

Neogene Diatoms from Wamura, Nagano Prefecture, Central Nippon

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With Plates IV-VIII

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For some years I have been occupied with an examination of diatom flora of Nippon and this is my first note on fossil diatoms, received through the kindness of Prof. TAMIJI KAWAMURA of the Zoological Institute, College of Science, Kyoto Imperial University.

The sample from Wamura consists of soft pieces of light gray color, with texture resembling chalk. The microscopical analyses of the deposits have shown it to contain diatom frustules, coniferous pollen and fragments of sponge needles. The Wamura diatoms were of fresh-water origin of about neogene age. As in external, so in microscopic character, it exhibits a great degree of uniformity throughout with respect to number of genera represented, which are few, and with respect to their ratio to one another. Thus the preponderance of *Fragilaria*, *Neidium*, *Pinnularia*, *Cymbella* and *Epithemia* is to be contrasted with much less frequent presence of *Melosira*, *Stephanodiscus*, *Caloneis*, *Navicula*, *Gomphonema* and *Suriella*. Among the heavier material *Naviculae* predominate, whilst among the lightest minute forms of *Cyclotella* are most common. The rare occurrence of some species, even of large size, is remarkable, e. g. *Neidium obliquestriatum* var., *Anomoeoneis sphaerophora*, *Navicula halophila*, *Navicula Perrotettii*, and contrasts curiously with the great abundance of other species of the same genus. Among the rarer species the following may also be noted: *Diatoma elongatum*, *Navicula seminulum*, *Navicula Lambda*, *Cymbella Yabe*.

The Wamura fossil diatom flora, compared with recent diatom floras of Aoki, Kizaki, Biwa and Ikeda Lakes, is very similar. This similarity consists in presence of common species *Melosira*, *Stephanodiscus*, different forms of *Fragilaria*, in abundance of *Synedra Ulna* and *Synedra parasitica*, large *Navicula cuspidata*, *Navicula pupula* var. *capitata*, *Navicula lanceolata*, *Pinnularia microstauron*, *Amphora ovalis* var. *libyca*, *Cymbella Ehrenbergii*, *Cymbella ventricosa*, *Cymbella cistula*, *Cymbella tumida*, *Gomphonema constrictum* var. *capitata*, *Gomphonema augur* var. *Gautieri*, *Epithemia turgida*, *Epithemia sores*, *Rhopalodia gibba*, *Cymatopleura solea* and *Surirella biseriata* var. *bifrons*. Only *Pinnularia nobilis* var. *fossilis*, known as fossil in Europe, was refound in Wamura deposits. More frequent were *Neidium obliquestriatum* var. *rostrata*, *Neidium bisulcatum* var. *nipponica* recently described from Kizaki Lake and *Navicula subdicephala*, reported from Aoki Lake, Nippon.

101 different diatoms are described by me in Wamura deposits. Among fresh-water species, several can be noted as of brackish water. They are *Fragilaria construens* var. *subsalina*, *Anomoeoneis sphaerophora* and *Navicula peregrina* var. *kefvingensis*. Several interesting and novel, especially varieties have been described in this interesting collection.

***Melosira granulata* (EHR.) RALFS var. *angustissima* O. MULL.**

Melosira granulata (EHR.) RALFS var. *angustissima* O. MULL., FR. HUSTEDT, Bacillar. (1930) 88, fig. 45.

Frustules long and narrow, about 0.005 mm in breadth. Striae distinctly spiral and punctate. Not common. Reported from Biwa Lake.

***Melosira italica* (EHR.) KUTZ. var. *tenuissima* (GRUN.) O. MULL.**

Melosira italica (EHR.) KUTZ. var. *tenuissima* (GRUN.) O. MULL., FR. HUSTEDT, Bacillar. (1930) 91.

Frustule more short with distinct spines at the ends. Breadth, 0.0025 to 0.004 mm. Common. Reported from Kizaki Lake.

***Cyclotella stelligera* CLEVE and GRUN.**

Cyclotella stelligera CLEVE and GRUN., FR. HUSTEDT, Bacillar. (1930) 100, fig. 65.

Valve circular, somewhat undulate; valve surface separated into two areas; the outer areas forming a band one-third the radius in width, strongly marked with closely set radiating costae; inner areas hyaline with a stellate beads in the center. Diameter 0.012 to 0.017 mm. Reported from Aoki, Kizaki and Ikeda Lakes.

Stephanodiscus astraea (EHR.) GRUN. var. **minutula** (KUTZ.) GRUN. Plate VI, fig. 12.

Stephanodiscus astraea (EHR.) GRUN. var. *minutula* (KUTZ.) GRUN., Fr. HUSTEDT, Bacillar. (1930) 110, fig. 86.

Valve circular, flat to within one-half of the radial length from the margin, then strongly convex for a half of that distance, center constricted. Valve surface separated into two areas, an outer areas covered with radiating rows of beads and the inner circular areas, sparsely punctate with irregular dots. Each row of beads is composed of two parts. The marginal part more densely beaded and composed of two rows of beads, and the central part with one row of beads. Diameter 0.008 to 0.01 mm. The type is known from Aoki and Kizaki Lakes.

Stephanodiscus astraea (EHR.) GRUN. var. **intermedia** FRICKE. Plate VI, fig. 1.

Stephanodiscus astraea (EHR.) GRUN. var. *intermedia* FRICKE, A. SCHMIDT, Atlas Diatom. (1901) pl. 225, fig. 38.

Differs from var. *minutula* in its more robust valves, with 3 to 5 beads in the marginal part of the rows. The radiating rows of beads are approaching the center of the valve. Diameter 0.02 to 0.027 mm. Rare.

Diatoma elongatum AGARDH.

Diatoma elongatum AGARDH, Fr. HUSTEDT, Bacillar. (1930) 127, fig. 111.

Valve linear with parallel margins and capitate ends. Length, 0.017 mm. Striae 15 in 0.01 mm. Rare. Known from Aoki Lake.

Fragilaria construens (EHR.) GRUN.

Fragilaria construens (EHR.) GRUN, A. SCHMIDT, Atlas Diatom. (1913) pl. 296, figs. 40-47.

Valve lanceolate, narrowed towards the ends. Length, 0.0068 to 0.02 mm; breadth, 0.0034 to 0.0085. Striae 12 to 15 in 0.01 mm. Very common. Reported from Kizaki Lake.

Fragilaria construens (EHR.) GRUN. var. **venter** (EHR.) GRUN.

Fragilaria construens (EHR.) GRUN. var. *venter* (EHR.) GRUN., A. SCHMIDT, Atlas Diatom. (1913) pl. 296, figs. 30-33, 47.

