

## Checklist of Diatoms in Shatt Al-Arab River, Basrah Province, Southern Iraq

Rehab N. Al-Saedy<sup>1</sup>, Maitham A. Al-Shaheen<sup>1</sup> & Adil Y. Al-Handal<sup>2\*</sup>

<sup>1</sup>Department of Ecology, College of Science, University of Basrah, Iraq

<sup>2</sup>Department of Biological and Environmental Sciences, University of Gothenburg, Sweden

\*Corresponding author: adil.yousif@bioenv.gu.se

**Abstract:** The present checklist contributes to our knowledge on the biodiversity, distribution and environmental preferences of Shatt Al-Arab river diatoms. The list is compiled from all diatoms reported and documented in a number of scientific articles in the last six decades. Diatom names are the latest accepted names; synonyms are provided only for those recently changed. The total number of identified taxa in this checklist is 410 species and varieties belonging to 121 genera, besides 11 taxa of uncertain identity. The widely distributed genera are *Nitzschia* with 50 species, *Navicula* with 22 species and *Gomphonema* with 19 species. Diatom assemblages in the river are mixture of freshwater, brackish water and marine species. Freshwater taxa constituted only 22% of the total number of taxa. Most of the species are of benthic or periphytic nature, which also dominate in the pelagic habitat. Several species reported in older literature are no longer present in recent works owing to drastic changes in water quality of the river. The present checklist does not represent the whole diatom flora of Shatt Al-Arab river; many species of very small size observed by the authors could not be matched with published taxa.

**Keywords:** Checklist, Diatoms, Ecology, Shatt Al-Arab river, Southern Iraq

### Introduction

Shatt Al-Arab river (30° 18' N, 48° 53' E) is a long and wide waterway flowing for a distance exceeding 200 km from its origin at Qurna city, 60 km north of Basrah (Figure 1). The river is formed by the confluence of Tigris and Euphrates rivers and flow through all Basrah district to discharge into the north-western part of the Arabian Gulf, it terminates at a wide deltaic region surrounded by vast mudflats. Along the river course, hundreds of side-canal of variable lengths run on both sides and form huge network of water impoundment.

Over the last few decades, particularly after 1991, considerable changes in the water quality of Shatt Al-Arab river occurred. This altering is attributed to anthropogenic influence and climate change. Anthropogenic influence includes reduction of freshwater discharge from Euphrates and Tigris rivers (Mohamed & Abood, 2017) because of several dams constructed along those rivers in riparian countries, as well as from other tributaries (Karun and Karkha rivers). Discharge rate has been reduced from 207 m<sup>3</sup>/s in the late 1970s to as low as 60 m<sup>3</sup>/s in 2014. This has led to increasing salinity owing to penetration of sea water front from the Gulf to reach long distances upstream (Abdullah et al., 2016). On the other hand, the uncontrolled discharge of untreated domestic and industrial wastes drastically deteriorates water quality, particularly around Basrah urban regions where harmful levels of pollution were detected (Naff & Hanna, 2003). Climate change caused prolonged warm seasons with higher temperature that led to excessive evaporation and higher pollutants concentration and salt content.

Water quality deterioration in Shatt Al-Arab river greatly influenced the occurrence and distribution of its biota. A comparison between earlier and recent investigations reveal a considerable change in the fauna and flora where several species disappeared and new ones emerged including alien intruders (Huq et al., 1978; Hadi et al., 1984; Al-Hassan et al., 1989; Al-Handal & Abdullah, 1994; Al-Essa, 2004; Mohamed et al., 2013). Diatoms, which are rather sensitive to changes of environmental condition in freshwater, exhibited a remarkable shift in its species composition in Shatt Al-Arab river over the last few decades (Al-Handal & Abdullah, 1994; Al-Handal & Al-Shaheen, 2019). Owing to considerable changes in salinity, large number of taxa of marine origin appeared while those salt sensitive species disappeared (Al-Shaheen, 2016).

The present work aims at documenting diatom species in the Shatt Al-Arab river. Diatom records are found in large number of investigations, either part of environmental studies (Antoine & Al-Saadi, 1982; Antoine, 1983) or included in works dealt with phytoplankton assemblages (Kell & Saad, 1975; Huq et al., 1978; Hinton & Maulood, 1983). The present checklist includes all diatom taxa that have been reported in the river over a period of six decades, of which several taxa are no longer thrive. Therefore, this list is a worthwhile documentation of the diatoms of Shatt Al-Arab river.

## Resources

A number of publications on phytoplankton in general and diatoms in particular were considered to prepare the present preliminary checklist of diatoms in Shatt Al-Arab river. These publications cover the entire Shatt Al-Arab proper and some of its side canals. The consulted literature which have dealt with all phytoplankton groups include Kell & Saad (1975), Al-Saadi et al. (1979), Antoine & Al-Saadi (1982), Antoine (1983), Al-Mousawi et al. (1986), Al-Handal (1989) and Hadi & Al-Saboonchi (1989). These publications, however, provided fragmentary information on diatoms where number of species was rather low.

