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A Floristic Analysis of the Attached Diatoms in Selected Areas of the Upper Mississippi River

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Attached diatom communities were studied along the border of the main channel of Navigation Pools 5 and 9 of the Upper Mississippi River. A total of 296 diatom taxa representing 42 genera were observed in the study. Approximately 52% of the taxa were common to both pools. The number of taxa was greatest in both study areas during the spring and fall and lowest during the summer. *Cocconeis placentula* var. *euglypta* (Ehr.) Cl. usually accounted for ca 50% of the diatom density during the summer in Pool 5, whereas *Cocconeis placentula* var. *euglypta* and *Navicula tripuntata* var. *schizonemoides* (V.H.) Patr. were codominant taxa during the summer in Pool 9. Similar dominance by one or two species was usually not observed during the spring and fall. Because the present studies were limited to main channel areas, the number of taxa observed in this study probably represents only a portion of the diatom flora of typical pools of the Upper Mississippi River.

INDEX DESCRIPTORS: Diatoms, Upper Mississippi River, Attached Algae

Diatoms are fundamentally important as primary producers in lake and river systems (Williams and Scott, 1962; Hutchinson, 1967); however, only a few studies have been conducted on the diatom flora of the Upper Mississippi River. Early ecological investigations on phytoplankton were performed by Bailey (1848), Tilden (1895), and Reinhardt (1931); more recent studies were conducted by Williams and Scott (1962) and Huff (1983). Galtsoff (1924), Wiebe (1928), and Mischuk (1976) have compiled floristic inventories of phytoplanktonic diatoms; similar inventories of attached diatoms have been presented by Kuhl (1979) and Commonwealth Edison Company (1981). Strenski (1977, 1979) has investigated the attached diatoms of the Black River, and Drum (1981) studied both attached and planktonic diatoms of the Des Moines River. Both rivers are tributaries of the Upper Mississippi.

There is a need to gather data that will broaden our basic understanding of major riverine systems such as the Mississippi River. Baseline data for all ecological components of the Upper Mississippi River must be established because of the multiple-use resource plan that is being developed for the river (Jackson et al., 1981; Jackson et al., in press). Because of the small amount of data available on algae of the Upper Mississippi River, two ecological studies were conducted on the attached diatom communities of Navigation Pools 5 (Luttenton, 1982) and 9 (Vansteenburg, 1983). This paper presents a list of diatom taxa that were observed in those studies. General seasonal distributions of diatoms are also discussed.

DESCRIPTION OF THE STUDY AREA

The Mississippi River and its tributaries drain ca 41% of the contiguous United States. The stretch of river upstream from the mouth of the Ohio River near Cairo, Illinois is denoted as the Upper Mississippi River. During the 1930s, most of it was converted from a natural free flowing river system into a series of shallow reservoirs controlled for commercial navigation by the U.S. Army Corps of Engineers. Each reservoir typically consists of three distinct ecological areas (Fremling and Claflin, in press). Tailwaters immediately downstream from the locks and dams are characterized by an unmodified river morphometry with deep sloughs and relatively rapid current velocities. Mid-reaches are typified by large open water areas with numerous stump fields where stands of timber were located prior to impoundment. Downstream reaches are deeper, open warer areas with heavily silted bottoms. The main channel of the Upper Mississippi River has numerous wing dams and closing dams along its borders.

Typical pools on the Upper Mississippi River represent habitat rypes that range in a continuum from free flowing channels to stagnant backwater lakes and ponds. In addition, there is a wide variety of substrate types for diatom colonization and growth, e.g. aquatic macrophytes, tree stumps, rocks of wing dams, and other algae. A diverse attached algal community, particularly diatoms, would be expected to exist in the Upper Mississippi River.

The areas investigated in this study were located along the border of the main channel between River Miles 750 and 752 in Pool 5 and between River Miles 679 and 678 in Pool 9 (Fig. 1). One station in Pool 9 was influenced by the thermal effluent of a power generating complex.

METHODS AND MATERIALS

Samples were collected in Pool 5 during the ice free-period from 5 July 1978 to 2 July 1980 and in Pool 9 from 6 May 1980 to 1 June 1981. Four stations were located along the border of the main channel in each pool. Duplicate samplers with glass microscope slides as substrates were placed at each station at the beginning of the sampling seasons. Two more samplers were placed at each station 14 days later; all samplers were exposed for 28 days, with sampling perids overlapping by 14 days. Samples from natural substrates were also collected regularly in each pool. Water samples were collected in conjunction with phycoperiphyton sampling. The water was analyzed for pH, hardness, combined inorganic nitrogen (nitrite + nitrate + ammonia), and total phosphorus according to methods of the U.S. Environmental Protection Agency (1979).