Differs from: the type in its more narrow valves. Length, 0.0076 to 0.0085 mm; breadth, 0.0045 to 0.005. Common.

Fragilaria construens (EHR.) GRUN. var. **binodis** (EHR.) GRUN.

Fragilaria construens (EHR.) GRUN. var. *binodis* (EHR.) GRUN., A. SCHMIDT, Atlas Diatom. (1913) pl. 296, figs. 19-24.

Valve linear, biconstricted with rostrate ends. Length, 0.018mm; breadth, 0.0042. Striae 15 in 0.01 mm. Reported from Aoki and Kizaki Lakes.

Fragilaria construens (EHR.) GRUN. var. **subsalina** HUST. Plate VIII, fig. 9.

Fragilaria construens (EHR.) GRUN. var. *subsalina* HUSTEDT, Bacillar. (1930) 141, fig. 139.

Valve linear-lanceolate with parallel margins and narrowed ends. Length, 0.024 mm, breadth, 0.0045. Striae 15 in 0.01 mm. Common. Reported from Kizaki Lake. Known from brackish waters in Europe.

Fragilaria construens (EHR.) GRUN. var. **nipponica** SKV. Plate VIII, fig. 8.

Fragilaria construens (EHR.) GRUN. var. *nipponica* SKVORTZOV, Diatom. Kizaki Lake pl. 10, fig. 15. pl. 16, fig. 13.

Valve broad-lanceolate, constricted from both or one side. Length, 0.011 mm; breadth, 0.005. Striae 12 in 0.01 mm. Very common. Differs from var. *binodis* in its more short valves. Reported from Kizaki Lake.

Fragilaria virescens RALFS. Plate VIII, fig. 7.

Fragilaria virescens RALFS, A. SCHMIDT, Atlas Diatom. (1913) pl. 297, fig. 15.

Valve lanceolate with apiculate rounded ends. Striae parallel, reaching a linear, narrow pseudoraphe, 15 in 0.01 mm. Length, 0.017 mm; breadth, 0.005. Not common. Reported from Kizaki Lake.

Fragilaria pinnata EHR.

Fragilaria pinnata EHR., A. SCHMIDT, Atlas Diatom, (1913) pl. 297, figs. 68-71.

Valve minute, elliptical with distinct and robust costae, 9 in 0.01 mm. Length, 0.0068 mm; breadth, 0.005. Uncommon. Reported from Kizaki Lake.

Synedra Ulna (NITZSCH.) EHR.

Synedra Ulna (NITZSCH.) EHR., Fr. HUSTEDT, Bacillar. (1930) 151, figs. 158, 159.

Valve narrow linear with parallel margins and rostrate ends. Length, 0.144 m; breadth, 0.007. Common. Reported from Aoki, Kizaki, Biwa and Ikeda Lakes.

Synedra Ulna (NITZSCH.) EHR. var. **biceps** (KUTZ.)

Synedra Ulna (NITZSCH.) EHR. var. *biceps* (KUTZ.), Fr. HUSTEDT, Bacillar. (1930) 154, fig. 166.

Differs from the type in its capitate ends. Length, 0.26 mm; breadth, 0.008. Common. Reported from Kizaki and Ikeda Lakes.

Synedra rumpens KUTZ. var. **scotica** GRUN.

Synedra rumpens KUTZ. var. *scotica* GRUN., Fr. HUSTEDT, Bacillar. (1930) 156, fig. 177.

Valve narrow-lanceolate, narrowed towards the ends. The middle part somewhat undulate. Length, 0.042 mm; breadth, 0.0025. Striae 15 in 0.01 mm. Not frequent.

Synedra parasitica (W. SMITH) Plate VIII, fig. 13.

Synedra parasitica (W. SMITH), Fr. HUSTEDT, Bacillar. (1930) 161, fig. 195.

Valve lanceolate-rhomboidal, undulate at the middle and attenuate towards the both ends. Length, 0.014 mm; breadth, 0.0056. Striae 15 in 0.01 mm. Common. Reported from Aoki, Kizaki, Biwa and Ikeda Lakes.

Eunotia pectinalis (KUTZ.) RABH.

Eunotia pectinalis (KUTZ.) RABH., Fr. HUSTEDT, Bacillar. (1930) 180-181, fig. 237.

Valve almost linear and slightly arcuate. Length, 0.056 mm; breadth, 0.0076. Striae 10 in 0.01 mm. Rare.

Eunotia monodon EHR.

Eunotia monodon EHR., Fr. HUSTEDT, Bacillar. (1930) 185, fig. 254.

Valve robust with arcuate dorsal and concave ventral margin. Ends subcapitate, broadly rounded. Length, 0.03 mm; breadth, 0.01. Striae 10 in 0.01 mm. Not rare.

Cocconeis placentula (EHR.)

Cocconeis placentula (EHR.), Fr. HUSTEDT, Bacillar. (1930) 189, fig. 260a, b.

Valve elliptical with a distinct loculiferous rim. Length, 0.025 mm; breadth, 0.015. Unfrequent. Reported from Aoki and Biwa Lakes.

Cocconeis placentula (EHR.) var. **lineata** (EHR.) CLEVE. Plate V. fig. 8.

Cocconeis placentula (EHR.) var. *lineata* (EHR.) CLEVE, Fr. HUSTEDT, Bacillar. (1930) 190, fig. 262.

The upper valve covered with fine punctate striae, crossed by each side of the valve by 8 to 10 longitudinal blank undulating bands. Length, 0.04 mm; breadth, 0.02. Striae 18 in 0.01 mm. Fairly common. Reported from Kizaki and Biwa Lakes.

Achnanthes exigua GRUN.

Achnanthes exigua GRUN., Fr. HUSTEDT, Bacillar. (1930) 201, fig. 286.

Valve rectangular-elliptical with rostrate ends. Length, 0.011 mm; breadth, 0.005. Upper valve with narrow and linear central axial area. Lower valve with large, outward dilated central area. Rare. Reported from Kizaki and Aoki Lakes.

Achnanthes hungarica GRUN.

Achnanthes hungarica GRUN., Fr. HUSTEDT, Bacillar. (1930) 201, fig. 283.

Valve linear with parallel margins and cuneate ends. Length, 0.017 mm; breadth, 0.006. Upper valve with linear central and axial areas. Lower valve with broad, quadrate, unilateral central area. Not uncommon. Known from Aoki Lake.

Caloneis silicula (EHR.) CLEVE. Plate IV, fig. 12; Plate VI, fig. 3.

Caloneis silicula (EHR.) CLEVE, Fr. HUSTEDT, Bacillar. (1930) 236-237, fig. 362.

