Bernardino county: Arrowhead Hot Springs, *Setchell* 1539, 1545, 19 Dec. 1896 (FC, UC), *Gardner* 17, 18, 27 May 1930 (FC, UC). San Diego county: along a stream west of Dulzura, *P. Drouet & J. F. Macbride* 4827, 18 Oct. 1941 (FC). San Francisco: Fort Point, *Gardner* 1778 (UC), on rocks, *Gardner* (as *Gloeocapsa polydermaica* in Coll., Hold., & Setch., Phyc. Bor.-Amer. no. 1751b, FC, L, TA); on moist sand, Mountain lake, *Gardner* 1462, 17 May 1905 (UC; as *Aphanothece microscopica* in Coll., Hold., & Setch., Phyc. Bor.-Amer. no. 1702a, FC, L, TA); in the conservatory, Golden Gate park, *Gardner* 7263, 7592, 3 May, 19 Sept. 1933 (FC, UC); in Plath's greenhouse, *Duran* 6957, 8 Jan. 1932 (FC, UC), *Gardner* 7246, 20 Apr. 1933 (FC, UC); floating in Lake Merced, *Gardner* 1583a, 13 Nov. 1905 (UC; as *A. microscopica* in Coll., Hold., & Setch., Phyc. Bor.-Amer. no. 1702b, FC, L, TA); on a bank of soft sandstone, Lake Merced, *Gardner* 844, Nov. 1902 (UC; as *Gloeobacca rupestris* in Coll., Hold., & Setch., Phyc. Bor.-Amer. no. 1703c, FC, L, MICH, TA); culture from Lake Merced, *Gardner* 7427, 24 Jul. 1933 (FC, UC). Santa Clara county: culture from Milpitas collected by H. E. Parks, *Gardner* 6659, 1931 (UC). Tulare county: on damp soil, Exeter, *H. E. Parks*, Dec. 1930 (UC); in shallow water of Tule river, Porterville, *Drouet & M. J. Groebbeck* 4448, 4450, 4 Oct. 1941 (FC).

PUERTO RICO: on rocks, Arroyo de los Corchos, Adjuntas to Jayuya, N. Wille 1697, 1703, Mar. 1915 (NY); on limestone, Arecibo to Utuado, Wille 1469b, 1470, Mar. 1915 (NY); Cabo Rojo, A. A. Heller 4435, Jan. 1890 (FC); rocks 7 km. east of Coamo, Wille 1873, Mar. 1915 (NY); Coamo Springs, Wille 372, 11, Jan. 1915 (NY); 1861a, Mar. 1915 (FC, UC); on stones near Maricao, Wille 1129, Feb. 1915 (NY); on a water pipe near a stream, Maricao, Wille 1147 (Type of *Aphanobeco conferta* var. *brevis* Gardn., NY [Fig. 160]; isotype, D), 1147a, Feb. 1915 (NY, D); on brick wall, Experiment Station, Mayaguez, Wille 967, Feb. 1915 (NY); Hacienda Catalina near Palmer, Wille 754a, Feb. 1915 (Type of *Aphanobeco Richieriana* var. *major* Gardn., NY); on rocks near Penuelas, Wille 1848a, Mar. 1915 (Type of *Aphanobeco microscopica* var. *granulosa* Gardn., NY [Fig. 151]); on wall of Fort Cristobal, San Juan, Wille 2003c (NY), A. Lutz 2018 (FC, UC), Mar. 1915; on wall of a cemetery, San Juan, Wille 131a, Dec. 1914 (Type of *Gloeocapsa quaternata* var. *major* Gardn., NY [Fig. 146]); on a wall by Hotel Nava, Santurce, Wille 54a, Dec. 1914 (Type of *Gloeobeco interspersa* Gardn., NY [Fig. 155]); on tree trunk on hills near Santurce, Heller 4333, Jan. 1890 (FC); on limestone at the hacienda, Laguna Toruquero, Wille 866a, Feb. 1915 (NY); on limestone, Utuado to Adjuntas, Wille 1640a, Mar. 1915 (Type of *Anacystis cylindracea* Gardn., NY [Fig. 156]); on rocks between Utuado and Adjuntas, Wille 1635a (D, NY), 1637a (FH, NY), 1650ab (NY), Mar. 1915; on rocks about 10 km. north of Utuado, Wille 1525 (FC, UC), 1528a, 1566, 1568 (NY), Mar. 1915. JAMAICA: Middle Morant cay, V. J. Chapman 11, 14, 1939 (FC); on concrete wall, Arntully, C. R. Orcutt, 19 May 1928 (FC, US). MEXICO: Eisenbahnsimpfe bei Vera Cruz, F. Müller 167, Feb. 1853 (Type of *Palmella heterococca* Kütz., L [Fig. 153]); paredes húmedas, Cueva de Sambula, Motul, Yucatan, Exp. Rec. Hid. 97-143, 18 Mar. 1947 (FC); island in Rio Sanca Catarina near Santa Catarina, Nuevo Leon, F. A. Barkley 146-09, 16 Aug. 1944 (FC, TEX); in crevices of rocks at Aurora, south of Baviacora, Sonora, F. Drouet, D. Richards, & W. A. Lockhart 2949, 16 Nov. 1939 (FC); in seepage near highway between Morelia and Ciudad México, F. B. Plummer, 5 Sept. 1943 (FC, TEX); on sides of cave and on bank of Rio Tuxpan, San José de Purúa, Michoacan, R. Patrick 431, 443, 4 Aug. 1947 (FC, PH); Lake Patzcuaro, Michoacan, Patrick 510, 517, 10 Aug. 1947 (FC, PH).

GUATEMALA: on limestone bluff, Cerro de Agua Torcuca near Cubilguitz, dept. Alta Verapaz, J. A. Stoyermark 44588, 4 Mar. 1942 (FC); damp bank north of Chiantla, dept. Huehuerenango, P. C. Standley 82585, 6 Jan. 1941 (FC); on wet banks along stream, Jalapa, Stoyermark 32149, 28 Nov. 1939 (FC); in cold trickle by road between San Francisco El Alto and Momostenango, dept. Totonicapán, Standley 83987, 19 Jan. 1941 (FC); on mud near the electric plant of Rio Hondo, base of Sierra de las Minas, dept. Zacapa, Standley 74057, 11 Oct. 1940 (FC). HONDURAS: in shallow running water near Yucarán, dept. El Paraíso, Standley 1218, 11 Dec. 1946 (FC); on wet masonry and banks, El Zamorano, dept. Morazán, Standley 4413, 4416, 4422, 4423a, 4426, Feb. Mar. 1947 (FC). NICARAGUA: on wet bank, Chichigalpa, dept. Chinandega, Standley 11461, Jul. 1947 (FC); on tree trunk, La Libertad, dept. Chontales, Standley 8845, May-June 1947 (FC); on tree trunks, Casa Colorada near El Crucero, summit of Sierra de Managua, Standley 8151, 8213, May 1947 (FC). PANAMA: in north arm of Gigante bay, Canal Zone, C. W. Dodge, 9 Aug. 1925 (D, MO); in cave along San Carlos river, G. W. Prescott & R. L. Caylor CZ125, 10 Sept. 1939 (FC). BRAZIL: Pará: on moist wall of mill-race, Santa Isabel, east of Belém, P. Drouet 1534, 10 Jul. 1935 (D); on rocks in seepage from artificial spring, Bosque Rodriguez Alves, Belém, Drouet 1530, 1 Jul. 1935 (D). Ceará: in pools by road 3 km. south of Porangaba, Fortaleza, Drouet 1378, 23 Aug. 1935 (D, FH, MICH, NY); in a temporary reservoir in Rio Marangapinho, Barro Vermelho, Fortaleza, Drouet 1499, 22 Nov. 1935 (D, FH, NY). ECUADOR: in rupibus humidis prope Baños (Tungurahua), G. Lagerheim, Dec. 1891 (S; as *Gloeobeco lepidarium* in Wittn., Nordst., & Lagerh., Alg. Exs. No. 1545, L). PERU: agua alcalina, Chan-Chan y Buenos Aires, Trujillo, N. Ibañez H. "P", "W", 19 & 27 Oct. 1952 (FC). ARGENTINA: Cap. Federal, S. A. Guarrera 2201, 20 Sept. 1938 (FC); mpezando una pared, húmeda, Buenos Aires, Guarrera 3343, 25 Aug. 1939 (FC); culture in Instituto Bacteriológico, Dept. Nacional de Higiene, Buenos Aires, D. Rabinovich CP20, Dec. 1943 (FC). CHILE: in pool, Punta Arenas, R. Thaxter, 1905-1906 (D, FH).

HAWAIIAN ISLANDS: rocks on cliff, Nuuanu point, Honolulu, G. T. Shigenra, 4 Mar. 1939 (FC, PH); in a rice field, Aiea, Oahu, J. E. Tilden, 2 June 1900 (as *Aphanobeco prasina* in Tild., Amer. Alg. no. 498, FC; as *Gloeobeco fuscolinea* in Tild., Amer. Alg. no. 500, FC); in brackish stagnant water, Mebeiwai, Makao, Koolauloa, Oahu, Tilden, 20 Jun. 1900 (as *Aphanobeco prasina* in Tild., Amer. Alg. no. 498B, FC); on wet cliffs south of Laupahoehoe, Hawaii, Tilden, 10 Jul. 1900 (as *Gloeocapsa quaternata* in Tild., Amer. Alg. no. 499, FC). MARSHALL ISLANDS: on soil of open coconut grove, Taka islet, Taka atoll, F. R. Fosberg 33733, 5 Dec. 1951 (FC, US); on flat on south end of Bikar islet, Bikar atoll, Fosberg 34576, 6 Aug. 1952 (FC, US); ocean side of Eneen-Erdik islaod, Amo atoll, L. Horwitz 9024, 7 Jul. 1951 (FC). SOCIETY ISLANDS: Tahiti, J. E. Tilden, Oct. 1909 (as *Aphanobeco microspora* in Tild., So. Pacific Alg. no. 3, 1, MIN, UC); on dripping rocks, Tahara mountain, Tahiti, W. A. Seicholl & H. E. Parks 5067a, 24 May 1922 (UC); moist cliffs near mouth of Papenu river, Tahiti, Seicholl & Park 5351, 5 Jun. 1922 (UC).

SAMOA: on shaded tree-trunks, roadside beyond Aua, Tutuila island, *Seibell* 1178, 4 Jul. 1920 (UC); with *Haisallia Rechingeri* Wille, Upolu, K. H. Rechinger 5137, 1915 (Type of *Gloeotilbea samoensis* f. *major* Wille in the slide collection of N. Wille, O). GILBERT ISLANDS: surface of a Babai pit, center of North island, Onotoa, E. T. Mout 8324, 8 Aug. 1951 (FC); bottom of abandoned Babai pit, Tahuarorae island, Onotoa, Mout 8242, 26 Jul. 1951 (FC). NEW ZEALAND: Rangitoto island (Waitemata), V. J. Chapman, Jul. 1946 (FC); Oroago Bay (Bay of Islands), Chapman, Jan. 1948 (FC); Brown's island, Auckland harbor, Chapman, 18 Mar. 1950 (FC); in cave, fresh water, Kororureka Point (Bay of Islands), I. B. & V. R. Warnock, 16 Jan. 1955 (as *Coccochloris stagnina* in Tild., So. Pacific Pl., 2nd Ser., no. 358, FC).