Diatom samples were cleaned by boiling in nitric acid and mounted in Hyrax (Custom Research and Development Inc., Auburn, CA). Slides prepared from glass substrates were analyzed by counting valves along a transect until a minimum of 500 valves were tallied. Slides prepared from natural substrates were scanned to determine the most abundant taxa, general community structure, and to identify rare taxa. Many taxa have been verified with herbarium specimens at the Academy of Natural Sciences of Philadelphia. The slides used for these investigations have been retained by the authors. Quantitative data for relative abundance and community structure of phycoperiphyton observed in these studies can be obtained from Luttenton (1982) and Vansteenburg (1983).

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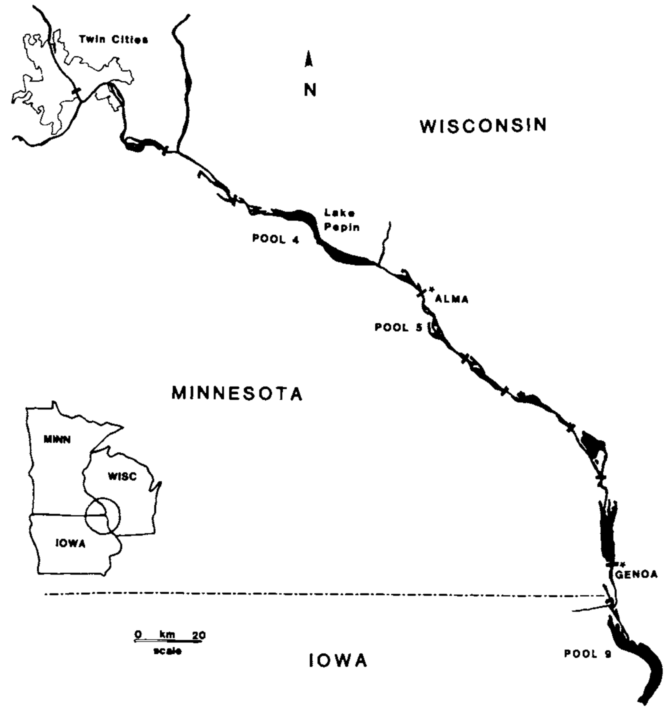

Fig. 1. Map of study areas in the Upper Mississippi River. Locks and dams that delimit the navigation pools are denoted by a solid line across the river.

RESULTS AND DISCUSSION

The reaches of Mississippi River investigated in this study can be characterized as having hard, alkaline, and eutrophic waters (Table 1). The water chemistry appears to be somewhat different between Pools 5 and 9, but these data were collected during different years and therefore are not directly comparable. The concentrations for both pools do, however, fall within the ranges reported for a 10-year monitoring study conducted on Pool 7 (Dawson et al., in press), which is located between these study areas.

A total of 296 diatom taxa representing 42 genera was collectively observed in Pools 5 and 9 (Table 2). Of these taxa, 242 and 206 were recorded for Pool 5 and Pool 9, respectively. Community similarity between pools estimated with Jaccard's coefficient (Weitzel, 1979) indicated that about 52% of the taxa observed were common to both study areas. Similarity coefficients between Pools 5 and 9 may become greater as more areas are studied and a larger portion of the rare diatoms are identified.

Only 181 of the 296 taxa observed in this study were identified in other studies of diatoms in the Upper Mississippi river (Bailey, 1848; Tilden, 1895; Galtsoff, 1924; Wiebe, 1928; Reinhardt, 1931; Williams and Scott, 1962; Kuhl, 1979; Mischuk, 1976; Commonwealth Edison Company, 1981; Huff, 1983). However, many species observed in other studies were not found in Pools 5 and 9. For example, only 137 of the 275 attached diatoms recorded in Pool 14 downstream of Clinton, Iowa (Commonwealth Edison Company, 1981) were encountered in Pools 5 and 9.