The first publication on diatoms of Shatt Al-Arab river was Hadi et al. (1984) who reported and illustrated 116 taxa along the river course. A rather comprehensive list of diatoms with 297 species appeared in Al-Handal & Abdullah (1994) who categorised diatoms according to their environmental preference in regard to pH, salinity and organic pollution tolerance. In his unpublished survey, Al-Shaheen (2016) investigated diatoms of the Shatt Al-Arab river over a period of 12 months and illustrated 193 taxa. More recently, Al-Handal & Al-Shaheen (2019) published their results on diatom research in Southern Iraq describing and illustrating 293 taxa inhabiting various substrates.

### **Diatom Assemblages**

Diatom species composition in Shatt Al-Arab river is dominated by epiphytic and edaphic (sediment associated) taxa. Epiphytic forms are widespread owing to thriving of several aquatic macrophytes in the river. Many of these diatoms are detached from their substrates and are commonly found in the plankton or on the sediment. In the northern parts of the river, freshwater species dominates of which taxa belonging to *Amphora*, *Cocconeis*, *Cyclotella*, *Fragilaria* and *Ulnaria* are the most common. Diatoms of the southern parts are mostly dominated by brackish water taxa, among which *Berkeleya scopulorum*, *Gyrosigma eximum*, *Mastogloia braunii*, *Mastogloia elliptica*, and to less extent *Achnanthes brevipes*, *Cyclotella striata* and *Gyrosigma acuminatum* are more common. Because of the penetration of sea water front into Shatt Al-Arab river, a number of marine forms are normally encountered, these include *Hyalodiscus ambiguus*, *Gyrosigma sinense*, *Nitzschia sigma*, *Pleurosigma angulatum* and others.

It is worth mentioning that, owing to the rapid change in water quality as a result of deteriorating environmental conditions, diatoms species composition and assemblages were greatly altered. Organic and industrial pollution as well as elevating salinity were the most effective factors. Several species belonging to *Eunotia*, *Pinnularia*, *Mastogloia* and *Diatoma* which were normal components of the diatom flora in the river have disappeared. Furthermore, recent collections made during 2019 revealed remarkable disappearance of large number of taxa.

In general, diatom assemblages found in the last decade are comprised of 22% freshwater taxa, 18% brackish water and 27% marine forms. The remaining 33% of taxa were of uncertain ecological preference. The lower percentage of freshwater taxa clearly points to the shift of water quality towards highly brackish condition.

### **Checklist Format**

During the last few decades, significant changes in diatom taxonomy have occurred and name status of large number of species have changed. The overall arrangement of systematic position of classes, orders, families and genera followed in the present work are based on Ross et al. (1979) and Round et al. (1990). Genera described or erected after 1990 are placed according to Kociolek & Spaulding (2003) and the publications they appeared in.

Species and genera under each family are arranged alphabetically. The current accepted name of species is used. If a species name is changed recently, its synonym (original name) is provided and placed between brackets. To provide more information on the ecology and occurrence of all taxa, their environmental preference, habitat and occurrence in Shatt Al-Arab river is given. It is emphasized here that the present checklist does not cover all diatom species in the river. Several taxa appeared in the local literature without description or illustration were not included in the list. Verification of the identity of such taxa was not possible by us, particularly those taxa with very small valve size which require high quality optics or scanning electron microscopy (SEM) for identification. Species of the uncertain identity which were described and illustrated in the works of Al-Shaheen (2016) and Al-Handal & Al-Shaheen (2019) are separated and listed at the end of this checklist.

The following abbreviations were used: NSH, northern parts of Shatt Al-Arab river, representing the region from Garma and upstream (Figure 1), MSH, middle part of the river extending from Ashar city to Abu Flos region, and SSH, representing the southern part which extend from Siba to Faw towns.

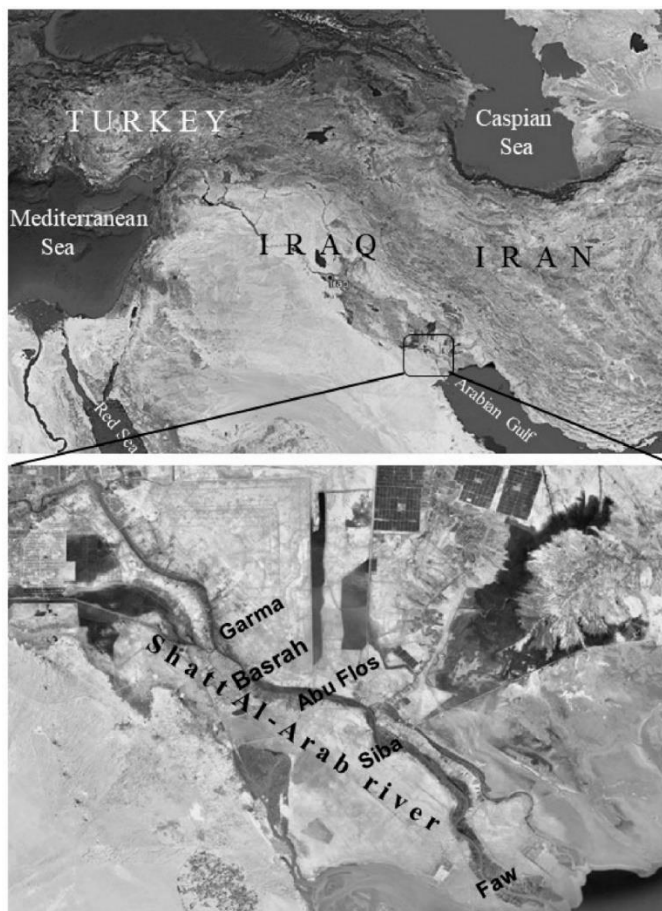


Figure 1: Map showing location of Shatt Al-Arab river, Southern Iraq.