Valve linear-lanceolate, triundulate with cuneate, slightly capitate ends. One specimens with broad central, other with rectangular, dilated areas. Length, 0.042 to 0.088 mm; breadth, 0.0085 to 0.017. Striae 16 to 18 in 0.01 mm. Common. Known from Ikeda Lake.

Neidium obliquestriatum A. S. var. **rostrata** SKV. Plate VII, fig. 6.

Neidium obliquestriatum A. S. var. *rostrata* SKVORTZOV, Diatom. Kizaki Lake (1936) pl. 4, fig. 16.

Valve linear-lanceolate with rostrate ends. Striae oblique, 21 in 0.01 mm. Length, 0.07 mm; breadth, 0.014. Differs from the Kizaki specimens in its broad obtuse ends. Reported from Kizaki Lake.

Neidium iridis (EHR.) CLEVE.

Neidium iridis (EHR.) CLEVE, Fr. HUSTEDT, Bacillar. (1930) 245, fig. 379.

Valve robust, linear-lanceolate, narrowed towards the ends. Length, 0.158 mm; breadth, 0.028. Striae 18 in 0.01 mm. Reported from Aoki and Biwa Lakes.

Neidium iridis (EHR.) CLEVE var. **amphigomphus** (EHR.) VAN HEURCK.

Neidium iridis (EHR.) CLEVE, var. *amphigomphus* (EHR.) VAN HEURCK, Fr. HUSTEDT, Bacillar. (1930) 245, fig. 382.

Differs from the type in its subrostrate ends. Length, 0.07 mm; breadth, 0.02. Striae 18 in 0.01 mm. Not common. Known from Ikeda Lake.

Neidium bisulcatum (LAGER.) CLEVE var. **nipponica** SKV. Plate IV, fig. 8.

Neidium bisulcatum (LAGER.) CLEVE var. *nipponica* SKVORTZOV. Diatom. Kizaki Lake (1936), Plate 3, fig. 1; Plate 4, fig. 8.

Valve sublinear attenuated towards the rounded ends. Length, 0.054 mm; breadth, 0.013. Striae 21 in 0.01 mm. Differs from the type in its attenuate and acute ends. Uncommon. Known from Kizaki Lake.

Stauroneis phoenicenteron EHR. Plate 2, figs. 3, 4; Plate VII, fig. 8.

Stauroneis phoenicenteron EHR., Fr. HUSTEDT, Bacillar. (1930) 255, fig. 404.

Valve lanceolate with broad rounded ends. Length, 0.068 to 0.119 mm; breadth, 0.015 to 0.025. Striae 12 to 18 in 0.01 mm. Very common. Known from Aoki Lake.

Stauroneis anceps EHR. fo. **gracilis** (EHR.) CLEVE.

Stauroneis anceps EHR. fo. *gracilis* (EHR.) CLEVE, Fr. HUSTEDT, Bacillar. (1930) 256, fig. 406.

Valve lanceolate with long attenuate and capitate ends. Length, 0.064 mm; breadth, 0.01. Not rare.

Stauroneis anceps EHR. fo. **linearis** (EHR.) CLEVE.

Stauroneis anceps EHR., fo. *linearis* (EHR.) CLEVE, Fr. HUSTEDT, Bacillar. (1930) 256, fig. 407.

Valve linear-lanceolate with parallel margins and abruptly capitate ends. Length, 0.068 mm; breadth, 0.015. Striae 18 to 20 in 0.01 mm. Not common.

Anomoeoneis sphaerophora KUTZ. Plate VIII, fig. 3.

Anomoeoneis sphaerophora KUTZ., A. SCHMIDT, Atlas Diatom. (1877) pl. 49, fig. 51.

Valve elliptical-lanceolate with rostrate-capitate ends. Length, 0.06 mm; breadth, 0.018. Striae 18 in 0.01 mm. Central area larger on one side of the valve than on the other. Unfrequent. Known from fresh or slightly brackish water.

Navicula cuspidata KUTZ. Plate V, fig. 9.

Navicula cuspidata KUTZ., Fr. HUSTEDT, Bacillar. (1930) 268, fig. 433.

Valve rhomboid-lanceolate, narrowed towards the ends. Length, 0.129 mm; breadth, 0.03. Striae 12. Very common. Reported from Aoki, Kizaki and Ikeda Lakes.

Navicula cuspidata KUTZ. var. **ambigua** (EHR.) CLEVE. Plate VIII, fig. 4; Plate V, fig. 7.

Navicula cuspidata KUTZ. var. *ambigua* (EHR.) CLEVE, Fr. HUSTEDT, Bacillar. (1930) 268, fig. 434.

Differs from the type in its subrostrate-capitate ends. Length, 0.07 to 0.085 mm; breadth, 0.022 to 0.025. Striae 12 to 15 in 0.01 mm. Common.

Navicula halophila (GRUN.) CLEVE.

Navicula halophila (GRUN.) CLEVE, Fr. HUSTEDT, Bacillar. (1930) 268, fig. 436.

Valve rhomboid-lanceolate with subacute ends. Length, 0.074 mm; breadth, 0.018. Striae radiate in the middle and convergent at the ends, 18 in 0.01 mm. Not unfrequent. Known from brackish water.

Navicula Perrotettii GRUN. Plate V, fig. 2.

Navicula Perrotettii GRUN., CLEVE, Synopsis Navicul. Diatoms (1894) 1, 110, pl. 3, fig. 12.

Valve rhombic-lanceolate with subacute ends. Length, 0.183 mm; breadth, 0.044. Striae crossed by many broad longitudinal blank parallel bands. Rare. Known from slightly brackish water in sub- and tropical regions.

Navicula seminulum GRUN.

Navicula seminulum GRUN., Fr. HUSTEDT, Bacillar. (1930) 272, fig. 443.

Valve linear-lanceolate with obtuse rounded ends. Length, 0.012 mm; breadth, 0.005. Striae 18 in 0.01 mm. Rare.

Navicula pupula KUTZ. var. **rectangularis** (GREG.) GRUN.

Navicula pupula KUTZ. var. *rectangularis* (GREG.) GRUN., Fr. HUSTEDT, Bacillar. (1930) 281, fig. 467b.

Valve linear with broad rounded ends. Length, 0.039 mm; breadth, 0.0085. Common. Known from Ikeda Lake.

Navicula pupula KUTZ. var. **capitata** HUST.

Navicula pupula KUTZ. var. *capitata* HUSTEDT, Bacillar. (1930) 281, fig. 467c.

Differs from the type in its capitate ends. Length, 0.03 mm; breadth, 0.0068. Not uncommon. Known from Kizaki, Biwa and Ikeda Lakes.