PHILIPPINES: Bataan: on damp stone wall at Balanga, G. T. Velasquez 2404, 12 Jul. 1950 (FC, PUH); soil by the river, Panilao, Pilar, Velasquez 2412, 13 Jul. 1950 (FC, PUH). Batangas: floating in rice fields at Lips, Velasquez 595a, 12 Jan. 1941 (FC). Iloilo: soil in ruined church, Dueñas, J. D. Soriano 1082, 20 Jul. 1952 (FC, PUH); in Delicana's fishpond, Damangas, Soriano 1595, 1596, 25 Jan. 1953 (FC, PUH); on adobe wall of churchyard, Guimhal, Soriano 1570, 10 Jan. 1953 (FC, PUH); on aquarium, Iloilo College, Iloilo City, Soriano 1543, 10 Dec. 1952 (FC, PUH); in Griños fishponds, Leganes, Soriano 1591, 11 Jan. 1953 (FC, PUH); on damp walk at Catholic Church, Janiuay, Soriano 1034, 23 Jun. 1952 (FC, PUH); on interior walls of ruined Catholic Church, Leon, Soriano 1820, 15 Feb. 1953 (FC, PUH); on sides of dam, Oganon river irrigation system, San Miguel, Soriano 1050, 29 Jun. 1952 (FC, PUH); on interior walls of ruined church, Santa Barbara, Soriano 1038, 23 Jun. 1952 (FC, PUH). Leyte: in pond in coral pit near airstrip, Tacloban, M. E. Britton 153, 10 Oct. 1945 (FC). Manila: Soriano 890, 5 May 1951 (FC, PUH); near Manila, R. C. McGregor 86, 23 Oct. 1904 (FC, UC); on sandy soil at Dewey boulevard, Velasquez 90, 12 Nov. 1939 (FC); on stone wall along Pennsylvania street, Velasquez 108a, 18 Nov. 1939 (FC); on walls and in an aquarium and a tank, Velasquez 468, 574, 591, 18 Mar., 26 Nov. 1940, 11 Jan. 1941 (FC); in concrete tank at Pennsylvania and California streets, Camina, Soriano 415, 16 Oct. 1949 (FC, PUH); in standing water in front of old Sto. Domingo church, Intramuros, Soriano 409, 11 Oct. 1949 (FC, PUH); on soil of garden, San Andres elementary school, Malate, Soriano 422, 17 Oct. 1949 (FC, PUH); on high wall of Malate church, Soriano 529, 3 Dec. 1949 (FC, PUH); on bark of acacia tree, 281 Cristobal street, Paco, Soriano 644, 26 Mar. 1950 (FC, PUH); in a rice field at Pandacan, Velasquez 572, 10 Aug. 1940 (FC); on adobe walls and soil and in standing water, Paodacan, Soriano 348, 350-352, 17 Aug. 1949 (FC, PUH); on wall under roof garden, Quiapo, Soriano 482, 22 Dec. 1949 (FC, PUH); on soil and adobe walls, Sampaloc, Soriano 70, 391, 393-395, 680, 751, 758, Jun. 1948-Nov. 1950 (FC, PUH); moist soil in school grounds, San Nicolas, Soriano 437, 21 Oct. 1949 (FC, PUH); in standing water, 2523 Herran street, Santa Ana, Soriano 445, 446, 24 Oct. 1940 (FC, PUH); on adobe fence, La Concordia College, Santa Ana, Soriano 551, 11 Dec. 1949 (FC, PUH); on inundated lot, Santa Cruz, Soriano 429, 19 Oct. 1949 (FC, PUH); in canal, Singalong, Velasquez 260, 3 Jan. 1940 (FC); in standing water and on an adobe fence, Singalong, Soriano 367, 588, 12 Sept., 26 Dec. 1949 (FC, PUH); on soil and walls, Tondo, Soriano 330, 517, 3 Aug., 27 Nov. 1949 (FC, PUH). Laguna: hot spring, Talakay, College, Velasquez 2464, 2465, 8 Aug. 1948 (FC, PUH). Mindoro: artesian well and pond, Tabinay Malit, Puerto Galera, Velasquez 728, 729, 926, Apr. 1941 (FC); on a drying pond of brackish water at Balatero Malaki, Puerto Galera, Velasquez 944, 22 Apr. 1941 (FC); near the waterfall at Bisayaan, Puerto Galera, Velasquez 1954, 25 May 1949 (FC, PUH); Big Balatero, Puerto Galera, Velasquez 7, 25 Apr. 1953 (FC, PUH). Palawan: Cuyo, Velasquez 2848, 9 Jun. 1951 (FC, PUH); Araceli, Velasquez 2933, 15 Jun. 1951 (FC, PUH). Rizal: on drainage canal, University of the Philippines, Diliman, Soriano 236-3, 20 Jan. 1949 (FC, PUH); rice paddy near Km. 17, Marikina valley, Soriano 935, 18 May 1952 (FC, PUH); rice paddy, Barrio Mayanbayan, Marikina, Soriano 921, 16 May 1952 (FC, PUH); rice field at Barrin Mangabao, Pasig, Soriano 937, 18 May 1952 (FC, PUH); rice field, Broadway street, Quezon City, Velasquez 178, 13 Dec. 1939 (FC); moist ground, University of the Philippines campus, Diliman, Quezon City, Velasquez 2425, 2454, 22 & 28 Jul. 1950 (FC, PUH); in creek behind Christ the King Seminary, Kamuning, Quezon City, Velasquez 2538, 2540, 19 Aug. 1950 (FC, PUH); rice paddies along road to Taytay, Pasig, Soriano 930, 18 May 1952 (FC, PUH). Sulu Archipelago: on adobe, Sanga-Sanga, Tawi-Tawi, Velasquez 3218, 12 May 1952 (FC, PUH).

CHINA: Fukien: Fulung hot springs, H. H. Chung A439 (Type of *Aphanotilbea gelatinosa* Gardn., FH; isotype, D). A454 (MICH, NY), Sept. 1926; Huangchun near Foochow, Chung A432, Sept. 1926 (D, FH). Kiangsu: on rock and in ditch, Nanking, C. C. Wang 317, 373, 16 & 20 Apr. 1930 (FC, UC). Szechwan: on wet rock, Lung-chi bridges, Nanzschwan, H. Chu 716, 7 Aug. 1945 (FC); on wet rock, Thousand Gods Cliff, Nanzschwan, H. Chu 774, 9 Aug. 1945 (FC); under dripping rock, Ko-Fu-Tung, Mt. King-Fu, Nanzschwan, H. Chu 849, 15 Apr. 1945 (FC); on rock in rapid stream, Shan-Shan-Kow, Omei, Chu 1329, 21 Aug. 1942 (FC); on rock under dripping cliff, Hu-Lung-Kiang, Omei, Chu 1336, 22 Aug. 1942 (FC); on dripping cliff, Elephant pool, Omei, Chu 1356, 23 Aug. 1942 (FC); on wet rock, Lung-Men-Tung, Omei, Chu 1389, 25 Aug. 1942 (FC). NEW GUINEA: open creek, H. J. Rogers NG23, 2 Oct. 1944

(FC). INDONESIA: Sumatra: an warmem Stein 10 cm. ober Wasser, am Boden des unteren Beckens, Bukit Kili, *Rutimer*, 1928-29 (Type of *Aphanobacca bullosa* var. *minor* Geid., slide no. SKW1g in the collection of L. Geider); Bukit Kili Kergil, 5 cm. ober Wasser an Steinen, *Thienemann*, 7 Mar. 1939 (in slide collection of L. Geider); Kalkstalakriten, Grosser Wasserfall, Kalkruife von Panjingahan am Westufer des Sees, *Rutimer*, 6 Mar. 1929 (Type of *Gloanobacco rupestris* var. *major* Geid., slide no. SkB3aß in the collection of L. Geider). Flores: Bari, *A. Weber-van Bosse* 1192, Nov. 1888 (D. L.). Celebes: Tempe, *Weber-van Bosse* 856, Oct. 1888 (L.). AUSTRALIA: on dripping rocks, Paradise cave, Noosa, Queensland, *A. B. Cribb* 99, 24 May 1949 (FC); Point Lonsdale, Victoria, *A. Nash & T. T. Earle*, Nov. 1934 (as *Aphanobacca stagnina* in Tild., So. Pac. Pl., 2nd Ser., no. 169, FC); Muston, American River inlet, Kangaroo island, South Australia, *H. B. S. Womersley* A6718b (K12305b), 10 Jan. 1948 (FC). BURMA: Pegu, Northern Yomah, Mayzelee Choung?, *S. Kurz* [1854, 20 Jan. 1868] (Type of *Gloeoacapsa luteo-fusca* Mart. in herb. Agardh, LD; isotypes, K, L); Arracan, Kolodyne river, *S. Kurz* 1960 (L); Royal lake, Rangoon, *L. P. Khanna* 572, 2 Dec. 1935 (FC); Maymyo, Northern Shan States, *Khanna* 639, 12 May 1936 (FC); Monywa lake, Monywa, *Khanna* 857-859, 864, 867, 880, 883, 889-891, 15 Mar. 1938 (FC). INDIA: on paths in the Royal Botanic Garden, Calcutta, *S. Kurz* 7882, Jul. 1868 (L).

3. COCCOCHLORIS ELABENS Drouet & Daily, *Lloydia* 11: 77. 1948. *Micraloa elabens* Brébisson in Meneghini, Mem. R. Accad. Torino, 2nd ser., 5 (Sci. Fis. & Mar.): 104. 1843. *Microcystis elabens* Kützing, Tab. Phyc. 1: 6. 1846. *Diplocystis elabens* Trevisan, Sagg. Monogr. Alg. Coccot., p. 40. 1848. *Polycystis elabens* Kützing, Sp. Algar., p. 210. 1849. *Microhaloa elabens* Brébisson ex Ainé, Pl. Crypt.-Cellul. du Dept. Saone-et-Loire, p. 259. 1863. *Anacystis elabens* Setch. & Gardn. in Gardn., Univ. Calif. Publ. Bot. 6: 455. 1918. *Aphanothece elabens* Elenkin, Monogr. Algar. Cyanophyc., Pars Spec. 1: 146. 1938. —Type from Falaise, France (L). FIG. 168.

Palmella Castagnei Kützing, Tab. Phyc. 1: 9. 1846. *Oncobrysa Castagnei* Brébisson pro synonym. in Kützing, loc. cit. 1846. *Cagniardia Castagnei* Trevisan, Sagg. Monogr. Alg. Coccot., p. 51. 1848. *Aphanocapsa Castagnei* Rabenhorst, Fl. Eur. Algar. 2: 50. 1865. *Aphanobacca Castagnei* Rabenhorst, Fl. Eur. Algar. 2: 64. 1865. *Coccochloris Castagnei* Drouet & Daily, *Lloydia* 11: 77. 1948. —Type from Aix, France (L).

Palmella pulchra Kützing, Sp. Algar., p. 214. 1849. *Aphanocapsa pulchra* Rabenhorst, Fl. Eur. Algar. 2: 49. 1865. *Microcystis Grevillei* f. *pulchra* Elenkin, Monogr. Algar. Cyanophyc., Pars Spec. 1: 129. 1938. —Type from Hanau, Germany (L).

Protococcus elongatus Nägeli in Kützing, Sp. Algar., p. 197. 1849. *Synochococcus elongatus* Nägeli, Gart. Einz. Alg., p. 56. 1849. —Type from Zürich, Switzerland (ZT).

Synochococcus violaceus Grunow in Rabenhorst, Fl. Eur. Algar. 3: 419. 1868. —Type from Wagram, Austria (W).

Polycystis Packardii Farlow in Packard, Amer. Nat. 13: 702. 1879. *Microcystis Packardii* Tilden, Minn. Alg. 1: 36. 1910. *Aphanobacca Packardii* Setchell in Daniels, Amer. Nat. 51: 502. 1917. —Type from Great Salt lake, Utah (FH). FIG. 164.

Aphanobacca utahensis Tilden, Amer. Alg. 3: 297. 1898. *A. salina* f. *utahensis* Elenkin, Monogr. Algar. Cyanophyc., Pars Spec. 1: 151. 1938. —Type from Great Salt lake, Utah (MIN). FIG. 169.

Synochococcus parvus Migula, Crypt. Germ., Austr. & Helvet. Exs. 26-27 (Alg.): 123. 1906. —Isotypes from Lainz near Vienna, Austria (MICH, NY, TA).

Synochococcus curtus Setchell in Collins, Holden & Setchell, Phyc. Bor.-Amer. 28: 1351. 1907. —Type from Oakland, California (UC). FIG. 167.

Microcystis elabens var. *minor* Nygaard, Vidensk. Medd. Dansk Naturh. Foren. Kjøbenhavn. 82: 204. 1926. —Type from Kai islands, Indonesia (in the collection of G. Nygaard).

Aphanobacca microscopica var. *congesta* W. R. Taylor, Proc. Acad. Nat. Sci. Phila. 80: 85. 1928. —Type from Kootenay country, British Columbia (TA).

Aphanobacca conglomerata Rich, Trans. Roy. Soc. S. Africa 20: 185. 1932. —Type from Cape Town, South Africa (D). FIG. 166.

Aphanobacca Lebrunii DuVigneaud & Symoens, Inst. Parcs Nat. Congo Belge, Explor. Parc Nat. Albert, Mission J. Lebrun (1937-1938) 10: 9. 1948. —Type from Parc National Albert, Belgian Congo (BR). FIG. 165.

Aphanobacca minor Frémy ex J. de Toni, Diagn. Alg. Nov. I. Myxophyc. 10: 959. 1955. —Type from Dutch West Indies (L).

Original specimens have not been available to us for the following names; their original descriptions are here designated as the Types until the specimens can be found:

Aphanobacca curvata Lagerheim, Öfvers. K. Sv. Vet.-Akad. Förh. 40(2): 44. 1888.

Synechococcus Cedrorum Sauvageau, Bull. Soc. Bot. France, ser. 2, 14: cxv. 1892.

Aphanotheca Stuhlmannii Hieronymus in Engler, Pflanzenwelt Ostafri. C: 8. 1895. *A. Kublmannii* Hieronymus ex Geitler, Rabenh. Krypt.-Fl. 14: 171. 1932.

Bacularia coarulescens Borzi, Nuova Notarisa 1905: 21. 1905. *Aphanotheca coarulescens* Geitler, Rabenh. Krypt.-Fl. 14: 173. 1932. *A. Geitleri* J. de Toni, Noter. Nomencl. Algol. 3: 1936.

Aphanotheca salina Elenkin & Danilov, Bull. Jard. Imp. Bot. Pierre le Grand 15: 180. 1915.

Glaucobeco linearis var. *composita* G. M. Smith, Bull. Wisconsin Geol. & Nat. Hist. Surv. 57: 46. 1920. *Rhabdoderma lineare* f. *compositum* Hollerbach in Elenkin, Monogr. Algar. Cyanophyc., Pars Spec. 1: 44. 1938.

Microcystis elabentoides Zalesky, Rév. Gén. de Bot. 38: 33. 1926.

Microcystis aphanothecoides Zalesky, Rév. Gén. de Bot. 38: 33. 1926.

Microcystis angulata Zalesky, Rév. Gén. de Bot. 38: 34. 1926.

Microcystis floccosa Zalesky, Rév. Gén. de Bot. 38: 34. 1926.

Microcystis globosa Zalesky, Rév. Gén. de Bot. 38: 34. 1926.

Aphanotheca glebulenta Zalesky, Rév. Gén. de Bot. 38: 34. 1926.

Aphanotheca cancellata Zalesky, Rév. Gén. de Bot. 38: 35. 1926.

Chroococcus kerguelensis Wille, Deutsche Südpolar-Exped. 1901—03, 8: 414. 1928.

Synechococcus elongatus f. *minor* Wille, Deutsche Südpolar-Exped. 1901—03, 8: 417. 1928.

Dzentsia salina Woronichin, Bull. Jard. Bot. Princip. U. R. S. S. 28: 155. 1929.

Aphanotheca nosiopsis Skuja, Acta Horti Bot. Univ. Lav. 7: 45. 1932.

Aphanotheca halophysica Frémy in Hof & Frémy, Rec. Trav. Bot. Néerl. 30: 152. 1933.