## The Checklist

### Division: BACILLARIOPHYTA

Class Coscinodiscophyceae Round & Crawford in Round et al. 1990

Order Thalassiosirales Glezer & Makarova 1986

Family Thalassiosiraceae Lebour 1930

*Thalassiosira bramaputrae* (Ehrenberg) Håkansson & Locker 1981

(*Thalassiosira lacustris* (Grunow) Hasle in Hasle & Fryxell 1977)

Fresh to brackish water. Planktonic, epipellic, epiphytic, epilithic, NSH, MSH, SSH.

*Thalassiosira eccentrica* (Ehrenberg) Cleve 1904

Marine. Planktonic, epipellic, epiphytic, NSH, MSH, SSH.

*Thalassiosira decipiens* (Grunow ex Van Heurck) Jørgensen 1905

Marine species. Planktonic, NSH, MSH, SSH.

*Thalassiosira spinoconvexa* Akiba & Yanagisawa 1998

Marine. Planktonic, epipellic, epiphytic, MSH, SSH.

*Thalassiosira visurgis* Hustedt 1957

Brackish water. Planktonic, NSH, MSH, SSH.

Family Skeletonernataceae Lebour 1930

*Skeletonema costatum* (Greville) Cleve 1873

Marine. Planktonic, SSH.

Family Stephanodiscaceae Glezer & Makarova 1986

*Cyclotella atomus* Hustedt 1937

Fresh to brackish water. Planktonic, NSH, MSH, SSH.

*Cyclotella meneghiniana* Kützing 1844

Fresh to brackish water. Planktonic, epipellic, epiphytic, NSH, MSH, SSH.

*Cyclotella radiosa* (Grunow) Lemmermann 1899

Freshwater. Planktonic, NSH, MSH.

*Cyclotella striata* (Kützing) Grunow in Cleve & Grunow 1880

Marine to brackish water. Planktonic, epipellic, epiphytic, epilithic, NSH, MSH, SSH.

*Cyclotella stylorum* Brightwell 1860

Marine. Planktonic, epipellic, epiphytic, epilithic, NSH, MSH, SSH.

*Discostella stelligera* (Cleve & Grunow) Houk & Klee 2004

(*Cyclotella stelligera* (Cleve & Grunow) Van Heurck 1882)

Freshwater. Planktonic, NSH, MSH.

*Lindavia antiqua* (W. Smith) Nakov, Guillory, Julius, Theriot & Alverson 2015

(*Cyclotella antiqua* W. Smith 1853; *Handmannia antiqua* (W. Smith) Khursevich & Kociolek 2012)

Freshwater. Planktonic, NSH, MSH.

*Lindavia glomerata* (Bachmann) Adesalu & Julius 2017

(*Cyclotella glomerata* Bachmann 1911; *Discostella glomerata* (Bachmann) Houk & Klee 2004)

Freshwater. Planktonic, benthic, NSH, MSH.

*Pantocsekiella kuetzingiana* (Thwaites) Kiss & Ács in Ács et al. 2016  
(*Cyclotella kuetzingiana* Thwaites 1848; *Lindavia kuetzingiana* (Thwaites) Nakov et al. 2015)

Brackish water. Planktonic, MSH, SSH.

*Pantocsekiella ocellata* (Pantocsek) Kiss & Ács in Ács et al. 2016  
(*Cyclotella ocellata* Pantocsek 1901; *Lindavia ocellata* (Pantocsek) Nakov et al. 2015)

Freshwater. Planktonic, NSH, MSH.

*Stephanodiscus alpinus* Hustedt in Huber-Pestalozzi 1942

Freshwater. Planktonic, epiphytic, NSH, MSH.

*Stephanodiscus neoastraea* Håkansson & Hickel 1986

Freshwater. Planktonic, epiphytic, epilithic, episammic, NSH, MSH, SSH.

Order Aulacoseirales Crawford in Round et al. 1990

Family Aulacoseiraceae Crawford in Round et al. 1990

*Aulacoseira granulata* (Ehrenberg) Simonsen 1979

Fresh to brackish water. Planktonic, epiphytic, periphytic, NSH, MSH, SSH.

*Aulacoseira granulata* var. *angustissima* (Müller) Simonsen 1979

Freshwater. Planktonic, benthic, NSH, MSH.

Order Melosirales Crawford in Round et al. 1990

Family Melosiraceae Kützing 1844

*Melosira moniliformis* C. Agardh 1824

Brackish and marine coastal water. Epiphytic, NSH, MSH

*Melosira varians* C. Agardh 1827

Freshwater to slightly brackish water. Planktonic, epiphytic, NSH, MSH.

Family Stephanopyxidaceae Nikolaev 1984

*Stephanopyxis palmeriana* (Greville) Grunow 1884

Marine. Planktonic, SSH.

Order Paralleles Crawford in Round et al. 1990

Family Paraliaceae Crawford in Round et al. 1990

*Paralia sulcata* (Ehrenberg) Cleve 1873

Marine species. Planktonic, benthic, SSH.