Navicula subdicephala HUST.

Navicula subdicephala HUSTEDT, Bacillar. aus dem Aokikosee in Japan 164-165, taf. 5, fig. 9.

Valve lanceolate with capitate ends. Length, 0.027 mm; breadth, 0.0076. Axial area narrow, linear, somewhat dilated in the middle. Central area widened and truncate outwards. Striae radiate, closer towards the ends, in the middle alternately longer and shorter, 18 in 0.01 mm. Rare. Known from Aoki Lake.

Navicula subdicephala HUST. fo. **recta** fo. nov. Plate V, fig. 13.

Differs from the type in its rectangular-lanceolate valves. Length, 0.024 mm; breadth, 0.0085. Striae 15 in 0.01 mm. Uncommon. The type known from Aoki Lake.

Navicula americana EHR.

Navicula americana EHR., Fr. HUSTEDT, Bacillar. (1930) 280, fig. 464.

Valve linear with parallel margins and broad obtuse ends. Median line in a thick siliceous rib. Length, 0.102 mm; breadth, 0.025. Uncommon. Known from Kizaki Lake.

Navicula Lambda CLEVE. Plate VII, fig. 9.

Navicula Lambda CLEVE, Synopsis Navicul. Diatoms (1894) 136, pl. 5, fig. 19.

Valve linear with constricted margin and broad, obtuse ends. Length, 0.044 mm; breadth, 0.01. Axial area narrow, central area orbicular. Striae 12 to 14 (middle), 18 (ends) in 0.01 mm, slightly radiate. Uncommon. Known from Demerara River, South America.

Navicula cryptocephala KUTZ.

Navicula cryptocephala KUTZ., Fr. HUSTEDT, Bacillar. (1930) 295, fig. 495.

Valve lanceolate with subacuminate ends. Length, 0.025 mm; breadth, 0.005. Striae 15 in 0.01 mm. Common. Known from Kizaki and Biwa Lakes.

Navicula viridula KUTZ. var. **slesvicensis** (GRUN.) CLEVE. Plate IV, fig. 11.

Navicula viridula KUTZ. var. *slesvicensis* (GRUN.) CLEVE, VAN HEURCK, Synopsis (1884-85) pl. 7, fig. 26.

Valve linear-lanceolate with subacute, subrostrate ends. Length, 0.039 mm; breadth, 0.0085. Striae radiate, linear, 10 in 0.01 mm. Not unfrequent.

Navicula viridula KUTZ. var. **nipponica** var. nov. Plate IV, fig. 10.

Valve broadly lanceolate with subrostrate ends. Length, 0.025 mm; breadth, 0.01. Axial area narrow, somewhat dilated in the middle. Central area orbicular. Striae radiate, lineolate, 8 in 0.01 mm. Differs from var. *slesvicensis* in its more undulate margins. Uncommon.

Navicula placentula (EHR.) GRUN. Plate VI, fig. 11.

Navicula placentula (EHR.) GRUN., Fr. HUSTEDT, Bacillar. (1930) 303, fig. 532.

Valve elliptical-lanceolate with subrostrate ends. Length, 0.037 mm; breadth, 0.015. Striae radiate, 12 in 0.01 mm. Central area orbicular. Rare. Known from Biwa Lake.

Navicula peregrina (EHR.) KUTZ. var. **kefvingensis** (EHR.) CLEVE. Plate VIII, fig. 12.

Navicula peregrina (EHR.) KUTZ. var. *kefvingensis* (EHR.) CLEVE, A. SCHMIDT, Atlas Diatom. (1876) pl. 47, figs. 61, 62.

Valve lanceolate with subacute ends. Length, 0.059 mm; breadth, 0.013. Striae robust, lineolate, radiate, $7\frac{1}{2}$ in 0.01 mm. Uncommon. Known from brackish water.

Navicula menisculus SCHUM. Plate IV, fig. 9.

Navicula menisculus SCHUMANN, Fr. HUSTEDT, Bacillar. (1930) 301, fig. 517.

Valve elliptical-lanceolate with subacute ends. Length, 0.032 mm; breadth, 0.009. Striae radiate, not lineate, 9 in 0.01 mm. Uncommon. Known from Biwa Lake.

Navicula lanceolata (AGARDH) KUTZ.

Navicula lanceolata (AGARDH) KUTZ., Fr. HUSTEDT, Bacillar. (1930) 305, fig. 540.

Valve lanceolate, narrowed towards the ends. Length, 0.042 mm; breadth, 0.0085. Striae distinct, lineolate, 12 in 0.01 mm. Uncommon. Known from Kizaki and Ikeda Lakes.

Pinnularia microstauron (EHR.) CLEVE. Plate V, fig. 6.

Pinnularia microstauron (EHR.) CLEVE, Fr. HUSTEDT, Bacillar. (1930) 320, fig. 582.

Valve linear with parallel margins with subrostrate-capitate ends. Length, 0.069 mm; breadth, 0.011. Central area a broad stauros. Striae 10 in 0.01 mm. Differs from the type in its broader central area. Uncommon. Known from Aoki, Kizaki and Biwa Lakes.

Pinnularia episcopalis CLEVE.

Pinnularia episcopalis CLEVE, A. SCHMIDT, Atlas Diatom. (1914) taf. 312, figs. 1, 2.

Valve linear-elliptical with broad rounded ends. Length, 0.24 mm; breadth, 0.051. Striae radiate, robust, 6 to 7 in 0.01 mm. Central area a broad truncate outward stauros. Unfrequent.

Pinnularia brevicostata CLEVE. Plate VII, fig. 4.

Pinnularia brevicostata CLEVE, Diatoms of Finland (1891) 25, pl. 1, fig. 5.

Pinnularia montana HUST. var. *sinica* SKVORTZOV, Alpine diatom from South China (1929) 43, pl. 2, fig. 14; pl. 3, fig. 15.

Valve long-linear with almost parallel margins and obtuse ends. Length, 0.153 mm; breadth, 0.02. Axial area broad, somewhat less than $\frac{1}{2}$ of the breadth of the valve. Central area somewhat dilated. Striae slightly radiate, 7 to 8 in 0.01 mm. Uncommon. Reported from South China, and Kizaki Lake.

Pinnularia gibba EHR. fo. **subundulata** MAYER. Plate IV, fig. 7.

Pinnularia gibba EHR. fo. *subundulata* MAYER, FR. HUSTEDT, Bacillar. (1930) 327, fig. 601.

Valve linear, slightly triundulate with rostrate-capitate ends. Length, 0.073 mm; breadth, 0.01. Striae 9 to 10 in 0.01 mm. Central area a broad rhombical stauros. Uncommon. Known from Kizaki and Ikeda Lakes.