Two distinct diatom assemblages were apparent from glass substrates in Pool 5, a spring-fall assemblage and a summer assemblage (July to October). The spring assemblage was composed of several common species, i.e. those that individually accounted for 5% to 25% of the total standing crop. *Melosira varians* Ag., *Gomphonema olivaceum* (Lyngb.) Kütz., *G. angustatum* (Kütz) Rabh., *Synedra ulna* (Nitz.) Ehr., *S. ulna* var. *oxyrhynchus* (Kütz.) V.H., *Diatoma vulgare* Bory, *Nitzschia palea* (Kütz.) W. Sm., *Meridion circulare* (Grev.) Ag., *Cymbella minuta* Hilse *ex* Rabh., and several species of *Stephanodiscus* were common during the spring. In contrast, the summer community was strongly dominated by *Cocconeis placentula* var. *euglypta* (Ehr.) Cl. Other common taxa included *Cocconeis placentula* var. *lineata* (Ehr.) V.H., *Achnanthes lanceolata* (Bréb.) Kütz., and *Achnanthes lanceolata* var. *dubia* Grun. The remaining species individually composed between 0.15% to 5% of the total standing crop. A major change in community structure occurred in late October. The most significant change was a decline in the relative density of *C. placentula* var. *euglypta* from ca 50% to 10% of the diatom cell density, and an increase in the total number of taxa from ca 40 to 60. Fall diatom assemblages were similar to spring assemblages; taxa individually accounting for 5% to 25% of cell densities were *M. varians, G. olivaceum, D. vulgare,* and *Navicula tripunctata* var. *schizonemoides* (V.H.) Patr.

General trends of dominance and the relative composition of diatom assemblages in Pool 9 were similar to those in Pool 5. *Stephanodiscus rotula* (Kütz.) Hendey was the dominant taxon during May and April; however, *varians, M. italica* (Ehr.) Kütz., *Cyclotella striata* (Kütz.) Grun., *Navicula salinarium* var. *intermedia* (Grun.) Cl., *N. tripunctata* var. *schizonemoides,* and *N. palea* were also common. *Cocconeis placentula* var. *euglypta* composed about 75% of the total number of diatoms during July to early November. Other common species were *N. palea, C. placentula* var. *lineata, A. lanceolata, A. lanceolata* var. *dubia, Navicula vaucheriae* Peterson, *Melosira varians, M. granulata* (Ehr.) Ralfs, and *M. italica.* A major shift in community structure occurred by mid-November when *M. varians* became the dominant species and *S. rotula* the second most common taxon. *Fragilaria vaucheriae* (Kütz.) Peters., *Fragilaria capucina* var. *mesolepta* Rabh., *D. vulgare, S. ulna,* and *G. olivaceum* were common during the fall-winter period. Seasonal trends at the station influenced by a thermal effluent in Pool 9 were different than the other stations in a few respects. The appearance of the fall-winter assemblage was probably delayed because of the warmer water temperatures, and fewer species were observed in winter compared to the other stations. During that time, *S. rotula* composed approximately 70% of the diatom density at that station.

SUMMARY

The results of this study demonstrate that the border of the main channel of the Upper Mississippi River supports attached diatom communities with large numbers of species. Seasonal trends of dominant taxa and species richness were similar in the study areas of Pools 5 and 9, which were 70 river miles (113 km) apart. This study investigated only a small amount of the habitat diversity of the river; studies of different reaches of navigation pools are needed to under-

Table 1. Means and ranges of selected water quality variables measured in Navigation Pools 5 and 9, Upper Mississippi River.

Variable	Pool 5	Pool 9
pH	7.9 (7.15-8.3)	7.7 (7.3-8.9)
Total Hardness (mg/1 as $CaCO_3$)	196 (146-270)	146 (100-208)
Combined inorganic-N (mg/1)	1.36 (0.03-4.68)	0.85 (0.23-1.79)
Total-P (mg/1)	0.13 (<0.05-0.50)	0.20 (0.08-0.43)

stand the complex nature of algal communites of this major river system.

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Table 2. Taxonomic list of diatoms identified in Navigation Pools 5 and 9 of the Upper Mississippi River. The presence of a taxon within a navigation pool is indicated by the pool number (5 or 9); B indicates its presence in both pools.