Order Coscinodiscales Round & Crawford in Round et al. 1990

Family Coscinodiscaceae Kützing 1844

*Coscinodiscus asteromphalus* Ehrenberg 1844

Marine species. Planktonic, MSH, SSH.

*Coscinodiscus gigas* Ehrenberg in Ehrenberg 1843

Marine. Planktonic, SSH.

*Coscinodiscus oculus-iridis* (Ehrenberg) Ehrenberg 1840

Marine. Planktonic, epipelagic, epiphytic, MSH, SSH.

*Coscinodiscus perforatus* Ehrenberg 1844

Marine. Planktonic, SSH.

*Coscinodiscus radiatus* Ehrenberg 1840

Marine. Planktonic, epipelagic, SSH.

*Coscinodiscopsis jonesiana* (Greville) Sar & Sunesen in Sar et al. 2008

(*Coscinodiscus jonesianus* (Greville) Ostenfeld 1915)

Marine. Planktonic, epipelagic, epiphytic, MSH, SSH.

*Palmerina hardmaniana* (Greville) Hasle 1969

(*Palmeria hardmaniana* Greville 1865)

Marine. Planktonic, SSH.

#### Family Hemidiscaceae Hendey 1937

*Actinocyclus curvatulus* Janisch in Schmidt 1878

Marine. Planktonic, epiphytic, epipelagic, MSH, SSH.

*Actinocyclus octonarius* Ehrenberg 1837

Marine. Planktonic, epiphytic, benthic, MSH, SSH.

*Actinocyclus subtilis* (Gregory) Ralfs in Pritchard 1861

Marine. Planktonic, epiphytic, benthic, MSH, SSH.

#### Order Asterolamprales Round & Crawford in Round et al. 1990

##### Family Asterolampraceae Smith 1872

*Asteromphalus hookeri* Ehrenberg 1844

Marine. Planktonic, SSH.

#### Order Triceratiales Round & Crawford in Round et al. 1990

##### Family Triceratiaceae (Schütt) Lemmermann 1899

*Odontella aurita* (Lyngbye) Agardh 1832

Marine. Planktonic, epipelagic, epiphytic, epilithic, NSH, MSH, SSH.

*Triceratium favus* Ehrenberg 1839

Marine. Benthic, SSH.

*Trieres chinensis* (Greville) Ashworth & Theriot in Ashworth et al. 2013

(*Odontella chinensis* (Greville) Grunow 1884)

Marine. Planktonic, SSH.

*Trieres mobiliensis* (Bailey) Ashworth & Theriot in Ashworth et al. 2013

(*Odontella mobiliensis* (Bailey) Grunow 1884)

Marine. Planktonic, epipelagic, SSH.

*Pleurosira indica* Karthick & Kociolek 2011

Freshwater. Planktonic, epipelagic, epiphytic, epilithic, episammic, NSH, MSH.

*Pleurosira laevis* (Ehrenberg) Compère 1982

(*Biddulphia laevis* Ehrenberg 1843; *Cerataulus laevis* (Ehrenberg) Ralfs 1861)

Brackish water. Planktonic, epipelagic, epiphytic, epilithic, episammic, NSH, MSH, SSH.

*Pleurosira inusitata* (Hohn & Hellerman) Desianti, Potapova & Beals 2015

(*Pleurosira laevis* f. *polymorpha* Compère 1982)

Marine, brackish and freshwater. Planktonic, Epipellic, epiphytic, epilithic, NSH, MSH, SSH.

*Pleurosira minor* Metzeltin, Lange-Bertalot & García-Rodríguez 2005  
Brackish water. Epiphytic, epipellic, epilithic, NSH, MSH, SSH.

Order Biddulphiales Krieger in Heiber & Kriger 1954

Family Biddulphiaceae Kützing 1844

*Hydrosera triquetra* Wallich 1858

Fresh to brackish water. Planktonic, epipellic, epiphytic, epilithic, NSH, MSH.

*Terpsinoë americana* (Bailey) Ralfs 1861

Marine. Epiphytic, SSH.

*Terpsinoë musica* Ehrenberg 1843

Freshwater. Epiphytic, NSH, MSH.

Order Hemiaulales Round & Crawford in Round et al. 1990

Family Hemiaulaceae Heiberg 1863

*Eucampia zodiacus* Ehrenberg 1839

Marine. Planktonic, SSH.

*Hemiaulus chinensis* Greville 1865

(*Hemiaulus sinensis* Greville 1865)

Marine. Planktonic, SSH.

Order Lithodesmiales Round & Crawford in Round et al. 1990

Family Lithodesmiaceae Round in Round et al. 1990

*Ditylum brightwellii* (West) Grunow in Van Heurck 1885

Marine. Planktonic. SSH.

Order Corethrales Round & Crawford in Round et al. 1990

Family Corethraceae Lebour 1930

*Corethron pennatum* (Grunow) Ostefeld in Van Heurck 1909

Marine. Planktonic, SSH.

Order Rhizosoleniales Silva 1962

Family Rhizosoleniaceae De Toni 1891

*Proboscia alata* (Brightwell) Sundström 1986

(*Rhizosolenia alata* Brightwell 1858)

Marine. Planktonic, SSH.

*Proboscia indica* (Peragallo) Hernández-Becerril 1995

(*Rhizosolenia alata* f. *indica* (Peragallo) Gran in Gran 1908)

Marine. Planktonic, SSH.