Pinnularia major (KUTZ.) CLEVE var. **transversa** A. S. Plate IV, fig. 6.

Navicula transversa A. SMITH, A. SCHMIDT, Atlas Diatom (1876) pl. 43, fig. 6 not 5.

Valve narrow linear, very slender. Ends rounded. Length, 0.181 mm; breadth, 0.022. Axial area linear, broad. Central area somewhat dilated in the middle. Striae robust, radiate, 7 to 8 in 0.01 mm, with distinct bands. Median line oblique. Uncommon. Known from Finland, America and Australia.

Pinnularia Dactylus EHR. Plate IV, fig. 3.

Pinnularia Dactylus EHR., A. SCHMIDT, Atlas Diatom. (1876) pl. 42, figs. 1, 3, 4.

Valve subelliptical-linear with obtuse ends. Length, 0.303 mm; breadth, 0.051. Striae with distinct bands, 4 in 0.01 mm. Median line oblique. Doesn't differ from recent one. Common in diatomaceous earth in America.

Pinnularia viridis (NITZSCH.) EHR. Plate V, fig. 1.

Pinnularia viridis (NITZSCH.) EHR., FR. HUSTEDT, Bacillar. (1930) 334, fig. 617a.

Valve elliptical-linear, narrowed towards the ends. Length, 0.111 mm; breadth, 0.018. Striae slightly radiate, 8 in 0.01 mm. Median line complex. Not frequent. Known from Aoki Lake.

Pinnularia distinguenda CLEVE. var. **fossilis** var. nov. Plate VI, fig. 4.

Valve linear-lanceolate, slightly gibbous in the middle, gradually attenuate towards the obtuse ends. Length, 0.107 mm; breadth, 0.017. Striae radiate with distinct bands, 8 in 0.01 mm. Axial area dilated, widened in the middle part of the valve. Differs from the type in its gibbous middle part, gradually attenuate towards the obtuse ends. Uncommon.

Pinnularia gentilis DONK. var. **fossilis** var. nov. Plate IV, fig. 4.

Valve linear, gradually attenuate towards the ends. Length, 0.139 to 0.178 mm; breadth, 0.02 to 0.023. Striae radiate, 6 to 7 in 0.01 mm, with distinct bands. Median line complex. Axial area narrow linear. Central area widened. Differs from the type * in its slightly attenuate ends. Common.

Pinnularia nobilis EHR. Plate IV, fig. 1.

Pinnularia nobilis EHR., FR. HUSTEDT, Bacillar. (1930) 337, fig. 619.

Valve linear, slightly gibbous in the middle and at the broadly rounded ends. Length, 0.255 mm; breadth, 0.035. Striae divergent in the middle and convergent at the ends, 5 to 6 in 0.01 mm. Axial area broad, central area widened. Median line complex. Common.

Pinnularia nobilis EHR. var. **fossilis** PANT. Plate IV, fig. 2.

Pinnularia nobilis EHR., var. *fossilis* PANTOCSEK, Fossile Bacillarien Hugarns (1903) 2, 51.

Differs from the recent forms in smaller size. Length, 0.175 to 0.204 mm; breadth, 0.02 to 0.027. Striae 6 to 7 in 0.01 mm. Very common. Reported from Hungary as fossils.

Pinnularia streptoraphe CLEVE. Plate IV, fig. 5.

Navicula sp. in A. SCHMIDT, Atlas Diatom. (1876) pl. 42, fig. 7.

Valve linear with parallel margins and broad rounded ends. Length, 0.153 mm; breadth, 0.025. Striae almost parallel, 6 in 0.01 mm. Median line robust and complex. Common. Common in diatomaceous earth from Lapland, and North America.

Pinnularia cardinalis (EHR.) W. SMITH. Plate V, fig. 5.

Pinnularia cardinalis (EHR.) W. SMITH, FR. HUSTEDT, Bacillar. (1930) 337, fig. 621.

Valve linear with parallel margins and broad ends. Length, 0.144 to 0.15 mm; breadth, 0.025 to 0.028. Striae divergent in the middle, convergent at the ends, 5 to 5½ in 0.01 mm, with distinct longitudinal bands. Median line complex. Central area a broad, truncate outward stauros. Common.

Amphora ovalis KUTZ. var. **libyca** (EHR.) CLEVE.

Amphora libyca EHR. in A. SCHMIDT, Atlas Diatom. (1876) pl. 26, fig. 105.

Valve elliptical with broad ends. Length, 0.032 mm; breadth, 0.0068. Striae 18 in 0.01 mm, closer than at the type. Common. Reported from Kizaki, Biwa and Ikeda Lakes.

* A. SCHMIDT, Atlas Diatom. (1876) pl. 42, fig. 2.

Amphora ovalis KUTZ. fo. **gracilis** (EHR.) CLEVE.

Amphora gracilis EHR. in A. SCHMIDT, Atlas Diatom. (1875) pl. 26, fig. 101.

Valve more narrow than of var. *libyca*. Length, 0.042 mm; breadth, 0.018. Striae 13 in 0.01 mm. Uncommon. Reported from Kizaki and Ikeda Lakes.

Cymbella Reinhardtii GRUN. Plate V, fig. 15.

Cymbella Reinhardtii GRUN., Fr. HUSTEDT, Bacillar. (1930) 354, fig. 644.

Valve slightly asymmetrical, with dorsal more arcuate than the ventral sides. Length, 0.035 mm; breadth, 0.01. Striae robust, radiate, 10 in 0.01 mm. Median line slightly arcuate and enlarged in the middle part. Reported from Kizaki Lake.

Cymbella Ehrenbergii KUTZ. Plate VI, figs. 5-7; Plate VIII, fig. 6.

Cymbella Ehrenbergii KUTZ., A. SCHMIDT, Atlas Diatom. (1875) pl. 9, figs. 6-9.

Valve slightly asymmetrical, naviculiform, broad lanceolate with subrostrate and subacute ends. Length, 0.087 to 0.153 mm; breadth, 0.034 to 0.039. Striae robust, coarsely lineate, about 7 to 9 in 0.01 mm. Median line slightly arcuate. Axial area narrow-linear. Central area orbicular. Very common. Reported from Aoki and Kizaki Lakes.

Cymbella naviculiformis AUERSW. Plate V, fig. 14.

Cymbella anglica LAGERST. in A. SCHMIDT, Atlas Diatom. (1875) pl. 9, fig. 63.

Valve slightly asymmetrical, elliptical with rostrate ends. Length, 0.034 mm; breadth, 0.012. Striae radiate, 10 (dorsal), 12 (ventral) in 0.01 mm. Central areas orbicular. Differs from the type in its more robust striae. Uncommon. Reported from Kizaki Lake.