Aphanocapsa benaresensis Bharadwaja, Proc. Indian Acad. Sci. 2: 96. 1935.

Aphanotheca korukurae Lami, Rév. Algol. 11: 221. 1938.

Synechococcus inbalsus Skuja, Acta Horti Bot. Univ. Lav. 11—12: 44. 1939.

Synechococcus Koidzumii Yoneda, Acta Phytotax. & Geobot. 13: 97. 1943.

Plantae aeruginosae, olivaceae, luteolae, violaceae, vel roseae, microscopicae vel mactoscopicae, 1—pluri—multi-cellulares, cellulis in divisione binis quadrato-sphaericis usque ad elliptico-cylindraceas, aetate provecta cylindraceis, ad apices truncato-rundis, diametro 2—6 μ crassis, usque ad 8-plo longiores, rectis, in matrice gelatinosa saepe conferte completis; gelatino vaginale hyalino, homoganeo, nonnumquam omnino diffuente; protoplasmate aerugineo, olivaceo, luteolo, violaceo, vel roseo, homoganeo vel granuloso. FIGS. 164—169.

On wet rocks, wood, and soil, in seepage, in shallow fresh, brackish, and marine waters, and in the plankton. The smaller growth-forms of this species may sometimes be confused with those of *Anacystis montana*. Where the cells are large, they may be distinguished from cells of *Coccochloris stagnina* by their more cylindrical shape and their apparently truncate ends.

Specimens examined:

GERMANY: Grunewaldsee (bei Berlin), am Ufer, P. Hennings, Mai 1888 (as *Coccochloris piscinalis* in Henn., Phyk. March. no. 44, FH, L; in Hauck & Richt., Phyk. Univ. no. 240, L); Schlachtensee (bei Berlin), Hennings, Aug. 1892 (as *C. piscinalis* in Henn., Phyk. March. no. 44, FH, L); Leipzig, O. Bulnheim (FH); Polenx bei Wurzen, Bulnheim, 1859 (FH, NY); Tortmoor, Wurzen bei Leipzig, Bulnheim (B); Leipzig, Altmannsdorf, P. Richter (UC); Hanau, Tbeobald (Type of *Palmella pulchra* Kütz., L; isotype, UC). AUSTRIA: in fons fundo prope Wagrain Austriae superioris, de Mörl, Aug. 1862 (Type of *Synechococcus violaceus* Grun., W); Tiergarten von Lainz unweit Wien, in Wassergefassen weiter cultiviert, K. H. Reebinger, Oct. 1904 (isotypes of *S. parvus* Mig., Crypt. Germ., Austr., & Helv. Exs., Alg. no. 123, MICH, NY, TA). SWITZERLAND: Zürich, im Kazensee, Überzug auf Schlamm am Ufer, C. von Nägeli, Jul. 1847 (Type of *S. elongatus* Näg. and *Protococcus elongatus* Näg. with *Leptothrix calcarea* Näg., ZT). FRANCE: Palaise, Calvados, A. de Brébisson (Type of *Micraloa elabens* Bréb., L [Fig. 168]; isotypes, B, FC, L, S; as *Polycystis elabens* in Rabenh. Alg. no. 2178, B, FH, L, S, UC; as *Microcystis elabens* in Desmaz., Pl. Crypt. Fr. no. 1952, FC), Brébisson 726 (L); Aix en Provence, ex herb. Lenormand, Castagne (Type of *Palmella Castagnei* Kütz., L; isotypes, FC, UC); dans l'étang salé de la Valdue près Aix, Castagne (L, S; as *Palmella Castagnei* in Desmaz., Pl. Crypt. Fr. no. 1955, FI). BELGIAN CONGO: Mayya-moto, rivière Mokoodo, Parc National Albert, J. Lebrun 9209, Dec. 1937 (Type of *Aphanotheca Lebrunii* Duvign. & Sym., BR [Fig. 165]). UNION OF SOUTH AFRICA: Zeekoe Vlei, Cape Flats near Cape Town, Mrs. G. E. Hutchinson 35, 1928 (Type of *A. conglomerata* Richt., D [Fig. 166]).

NEW BRUNSWICK: Island lake, 30—50 miles due south of Dalhousie, M. Le Mesurier 5.

Aug. 1953 (FC); edge of lake, Blue Bell, Victoria county, *H. Habeeb* 10349, 7 Jul. 1948 (FC, HA); in lake 8 miles south of Grand Falls, *Habeeb* 11650, 11655, 22 Jun. 1951 (FC, HA). MASSACHUSETTS: Horn pond, Woburn, *F. S. Collins* 5739, Sept. 1908 (FH). RHODE ISLAND: Watch Hill pond, Watch Hill, *W. A. Setchell* 6425, 16 Jun. 1908 (FC, UC). CONNECTICUT: in ditches in salt marsh, Eastern point, Groton, *Setchell*, 13 Jul. 1888 (UC). MARYLAND: in a marsh pool at Chance, Somerset county, *P. W. Wolle & P. Drouet* 2268, 22 Aug. 1938 (FC). NORTH CAROLINA: on overhanging rocks below Dry falls, Highlands, Macon county, *H. C. Bold* H220, 29 Jun. 1939 (DA, FC); intertidal sand in turtle pen, Fish & Wildlife Laboratory, Beaufort, *H. J. Humm*, 5 Aug. 1949 (FC); intertidal sand inside beach, Shackleford Banks, Beaufort, *Humm*, 7 Aug. 1949 (FC). SOUTH CAROLINA: Alligator lake near Myrtle Beach, Horry county, *P. J. Philson* SC1, 2 Jul. 1932 (FC). FLORIDA: intertidal on sand in St. Andrews bay at Hathaway bridge, west of Panama city, Bay county, *F. Drouet & C. S. Nielsen* 10928, 15 Jan. 1949 (FC, T); Eastpoint, shore on U. S. highway no. 98, Franklin county, *G. C. Madsen, A. L. Pates, M. N. Hood, & L. Elias* 1949, 11 Sept. 1949 (FC, T); on Chara, Hernando county, *M. A. Brannon* 557, 23 Oct. 1948 (FC, PC); on pilings in the pond at 14th and Center streets, Leesburg, Lake county, *Drouet & Brannon* 11077, 19 Jan. 1949 (FC); saline pool, Southeast Hammock, Big Pine key, Monroe county, *E. P. Killip* 42479, 7 Jan. 1953 (FC, US); wet sand in the outlet of a sewer into Santa Rosa sound, Fort Walton, Okaloosa county, *Drouet, Nielsen, Madsen, D. Crowson, & Pates* 10645, 9 Jan. 1949 (FC, T); Buggs Springs, Okahumpka, Lake county, *J. Branham*, 10 Apr. 1955 (D, T).

MICHIGAN: pool along shore of Echo lake, Bois Blanc island, Mackinac county, *H. K. Pbinney* 34, 8 Jul. 1942 (FC, PHI); submerged near shore, Carp lake, Emmet county, *W. A. Daily* 43, 2 Jun. 1935 (DA, FC); Sodon lake, Oakland county, *S. A. Cain*, Dec. 1947 (FC). INDIANA: lake 2 miles north of Columbus, Bartholomew county, *W. A. & F. K. Daily & C. Kenoyer* 1162, 19 Sept. 1943 (DA, FC); Little Eagle lake, Winona Lake, Kosciusko county, *C. M. Palmer* B420, 23 Aug. 1935 (DA, FC); shore of Messick lake north of Eddy, Lagrange county, *F. K. & W. A. Daily* 2689, 26 Aug. 1953 (DA, FC); in Lost lake, Culver, Marshall county, *F. K. & W. A. Daily* 1510, 1516, 3 Jul. 1946 (DA, FC); in Lake Maxinkuckee, Culver, *F. K. & W. A. Daily* 1529, 4 Jul. 1946 (DA, FC); in Bass lake, 5 miles south of Knox, Starke county, *F. K. & W. A. Daily* 1562, 6 Jul. 1946 (DA, FC); Crooked lake, Steuben county, *Palmer* B49, Sept. 1935 (DA, FC). WISCONSIN: Wandewoga Lake, *G. W. Prescott* 3W57, 3W137, 8 Aug. 1938 (FC). MISSOURI: in a muricid spring, Kimmiswick, Jefferson county, *J. A. Steyermark*, 1 May 1934 (D). LOUISIANA: in ponds, Little Lake Club, Plaquemines parish, *J. N. Gowenlock*, Sept. 1944 (FC).

NEBRASKA: culture from gravel pit northwest of Fremont, Dodge county, *W. Kiener* 13769, 16 Jul. 1944 (FC, KI); plankton in pool, Lincoln, *Kiener* 16593, 16594, 15 May 1944 (FC, KI), and culture, *Kiener* 16351, 13 Jul. 1944 (FC, KI); culture from soil in red oak woods 3 miles south of Lincoln, *Kiener* 13741, 16 Jul. 1944 (FC, KI); culture from roadside ditch 4 miles east of Maxwell, Lincoln county, *Kiener* 16463c, 1 Oct. 1944 (FC, KI); culture from Dismal river near Halsey, Thomas county, *Kiener* 16750c, 7 Oct. 1945 (FC, KI). WYOMING: Yellowstone National Park: border and bottom of Bath lake, Lower Geyser Basin, *W. A. Setchell* 1932, 27 Aug. 1898 (FC, UC); in stream from the spring under the main road and boardwalk, Mammoth hot springs, *Setchell* 2021, 2022, 1 Sept. 1898 (FC, UC); spring on Angel Terrace, Mammoth hot springs, *Setchell* 2000, 31 Aug. 1898 (FC, UC); in Bath lake, Mammoth hot springs, *Setchell* 1993, 1997, 2004a, 31 Aug. 1898 (FC, UC); in overflow and in pool, Cleopatra Terrace, Mammoth hot springs, *Setchell* 1982, 1988, 31 Aug. 1898 (FC, UC); borders of small spring above Devil's Kitchen, Mammoth hot springs, *Setchell* 2002, 31 Aug. 1898 (FC, UC); overflow pool from Minerva Terrace, Mammoth hot springs, *Setchell* 2027, 1 Sept. 1898 (FC, UC); pool from a very small spring, Pulpit Terrace, Mammoth hot springs, *Setchell* 1999, 31 Aug. 1898 (FC, UC); in a side pool of the spring (Laundry pool) nearest West Thumb station, *Setchell* 1914, 23 Aug. 1898 (FC, UC). Medicine Bow National Forest: bottom of Trail's Divide lake, *W. G. Solheim* 14, 22 Jun. 1933 (FC). NEW MEXICO: in the outlet of a hot spring, Montezuma (Hot Springs), San Miguel county, *F. Drouet & D. Richards* 2671, 19 Oct. 1939 (FC).

UTAH: Great Salt Lake: *A. S. Packard Jr.*, on Hayden's Expedition (Type of *Polycystis Packardii* Farl., FH [Fig. 164]; isotype, D); *Mrs. E. A. McVicker* (FC, UC); *J. A. Harris*, Jul. 1929 (MIN); *E. R. Walker*, 1908 (FC, UC); *D. Sinard*, 17 Sept. 1928 (FC); Sta. Ac, *A. J. Eardley* 3, 4, 1934 (D); Black Rock, Salt Lake county, *A. O. Garrett* 23, 27, 27 Aug. 1929 (FC, UC); *R. P. Ehrhardt* 1, 3, 21 Oct. 1946 (FC); East bay, *Garrett* 17, 15 Jun. 1929 (FC, UC); Saltair, Salt Lake county, *Garrett* 24, 27 Aug. 1929 (FC, UC), *Drouet & H. B. Louderback* 5734, 5763, 5766, 21 Aug. 1946 (FC); West Point, *Garrett* 11-14, 22 Jun. 1929 (FC, UC); Garfield Beach, *J. E. Tilden*, 7 Jul. 1897 (Type of *Aphanibecca niabensis* Tild. in Tild., Amer. Alg. no. 297, MIN; isotypes, FC [Fig. 169], L, UC; as *Polycystis Packardii* in Tild., Amer. Alg. no. 298, B, FC, L); near Stansbury island, *Garrett* 3, Aug. 1929 (FC, TA, UC). ARIZONA: south slope of Calville wash, Lake Mead, *E. U. Clover*, 12 Sept. 1940 (FC, MICH); NEVADA: sloughs near Fairbanks Springs house, Ash Meadows, Nye county, *I. La Rivers* 1010, 3 Apr. 1950 (FC); in hot water

just above level of Pyramid lake, west side of Pyramid, Washoe county, *La Rivers* 1405, 22 Sept. 1951 (FC). ALASKA: small pond, Milepost 42 (from Anchorage), Steese highway, *D. K. Hilliard* 2, 3 Sept. 1953 (FC); Mile 163 (from Anchorage), Glenallen highway, *Hilliard* 17a, 13 Sept. 1953 (FC). BRITISH COLUMBIA: Spillamacheen valley lakes near Bald mountain, Purcell range, Kootenay county, *W. R. Taylor*, Sept. 1925 (Type of *Aphanothece microscopica* var. *congesta* *W. R. Taylor*, TA). CALIFORNIA: culture from an aerating tank, West Berkeley, *N. L. Gardner* 6926, 21 Oct. 1930 (FC, UC); in a cold pool, Bridgeport, Mono county, *M. J. Groesbeck* 42, 5 Apr. 1940 (FC); small hot spring at Hot Creek, about 2 miles south of Whitmore Tubs, Mono county, *Groesbeck* 61, 16 Jun. 1940 (FC); in hot salt water near Key Route power house, Oakland, *Gardner* 1557, 6 Sept. 1905 (Type of *Synechococcus curvis* *Setch.*, UC; isotypes, FC, and in Coll., *Hold.*, & *Setch.*, Phyc. Bor.-Amer. no. 1351, FC [Fig. 167], L. TA), *Gardner* 1508, Jul. 1905 (FC, UC); culture (from Woods Hole, Massachusetts, from E. H. Battley) in Hopkins Marine Station, Pacific Grove, *M. B. Allen*, 29 Jan. 1952 (FC).