*Proboscia truncata* (Karsten) Nöthig & Ligowski in Jordan et al. 1991

(*Rhizosolenia alata* f. *truncata* (Karsten) Hasle 1969)

Marine. Planktonic, SSH.



*Rhizosolenia bergonii* Peragallo 1892

Marine. Planktonic, SSH.

*Rhizosolenia cochlea* Brun 1891

Marine. Planktonic, SSH.

*Rhizosolenia hebetata* f. *semispina* (Hensen) Gran 1908

Marine. Planktonic, SSH.

*Rhizosolenia imbricata* Brightwell 1858

Marine. Planktonic, SSH.

*Rhizosolenia setigera* Brightwell 1858

Marine. Planktonic, SSH.

Order Chaetocerotales Round & Crawford in Round et al. 1990

Family Chaetocerotaceae Ralfs 1861

*Bacteriastrum delicatulum* Cleve 1897

Marine. Planktonic, SSH.

*Bacteriastrum hyalinum* Lauder 1864

Marine. Planktonic, SSH.

*Chaetoceros affinis* Lauder 1864

Marine. Planktonic, SSH.

*Chaetoceros compressus* Lauder 1864

Marine. Planktonic, SSH.

*Chaetoceros curvisetus* Cleve 1889

Marine. Planktonic, SSH.

*Chaetoceros lorenzianus* Grunow 1863

Marine. Planktonic, SSH.

Class Fragilariophyceae Round in Round et al. 1990

Order Fragilariales Silva 1962

Family Fragilariaceae Greville 1833

*Catacombas gaillonii* (Bory) Williams & Round 1986

(*Synedra gaillonii* (Bory) Ehrenberg 1830; *Fragilaria gaillonii* (Bory) Lange-Bertalot 1980)

Marine to brackish water. Planktonic, MSH, SSH.

*Ctenophora pulchella* (Ralfs ex Kützing) Williams & Round 1986

(*Synedra pulchella* (Ralfs ex Kützing) Kützing 1844; *Fragilaria pulchella* (Ralfs ex Kützing) Lange-Bertalot 1980)

Brackish to freshwater. Planktonic, epipelagic, epiphytic, epilithic, NSH, MSH, SSH.

*Odontidium mesodon* (Kützing) Kützing 1849

(*Diatoma mesodon* (Ehrenberg) Kützing 1844)

Freshwater. Epiphytic, NSH, MSH.

*Diatoma elongata* (Lyngbye) Agardh 1824

Freshwater. Planktonic, NSH, MSH.

- Diatoma tenuis* Agardh 1812  
Freshwater. Epiphytic, NSH, MSH.
- Diatoma vulgaris* Bory in Bory & Coll. 1824  
Fresh to brackish water. Epiphytic, NSH, MSH.
- Diatoma vulgaris* var. *brevis* Grunow 1862  
Fresh to brackish water. Epiphytic, NSH, MSH.
- Fragilaria barbatula* (Kützing) Lange-Bertalot 1993  
(*Tabularia barbatula* (Kützing) Williams & Round 1986)  
Fresh to brackish water. Benthic, NSH, MSH.
- Fragilaria capucina* Desmazières 1830  
Fresh to brackish water. Benthic, NSH, MSH.
- Fragilaria koensabbei* Al-Handal & Al-Shaheen 2019  
Fresh to brackish water. Planktonic, Epiphytic, epipelagic, epilithic, NSH, MSH, SSH.
- Fragilaria tenera* (W. Smith) Lange-Bertalot 1980  
(*Synedra tenera* W. Smith 1856)  
Freshwater. Planktonic, SSH.
- Fragilaria vaucheriae* (Kützing) Petersen 1938  
Freshwater. Epiphytic, epilithic, SSH.
- Fragilariforma virescens* (Ralfs) Williams & Round 1988  
(*Fragilaria virescens* Ralfs 1843; *Neofragilaria virescens* (Ralfs) Williams & Round 1988)  
Freshwater. Epiphytic, NSH, MSH.
- Neosynedra provincialis* (Grunow) Williams & Round 1986  
(*Synedra provincialis* Grunow 1877)  
Marine. Epiphytic, MSH, SSH.
- Pseudostaurosira brevistriata* (Grunow) Williams & Round 1988  
(*Staurosira brevistriata* (Grunow) Grunow 1884; *Fragilaria brevistriata* Grunow in Van Heurck 1885)  
Freshwater. Episammic, NSH, MSH.
- Pseudostaurosira robusta* (Fusey) Williams & Round 1988  
(*Fragilaria construens* f. *robusta* Fusey 1951; *Fragilaria robusta* (Fusey) Manguin 1954)  
Freshwater. Planktonic, epiphytic, NSH, MSH.
- Staurosira construens* Ehrenberg 1843  
Freshwater. Episammic, NSH, MSH.
- Staurosira leptostauron* (Ehrenberg) Kulikovskiy, Genkal & Mikheyeva 2011  
(*Fragilaria leptostauron* (Ehrenberg) Hustedt 1932; *Staurosirella leptostauron* (Ehrenberg) Williams & Round 1988)  
Freshwater. Epiphytic, NSH, MSH.
- Staurosirella martyi* (Héribaud-Joseph) Morales & Manoylov 2006  
(*Fragilaria martyi* (Héribaud-Joseph) Lange-Bertalot 1993; *Staurosira martyi* (Héribaud-Joseph) Lange-Bertalot in Krammer & Lange-Bertalot 2000)  
Fresh to brackish water. Epiphytic, NSH, MSH.