Cymbella lacustris (AGARDH) CLEVE. Plate VIII, fig. 10.

Cymbella lacustris (AGARDH) CLEVE, Fr. HUSTEDT, Bacillar. (1930) 357, fig. 658.

Valve naviculiform, lanceolate with obtuse, subacute ends. Length, 0.034 mm; breadth, 0.008 to 0.009. Striae radiate, robust, 10 to 11 in 0.01 mm. Axial area narrow, central area orbicular. Median line straight, enlarged in the middle part. Uncommon.

Cymbella turgida (GREG.) CLEVE. Plate VIII, fig. 5.

Cymbella turgida (GREG.) CLEVE, Fr. HUSTEDT, Bacillar. (1930) 358, fig. 660.

Valve boat-shaped with straight ventral and arcuate dorsal sides. Length, 0.045 mm; breadth, 0.013. Striae radiate, 7 (dorsal), 9 to 10 (ventral). Common. Reported from Aoki Lake.

Cymbella ventricosa KUTZ.

Cymbella ventricosa KUTZ., FR. HUSTEDT, Bacillar. (1930) 359, fig. 661.

Valve lunate with subacute ends. Dorsal side arcuate, ventral slightly undulate. Length, 0.018 mm; breadth, 0.005. Very common. Reported from Aoki, Kizaki and Ikeda Lakes.

Cymbella Mölleriana GRUN. var. **nipponica** var. nov. Plate V, figs. 10, 11.

Valve asymmetrical, elliptical-lanceolate with subacute ends. Length, 0.064 to 0.078 mm; breadth, 0.015. Striae robust, slightly radiate, lineate, 6 in 0.01 mm. Axial area narrow, dilated in the middle. Differs from the type in its more robust striae. Common. *Cymbella Mölleriana* GRUN. is a rare species reported from Holstein and Platten Lane from Europe.

Cymbella cymbiformis (AGARDH? KUTZ.) VAN HEURCK.

Cymbella cymbiformis (AGARDH? KUTZ.) VAN HEURCK, FR. HUSTEDT. Bacillar. (1930) 362-363, fig. 672.

Valve cymbiform with elongate, subacute ends. Length, 0.073 mm; breadth, 0.013. Striae slightly radiate, 9 to 10 in 0.01 mm. At the ventral side of the central nodule is one small isolated puncta, ending the median striae. Uncommon. Reported from Kizaki and Ikeda Lakes.

Cymbella cistula (HEMPRICH) GRUN. Plate VI, fig. 8.

Cymbella cistula var. *maculata* GRUNOW, A. SCHMIDT, Atlas Diatom. (1881) pl. 71, fig. 21.

Valve asymmetrical, boat-shaped with arcuate dorsal side. Length, 0.091 mm; breadth, 0.018. Striae 6 (dorsal), 8 (ventral) in 0.01 mm. At the ventral side of the central nodule are two small isolated puncta, ending the median striae. Common. Reported from Aoki, Kizaki, Biwa and Ikeda Lakes.

Cymbella cistula (HEMPRICH) GRUN. var. **maculata** (KUTZ.) VAN HEURCK. Plate V, fig. 12.

Cymbella cistula (HEMPRICH) GRUN. var. *maculata* (KUTZ.) VAN HEURCK, FR. HUSTEDT, (1930) 363, fig. 676b.

Differs from the type in absence of isolated puncta at the ventral margin of the central nodule. Length, 0.039 mm; breadth, 0.013. Striae 8 (dorsal), 9 (ventral) in 0.01 mm. Rare.

Cymbella lanceolata (EHR.) VAN HEURCK.

Cymbella lanceolata (EHR.) VAN HEURCK, FR. HUSTEDT, Bacillar. (1930) 364, fig. 679.

Valve asymmetrical, boat-shaped with attenuate ends. Length, 0.091 mm; breadth, 0.018. Striae radiate, 9 in 0.01 mm. No isolated puncta at the ventral side of the central nodule. Uncommon.

Cymbella aspera (EHR.) CLEVE.

Cymbella aspera (EHR.) CLEVE, Fr. HUSTEDT, Bacillar. (1930) 365, fig. 680.

Valve boat-shaped with slightly gibbous margin and obtuse ends. Length, 0.124 mm; breadth, 0.03. Striae radiate, punctate, 7 in 0.01 mm. Frequent. Reported from Ikeda Lake.

Cymbella tumida (BREB.) VAN HEURCK. Plate VI, fig. 10.

Cymbella tumida (BREB.) VAN HEURCK, Fr. HUSTEDT, Bacillar. (1930) 366, fig. 677.

Valve boat-shaped with rostrate ends. Length, 0.068 mm; breadth, 0.017. Striae radiate, punctate, 8 to 9 in 0.01 mm. Common. Reported from Aoki, Kizaki and Biwa Lakes.

Cymbella tumida (BREB.) VAN HEURCK var. **borealis** GRUN.

Cymbella tumida (BREB.) VAN HEURCK, var. *borealis* GRUN., CLEVE and GRUNOW, Arctische Diatomeen (1880) 26.

Differs from the type in its obliquely-truncate not rostrate ends. Length, 0.076 mm; breadth, 0.02. Uncommon. Reported from Kizaki and Biwa Lakes.

Cymbella Yabe sp. nov. Plate VII, fig. 11.

Valve boat-shaped, asymmetrical with centrally gibbous ventral and arcuate dorsal margins. Length, 0.081 mm; breadth, 0.014. Striae radiate, punctate, 8 in 0.01 mm. Axial area narrow, central area dilated. Uncommon. This new form is nearly connected with *Cymbella lanceolata*. Named in honor of Prof. Dr. H. YABE, Sendai.

Gomphonema sphaerophorum EHR. Plate VII, fig. 10.

Gomphonema sphaerophorum EHR., Fr. HUSTEDT, Bacillar. (1930) 372, fig. 695.

Valve elliptical, subtruncate with constricted apex. Length, 0.04 mm; breadth, 0.008. Striae slightly radiate, 15 in 0.01 mm. Central area unilateral. The median stria opposite to the stigma being shortened. Rare.

Gomphonema parvulum (KUTZ.) GRUN.

Gomphonema parvulum (KUTZ.) GRUN., Fr. HUSTEDT, Bacillar. (1930) 372, fig. 713a.

Valve lanceolate with subrostrate apex and narrow basis. Length, 0.017 mm; breadth 0.005. Striae 17 to 18 in 0.01 mm. The median stria opposite to the stigma being shortened. Uncommon.