BAHAMA ISLANDS: Nassau, *A. E. Wight*, Jan. 1905 (FH); Lake Cunningham, New Providence, *A. D. Paggs*, Jul. 1940, 1941, 10 May 1941 (FC). BRITISH WEST INDIES: in canals of salt works, Cockburn Harbor, South Caicos, *M. A. Howe* 5581, 16 Dec. 1907 (D, FH, L). PUERTO RICO: pools, College of Agriculture, Mayaguez, *L. R. Almodovar* 375, 412, 22 Aug. 1954 (D, T).

JAMAICA: in a brackish pond, north cay, Morant cays, *V. J. Chapman* 9a, 1939 (FC); in the brackish pond, Gun cay, Kingston, *Chapman* 3d, 1939 (FC). DUTCH WEST INDIES: Bonaire: ten zuiden van Witte Pan, Fekelmeer, *P. Wagenaar Hummelinck*, Sept. 1930 (L); Salinja Tam, *Wagenaar Hummelinck*, Nov. 1930 (L); Salinja de Klein Bonaire, *Wagenaar Hummelinck*, Sept. 1930 (Type of *Aphanothece minor* *Frémy*, L). BRAZIL: in a freshwater pond in the dunes, Arpoadourus, Fortaleza, Ceará, *F. Drouet* 1469, 5 Oct. 1935 (D); praia da Sununga, Ubatuba, São Paulo, *A. B. Joly* 9, 3 July 1953 (D); raio pool on concrete dam of tanque, Anil, São Luiz, Maranhão, *Drouet* 1325, 24 Jul. 1935 (D). ECUADOR: salt lake south of Tagus cove, Albemarle island, Galapagos islands, *W. L. Schmitt* 331—35, 10 Dec. 1934 (FC). PERU: near Lima, *A. Maldonado* 1, Dec. 1940 (FC); salt lakes, Haucho, prov. Chancay, *Maldonado* 88, 94, 95, Feb., Mar. 1942 (FC). ARGENTINA: culture in Instituto Bacteriologico, Depto. Nacional de Higiene, Buenos Aires, *D. Rabinovich* CP11, Dec. 1943 (FC). GILBERT ISLANDS: fish-pond in south part of Beru, *Mrs. R. Catala* 23, Jul. 1951 (FC). WEST AUSTRALIA: Piok lake, Rottnest island, near Perth, *L. A. Doore*, 12 Oct. 1934 (in *Tild.*, So. Pacific Pl., 2nd Ser., no. 18, FC). CHINA: plankton of West lake, Hangchow, Chekiang, *J. E. Nielsen*, 29 Sept. 1923 (FC). INDONESIA: plankton of Lake Ohoitid, Kai islands, *H. Jensen & O. Hagerup*, 1922 (Type of *Microcystis elabens* var. *minor* *Nyg.*, in the slide collection of G. Nygaard); Siroe Bagendit, West Java, *A. Weber-van Bossa* 755, 1888 (D, FH, L).

4. COCCOCHLORIS PENIOCYSTIS *Drouet & Daily*, *Lloydia* 11: 78. 1948. *Gloeocapsa Peniocyctis* *Kützing*, *Tab. Phyc.* 1: 25. 1846. *Peniocyctis purpurea* *Brébisson pro synonym* in *Kützing*, loc. cit. 1846. *Gloeotheca linearis* var. *purpurea* *Brébisson* in *Rabenhorst*, *Alg. Eur.* 218—220: 2193. 1870. *Bichatia Peniocyctis* *Kuntze*, *Rev. Gen. Pl.* 2: 886. 1891. *Anacyctis Peniocyctis* *Dr. & Daily*, *Amer. Midl. Nat.* 27: 651. 1942. —Type from Arromanches, France (L). *Wille* in *Nyt Mag. Naturvid.* 62: 196 (1925) erroneously interpreted *Kützing's* original description as referring to *Anacyctis thermalis*, plants of which are present in the original specimens.

Gloeocapsa purpurea *Kützing*, *Tab. Phyc.* 1: 18. 1846. *Bichatia purpurea* *Kuntze*, *Rev. Gen. Pl.* 2: 886. 1891. —Type from Arromanches, France (L). *Wille* in *Nyt Mag. Naturvid.* 62: 196 (1925) erroneously interpreted *Kützing's* original description as referring to *Anacyctis thermalis*, plants of which are present in the original specimens.

Cryptococcus carneus *Kützing*, *Sp. Algal.*, p. 146. 1849. —Type from St. Chamas, Bouches du Rhone, France (L).

Gloeotheca linearis *Nägeli*, *Gatt. Einzell. Alg.*, p. 58. 1849. —Type from Blickensdorf, Zug, Switzerland (ZT).

Aphanothece saxicola *Nägeli*, *Gatt. Einzell. Alg.*, p. 59. 1849. *Palmogloea saxicola* *Nägeli pro synonym*, loc. cit. 1849. —Type from Künsnacht, Zürich, Switzerland (ZT).

Aphanothece saxicola var. *aquatica* *Wittrock* in *Wittrock & Nordstedt*, *Alg. Exs.* 6: 295. 1879. —Type from Upsala, Sweden (S). FIG. 170.

Aphanothece caldarium var. *covernatum* *Hansgirg*, *Bot. Centralbl.* 37: 38. 1889. —Type from Koroň near Beroun, Bohemia (W).

Aphanothece subachroa *Hansgirg*, *Sitzungsber. K. Böhm. Ges. Wiss., Math.-Nat. Cl.*, 1890(2):

98. 1891. *A. saxicola* f. *subalbrosa* Elenkin, Monogr. Algar. Cyanophyc., Pars Spec. I: 151. 1938.
 —Type from Smichov, Bohemia (W). FIG. 172.
Gloeotheba lunata W. & G. S. West, Journ. Linn. Soc. Bot. 30: 277. 1894. —Type from St. Vincent, West Indies (BM).
Synechococcus minutus West, Proc. Roy. Irish Acad. 31: 40. 1912. —Type from Clare island, Ireland (BIRM).
Synechocystis primigenia Gardner, Mem. New York Bot. Gard. 7: 2. 1927. —Type from Arecibo, Puerto Rico (NY).
Aphanotheba bacilloidea Gardner, Mem. New York Bot. Gard. 7: 5. 1927. —Type from near Arecibo, Puerto Rico (NY).
Gloeoopsis cartilaginea var. *minor* Gardner, Mem. New York Bot. Gard. 7: 9. 1927. —Type from Arecibo, Puerto Rico (NY).
Gloeotheba prototypa Gardner, Mem. New York Bot. Gard. 7: 14. 1927. —Type from Arecibo, Puerto Rico (NY). FIG. 171.
 Original specimens have not been available to us for the following names; their original descriptions are here designated as the Types until the specimens can be found:
Cylindrocystis coerulea Brébisson in Meneghini, Mem. R. Accad. Sci. Torino, ser. 2, 5 (Sci. Fis. & Mat.): 91. 1843. *Plourococcus coerulea* Brébisson in Rahenhorst, Fl. Eur. Algar. 3: 28. 1868. *Chroococcus coeruleus* Porri, Syll. Myxophyc., p. 25. 1907.
Synechococcus racemosus Wolle, Bull. Torr. Bot. Club 8: 37. 1881.
Bacillus muralis Tomashek, Bot. Zeitung 45: 665. 1887. *Aphanotheba caldariorum* b. *muralis* Hansgirg, Prodr. Algenfl. Böhmen 2: 137. 1892. *A. caldariorum* var. *muralis* Hansgirg ex Forci, Syll. Myxophyc., p. 80. 1907. *A. muralis* Lemmermann, Krypt.-Fl. Mark Brandenb. 3: 69. 1907.
Aphanotheba saxicola var. *violacea* W. & G. S. West, Trans. Roy. Microsc. Soc. 1894: 17. 1894.
Rhabdoderma lineare Schmidle & Lauterborn, Ber. Deutsch. Bot. Ges. 18: 148. 1900.
Microcystis orissica West, Journ. & Proc. Asiatic Soc. Bengal, N. S. 7: 84. 1911.
Rhabdoderma Gortikii Wolostynskia, Bull. Acad. Sci. Cracovie, Cl. Math. & Nat., ser. B, 1917: 127. 1917.
Rhabdogloea ellipsoidea Schröder, Ber. Deutsch. Bot. Ges. 35: 549. 1917. *Dactylococcopsis ellipsoidea* Geitler in Engler & Prantl, Natürl. Pflanzenfam., ed. 2, lb: 44. 1942.
Aphanotheba longior Naumann, K. Sv. Vet.-Akad. Handl. 62(4): 17. 1921. *A. saxicola* f. *longior* Elenkin, Monogr. Algar. Cyanophyc., Pars Spec. I: 149, 151. 1938.
Spirillopsis irregularis Naumann, K. Sv. Vet.-Akad. Handl. 62(4): 18. 1921. *Rhabdoderma irregularis* Geitler in Pascher, Süßwasserfl. 12: 113. 1925.
Aphanotheba clathrata var. *brevis* Bachmann, Verh. Naturf. Ges. Basel 35(1): 152, 165. 1923.
Rhabdoderma sigmoideum Moore & Carter, Ann. Missouri Bot. Gard. 10: 398. 1923.
Rhabdoderma sigmoideum f. *minus* Moore & Carter, Ann. Missouri Bot. Gard. 10: 398. 1923.
Dactylococcopsis Smiihii R. & P. Chodat, Veröffent. Geobot. Inst. Rübel Zürich 3: 455. 1925.
Dactylococcopsis Smiihii var. *sigmoidea* R. & F. Chodat, Veröffent. Geobot. Inst. Rübel Zürich 3: 445. 1925.
Aphanotheba saxicola var. *clathratoides* Liebetanz, Bull. Int. Acad. Polon. Sci., Cl. Sci. Math. & Nat., ser. B, 1925: 109. 1925.
Aphanotheba rubra Liebetanz, Bull. Int. Acad. Polon. Sci., Cl. Sci. Math. & Nat., ser. B, 1925: 109. 1925.
Dactylococcopsis Elenkensis Roll, Ann. de Protistol. 1: 164. 1928.
Gloeotheba coerulea Geitler, Arch. f. Protistenk. 60: 440. 1928.
Cyanocloster muscicola Kufferath, Ann. Crypt. Exot. 2: 49. 1929.
Krkia croatica Pavalek, Acta Bot. Inst. Bot. Univ. Zagreb. 4: 55. 1929.
Rhabdoderma Gortikii var. *spirale* Lundberg, Bot. Notiser 1931: 279. 1931.
Tetrarcus Isteri Skuja, Acta Horti Bot. Univ. Latv. 7: 46. 1932.
Gloeotheba Kriegeri Frémy, Ann. Crypt. Exot. 5: 193. 1932.
Dactylococcopsis alutkana Kol, Smiths. Misc. Coll. 101(16): 27. 1942.
Dactylococcopsis planctonica Teiling, Bot. Notiser 1942: 64. 1942.
Dactylococcopsis scenedesmoides Nygaard, K. Danske Videnskab. Selsk. Biol. Skr. 7(1): 185. 1949.
Dactylococcopsis rhabdoides var. *solitaria* Fjerdingsrad, Dansk Bot. Ark. 14(3): 33. 1950.
Rhabdoderma vermicularis Fort, Preslia 24: 192. 1952.

Plantae violaceae, roseae, vel aerugineae, microscopicae vel macroscopicae, 1—pluri—multi-cellulares, cellulis in divisione binis cylindraceutis, aetate protracta longi-

cylindraceis et ad apices rotundis, haud raro attenuato-conicis, diametro 1—3 μ crassis, usque ad 12-plo longiores, curvatis vel rectis; gelatino vaginale hyalino, homogenero vel lamelloso, saepe omnino diffuente; protoplasmate violaceo, roseo, vel aerugineo, homogenero, nonnumquam granuloso. FIGS. 170—172.

On wet rocks, wood, and soil, in seepage, in shallow and deep fresh water, and in the plankton. In the plankton there is sometimes encountered a growth-form with cells somewhat attenuated and bluntly conical at the tips. The large bacteria are often confused with this species, as are likewise certain smaller growth-forms of *Anacystis montana* and *Palmogloea protuberans* (Sm. & Sow.) Kütz., especially where the latter are poorly preserved. In hot springs the one- and two-celled hormogonia of *Phormidium laminosum* (Ag.) Gom., *P. tenue* (Menegh.) Gom., and *P. Treleasei* Gom. are reminiscent, in some respects, of the cells of *Coccochloris Peniocystis*. The short hormogonia of *Plectonema Nostocorum* Born. and of the organism passing under the name *Phormidium mucicola* Naum. & Hub. can also be mistaken as cells of this species.