*Stauriosirella pinnata* (Ehrenberg) Williams & Round 1988

(*Fragilaria pinnata* Ehrenberg 1843)

Fresh to brackish water. Epiphytic, NSH, MSH.

*Tabularia fasciculata* (Agardh) Williams & Round 1986

(*Synedra tabulata* var. *fasciculata* (Agardh) Grunow ex Hustedt 1932; *Synedra fasciculata* (Agardh) Kützing 1844; *Fragilaria fasciculata* (Agardh) Lange-Bertalot 1980)

Brackish water to marine. Planktonic, epiphytic, episammic, NSH, MSH, SSH.

*Tabularia tabulata* (Agardh) Snoeijis 1992

(*Synedra tabulata* (Agardh) Kützing 1844; *Synedra affinis* var. *tabulata* (Agardh) Juhlin-Dannfelt 1882)

Brackish water to marine. Planktonic, epipelagic, epiphytic, epilithic, episammic, NSH, MSH, SSH.

Order Thalassionematales Round in Round et al. 1990

Family Thalassionemataceae Round in Round et al. 1990

*Thalassionema nitzschioides* (Grunow) Mereschkowsky 1902

Marine. Planktonic, epiphytic, SSH.

Order Licmophorales Round in Round et al. 1990

Family Ulnariaceae Cox 2015

*Ulnaria acus* (Kützing) Aboal in Aboal et al. 2003

(*Synedra acus* Kützing 1844)

Freshwater to brackish. Planktonic, epiphytic, NSH, MSH, SSH.

*Ulnaria biceps* (Kützing) Compère 2001

(*Fragilaria ulna* var. *biceps* (Kützing) Compère 1991)

Freshwater to brackish. Planktonic, epiphytic, NSH, MSH, SSH.

*Ulnaria capitata* (Ehrenberg) Compère 2001

(*Synedra capitata* Ehrenberg 1836)

Freshwater. Planktonic, MSH, SSH.

*Ulnaria danica* (Kützing) Compère & Bukhtiyarova in Bukhtiyarova & Compère 2006

(*Synedra ulna* var. *danica* (Kützing) Grunow in Van Heurck 1885; *Fragilaria danica* (Kützing) Lange-Bertalot in Lange-Bertalot & Metzeltin 1996)

Freshwater to brackish. Planktonic, NSH, MSH, SSH.

*Ulnaria delicatissima* var. *angustissima* (Grunow) Aboal & Silva 2004

(*Synedra delicatissima* var. *angustissima* Grunow in Van Heurck 1881;

*Fragilaria delicatissima* var. *angustissima* (Grunow) Lange-Bertalot 1980)

Freshwater to brackish. Planktonic, epiphytic, epilithic, NSH, MSH, SSH.

*Ulnaria ulna* (Nitzsch) Compère 2001

(*Synedra ulna* (Nitzsch) Ehrenberg 1832; *Fragilaria ulna* (Nitzsch) Lange-Bertalot 1980)

Freshwater to brackish. Planktonic, epipelagic, epiphytic, NSH, MSH, SSH.

- Ulnaria ulna* var. *chaseana* (Thomas) Compère 1982  
(*Synedra ulna* var. *chaseana* Thomas in Walker & Chase 1886)  
Marine to brackish water. Planktonic, SSH.
- Ulnaria ulna* var. *claviceps* (Hustedt) Compère 1982  
(*Synedra ulna* var. *claviceps* Hustedt 1937)  
Fresh to brackish water. Planktonic, MSH.
- Williamsella iraqiensis* Al-Handal & Kociolek in Al-Handal et al. 2016  
Brackish water. Epiphytic, MSH, SSH.

Order Tabellariales Round in Round et al. 1990  
Family Tabellariaceae Kützing 1844

- Tabellaria fenestrata* (Lyngbye) Kützing 1844  
Freshwater. Planktonic, epiphytic, NSH, MSH.

Order Striatellales Round in Round et al. 1990  
Family Striatellaceae Kützing 1844

- Grammatophora hamulifera* Kützing 1844  
Marine. Planktonic, Epiphytic, SSH.

Class Bacillariophyceae Haeckel in Haeckel 1890  
Order Eunotiales Silva 1962  
Family Eunotiaceae Kützing 1844

- Eunotia bilunaris* (Ehrenberg) Schaarschmidt 1881  
Freshwater. Benthic NSH, MSH.