Taxon	Taxon Location
ACHNANTHES	
A. *clevei* Grun.	5
A. *clevei* v. *rostrata* Hust.	5
A. *exigua* Grun.	B
A. *exigua* v. *constricta* (Grun.) Hust.	9
A. *hauckiana* v. *rostrata* Schultz	B
A. *hungarica* (Grun.) Grun.	B
A. *lanceolata* (Bréb.) Kütz.	B
A. *lanceolata* v. *apiculata* Patr.	B
A. *lanceolata* v. *dubia* Grun.	B
A. *lanceolata* v. {c.f. *omissa*} Reim.	B
A. *lapponica* v. *ninckei* (Guerm. & Mang.) Reim.	5
A. *lewisiana* Patr.	5
A. *linearis* (W. Sm.) Grun.	B
A. *minutissima* Kütz.	5
AMPHORA	
A. *ovalis* (Kütz.) Kütz.	B
A. *ovalis* v. *affinis* Kütz. (=A. *libyca* Ehr.)	5
A. *ovalis* v. *pediculus* (Kütz.) V.H. *ex* DeT. (=A. *libyca* Ehr.)	B
A. *perpusilla* Grun. (=A. *pediculus* (Kütz.) Grun.)	B
A. *veneta* Kütz.	B
ASTERIONELLA	
A. *formosa* Hassall	B
BACILLARIA	
B. *paradoxa* Gmelin	9
BIDDULPHIA	
B. *laevis* Ehr. (=*Pleurosira laevis* (Ehr.) Compére)	5
CALONEIS	
C. *bacillium* (Grun.) Cl.	B
C. *hyalina* Hust.	5
C. *lewisii* Patr.	9
C. *limosa* (Kütz.) Patr.	5
C. *silicula* (Ehr.) Cl.	5
CAMPYLODISCUS	
Campylodiscus sp.	5
CAPARTOGRAMMA	
C. crucicula (Grun.) Ross	B
COCCONEIS	
C. *pediculus* Ehr.	B
C. *placentula* v. *euglypta* (Ehr.) Cl.	B
C. *placentula* v. *lineata* (Ehr.) V.H.	B
COSCINODISCUS	
Coscinodiscus sp.	B
CYCLOTELLA	
C. *atomus* Hust.	B
C. *comensis* Grun.	5
C. *comta* (Ehr.) Kütz.	B
C. *glomerata* Bachm.	5
C. *kuetzingiana* Thwaites	9
C. *meneghiniana* Kütz.	B
C. *michiganiana* Skv.	9
C. *pseudostelligera* Hust.	B
C. *stelligera* (Cl. & Grun.) V.H.	B
C. *stelligera* v. *tenuis* Hust.	5
C. *striata* (Kütz.) Grun.	B
C. *striata* v. *ambigua* Fricke	5
CYMATOPLEURA	
C. *solea* (Bréb.) W. Sm. (=C. *librile* (Ehr.) Pant.)	B
CYMBELLA	
C. *aspera* (Ehr.) H. Perag.	5
C. *cistula* (Ehr.) Kirchn.	5
C. *lanceolata* (Ag.) Ag.	5
C. *mexicana* (Ehr.) Cl.	5
C. *minuta* Hilse *ex* Rabh.	B
C. *minuta* v. *pseudogracilis* (Choln.) Reim.	9
C. *minuta* v. *silesiaca* (Bleisch) Reim.	B
C. *naviculiformis* Auerswald *ex* Heib.	B
C. *prostrata* (Berk.) Cl.	B
C. *sinuata* Greg.	5
C. *triangulum* (Ehr.) Cl.	B
C. *tumida* (Bréb.) V.H.	B
CYMBELLONITZSCHIA	
C. *diluviana* Hust.	5
DIATOMA	
D. *anceps* (Ehr.) Kirchn.	9
D. *tenue* Ag.	B
D. *tenue* v. *elongatum* Lyngb.	B
D. *vulgare* Bory	B
DIPLONEIS	
D. *finnica* (Ehr.) Cl.	5
D. *oculata* (Bréb.) Cl.	9
D. *puella* (Schum.) Cl.	5
D. *smithii* (Bréb.) Cl.	5
ENTOMONEIS	
E. *ornata* (J.W. Bail.) Reim.	B
EPITHEMIA	