Specimens examined:

SWEDEN: in piscina in Lassby backar prope Upsaliam, V. Wittrock, 20 Oct. 1878 (Type of *Aphanobceca saxicola* var. *aquatica* Witt. in Witt. & Nordst., Alg. Exs. no. 295, S; isotypes, FC [Fig. 170], L); Kristineberg, Bohuslän, G. Lagerheim, 13 Jul. 1884 (D, S); in piscina ad Strömsberg in Smolandia, O. Nordstedt, Jul. 1890 (as *Coccochloris Trempeolii* in Witt., Nordst., & Lagerh., Alg. Exs. no. 1598, L, N); in spelunca Silfvetgrotten mörns Kullen Scaniae, H. G. Simmons, Jul. 1897 (S); Måja, Upland, O. Borge, Sept. 1932 (S). ROMANIA: ex palude Saltica, dist. Ilfov, E. C. Teodoroscu 1041, 13 Nov. 1901 (FC, W). GERMANY: Dresden, hort. bot., Lagerheim, 6 Oct. 1882 (FC, D, L, S). CZECHOSLOVAKIA: Bohemia: in der Kalksteinhöhle unter dem Kaurakte im Felsenchale uoterhalb Kordo nächst Beraun, A. Hansgirt, Sept. 1888 (Type of *Aphanobceca caldarium* var. *cavernarium* Hansg., W; isotype, FC); auf feuchten Hölzern in Warmhäusern in k. k. botanischen Garten am Smičow, Hansgirt, Dec. 1883 (Type of *Aphanobceca subachroa* Hansg., W; isotype, FC); in caldarii horti in Tetschen, Hansgirt, Aug. 1890 (FC, W). AUSTRIA: Wien, Hort. bot., Lagerheim, 4 Oct. 1882 (D, S); ad parietes caldarium horti Augarten Vindobonae, Hansgirt, 30 Dec. 1884 (as *A. caldarium* in Witt. & Nordst., Alg. Exs. no. 793, FC, L, NY, S; and in Kerner, Fl. Exs. Austro-Hung. no. 1998, L, MO, S); Vindobonae in repidiarii horti botanici uoiversitatis, K. Rehbinger, Apr. (as *Gloobceca repidiarium* in Mus. Vindob. Krypt. Exs. no. 2138, FC, L). JUGOSLAVIA: Pola, Istria, A. Hansgirt, Apr. 1889 (FC, W). SWITZERLAND: Cr. Zug, Blickensdorf, an scharigen Felsen, K. von Nägeli (Type of *Gloobceca linearis* Näg., ZT); ad saxa, Zürich, G. Winter, Jul. 1878 (L); Cr. Zürich, Künsmacht, an feuchten Felsen, Nägeli 300, Sept. 1847 (Type of *Aphanobceca saxicola* Näg., ZT). NETHERLANDS: Korenhoefische plasien, A. Weber-van Bozou 144, Jun. 1886 (FC, L); warme kas, Utrecht, R. A. Maas Geesteranus, Oct. 1942 (L); on artificial rocks, hortus botanicus, Leiden, A. Meesse & J. van Oostrom 7658, Oct. 1942 (L); J. T. Koster 1032, 16 Oct. 1946 (FC, L), P. Luenhouts, 14 Oct. 1948, 12 Oct. 1950 (FC, L).

BRITISH ISLES: with Sphagnum, Mullranny, Clare island, Ireland, W. West, 7 Jun. 1911 (Type of *Synobococcus minutus* West, BIRM). FRANCE: Bouches du Rhooe: St. Chamas, ex herb. Lenormand (Type of *Cryptococcus carnosus* Kütz., L). Calvados: Arromanches, A. de Brébisson (Type of *Gloobceca Peniocystis* Kütz. and *G. purpurea* Kütz., L; isotypes, FC, NY, UC); dans une cascade des falaises d'Arromanches, Brébisson (as *G. purpurea* in Rabenh. Alg. no. 1596, FC, MIN, L), Sept. 1845 (L); sur des rochers calcaires arrosés par une source limpide, Brébisson (as *Gloobceca linearis* var. *purpurea* in Rabenh. Alg. no. 2193, L, MIN, S; in Roumeuguère, Alg. de Fr. no. 519, L); rochers inondés d'une rivière, Falaise, Brébisson (L); Falaise, herb. A. Le Jolis, Aug. 1844 (NY); Falaise, herb. Lenormand (S); anciennes carrières d'Allemagne aux environs de Caen, P. Prémy 739, Apr. 1924 (NY); Bayeux, Brébisson (L, S); Caen, etc. (as *Palmella hyalina* in Chauvin, Alg. de Normand. no. 130, L). Cber: Bourges, O. Ripart 265, Apr. 1877 (S). Seine et Maroe: environs de Melun, Roussel (as *Gloobceca Peniocystis* in Roumeuguère, Alg. de Fr. no. 26, L). MASSACHUSETTS: quarry, West Quincy, F. C. Seymour, 25 Sept. 1938 (FC). RHODE ISLAND: Hope reservoir, Providence, Appleton, Dec. 1883 (FH). NEW YORK: Glen lake, Warren county, W. R. Maxon (NY). WEST VIRGINIA: on sandstone in a spring, Buckhannon river 5 miles below Buckhannon, Upshur county, H. K. Pbinney 529, 30 Aug. 1938 (FC, PHI). NORTH CAROLINA: on wet rock near stream, rear of Duke University stadium, Durham, P. Jones 3, Apr. 1947 (FC). FLORIDA: on wet limestone about the entrance to the cave, Florida Caverns state park, Jackson county, P. Drouot, C. S. Nielsen, G. C. Madison, & D. Crowson 10384, 4 Jan. 1949 (FC, T).

OHIO: on cement wall, Peterson's greenhouse, Cincinnati, W. A. Daily & A. H. Bickler 286, 305, 23 Apr. 1940 (DA, FC), Daily 440, 441, 846, 9 Jul. 1940, 11 Jan. 1941 (DA, FC). KEN-

TUCKY: on wet sandstone, Torrent, Wolfe county, W. A. & P. K. Daily & R. Kojanek 465, 466, 14 Jul. 1940 (DA, FC); on wet sandstone, Tighr Holler, Pine Ridge, Wolfe county, W. A. Daily, A. T. Cross, & J. Tucker 766, 810, Sept. 1940 (DA, FC). INDIANA: on wall of cave, Elkhorn falls near Richmond, L. J. King 201, 8 Sept. 1940 (EAR, FC). WISCONSIN: sphagnum bogs near Trilby and Sand lakes, Vilas county, G. W. Prescott 3W58, 3W278, 15 Aug., 2 Sept. 1938 (FC).

MISSOURI: Sagamout, 2 miles south of Saginaw, Newton county, E. J. Palmer M43, 31 Jul. 1953 (D). ILLINOIS: in Thompson's lake at waterworks, Carbondale, W. B. Wolch CWT, 23 Jul. 1941 (FC). ARIZONA: at waterfall, Bull Durham canyon, Lake Meade, Coconino county, E. U. Clover 157, 9 Sept. 1940 (FC, MICH). NEVADA: in tepid pool, Screambor hot springs, Washoe county, M. J. Grossbeck 114, 192, 13 Jun., 4 Sept. 1940 (FC). CALIFORNIA: fresh water, Lemmon, 1877 (D, FH); in cold spring and pools, travertine quarry at Bridgeport, Mono county, Grossbeck 175, 265, 472, 3 Sept., 24 Nov. 1940, 8 Jul. 1941 (FC).

BAHAMA ISLANDS: on rocks in tide-pool, Eight Mile Rock, Great Bahama, M. A. Howe 3694, Feb. 1905 (NY). PUERTO RICO: on limestone, Arecibo to Hatillo, N. Wille 1377 (Type of *Gloeoecapsa cartilaginea* var. *minor* Gardn., NY), 1377a (Type of *Gloeoecapsa prototypa* Gardn., NY [Fig. 171]), 1377b (Type of *Synechocystis prismigonia* Gardn., NY), 1378, 1378a, Feb. 1915 (NY); on limestone, Arecibo to Uruado, Wille 1481a, Mar. 1915 (NY); in depressions in limestone, Hato Arriba near Arecibo, Wille 1407a (Type of *Aphanosyce bacilloidea* Gardn., NY), 1407b, Mar. 1915 (NY); in a water pipe near a stream, Maricao, Wille 1147, 1147c, Feb. 1915 (FC, FH, NY). ST. VINCENT: [on damp wall of dam, Sharp's River], W. R. Elliott 477 (Type of *Gloeoecapsa lunata* W. & G. S. West, with *Cosmarium pseudopyramidatum* in the slide collection, BM). HONDURAS: on wet masonry, vicinity of El Zamoraoo, dept. Morazán, P. C. Standley 4423, Feb.-Mar. 1947 (FC). PERU: Lima, A. Maldonado 2, Dec. 1940 (FC); agua estanciada cerca mar, Lago Villa, Maldonado 67, Jan. 1942 (FC). NEW ZEALAND: caves, Piha, V. J. Chapman, Apr. 1947 (FC). PHILIPPINES: hot spring, College, Laguna, G. T. Velasquez 2462, 8 Aug. 1948 (FC, PUH). CHINA: on rock in rapid streams, Omei-shan and Shan-Shan-Kow, Omei, Szechwan, H. Chu 1329, 1329a, Aug. 1941, 21 Aug. 1942 (FC). INDONESIA: op de wand de groot bij Brabakan, W. Docters van Leeuwen, Nov. 1913 (L); in the caves where the edible swallows' nests are collected, Borneo, comm. Holmes (PC).

GENUS 2. ANACYSTIS

Meneghini, *Consp. Algol. Eugan.*, p. 324. 1837. *Microcystis* Unterabtheilung *Anacystis* Kützing, *Tab. Phyc.* 1: 7. 1846. *Polycystis* Sectio *Anacystis* Hansgirg, *Prodr. Algenfl. Böhmen* 2: 144. 1892. —Type species: *Anacystis marginata* Menegh.

Pleurococcus Meneghini, *Coosp. Algol. Eugan.*, p. 337. 1837. —Type species: *P. communis* Menegh. Nägeli in *Gatt. Einzell. Alg.*, p. 64 (1849) names "*P. vulgare* Menegh. part." as the Typus of "*Pleurococcus* Menegh. part.", but it seems to us that attaching part of a name to part of a type is an impossibility under the present International Rules of Nomenclature. We have designated as the Type species here one of the species described at the same time as the genus.

Gloeoecapsa Kützing, *Phyc. Gener.*, p. 173. 1843. *Gloeoecapsa* Subgenus *Eugloeoecapsa* Hansgirg, *Notarisia* 3: 589. 1888. *Gloeoecapsa* Sectio *Eugloeoecapsa* Hansgirg, *Prodr. Algenfl. Böhmen* 2: 152. 1892. *Gloeoecapsa* Sectio *Hyalocapsa* Kitchner in Engler & Prand, *Natürl. Pflanzenfam.*, ed. 1, 1(1a): 54. 1898. —Type species: *Gloeoecapsa atrata* Kütz. See Drouet in Doty, *Lloydia* 13: 9, footnote (1950).

Sorospora Hassall, *Hist. Brit. Freshw. Alg.* 1: 309. 1845. —Type species: *Ulua montana* Lightf.

Microcystis Unterabtheilung *Polycystis* Kützing, *Tab. Phyc.* 1: 7. 1846. *Polycystis* Kützing, *Sp. Algar.*, p. 210. 1849; non Léveillé, 1846. *Diplocystis* Trevisan, *Sagg. Monogr. Alg. Coccot.*, p. 40. 1848; nec Berkeley & Curtis, 1869; nec J. Agardh, 1896; nec Cleve, 1900. *Clathrocystis* Hentley, *Trans. Microsc. Soc. London, N. S.*, 4: 53. 1856. *Polycystis* Sectio *Clathrocystis* Hansgirg, *Prodr. Algenfl. Böhmen* 2: 146. 1892. —Type species: *Micraloa aeruginosa* Kütz.

Cagniardia Trevisan, *Sagg. Monogr. Alg. Coccot.*, p. 47. 1848. —Type species: *Palmella cyanea* Kütz.

Chroococcus Nägeli, *Gatt. Einzell. Alg.*, p. 45. 1849. *Chroococcus* Subgenus *Euchroococcus* Hansgirg, *Notarisia* 3: 589. 1888. *Chroococcus* Sectio *Euchroococcus* Hansgirg, *Prodr. Algenfl. Böhmen* 2: 161. 1892. —Type species: *Protococcus rufescens* Kütz. (= *Chroococcus rufescens* Näg.).

Monocapsa Itzigsohn in Rabenhorst, *Alg. Sachs.* 27—28: 263. 1853. —Type species: *M. viregobila* Itzigs.

Rhodococcus Sectio *Rhodocapsa* Hansgirg, *Oesterr. Bot. Zeitschr.* 34: 315. 1884. —Type species: *Gloeoecapsa violacea* Kütz.

Eucapsis: Clements & Shantz, Minn. Bot. Stud. 3: 134, 1909. *Chroococcus* Subgenus *Eucapsis* Elenkin, Not. Syst. Inst. Crypt. Horti Bot. Petropol. 2: 68, 1923. —Type species: *Eucapsis alpina* Clem. & Shantz.

Endospora Gardner, Mem. New York Bot. Gard. 7: 27, 1927. —Type species: *E. rubra* Gardn. *Chroococcidiopsis* Geitler, Arch. f. Hydrobiol., Suppl. XII, 4: 625, 1933. —Type species: *C. iberialis* Geitl.

Radiocystis Skuja, Symbolae Bot. Upsal. 9(3): 43, 1948. —Type species: *R. geminata* Skuja.

Original specimens of the type species for the following generic and sub-generic names have not been available to us for study:

Aphococcus Roze, Jour. de Bot. 10: 321, 1896. —Type species: *A. natans* Roze.

Glaucocapsa Sectio *Cyanocapsa* Kirchner in Engler & Prand, Natürl. Pflanzenfam., ed. 1, 1(12): 54, 1898. *Glaucocapsa* Subgenus *Cyanocapsa* Kirchner ex Forti, Syll. Myxophyc., p. 39, 1907. —Type species: *Protococcus violaceus* Corda.

Coclospira Lemmermann, Abh. Nat. Ver. Bremen 16: 353, 1899. —Type species: *C. balophila* Lemm.

Planosphaerula Borzi, Nuova Notarisia 1905: 20, 1905. —Type species: *P. natans* Borzi.

Myxosarcina Printz, K. Norske Vidensk. Selsk. Skr. 1920(1): 35, 1920. —Type species: *M. concinna* Printz.

Sphaerodictyon Geitler, Beib. z. Bot. Centralbl., II, 41: 231, 1925. —Type species: *Polycystis ruscicata* Lemm.