Order Mastogloiales Mann in Round et al. 1990  
Family Mastogloiaceae Mereschkowsky 1903

- Mastogloia albertii* Pavlov, Jovanovska, Wetzel, Ector & Levkov 2016  
(*Mastogloia smithii* var. *amphicephala* Grunow 1880)  
Freshwater. Planktonic, Epiphytic, NSH, MSH.
- Mastogloia braunii* Grunow 1863  
Brackish water. Planktonic, epiphytic, epipelagic, NSH, MSH, SSH.
- Mastogloia danseyi* (Thwaites) Thwaites ex W. Smith 1856  
Brackish water to marine. Epiphytic, epipelagic, MSH, SSH.
- Mastogloia elliptica* (Agardh) Cleve in Schmidt 1893  
Brackish water. Epipelagic, epilithic, epiphytic, NSH, MSH, SSH.
- Mastogloia lanceolata* Thwaites ex W. Smith 1856  
Marine to brackish water. Epipelagic, epilithic, MSH, SSH.
- Mastogloia lacustris* (Grunow) Grunow 1880  
Freshwater. Benthic, epiphytic, NSH, MSH.
- Mastogloia pumila* (Grunow) Cleve 1895  
Brackish water. Epipelagic, epilithic, epiphytic, NSH, MSH, SSH.
- Mastogloia smithii* Thwaites ex W. Smith 1856  
Brackish water. Epiphytic, epipelagic, epilithic, NSH, MSH, SSH.

## Order Cymbellales D.G. Mann in Round et al. 1990

## Family Anomoeoneidaceae D.G. Mann in Round et al. 1990

*Anomoeoneis sphaerophora* (Ehrenberg) Pfitzer 1871

Brackish water. Epiphytic, NSH, MSH, SSH.

## Family Cymbellaceae Greville 1833

*Brebissonia lanceolata* (Agardh) Mahoney & Reimer 1986

(*Brebissonia boeckii* (Ehrenberg) Grunow 1860; *Cymbella lanceolata* (Agardh) Kirchner 1878)

Freshwater. Planktonic, epipelagic, epiphytic, NSH, MSH, SSH.

*Cymbella affinis* Kützing 1844

Freshwater. Epiphytic, epilithic, NSH, MSH.

*Cymbella aspera* (Ehrenberg) Cleve 1894

Freshwater species. Epiphytic, epipelagic, epilithic, NSH, MSH.

*Cymbella cistula* (Ehrenberg) Kirchner 1878

Freshwater. Epiphytic, epilithic, NSH, MSH.

*Cymbella cymbiformis* Agardh 1830

Freshwater. Epiphytic, epilithic, NSH.

*Cymbella helvetica* Kützing 1844

Freshwater. Epiphytic, epilithic, NSH, MSH.

*Cymbella hustedtii* Krasske 1923

Freshwater. Epiphytic, NSH, MSH.

*Cymbella neocistula* Krammer 2002

(*Cymbella cistula* f. *typica* (Meister) Mayer 1913; *Cymbella cistula* f. *truncata* Mayer 1913)

Freshwater. Epipelagic, epiphytic, epilithic, NSH, MSH.

*Cymbella obtusa* Gregory 1856

Freshwater. Epiphytic, NSH, MSH.

*Cymbella parva* (W. Smith) Kirchner 1878

Freshwater. Epiphytic, NSH, MSH.

*Cymbella tumida* (Brébisson) Van Heurck 1880

Freshwater. Planktonic, epipelagic, epiphytic, epilithic, NSH, MSH, SSH.

*Cymbopleura amphicephala* (Nägeli ex Kützing) Krammer 2003

(*Cymbella amphicephala* Nägeli ex Kützing 1849)

Freshwater. Epiphytic, NSH, MSH.

*Cymbopleura austriaca* (Grunow) Krammer 2003

(*Cymbella austriaca* Grunow in Schmidt 1875)

Freshwater. Epiphytic, NSH, MSH.

*Cymbopleura cuspidata* (Kützing) Krammer 2003

(*Cymbella cuspidata* Kützing 1844)

Freshwater. Epiphytic, NSH, MSH.

*Cymbopleura inaequalis* (Ehrenberg) Krammer 2003

(*Cymbella inaequalis* (Ehrenberg) Rabenhorst 1846)

Freshwater. Epiphytic, NSH, MSH.

- Cymbopleura lapponica* (Grunow ex Cleve) Krammer 2003  
(*Cymbella lapponica* Grunow ex Cleve 1894)  
Freshwater. Epiphytic, NSH, MSH.
- Cymbopleura naviculiformis* (Auerswald ex Heiberg) Krammer 2003  
(*Cymbella naviculiformis* Auerswald ex Heiberg 1863)  
Freshwater to weakly brackish water. Epiphytic, NSH, MSH.
- Encyonema caespitosum* Kützing 1849  
Freshwater. Epilithic, NSH, MSH.
- Encyonema elginense* (Krammer) D.G. Mann in Round et al. 1990  
(*Cymbella elginensis* Krammer 1980)  
Freshwater. Epiphytic, NSH, MSH.
- Encyonema mesianum* (Cholnoky) D.G. Mann in Round et al. 1990  
(*Cymbella mesiana* Cholnoky 1955)  
Fresh to brackish water. Epiphytic, epilithic, NSH, MSH.
- Encyonema leibleinii* (Agardh) Silva, Jahn, Ludwig & Menezes 2013  
(*Encyonema prostratum* (Berkeley) Kützing 1844; *Cymbella prostrata* (Berkeley) Cleve 1894)  
Freshwater. Epilithic, NSH, MSH.
- Encyonema ventricosum* (Agardh) Grunow in Schmidt 1875  
Fresh to brackish water. Epipellic, epiphytic, NSH, MSH, SSH.
- Encyonopsis microcephala* (Grunow) Krammer 1997  
(*Cymbella microcephala* Grunow in Van Heurck 1885)  
Freshwater. Epipellic, epilithic, NSH, MSH.
- Gomphonella olivacea* (Hornemann) Rabenhorst 1853  
(*Gomphonema clavatum* Ehrenberg 1832)  
Freshwater. Epiphytic, NSH.
- Navicymbula pusilla* (Grunow) Krammer 2003  
(*Cymbella pusilla* Grunow in Schmidt 1875; *Navicella pusilla* (Grunow) Krammer 1997; *Seminavis pusilla* (Grunow) Cox & Reid 2004)  
Freshwater. Epipellic, epilithic, NSH, MSH.