E. *adnata* (Kütz.) Bréb.	B
E. *argus* (Ehr.) Kütz.	9
E. *sorex* Kütz.	5
E. *turgida* v. *westermannii* (Ehr.) Grun.	B
EUNOTIA	
E. arcus Ehr.	9
E. *arcus* v. *bidens* Grun.	9
E. *curvata* (Kütz.) Lagerst.	B
E. *exigua* (Bréb. *ex* Kütz.) Rabh.	9
E. *hexaglyphis* Ehr.	5
E. *lunaris* (Ehr.) Grun.	5
E. *monodon* Ehr.	B
E. *pectinalis* (O. Müll.) Rabh.	B
E. *vanheurckii* v. *intermedia* (Krasske) Patr.	5
FRAGILARIA	
F. *brevistriata* Grun.	5
F. *capucina* Desm.	B
F. *capucina* v. *mesolepta* Rabh.	B
F. *construens* (Ehr.) Grun.	B
F. *construens* v. *binodis* (Ehr.) Grun.	5
F. *construens* v. *pumila* Grun.	B
F. *construens* v. *venter* (Ehr.) Grun.	B
F. *crotonensis* Kitton	B
F. *crotonensis* v. *oregona* Sov.	9
F. *lapponica* Grun.	5
F. *leptostauron* (Ehr.) Hust.	B
F. *leptostauron* v. *dubia* (Grun.) Hust.	5
F. *leptostauron* v. *rhomboides* (Grun.) Hust.	5
F. *pinnata* Ehr.	B
F. *pinnata* v. *intercedens* (Grun.) Hust.	9
F. *pinnata* v. *lancettula* (Schum.) Hust.	5
F. *vaucheriae* (Kütz.) Peters.	B
FRUSTULIA	
F. *rhomboides* v. *amphipleuroides* (Grun.) Cl.	B
GOMPHONEMA	
G. acuminatum Ehr.	5
G. *affine* Kütz.	9
G. *angustatum* (Kütz.) Rabh.	B
G. *angustatum* v. *obtusatum* (Kütz.) Grun.	B
G. *angustatum* v. *sarcophagus* (Greg.) Grun.	B
G. *constrictum* v. *capitatum* (Ehr.) Cl.	9
G. *dichotomum* Kütz.	B
G. *gracile* Ehr. emend. V.H.	B
G. *grovei* Schmidt	5
G. *intricatum* Kütz.	B
G. *intricatum* v. *pulvinatum* (Braun) Grun.	B
G. *olivaceum* (Lyngb.) Kütz.	B
G. *olivaceum* v. *calcarea* (Cl.) Cl.	9
G. *parvulum* (Kütz.) Kütz.	B
G. *simus* Hohn & Hellerm.	9
G. *subclavatum* v. *commutatum* (Grun.) A. Mayer	B
G. *subclavatum* v. *mexicanum* (Grun.) Patr.	B
G. *tenellum* Kütz.	B
G. *truncatum* Ehr.	5
G. *ventricosum* Greg.	9
GYROSIGMA	
G. *acuminatum* (Kütz.) Rabh.	5
G. *obtusatum* (Sulliv. & Wormley) Boyer	B
G. *scalproides* (Rabh.) Cl.	B
G. *sciotense* (Sulliv. & Wormley) Cl.	B
G. *spencerii* (W. Sm.) Cl.	9
MELOSIRA	
M. *ambigua* (Grun.) O. Müll. (=*Aulacosira ambigua* (Grun.) Simons.)	5
M. *distans* (Ehr.) Kütz. (=A. *distans* (Ehr.) Simons.)	B
M. *granulata* (Ehr.) Ralfs (=A. *granulata* (Ehr.) Simons.)	B
M. *granulata* v. *angustissima* O. Müll. (=A. *granulata* v. *angustissima* (O. Müll.) Simons.)	5
M. *italica* (Ehr.) Kütz. (=A. *italica* (Ehr.) Simons.)	B
M. *italica* v. *tenuissima* (Grun.) O. Müll. (=A. *italica* (Grun.) Simons.)	5
M. *varians* Ag.	B