Plantae microscopicae vel macroscopicae, cellulis in divisione binis plus minusve hemisphaericis, aetate protracta globosis, per gelatinum vaginale irregulariter vel in seriebus in tribus planis unoquodque ad alia perpendicularibus distributis; divisionibus cellularum seriatim in tribus planis unoquodque ad alia perpendicularibus procedentibus; gelatino vaginale hyalino vel deinde (in *A. montana*) rubrescentes vel coerulescentes vel lutescentes.

In species of *Anacystis* the spherical cells divide successively in three planes perpendicular to each other. The cells thus formed become irregularly distributed through the gelatinous matrix or retain a regular cubical (eucapsoid) arrangement, distributed in series of rows in three planes perpendicular to each other. Bacteria, palmelloid Chlorophyceae and Rhodophyceae, and growth-forms of Nostocaceae and *Entophysalis* spp. are often mistaken as species of *Anacystis*.

Key to species of *Anacystis*:

1. Cells without pseudovacuoles, plants not developing as water blooms 3.
1. Cells containing pseudovacuoles, plants developing as water blooms 2.
2. Cells (2.5—)3—7(—10) μ in diameter 1. *A. CYANEA*
2. Cells 0.5—2 μ in diameter 2. *A. INCERTA*
3. Cells 0.5—2 μ in diameter 3. *A. MARINA*
3. Cells larger 4.
4. Cells up to 6 μ in diameter (larger where parasitized by fungi), the gelatinous matrix developing red, blue, or yellowish-brown pigments in aerial and subaerial habitats 4. *A. MONTANA*
4. Cells 6 μ in diameter or more, gelatinous matrix hyaline 5.
5. Cells (8—)12—50 μ in diameter, usually remaining angular after division 5. *A. DIMIDIATA*
5. Cells chiefly 6—12 μ in diameter, soon becoming spherical after division .. 6.
6. Plants marine, usually macroscopic 6. *A. AERUGINOSA*
6. Plants of fresh water, usually microscopic 7. *A. THERMALIS*

1. *ANACYSTIS CYANEA* Drouet & Daily, Butler Univ. Bot. Stud. 10: 221. 1952. *Palmella cyanea* Kützing, Phyc. Gener., p. 172. 1843. *Cagniardia cyanea* Trevisan, Sagg. Monogr. Alg. Coccot., p. 47. 1848. —Type from Jever, Germany (L).

Micraloa aeruginosa Kützing, Linnæa 8: 371. 1833. *Sphaerobrombium aeruginosum* Kützing pro synonym, ibid. p. 370. 1833. *Microcystis ichthyoblabe* Kützing, Phyc. Gener., p. 170. 1843. *Palmella ichthyoblabe* Kuntze pro synonym in Kützing, loc. cit. 1843. *Micraloa icthyolabe* Meneghini, Mem. R. Accad. Sci. Torino, ser. 2, 5 (Sci. Fis. & Mat.): 48, 104. 1843. *Palmella icthyolabe* Kuntze pro synonym, ex Meneghini, loc. cit. 1843. *Microcystis aeruginosa* Kützing, Tab. Phyc. 1: 6. 1846. *Micraloa ichthyoblabe* Rabenhorst, Deutschl. Krypt.-Fl. 2(2): 13. 1847. *Diplocystis aeruginosa* Trevisan, Sagg. Monogr. Alg. Coccot., p. 40. 1848. *D. ichthyoblabe* Trevisan, loc. cit. 1848. *Polycystis ichthyoblabe* Kützing, Sp. Algar., p. 210. 1849. *P. aeruginosa* Kützing, loc. cit. 1849. *Clathrocystis aeruginosa* Henfrey, Trans. Microsc. Soc. London, N. S., 4: 53. 1856. *Microbaloa aeruginosa* Kützing ex Rabenhorst, Fl. Eur. Algar. 2: 54. 1865. *Polycystis elabens* var. *ichthyoblabe* Hansgirg, Prodr. Algenfl. Böhmen 2: 145. 1892. —Type from Stuttgart, Germany (L). FIG. 9.

Polycystis viridis A. Braun in Rabenhorst, Alg. Eur. 141 & 142: 1415. 1862. *Microcystis viridis* Lemmermann, Abh. Nat. Ver. Bremen 17: 342. 1903. *M. aeruginosa* f. *viridis* Elenkin, Monogr. Algar. Cyanophyc., Pars Spec. 1: 106. 1938. —Type from Salzuengen, Germany (B).

Chroococcus indicus Zeller, Jour. Asiatic Soc. Bengal 42(2): 176. 1873; Hedwigia 12: 168. 1873. —Type from Prome, Burma (L). FIG. 8.

Polycystis prasina Witrock in Witrock & Nordstedt, Alg. Exs. 6: 297. 1879. *P. flos-aquae* var. *prasina* Witrock ex Hansgirg, Prodr. Algenfl. Böhmen 2: 144. 1892. *Microcystis prasina* Lemmermann, Ark. f. Bot. 2(2): 146. 1904. *Clathrocystis prasina* Woronichin, Nor. Syst. Sect. Crypt. Ins. Bot. Acad. Sci. U. R. S. S. 6(1—6): 39. 1950. —Type from Uppland, Sweden (S). FIG. 6.

Polycystis flos-aquae Witrock in Witrock & Nordstedt, Alg. Exs. 6: 298. 1879. *P. flos-aquae* f. *autumnalis* Witrock ex Lemmermann, Krypt.-Fl. Mark Brandenburg 3: 75. 1907. *Microcystis flos-aquae* Kirchner ex Forti, Syll. Myxophyc., p. 86. 1907. *M. aeruginosa* f. *flos-aquae* Elenkin, Monogr. Algar. Cyanophyc., Pars Spec. 1: 103. 1938. —Type from Dalsland, Sweden (S). FIG. 4.

Microcystis caerulea Dickie, Journ. Linn. Soc. Bot. 18: 128. 1880. —Type from Rio Tapajoz, Brazil (BM).

Polycystis scripta Richter, Hedwigia 25: 254. 1886. *P. flos-aquae* var. *scripta* Hansgirg, Prodr. Algenfl. Böhmen 2: 144. 1892. *Microcystis scripta* Migula, Krypt.-Fl. Deutschl. II. Alg. 1a: 37. 1905. *M. aeruginosa* f. *scripta* Elenkin, Monogr. Algar. Cyanophyc., Pars Spec. 1: 103. 1938. —Type from Halle, Germany (B). FIG. 2.

Polycystis aeruginosa var. *major* Witrock ex Hansgirg, Prodr. Algenfl. Böhmen 2: 146. 1892. *Clathrocystis aeruginosa* f. *major* Keissler, Oesterr. Bot. Zeitschr. 56: 56. 1906. *C. aeruginosa* var. *major* Witrock ex Forti, Syll. Myxophyc., p. 95. 1907. *Microcystis aeruginosa* var. *major* Witrock ex Lemmermann, Krypt.-Fl. Mark Brandenb. 3: 76. 1907. *M. aeruginosa* f. *major* Elenkin, Nor. Syst. Inst. Crypt. Hort. Bot. Petropol. 3: 15. 1924. —Type from Libochowitz, Bohemia (W). FIG. 7.

Polycystis (Clathrocystis) insignis Beck, Mus. Vindob. Krypt. Exs. 2: 227. 1896. —Type from Bombay, India (W). FIG. 10.

Polycystis ochracea Brand, Ber. Deutsch. Bot. Ges. 16: 200. 1898. *Microcystis ochracea* Forti, Syll. Myxophyc., p. 86. 1907; Lemmermann, Krypt.-Fl. Mark Brandenb. 3: 76. 1907. *M. aeruginosa* f. *ochracea* Elenkin, Monogr. Algar. Cyanophyc., Pars Spec. 1: 103. 1938. —Type from Wurmsee, Bavaria, Germany (B). FIG. 3.

Clathrocystis robusta Clark, Proc. Biol. Soc. Washington 21: 94. 1908. *Microcystis robusta* Nygaard, Dansk Bot. Ark. 4(10): 8. 1925. *M. aeruginosa* var. *robusta* Nygaard and *M. flos-aquae* var. *robusta* Nygaard, K. Danske Videnskab. Selsk. Skr. 7(1): 185. 1949. —Type from Lake Amatitlan, Guatemala (FC). FIG. 11.

Microcystis protocystis Crow, New Phytol. 22: 62. 1923. *M. aeruginosa* f. *protocystis* Elenkin, Monogr. Algar. Cyanophyc., Pars Spec. 1: 106. 1938. —Type from Anuradhapoorra, Ceylon (in the collection of F. E. Fritsch). FIG. 5.

Microcystis aeruginosa var. *major* Elenkin, Nor. Syst. Crypt. Hort. Bot. Reipubl. Ross. 3: 15. 1924. —Isotypes from Uppland, Sweden (FC, L, MICH).

Microcystis aeruginosa f. *occidentalis* W. R. Taylor, Amer. Journ. Bot. 15: 606. 1928. —Type from Flagstaff, Arizona (TA).

Microcystis toxica Stephens, Trans. Roy. Soc. So. Africa 32(1): 107. 1949. —Type from Vaaldam, Transvaal (L). FIG. 1.

Eucapsis alpina f. *violacea* Thomasson, Svensk Bot. Tidskr. 46: 233. 1952. —Isotype from Bessvatn, Sweden (DA).

Original specimens have not been available to us for the following names;

their original descriptions are here designated as the Types until the specimens can be found:

Coelosphaerium dubium Grunow in Rabenhorst, Fl. Eur. Algar. 2: 55. 1865. —Only a sketch with descriptive notes is present in the herbarium of A. Grunow in the Naturhistorisches Museum, Vienna. The material discussed by Schmida from Graz, Styria, is cited among the specimens below (see Hedwigia 37, Beibl. 1: 47. 1898).

Microcystis pseudofilamentosa Crow, New Phytol. 22: 64. 1923. *M. aeruginosa* f. *pseudofilamentosa* Elenkin, Monogr. Algar. Cyanophyc., Pars Spec. 1: 105. 1938.

Microcystis aeruginosa f. *minor* Elenkin, Not. Syst. Inst. Crypt. Hort. Bot. Reipubl. Ross. 3: 15. 1924.

Microcystis fusca Zalessky, Rév. Gén. de Bot. 38: 33. 1926.

Microcystis ramosa Bharadwaja, Proc. Indian Acad. Sci. 2: 96. 1935.

Microcystis aeruginosa var. *elongata* B. Rao, Proc. Indian Acad. Sci. 6: 341. 1937.

Microcystis aeruginosa f. *sphaerodictyoides* Elenkin, Monogr. Algar. Cyanophyc., Pars Spec. 1: 100. 1938.

Microcystis bairys Teiling, Bot. Noriser 1942: 63. 1942.

Microcystis flos-aquae var. *major* Nygaard, K. Danske Videnskab. Selsk. Biol. Skr. 7(1): 179. 1949.

Microcystis luteolens Schiller, Sitzungsber. Oesterr. Akad. Wiss., Math.-Nat. Kl., 1, 163: 112. 1954.

Microcystis punctata Schiller, Sitzungsber. Oesterr. Akad. Wiss., Math.-Nat. Kl., 1, 163: 118. 1954.

Plantae smaragdinae vel laete aeruginosae, microscopicae, sphaericae, cylindratae, vel ovoideae, varie et irregulariter lobatae et invaginatae vel clathratae, saepe conferte confluentes, planctonicae, cellulis in divisione binis depresso—sub-sphaeticis, aetate provecta globosis diametro [2.5—]3—7[—10.5] μ crassis, sine ordine (aut in seriebus eucapsoides) per gelatinum vaginale distributis; gelatino vaginale hyalino, homoganeo, ad superficiem distincte delimitato vel (saepe omnino) diffuente; protoplasmate dilute aerugineo, pseudovacuolis farcto. FIGS. 1—11.

In the plankton of freshwater lakes, ponds, and sluggish rivers, often appearing as conspicuous and heavy water blooms during the warm seasons of the year. The morphology, life history, and synonymy of this species have been discussed by Drouer & Daily in Field Mus. Bot. Ser. 20: 67—83 (1939). In pure cultures, the gelatinous matrix hydrolyzes completely and the cells become less pseudovacuolate than is characteristic of them in natural habitats. Often confused with this species are the various growth-forms of the bacterial *Lamprocystis rosea* (Kütz.) Dr. & Daily, the plants of which contain a red pigment in most living collections; this pigment is often lost in material preserved in liquid.