Gomphonema parvulum (KUTZ.) GRUN. var. **exilissima** GRUN.

Gomphonema parvulum (KUTZ.) GRUN. var. *exilissima* GRUN., VAN HEURCK, Synopsis (1880-81) pl. 25, fig. 12.

Differs from the type in its more narrow valve. Length, 0.027 mm; breadth, 0.0068. Striae 15 in 0.01 mm. Uncommon.

Gomphonema constrictum EHR. var. **capitata** (EHR.) CLEVE.

Gomphonema constrictum EHR. var. *capitata* (EHR.) CLEVE, FR. HUSTEDT, Bacillar. (1930) 377, fig. 715.

Valve clavate, not biconstricted, with broad rounded apex and elongate basis. Length, 0.035 mm; breadth, 0.013. Striae 11 in 0.01 mm. Stigma distinct. Uncommon. Reported from Kizaki, Biwa and Ikeda Lakes.

Gomphonema augur EHR. var. **Gautieri** VAN HEURCK.

Gomphonema augur EHR. var. *Gautieri* VAN HEURCK, FR. HUSTEDT, Bacillar. (1930) 372, fig. 689.

Valve clavate, slightly biconstricted with apiculate apex. Length 0.057 mm; breadth, 0.015. Stigma distinct. Common. Reported from Aoki, Kizaki, Biwa and Ikeda Lakes.

Gomphonema gracile EHR. var. **aurita** (A. BRAUN) CLEVE. Plate VIII, fig. 11.

Gomphonema gracile EHR. var. *aurita* (A. BRAUN) CLEVE, A. SCHMIDT, Atlas Diatom. (1902) pl. 236, figs. 20-24.

Valve narrow-lanceolate, slightly clavate, apex and basis subacute. Length, 0.044 mm; breadth, 0.0076. Striae 11 to 12 in 0.01 mm. Stigma distinct. Uncommon.

Gomphonema lanceolatum EHR. var. **insignis** (GREG.) CLEVE. Plate VI, fig. 2.

Gomphonema lanceolatum EHR. var. *insignis* (GREG.) CLEVE, FR. HUSTEDT, Bacillar. (1930) 376, fig. 701.

Valve lanceolate. Apex part slightly constricted and broad subacute. Basis gradually tapering from the middle to the subacute end. Length, 0.085 mm; breadth, 0.015. Striae robust, 9 in 0.01 mm. Uncommon. Reported from Kizaki and Biwa Lakes.

Gomphonema olivaceum (LYNGB.) KUTZ.

Gomphonema olivaceum (LYNGB.) KUTZ., FR. HUSTEDT, Bacillar. (1930) 378, fig. 719.

Valve clavate with broad rounded apex and attenuate basis. Length, 0.025 mm; breadth, 0.015. Striae 15 in 0.01 mm. No stigma. Rare. Reported from Aoki and Kizaki Lakes.

Epithemia turgida (EHR.) KUTZ. Plate VII, fig. 2.

Epithemia turgida (EHR.) KUTZ., Fr. HUSTEDT, Bacillar. (1930) 387, fig. 733.

Valve boat-shaped with almost straight ventral, and with arcuate dorsal margins. Ends rostrate. Length, 0.085 mm; breadth, 0.017. Common. Reported from Aoki and Biwa Lakes.

Epithemia Hyndmanii W. SMITH var. **gracilis** var. nov. Plate VII, fig. 3.

Valve lunate with subrostrate and slightly capitate ends. Length, 0.14 mm; breadth, 0.015. Costae 4 in 0.01 mm. Differs from the type in its more narrow valves. Common.

Epithemia zebra (EHR.) KUTZ. var. **porcellus** (KUTZ.) GRUN.

Epithemia zebra (EHR.) KUTZ. var. *porcellus* (KUTZ.) GRUN., Fr. HUSTEDT, Bacillar. (1930) 385, fig. 731.

Valve boat-shaped with straight ventral, and arcuate, rostrate dorsal margins. Length, 0.047 mm; breadth, 0.0085. Common. Known from Biwa and Ikeda Lakes.

Epithemia sorex KUTZ.

Epithemia sorex KUTZ., Fr. HUSTEDT, Bacillar. (1930) 388, fig. 736.

Valve lunate with capitate ends. Length, 0.034 mm; breadth, 0.009. Very common. Reported from Aoki, Kizaki, Biwa and Ikeda Lakes.

Rhopalodia gibba (EHR.) O. MULL.

Rhopalodia gibba (EHR.) O. MULL., Fr. HUSTEDT, Bacillar. (1930) 390, fig. 740.

Valve linear-lanceolate with reflexed dorsal margin. Length, 0.102 to 0.165 mm; breadth, 0.01 to 0.012. Common. Reported from Aoki, Kizaki, Biwa and Ikeda Lakes.

Hantzschia amphioxys (EHR.) GRUN. var. **vivax** (HANTZSCH.) GRUN. Plate VII, fig. 7.

Hantzschia amphioxys (EHR.) GRUN. var. *vivax* (HANTZSCH.) GRUN., Fr. HUSTEDT, (1930) 394, fig. 750.

Valve linear-lanceolate with gibbous ventral and constricted dorsal margins. Ends attenuate and subacute. Length, 0.136 mm; breadth, 0.01. Costae 8 to 9, striae 21 in 0.01 mm. Uncommon. Known from Ikeda Lake.

Nitzschia amphibia GRUN.

Nitzschia amphibia GRUN., Fr. HUSTEDT, Bacillar. (1930) 414, fig. 793.

A distinct species with lanceolate subacute valves. Length, 0.023 mm; breadth, 0.0034. Uncommon. Reported from Aoki and Ikeda Lakes.

Cymatopleura solea (BREB.) W. SMITH. Plate VI, fig. 9.

Cymatopleura solea (BREB.) W. SMITH, Fr. HUSTEDT, Bacillar. (1930) 425, fig. 823a.

Valve broad-linear, constricted in the middle part and cuneate-capitate at the ends. Length, 0.102 mm; breadth, 0.019. Costae 6 in 0.01 mm. Not common. Reported from Aoki, Kizaki, Biwa and Ikeda Lakes.

Surirella biseriata BREB. var. **constricta** GRUN. Plate VIII, fig. 1.

Surirella biseriata BREB. var. *constricta* GRUN., Fr. HUSTEDT, Bacillar. (1930) 433, fig. 835.

Valve lanceolate, constricted in the middle. Ends cuneate. Length, 0.22 mm; breadth, 0.042. Costae reaching the pseudoraphe, 2 in 0.01 mm. Uncommon, mostly in fragments. Reported from Ikeda Lake.