Taxon	Taxon Location
MERIDION	
M. *circulare* (Grev.) Ag.	B
M. *circulare* v. *constrictum* (Ralfs) V.H.	5
NAVICULA	
N. [c.f. *accomoda*] Hust.	9
N. *americana* Ehr.	5
N. *anglica* Ralfs	B
N. *angusta* Grun.	5
N. *arvensis* Hust.	B
N. *bacillum* Ehr.	5
N. *capitata* Ehr.	5
N. *capitata* v. *hungarica* (Grun.) Ross	B
N. *cincta* (Ehr.) Ralfs	9
N. *confervacea* (Kütz.) Grun.	5
N. *cryptocephala* Kütz.	B
N. *cryptocephala* f. *minuta* Boyer	5
N. *cryptocephala* v. *veneta* (Kütz.) Rabh.	B
N. *cuspidata* (Kütz.) Kütz.	B
N. *cuspidata* v. *major* Meist.	9
N. *decussis* Østr.	B
N. *dicephala* Ehr.	B
N. *elginensis* (Greg.) Ralfs	B
N. *elginensis* v. *lata* (M. Perag.) Patr.	9
N. *elginensis* v. *neglecta* (Krasske) Patr.	5
N. *elginensis* v. *rostrata* (A. Mayer) Patr.	9
N. *exigua* (Greg.) Grun.	5
N. *exigua* v. *capitata* Patr.	B
N. *festiva* Krasske	9
N. *gastrum* (Ehr.) Kütz.	B
N. *hambergii* Hust.	5
N. *ingrata* Krasske	9
N. *integra* (W. Sm.) Ralfs	B
N. [c.f. *lacustris* Greg.]	5
N. *lanceolata* (Ag.) Kütz.	B
N. *luzonensis* Hust.	5
N. *menisculus* Schum.	B
N. *menisculus* v. *upsaliensis* Grun.	B
N. *minima* Grun.	B
N. *mutica* Kütz.	B
N. *mutica* v. *stigma* Patr.	B
N. *palaearctica* Hust.	5
N. *paucivisitata* Patr.	5
N. *pelliculosa* (Brēb. *ex.* Kütz.) Hilse	9
N. *placentula* (Ehr.) Kütz.	5
N. *placentula* v. *rostrata* A. Mayer	5
N. *protracta* (Grun.) Cl.	B
N. *pseudoreinhardtii* Patr.	B
N. *pupula* Kütz.	B
N. *pupula* v. *capitata* Skv. & Meyer	9
N. *pupula* v. *elliptica* Hust.	5
N. *pupula* v. *rectangularis* (Greg.) Grun.	B
N. *radiosa* Kütz.	B
N. *radiosa* v. *parva* Wallace	5
N. *radiosa* v. *tenella* (Brēb.) Grun.	B
N. *reinhardtii* (Grun.) Grun.	B
N. *reinhardtii* v. *elliptica* Herib.	9
N. *rhynchocephala* Kütz.	B
N. *rhynchocephala* v. *amphiceros* (Kütz.) Grun.	9
N. *rhynchocephala* v. *germainii* (Wallace) Patr.	B
N. *salinarum* v. *intermedia* (Grun.) Cl.	B
N. *schroeteri* v. *escambia* Patr.	B
N. *scutelloides* W. Sm.	5
N. *secreta* v. *apiculata* Patr.	5
N. *secura* Patr.	9
N. *seminulum* Grun.	B
N. *symmetrica* Patr.	B
N. *tantula* Hust.	5
N. *tenera* Hust.	B
N. *terminata* Hust.	B
N. *tripunctata* (O. Müll.) Bory	B
N. *tripunctata* v. *schizonemoides* (V.H.) Patr.	B
N. *vaucheriae* Petersen	9
N. *viridula* (Kütz.) Ehr.	B
N. *viridula* v. *avenacea* (Brēb.) V.H.	B
N. *viridula* v. *linearis* Hust.	B
N. *viridula* v. *rostellata* (Kütz.) Cl.	B
N. *vulpina* Kütz.	5
NEIDIUM	
N. *affine* (Ehr.) Pfitz.	9
N. *iridis* (Ehr.) Cl.	5
NITZSCHIA	
N. *acicularis* W. Sm.	B
N. *acicularis* v. *closterioides* Grun.	9
N. *acuta* Hantz.	B
N. *adamata* Hust.	9
N. *affinis* Grun.	9
N. *amphibia* Grun.	B
N. *amphibia* v. *acutiuscula* Grun.	9
N. *brevissima* (Grun.) Kalinsky	9
N. *capitellata* Hust.	B