Specimens examined:

LATVIA: Riga, H. Skuja, 24 Aug. 1924 (DA, FC). SWEDEN: on lacu Kalungen Daliae, V. Wittrock, Aug. 1866 (Type of *Polycystis flos-aquae* Witt. in Witt. & Nordst., Alg. Exs. no. 298, S; isotypes, FC [Fig. 4], L, MIN, NY), 25 Aug. 1862 (D, S), Sept. 1882 (as *P. flos-aquae* in Witt. & Nordst., Alg. Exs. no. 509, D, FC, L, MIN, NY). Jun. (as *Aphanocapsa pulchra* in Aresch., Alg. Scand. Exs., Ser. Nov., no. 388, FC); in lacu Mälaren ad Flottsund Uplandiae, Wittrock, 3 Nov. 1878 (Type of *Polycystis prasina* Witt., S [Fig. 6]; isotypes, FC, L, MICH, TA, US); Bessvatn, K. Thomasson, 18 Jul. 1951 (isotype slide of *Eucapsis alpina* f. *violacea* Thomasson from the author, DA); in lacu Lötsjön par. Funbo Uplandiae, Wittrock, 6 Oct. 1878 (isotypes of *Microcystis aeruginosa* var. *major* Elenk. as *Polycystis aeruginosa* in Witt. & Nordst., Alg. Exs. no. 296, FC, L, MICH), Oct. (as *P. aeruginosa* in Aresch., Alg. Scand. Exs., Ser. Nov., no. 429, FC, L); pond, Nöresjö, Malmöhus, B. Carlin-Nilsson 525, 17 Aug. 1937 (D, NY); Dagsörpssjön, Malmöhus, Carlin-Nilsson 140, 25 Aug. 1931 (D, NY); lake, Fiolen, Kronoberg, Carlin-Nilsson 516, 27 Jul. 1937 (D, NY); Hammarbysjön in Danviken, Stockholm, G. Lagerheim, 1882 (D, S); Ringsjön ad Bosjöklöster, O. R. Holmberg, Sept. 1913 (S); in lacu ad Mullsjö Vestrogothiae, O. Nordstedt, Aug. 1900 (B, NY); Trebörningsjö, Upland, O. Borge, Sept. 1896 (NY); with *Anacystis incerta* in lacu Wombssjön Scaniae, Nordstedt, Jun. 1901 (B, NY, S, UC). DENMARK: in lacu prope Birkerød Selandiae, C. Ossenfeld-Hanson, 30 Aug. 1896 (D, C); Sjöen Naerum, C. Raseb, Jun. 1880 (C); Lillerød, Sjaelland, T. Rosenvinge, Sept. 1879 (C); Hut-sø, J. Schmidt, Sept. 1898 (C); Hofmangave, Fionen, Hofman-Bang (B). POLAND: Ockelsee bei Allenstein, Caspary, Aug. 1862

(B); Danzig, *Klinsmann*, 1858 (B); Sawadda-See (Westpreussen), *P. Hennings*, Sept. 1890 (B); Galgenberge bei Strehlen (Schlesien), *Hilse* (as *Anacyclus marginata* in Rabenh. Alg. no. 1522, B, FC, L, NY), Jul. 1859 (as *Polycystis aeruginosa* in Rabenh. Alg. no. 1174, B, FC, MIN, NY); Strehlen, *Hilse* (B, L); bei Habendorf, *Hilse* 8 (B); am Grosseiche von Habendorf bei Reichenbach, *Hilse*, Sept. 1862 (B); Rausern bei Breslau, *W. Migula*, Jul. 1877 (as *P. aeruginosa* in Hauck & Richt., Phyk. Univ. No. 2964, L, MIN), May 1887 (as *Microcystis aeruginosa* in Mig., Krypt. Germ., Austr., & Helv. Exs., Alg. no. 30, MICH, NY, TA); Breslau, *O. Rechner*, 1874 (as *Clathrocystis aeruginosa* in Rabenh. Alg. no. 2424, FC, L, MIN, NY, TA); im Teiche bei Schoffschütz in Oberschlesien, *A. Ugenannt* & *S. Schmula*, Sept. 1895 (as *Polycystis alabani* in Hauck & Richt., Phyk. Univ. no. 684, L, MIN, NY); Teich in Buchwald bei Schmiedeburg, *G. Hieronymus*, Sept. 1887 (B).

GERMANY: Baden: aus dem Grünloch in Ichenheim, *L. Lesner*, Sept. 1858 (as *P. aeruginosa* in Jack, Lejoer, & Stützenb., Krypt. Badens no. 461, FC, YU). Bavaria: Nürnberg, *P. Reinsch* (MICH); in Wassertümpeln bei Erlangen, *Glück*, Sept. 1895 (L, US); Erlangen, *Reinsch* (L, NY, US); Wurmssee, *F. Brand*, Sept. 1897 (Type of *P. ochracea* Brand, B [Fig. 3]). Brandenburg: Wannensee, *P. Hennings*, Sept. 1892 (Henn., Phyk. March. no. 47e, B, FH); Halensee, *Hennings*, Nov. 1890 (Henn., Phyk. March. no. 47b, B, FH); Wilmsdorfer See, Berlin, *Hennings*, Jul. 1882 (Henn., Phyk. March. no. 47a, B, FH); Müggel-See, Friedrichshagen, *Hennings*, Aug. 1892 (B), Sept. 1892 (Henn., Phyk. March. no. 47d, B, FH); *A. Braun* (B); in der Havel bei der Pfaueninsel, *Braun*, Aug. 1863 (B), bei Porsdam, *Bauer* (B, D, FH, L, NY), *L. Rabenborst*, Jul. 1857 (L); Berlin, *Braun*, Aug. 1854 (B, L), *Jahn*, 1857 (B); Hoer. Berol., *Braun*, Aug. 1852 (B); Golsen, *Schumann*, Jul. 1865, 1866 (B); Grunewald-See bei Berlin, *G. Hieronymus*, Aug. 1891 (B); in einem Graben, Neudamm, *Iszigobn*, May 1855 (B); im Tempelhofer Parkteiche bei Berlin, *Hennings*, Jul. 1883 (B; Henn., Phyk. March. no. 46, B, FH). Hamburg: Ansenalster, *Pitschen*, Jul. 1906 (S). Mecklenburg-Pomerania: Wolgast-See bei Haeringsdorf, *A. Braun*, Sept. 1864 (B, L). Oldenburg: Jever, *Jürgens* (Type of *Palmella cyanosa* Kütz., L). Saxony: Teiche in Bernbruch bei Lausigk, *P. Richter*, Jul. 1864 (as *Coelosphaerium Kuetzingianum* in Rabenh. Alg. no. 1791, FC); Maassfeld, *M. Marsson*, Jul. 1896 (NY); Leipzig, Lindenau, *Marsson*, Sept. 1897 (NY); Teich in Collau am Mulde, *Marsson*, Sept. 1897 (NY); Gohlis bei Leipzig, *Richter*, Sept. 1878 (NY), *Auerswald*, Sept. 1852 (B); in lacu salso Mansfeldensis prope Halam, *P. Richter* (Type of *Polycystis scripta* Richt. in Hauck & Richt., Phyk. Univ. no. 92, B [Fig. 2]; isotypes, L, MIN); Brösen bei Grimma, *Richter*, Aug. 1894 (in Hauck & Richt., Phyk. Univ. no. 748a, L, MIN, NY); in einem Teiche bei Anger, Leipzig, *Richter*, Aug. 1879 (L, PH, TA); auf Teichen, Moritzburg (L); auf einem Fischteiche, Ponickau, *Auerswald* (B, FC, FH, NY), 27 Jul. 1852 (as *P. ichtyobolae* in Rabenh. Alg. no. 210, B, FC, L, MIN, NY); Leipzig (Lipsiae), *Kuntze* (B, FC, NY, PH), *Auerswald* (FC), *Richter* (FC); in einem Graben am Grossen Garten in Dresden, *C. Schillor*, Jul. 1888 (in Hauck & Richt., Phyk. Univ. no. 296b, L, MIN); Schadebach bei Makranstadt (Leipzig), *H. Reichel* (in Hauck & Richt., Phyk. Univ. no. 297, L, MIN); Burgsee bei Salzungen, *A. Braun*, Sept. 1862 (Type of *Polycystis viridis* A. Br. in Rabenh. Alg. no. 1415, B; isotypes, FC, L, MIN, NY); Salzungen See, *A. Röse* (as *Microbalos Irma* in Rabenh. Alg. no. 453, FC, FH, L, NY, UC); Salzsee bei Halle, *O. Kuntze* (NY). Thuringia: Georgental, in einem Teich am Bahnhof, *W. Migula*, 1 Sept. 1928 (as *Microcystis aeruginosa* in Mig., Krypt. Germ., Austr., & Helv. Exs., Alg. no. 242, FC, TA). Württemberg: Stuttgart, *G. von Martens* (Type of *Microbalos aeruginosa* Kütz., L [Fig. 9]; isotypes, B, L, NY, UC), Jun. 1827, Aug. 1830, Aug. 1947 (B).

CZECHOSLOVAKIA: Moravia: près Eisgrub (L). Bohemia: Bystrice u Benesova, rybníky u drahy, *A. Hansgirg*, Aug. 1884 (FC, W); piscina Velky Pálenec prope Blatná, *B. Fott*, 4 Aug. 1948 (FC); Chlumec—Pílár, blíz stаницe, *Hansgirg*, Aug. 1887 (FC, W); Schlossteich in Cimelic, *Hansgirg*, Aug. 1887 (FC, W); Dobříš, *Hansgirg*, Aug. 1886 (FC, W); the Great Pond of Doksy, *Fott*, 12 Jul. 1947 (FC); Krivoklát, *Hansgirg*, Sept. 1884 (FC, W); Amalienhof u Krivokláta, *Hansgirg*, Sept. 1884 (FC, W); Gumniczsee, Joachimstal, *W. Panknin*, Aug. 1937 (B); bei Libochowitz, *Hansgirg*, Jul. 1888 (Type of *Polycystis aeruginosa* var. *major* Witt., W; isotype, FC [Fig. 7]); in Dolejší pond near Lnáre, *Fott*, 15 Aug. 1947 (FC); pond Mlýnský near Lnáre, *Fott*, 5 Aug. 1947 (FC); Nepomuk, *Hansgirg*, Aug. 1887 (FC, W); Stráncice, *Hansgirg*, Sept. 1885 (FC, W); Teplice, *Hansgirg*, Jul. 1883 (FC, W); pond Starý Hospidár near Trebon, *Fott*, 19 Jun. 1946 (FC); pond Velká Kus, *Fott*, 2 Aug. 1947 (FC); Planina a Zic u Chlumec blíz Treboné, *Hansgirg*, Sept. 1887 (FC, W). AUSTRIA: Teich im Schwarzenberggarten, Wien, *K. Rechner*, Jun. 1907 (as *Coelosphaerium dubium* in Mig., Krypt. Germ., Austr., & Helv. Exs., Alg. no. 154, MICH, TA); Vindobonae in piscinis hori Caesaris Schönbrunn, *C. de Keisler* (as *Clathrocystis aeruginosa* in Mus. Vindob. Krypt. Exs. no. 1517, B, FC, L, NY, US); Vindobonae in piscinis hortorum publicorum, *Rechner* (as *Microcystis Jlos-aquae* in Mus. Vindob. Krypt. Exs. no. 2355, B, FC, L, NY); in lacu Hilmteich ad Graz, *Schmula* (as *Coelosphaerium dubium* in Kerner, Fl. Exs. Austro-Hung. no. 3196, FC, L, MO); Ober-Premstätten—Liebach prope Graz, *Hansgirg*, Sept. 1890 (FC, W). HUNGARY: Budapest in lacu Városligeti tó, *P. Filarszky* (as *Polycystis aeruginosa* in Mus. Vindob. Krypt. Exs. no. 226, B, FC, L, NY); Budapest in excavationibus Lágymányosi holt Dunaág, *Filarszky*, May 1911 (Fl. Hungar. Exs. Alg. no. 21, FC, L, US). TRIESTE: ex herb. Hauck (D, PH, NY). SWITZER-

LAND: Zürich, Katzensee, auf dem Grunde am Strande liegend, K. von Nägeli (ZT). ITALY: in una vasca all'Orto Botanico di Pisa, Savi, 1865 (UC). NETHERLANDS: Haagse van den Bosch (L); Haagsche Bosch, den Haag, W. F. R. Suringar D18, May 1857 (D, L); Witte Singel, Leiden, J. T. Koster 233, 11 Aug. 1938 (FC, L); in aq. dulc. stagn. Ludg.-Batav. (Leiden), van den Bosch 376. Aug. 1846 (B, L); Holland, A. Weber-van Bosse, Oct. 1891 (L); forest, The Hague, W. Treloase, Jun. 1884 (MO); de Kaag, op de plas, Koster 953 (L); Rotterdam, Kralingse plas, J. Poolman, Jul. 1944 (L); Noorden, sloot langs de weg, Koster 301. Jun. 1940 (L); Kolkven, Oosterwijk, G. P. H. van Heusden, 17 May 1947 (FC, L). FRANCE: Falaise, Calvados, A. de Brébisson (B), Brébisson 528, 594 (L); Carentan, Manche, à la surface du canal de l'hospice, herb. Lebel (B, FC); dans un étang du parc du Château de Flamanville, Manche, P. Frémy, 10 Aug. 1932 (as *Microcystis aeruginosa* in Hamel, Alg. de Fr. no 151, FC); hortus, Clermont-Ferrand, W. F. R. Suringar (FC, L); Angers, Maine et Loire, F. Hy (B).

PORTUGUESE EAST AFRICA: Maloti lake near Masiyeoi, S. Chopilaod, E. L. Stephens 38, 27 Jun. 1928 (D, NY). UNION OF SOUTH AFRICA: Transvaal: Hartebeestpoort dam, Mrs. G. E. Hutchinson 15, 29 Apr. 1928 (D); Riekkuil, Bethal district, M. E. Blenkiron & D. Weinstein 24, 25 Feb. 1928 (D); Vaaldam, E. L. Stephens, Apr. 1945 (Type of *Microcystis toxica* Steph., L; isotype, FC [Fig. 1]). Cape of Good Hope: Zeekoe Vlei near Cape Town, Mrs. Hutchinson 35, 5 Feb. 1928 (D).