Surirella biseriata BREB. var. **bifrons** (EHR.) HUST.

Surirella biseriata BREB. var. *bifrons* (EHR.) HUST., Fr. HUSTEDT, Bacillar. (1930) 433 fig. 833.

Valve lanceolate-elliptical with subacute ends. Length, 0.085 mm; breadth, 0.03. Costae 3 in 0.01 mm. Frequently in fragments. Known from Aoki, Kizaki and Ikeda Lakes.

Surirella elegans EHR. var. **genuina** A. MAYER. Plate VIII, fig. 2.

Surirella elegans EHR. var. *genuina* A. MAYER, Bacillar. d. Regensburg. Gewässer (1912) 343, tab. 20, fig. 3.

Valve elongate ovate with one end much broader than the other. Length, 0.2 to 0.25 mm; breadth, 0.05 to 0.052. Common.

Surirella elegans EHR. var. **norvegica** (EULENST.) BRUN, fo. **typica** A. MAYER. Plate VII, fig. 1.

Surirella elegans EHR. var. *norvegica* (EULENST.) BRUN, fo. *typica* A. MAYER, Bacillar. d. Regensburger Gewässer. (1912) 344, tab. 23, fig. 1.

Differs from the type in its more longer valves. Length, 0.297 mm; breadth, 0.061. Costae 2 in 0.01 mm. Common. Known from Ikeda Lake.

Surirella elegans EHR. var. **norvegica** (EULENST.) BRUN, fo. **constricta** A. MAYER. Plate VII, fig. 5.

Surirella elegans EHR. var. *norvegica* (EULENST.) BRUN, fo. *constricta* A. MAYER. Bacillar. d. Regensburg. Gewässer. (1912) 344, tab. 23, fig. 3.

Valve constricted in the middle. Apex broad rounded, basis subacute. Length, 0.27 mm; breadth, 0.045 (lower part), 0.051 (upper part). Costae 2 in 0.01 mm. Uncommon.

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Illustrations

Plate IV

- Fig. 1. *Pinnularia nobilis* EHR.
2. *Pinnularia nobilis* EHR. var. *fossilis* PANT.
3. *Pinnularia Dactylus* EHR.
4. *Pinnularia gentilis* DONK. var. *fossilis* var. nov.
5. *Pinnularia streptoraphe* CLEVE.
6. *Pinnularia major* (KUTZ.) CLEVE var. *transversa* A. S.
7. *Pinnularia gibba* EHR. fo. *subundulata* MAYER.
8. *Neidium bisulcatum* (LAGERST.) CLEVE var. *nipponica* SKV.
9. *Navicula menisculus* SCHUM.
10. *Navicula viridula* KUTZ. var. *nipponica* var. nov.
11. *Navicula viridula* KUTZ. var. *slesvicensis* (GRUN.) CLEVE.
12. *Caloneis silicula* (EHR.) CLEVE.

Plate V

- Fig. 1. *Pinnularia viridis* (NITZSCH.) EHR.
2. *Navicula Perrotettii* GRUN.
- Figs. 3, 4. *Stauroneis phoenicenteron* EHR.

- Fig. 5. *Pinnularia cardinalis* (EHR.) W. SMITH.
 6. *Pinnularia microstauron* (EHR.) CLEVE.
 7. *Navicula cuspidata* KUTZ. var. *ambigua* (EHR.) CLEVE.
 8. *Cacconeis placentula* (EHR.) var. *lineata* (EHR.) CLEVE.
 9. *Navicula cuspidata* KUTZ.
 Figs. 10, 11. *Cymbella Mülleriana* GRUN. var. *nipponica* var. nov.
 Fig. 12. *Cymbella cistula* (HEMPRICH) GRUN. var. *maculata* (KUTZ.) VAN HEURCK.
 13. *Navicula subdicephala* HUST. fo. *recta* fo. nov.
 14. *Cymbella naviculiformis* AUERSV.
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Plate VI

- Fig. 1. *Stephanodiscus astraea* (EHR.) GRUN. var. *intermedia* FRICKE.
 2. *Gomphonema lanceolatum* EHR. var. *insignis* (GREG.) CLEVE.
 3. *Caloneis silicula* (EHR.) CLEVE.
 4. *Pinnularia distinguenda* CLEVE var. *fossilis* var. nov.
 Figs. 5, 6, 7. *Cymbella Ehrenbergii* KUTZ.
 Fig. 8. *Cymbella cistula* (HEMPRICH) GRUN.
 9. *Cymatopleura solea* (BREB.) W. SMITH.
 10. *Cymbella tumida* (BREB.) VAN HEURCK.
 11. *Navicula placentula* (EHR.) GRUN.
 12. *Stephanodiscus astraea* (EHR.) GRUN. var. *minutula* (KUTZ.) GRUN.

Plate VII

- Fig. 1. *Surirella elegans* EHR. var. *norvegica* (EULENST.) BRUN, fo. *typica* A. MAYER.
 2. *Epithemia turgida* (EHR.) KUTZ.
 3. *Epithemia Hyndmanni* W. SMITH var. *gracilis* var. nov.
 4. *Pinnularia brivicostata* CLEVE.
 5. *Surirella elegans* EHR. var. *norvegica* (EULENST.) BRUN, fo. *constricta* A. MAYER.
 6. *Neidium obliquistriatum* A. S. var. *rostrata* SKV.
 7. *Hantzschia amphioxys* (EHR.) GRUN. var. *vivax* (HANTZSCH.) GRUN.
 8. *Stauroneis phoenicenteron* EHR.
 9. *Navicula Lambda* CLEVE.
 10. *Gomphonema sphaerophorum* EHR.
 11. *Cymbella Yabe* sp. nov.

Plate VIII

- Fig. 1. *Surirella biseriata* BREB. var. *constricta* GRUN.
 2. *Surirella elegans* EHR. var. *genuina* A. MAYER.
 3. *Anomoeoneis sphaerophora* KUTZ.
 4. *Navicula cuspidata* KUTZ. var. *ambigua* (EHR.) CLEVE.
 5. *Cymbella turgida* (GREG.) CLEVE.
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 7. *Fragilaria virescens* RALFS.
 8. *Fragilaria construens* (EHR.) GRUN. var. *nipponica* SKV.
 9. *Fragilaria construens* (EHR.) GRUN. var. *subsalina* HUST.
 10. *Cymbella lacustris* (AGARDH) CLEVE.
 11. *Gomphonema gracile* EHR. var. *aurita* (BRUN.) CLEVE.
 12. *Navicula peregrina* (EHR.) KUTZ. var. *kefvingensis* (EHR.) CLEVE.
 13. *Synedra parasitica* (W. SMITH).