N. *clausii* Hantz.	5
N. [c.f. *communis* v. *abbreviata* Grun.]	5
N. *dissipata* (Kütz.) Grun.	B
N. *filiformis* (W. Sm.) Schutt	B
N. *fonticola* Grun.	B
N. *frustulum* (Kütz.) Grun.	5
N. *gracilis* Hantz.	B
N. *holsatica* Hust.	9
N. *hungarica* Grun.	9
N. *lacunarum* Hust.	9
N. *laevissima* Grun.	9
N. *linearis* (Ag. *ex* W. Sm.) W. Sm.	B
N. *palea* (Kütz.) W. Sm.	B
N. *paleacea* Grun.	5
N. *obtusa* v. *scalpelliformis* Grun.	9
N. *recta* Hantz.	B
N. *sigmoidea* (Nitz.) W. Sm.	B
N. *subcapitellata* Hust. (= N. gandersheimiensis Krasske)	B
N. *tryblionella* Hantz.	B
N. *tryblionella* v. *levidensis* (W. Sm.) Grun.	5
N. *tryblionella* v. *victoriae* Grun.	5
N. *vermicularis* (Kütz.) Grun.	5
OPEPHORA	
O. *martyi* Herib.	B
PINNULARIA	
P. *acrosphaeria* W. Sm.	5
P. *biceps* Greg.	B
P. *dactylus* Ehr.	9
P. *nodosa* (Ehr.) W. Sm.	5
P. *subcapitata* Greg.	9
P. *viridis* (Nitz.) Ehr.	5
PLAGIOTROPIS	
P. *lepidoptera* v. *proboscidea* (Cl.) Reim.	5
PLEUROSIGMA	
P. *delicatulum* W. Sm.	B
RHOICOSPHENIA	
R. *curvata* (Kütz.) Grun.	B
RHOPALODIA	
R. *gibba* (Ehr.) O. Müll.	B
SKELETONEMA	
S. *potamos* (Weber) Hasle	5
STAURONEIS	
S. *anceps* Ehr.	9
S. *ignorata* Hust.	5
S. *phoenicenteron* (Nitz.) Ehr.	5
S. *thermicola* (Peters.) Lund	5
STENOPTEROBIA	
S. *intermedia* Lewis	5
STEPHANODISCUS	
S. *dubius* (Fricke) Hust.	B
S. *hantzschii* Grun.	B
S. *invisitatus* Hohn & Hellerm.	B
S. *minutus* Grun.	5
(?S. *rotula* v. *minutula* (Kütz.) Ross & Sims)	
S. *niagarae* Ehr.	B
S. *niagarae* v. *magnifica* Fricke	5
S. *rotula* (Kütz.) Hendey	B
S. *tenuis* Hust.	B
SURIRELLA	
S. *angusta* Kütz.	B
S. *gracilis* (W. Sm.) Grun.	5
S. *iowensis* Lowe	5
S. *multiplicata* A. Cl. (= S. *ovalis* v. *salina* (W. Sm.) V.H.)	9
S. *ovata* Kütz.	B
S. *robusta* Ehr.	B
SYNEDRA	
S. *acus* Kütz.	B
S. *cyclopum* v. *robustum* Schulz.	9
S. *delicatissima* W. Sm.	B
S. *delicatissima* v. *angustissima* Grun.	B
S. *filiformis* v. *exilis* A. Cl.	5
S. *goulardi* (Brēb.) Grun.	5
S. *incisa* Boyer	5
S. *minuscula* Grun.	9
S. *parasitica* (W. Sm.) Hust.	B
S. *parasitica* v. *subconstricta* (Grun.) Hust.	9
S. *pulchella* Ralfs *ex.* Kütz.	B
S. *pulchella* v. *lacerata* Hust.	5
S. *radians* Kütz.	B
S. *rumpens* Kütz.	B
S. *rumpens* v. *familiaris* (Kütz.) Hust.	B
S. *rumpens* v. *fragilarioides* Grun.	B
S. *rumpens* v. *meneghiniana* Grun.	B
S. *socia* Wallace	B
S. *ulna* (Nitz.) Ehr.	B
S. *ulna* v. *amphirhynchus* (Ehr.) Grun.	9
S. *ulna* v. *contracta* Østr.	9
S. *ulna* v. *danica* (Kütz.) V.H.	5
S. *ulna* v. *oxyrhynchus* (Kütz.) V.H.	B
TABELLARIA	
T. *fenestrata* (Lyngb.) Kütz.	B
T. *flocculosa* (Roth) Kütz.	B
THALASSIOSIRA	
T. *fluviatilis* Hust. (= T. *weissflogii* (Grun.) Fryxell & Hasle)	5

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