MASSACHUSETTS: Arlington, E. Dewar, 27 Jul. 1891 (FC, NY); cemetery pond, Belmont, A. B. Seymour, Sept. 1918 (FC); Herring Run, Brewster, L. Walp, Aug. 1940 (FC); Fresh pond, Cambridge, W. G. Farlow, Oct. 1882 (FH, MO), 25 Oct. 1879 (FC), G. T. Moore, Oct. 1893 (B), H. H. Barlett 1179, Oct. 1907 (MICH), A. H. Moore 4090, 11 Oct. 1907 (FC), A. B. Seymour, Jul. 1913 (FC); pond, Currybrook island, F. S. Collins 5723, Aug. 1907 (NY); pond south of Nonquitt, Dartmouth, E. T. Rose & P. Drouet 1891, 18 Jul. 1936 (D); Fresh pond, Falmouth, W. R. Taylor, Jul. 1921 (TA), T. E. Hazen 5, 6 Jul. 1926 (DA, FC); Oyster pond, Falmouth, Taylor, 12 Aug. 1922 (FC, TA), Drouet 2118, 30 Jul. 1937 (D, FH, NY, S), J. Bader 84 (FC), 129 (D), Jul. 1938; Episcopal Ocean, Falmouth, Rose & Drouet 1867, 4 Jul. 1936 (D, NY, S), C. M. Palmer, 2 Sept. 1937 (DA, FC), R. N. Webster, 20 Jun. 1938 (D, FH, NY), Bader 127, 30 Jul. 1938 (D); Shivericks pond, Falmouth, E. T. Moul 6409, 2 Aug. 1949 (FC); basin no. 3, Framingham, Farlow, Nov. 1881 (FH); Ashumer lake northeast of Hachville, Moul 6404, 27 Jun. 1949 (FC); Hummock pond, Nantucket island, W. R. Taylor, 1920 (FC, TA); Long pond, Nantucket, Taylor & E. F. D. Runk, 17 Jul. 1938 (D); Hammond pond, Newton, H. M. Richards, Oct. 1889 (NY); Horn pond, Waburn, Farlow, 2 Aug. 1879 (FC, D, FH). RHODE ISLAND: Mashapaug pond, Providence, W. J. V. Osterhout, 15 Oct. 1892 (as *Clathrocystis aeruginosa* in Coll., Hold., & Setch., Phyc. Bor.-Amer. no. 51, FC, L, MICH, MIN, NY); Providence, Nichols, 1877 (D, FH); Haley's pond, Cranston, F. S. Collins 6444, Sept. 1911 (NY). CONNECTICUT: plankton of Smith Brothers pond, central Connecticut, G. E. Hutchinson, 22 Dec. 1942 (FC). NEW YORK: Central park, New York City, Jul. 1865 (B); in Basic reservoir, Rensselaerville, M. S. Marble 25, Jul. 1947 (EAR, FC). NEW JERSEY: small woodland lake 2 miles north of Gleewood, Sussex county, E. T. Moul 7169, 18 Oct. 1950 (FC). PENNSYLVANIA: pond north of Kennett Square, F. W. Pennell & W. S. May, Oct. 1921 (TA); plankton of Shenango river, Pymmarung Dam, Greenville, Clarksville, Sharon, and Wheatland, L. Walp & W. Murchio 6-15, Jul. & Sept. 1941 (FC).

VIRGINIA: in Queens Creek (Haw Tree Landing), York county, A. F. Chestnut, 8 Sept. 1942 (FC, ST). SOUTH CAROLINA: in Lake Chapin near Myrtle Beach, Horry county, F. J. Philson SC72, 21 Sept. 1938 (FC). FLORIDA: Gainesville, M. A. Brannon 11, 12, 25, 27, 227b, 365, 419, 422-426, Sept. 1941-May 1947 (FC, PC); Lake City, R. K. Strawn 589, 2 Aug. 1947 (FC, PC); in Lake Harris, Leesburg, Lake county, F. Drouet & Brannon 11049, 11053, 11056, 11062, 19 Jan. 1949 (FC); Henderson camp (Lee county?), O. Tollin, May 1886 (S). ONTARIO: Bay of Quinte, Lake Ontario, Prince Edward county, A. Tucker, 1946 (DA, FC); Clear lake, Kawartha lakes, Peterborough county, W. A. Sirov, 26 Aug. 1951 (DA, FC). OHIO: Auglaize county: St. Mary's lake, St. Marys, W. A. & F. K. Daily 633, 634, 22 Jul. 1940 (DA, FC). Franklin county: Goodale park, Columbus, E. H. Ablstrom, 17 Oct. 1933 (DA, FC). Hamilton county: pure culture no. 15 (from G. C. Gerloff, culture no. 1036) in Environmental Health Center, Cincinnati, C. M. Palmer (FC); pond in Arlington cemetery, Cincinnati, W. A. Daily & J. H. Hoskins 109, 4 Oct. 1939 (DA, FC), Daily 418, 5 Jul. 1940 (DA, FC), W. A. & F. K. Daily 741, 2 Sept. 1940 (DA, FC), E. Ward, 18 Jul. 1938 (DA, FC); lake in Burner Woods, Cincinnati, Daily & A. Blicke 104, 1 Oct. 1939 (DA, FC); Sharon Woods lake, Cincinnati, W. A. & F. K. Daily 743, 2 Sept. 1940 (DA, FC). Defiance county: in canal, Independence state park, east of Defiance, W. A. & F. K. Daily 642, 23 Jul. 1940 (DA, FC). Ottawa county: Lake Erie, Puc-in-Bay, C. E. Tall, 1935, 3 Aug. 1938 (DA, FC), near Gibraltar Is. Daily & Taji 649A, 24 Jul. 1940 (DA, FC); pond, Port Clinton, F. K. & W. A. Daily 648, 23 Jul. 1940 (DA, FC). Putnam county: in ponds, Erie-Miami canal, Delphos, W. A. & F. K. Daily 635, 636, 22 Jul. 1940 (DA, FC); in Auglaize river at Cascade park near Dupont, W. A. & F. K. Daily 640, 22 Jul. 1940 (DA,

FC). Stark county: in reservoir, Beach City, *W. A. & P. K. Daily* 576, 26 Jul. 1940 (DA, FC). Summit county: in Portage lake south of Akron, *W. A. & P. K. Daily* 575, 26 Jul. 1940 (DA, FC). KENTUCKY: pond near Walton, Boone county, *B. B. McInteer* 13, 652, 22 Aug. 1929 (DA, FC); *J. B. Lackey*, 10 Oct. 1940 (DA, FC); Blue pond, Fulton county, *McInteer* 545, 13 Aug. 1929 (DA, FC); pond 12 miles east of Hickman, Fulton county, *McInteer* 529, 13 Aug. 1929 (DA, FC); pond 2 miles south of Glasgow, Barren county, *McInteer* 516, 10 Aug. 1929 (DA, FC); in reservoir, Lexington, *Daily, McInteer, & A. Harvill* 845, 30 Oct. 1940 (DA, FC); pond in fish hatchery, Fort Mitchell, Kenton county, *J. H. Hoshins & Daily* 251, 2 Dec. 1939 (DA, FC); sandpit, Greenwood road near Louisville, *H. Bishop*, 30 Oct. 1931 (DA, FC).

TENNESSEE: Radnor Lake, *H. C. Bold*, 20 Oct. 1936 (FC); Percy Warner lake, Nashville, *Bold* 13, 1933 (FC); pond on M. Hayes farm, Obion county, *H. Silva* 1316, 1317, 1319, 12 Jul. 1949 (FC, TENN). ALABAMA: pond no. 9, Marion Fish Cultural Station, Marion, *J. R. Snow* 7, 9 Jul. 1953 (DA, FC). MICHIGAN: Thayer's lake, Torch lake, and Elk lake, Aotrim county, *J. H. Hoshins*, 24 Aug. 1934 (DA, FC); McDonald lake, Yankee Springs, Hastings, Barry county, *G. T. Velasquez* 16, 4 Aug. 1936 (D, TA); French Farm lake, Cheboygan county, *G. W. Prescott* 3M6, Aug. 1941 (FC); Interlochen, Grand Traverse county, *J. H. Hoshins*, 29 Aug. 1934 (DA, FC); Lake Leelanau, Leelanau county, *Hoshins*, 28 Aug. 1934 (DA, FC); Pasinski pond, Genoa township, Livingston county, *W. F. Carbine*, 1938 (FC, TA); Mud lake west of Curtis, Mackinac county, *H. K. Phinney* 4M41/15-1, 19 Jul. 1941 (FC, PHI); Lake George, Oakland county, *C. E. Tuf*: 155, Aug. 1936 (DA, FC); Anne Louise lake, Schoolcraft county, *Phinney* 9M41-16, 19 Jul. 1941 (FC, PHI); Three Lakes, Ann Arbor, *L. N. Johnson* 5, 27 Sept. 1892 (FC, NY).

INDIANA: Bartholomew county: Columbus By-pass pond, Columbus, *P. K. & W. A. Daily* 1581B, 20 Apr. 1947 (DA, FC), *P. K. & W. A. Daily & M. F. Cundiff* 2104, 13 May 1949 (DA, FC). Carroll county: Lake Freeman near Monticello, *Daily* 5, 15, 877, Jul. 1938, 1941 (DA, FC). Decatur county: in Cupp's pond 5 miles east of Greensburg and in limestone pond between Harts-ville and Greensburg, *W. A. & P. K. Daily & C. Kenoyer* 1166, 1168, 19 Sept. 1943 (DA, FC). Elkhart county: Simonton lake 4 miles north of Elkhart, *F. K. & W. A. Daily* 2616, 2618, 26 Aug. 1952 (DA, FC). Fulton county: Nyona (North Mud) lake 4 miles east of Fulton, *P. K. & W. A. Daily* 1476, 1477, 1479, 1480, 29 Jun. 1946 (DA, FC). Kosciusko county: Big Barbee lake 3 miles south of North Webster, *F. K. & W. A. Daily* 2271, 27 Jul. 1950 (DA, FC); Dewart lake, *F. K. & W. A. Daily* 2115, 9 Jul. 1949 (DA, FC); Eagle lake, *H. W. Clark & B. W. Evermann* 255, Aug. 1906 (FC, US); Kubu lake, Tippecanoe township, *F. K. & W. A. Daily* 2268, 27 Jul. 1950 (DA, FC); Pappakeechee lake south of Lake Wawasee, *F. K. & W. A. Daily* 2273, 28 Jul. 1950 (DA, FC); *B. H. Smith* 145, 15 Sept. 1929 (DA, FC); Ridinger lake, Washington township, *F. K. & W. A. Daily* 2270, 27 Jul. 1950 (DA, FC); Beaver Dam lake 4 miles northwest of Silver Lake, *Daily* 82, 10 Jun. 1939 (DA, FC); Silver lake north of Silver Lake, *F. K. & W. A. Daily* 2168, 2169, 22 Jul. 1950 (DA, FC); Lake Wawasee, *F. K. & W. A. Daily* 2190, 2209, 2232, 2258, 2274, 23—28 Jul. 1950 (DA, FC); Lake Winona, *B. H. Smith* 199, 15 Sept. 1929 (DA, FC), *C. M. Palmer*, 30 Aug. 1935 (D, DA, FC), *Palmer* 168, Summer 1936 (DA, FC). Lake county: Cedar lake at Cedar Lake, *P. K. & W. A. Daily* 2561, 2562, 28 Aug. 1951 (DA, FC); Calumer river north of Miller station, *P. D. Voith & F. Drouot* 2367, 28 Sept. 1938 (FC, NY). Marion county: in Bacon's Bog pond, Indianapolis, *W. A., F. K., J. H., & M. Daily* 861, 862, 27 Jul. 1941 (DA, FC). Marshall county: Lake of the Woods northeast of Plymouth, *Clark & Evermann* 27, 12 Jul. 1909 (FC, US); Lost lake, Culver, *F. K. & W. A. Daily* 1518, 3 Jul. 1946 (DA, FC); in spring by Culver depot, *Clark & Evermann* 272, 27 Sept. 1900 (FC, US); Lake Maxinkuckee, *Clark & Evermann* s. n. and 52, 18 Oct., 15 Nov. 1906 (FC, US). Monroe county: in a limestone sink-hole pond 3 miles south of Bloomington, *F. K. & W. A. Daily* 1004, 7 Sept. 1942 (DA, FC); Wiemer's lake 4 miles northwest of Bloomington, *F. K. & W. A. Daily* 1005, 7 Sept. 1942 (DA, FC). Montgomery county: in lagoon in Shades state park, Waveland, *F. K. & W. A. Daily* 965, 6 Jun. 1942 (DA, FC), *L. Lee*, 17 Jun. 1942 (DA, FC). Morgan county: Brickyard pond adjoining Bethany Park, *P. K. & W. A. Daily* 1031, 20 Sept. 1942 (DA, FC). Porter county: in Wahob lake and in a pond connected with Spectacle lake, north of Valparaiso, *F. K. & W. A. Daily* 2572, 2575, 30 Aug. 1951 (DA, FC). Steuben county: Clear lake 6 miles east of Fremont, *F. K. & W. A. Daily* 1933, 13 Sept. 1947 (DA, FC); Crooked lake at Crooked Lake, *Palmer* B50, 30 Sept. 1933 (DA, FC), *F. K. & W. A. Daily* 2459, 2461, 18 Jun. 1951 (DA, FC); Fox lake southwest of Angola, *F. K. & W. A. Daily* 2487, 19 Jun. 1951 (DA, FC); Lake George 6 miles north of Angola, *F. K. & W. A. Daily* 1934, 13 Sept. 1947 (DA, FC); Green lake west of Fremont, *F. K. & W. A. Daily* 2450, 17 Jun. 1951 (DA, FC); Hamilton lake, Circle park, Hamilton, *P. K. & W. A. Daily* 2443, 2445, 17 Jun. 1951 (DA, FC); Lake James, Pokagon state park, *F. K. & W. A. Daily* 1918, 12 Sept. 1947 (DA, FC); Mill Pond lake at Nevada Mills, *F. K. & W. A. Daily* 1936, 14 Sept. 1947 (DA, FC); Lake Pleasant 4 miles east of Orland, *F. K. & W. A. Daily* 2470, 18 Jun. 1951 (DA, FC); Pleasant lake at Pleasant Lake, *P. K. & W. A. Daily* 2458, 18 Jun. 1951 (DA, FC); Silver lake 4 miles west of Angola, *P. K. & W. A. Daily* 2488, 2490, 19 Jun. 1951 (DA, FC). Vigo county: *B. H. Smith* 647, 4 Aug. 1930 (DA, FC); St. Mary's lake, *Smith*