Family Gomphonemataceae Kützing 1844

- Gomphonema affine* Kützing 1844  
Freshwater. Planktonic, epipellic, epiphytic, NSH, MSH, SSH.
- Gomphonema acuminatum* Ehrenberg 1832  
Freshwater. Epiphytic, NSH, MSH.
- Gomphonema acuminatum* var. *longiceps* (Ehrenberg) Abarca & Jahn in Abarca et al. 2020  
(*Gomphonema longiceps* Ehrenberg 1854)  
Freshwater. Epiphytic, epipellic, NSH, MSH.
- Gomphonema angustatum* (Kützing) Rabenhorst 1864  
Freshwater. Epiphytic, NSH, MSH.
- Gomphonema augur* Ehrenberg 1840  
Freshwater. Epiphytic, NSH, MSH.

*Gomphonema contraturris* Lange-Bertalot & Reichardt in Lange-Bertalot 1993  
Freshwater. Planktonic, epiphytic, NSH, MSH, SSH.

*Gomphonema gracile* Ehrenberg 1838  
Freshwater. Epiphytic, NSH, MSH.

*Gomphonema grunowii* Patrick & Reimer 1975  
Freshwater. Epiphytic, benthic, NSH, MSH.

*Gomphonema helveticum* Brun 1895  
Freshwater. Epiphytic, NSH, MSH.

*Gomphonema italicum* Kützing 1844  
Freshwater. Epiphytic, NSH, MSH.

*Gomphonema insigne* Gregory 1856  
Freshwater. Epiphytic, benthic NSH, MSH.

*Gomphonema lagenula* Kützing 1844  
(*Gomphonema parvulum* var. *lagenula* (Kützing) Frenguelli 1923)  
Freshwater. Epiphytic, NSH, MSH.

*Gomphonema laticollum* Reichardt 2001  
Freshwater. Planktonic, epiphytic, NSH, MSH.

*Gomphonema parvulum* (Kützing) Kützing 1849  
Freshwater. Epiphytic, NSH, MSH.

*Gomphonema productum* (Grunow) Lange-Bertalot & Reichardt in Lange-Bertalot 1993  
(*Gomphonema angustatum* var. *productum* Grunow 1880)  
Freshwater. Epiphytic, NSH, MSH.

*Gomphonema truncatum* Ehrenberg 1832  
Freshwater. Planktonic, epipelagic, epiphytic, NSH, MSH.

*Gomphonema turris* Ehrenberg 1843  
(*Gomphonema acuminatum* var. *turris* (Ehrenberg) Wolle 1890; *Gomphonema augur* var. *turris* (Ehrenberg) Lange-Bertalot in Krammer & Lange-Bertalot 1985)  
Freshwater. Planktonic, epiphytic, NSH, MSH.

*Gomphonema ventricosum* Gregory 1856  
Freshwater. Epiphytic, benthic, NSH, MSH.

*Gomphonema vibrio* Ehrenberg 1843  
(*Gomphonema intricatum* var. *vibrio* (Ehrenberg) Cleve 1894)  
Freshwater. Epiphytic, NSH, MSH.

*Reimeria sinuata* (Gregory) Kociolek & Stoermer 1987  
(*Cymbella sinuata* Gregory 1856)  
Freshwater. Epiphytic, epilithic, NSH, MSH.

Family Rhoicospheniaceae Topachevs'kyj & Oksiyuk, 1960

*Rhoicosphenia abbreviata* (Agardh) Lange-Bertalot 1980  
(*Gomphonema abbreviatum* Agardh 1831)  
Fresh to brackish water. Planktonic, epipelagic, epiphytic, epilithic, NSH, MSH, SSH.

## Order Achnanthales Silva 1962

## Family Achnanthaceae Kützing 1844

*Achnanthes armillaris* (Müller) Guiry 2019

(*Conferva armillaris* Müller 1783)

Marine species. Benthic, SSH.

*Achnanthes brevipes* Agardh 1824

Marine, also found in freshwater. Epiphytic, epilithic, NSH, NSH, SSH.

*Achnanthes brevipes* var. *intermedia* (Kützing) Cleve 1895

Brackish water. Planktonic, epiphytic, epipelagic, epilithic, episammic, NSH, MSH.

*Achnanthes kuwaitensis* Hendey 1958

Marine species. Benthic, SSH.

## Family Achnanthidiaceae D.G. Mann in Round et al. 1990

*Achnanthidium affine* (Grunow) Czarnecki 1994

(*Achnanthes affinis* Grunow 1880; *Achnanthidium minutissimum* var. *affine* Grunow) Lange-Bertalot in Lange-Bertalot & Krammer 1989)

Freshwater. Benthic, NSH, MSH.

*Karayevia clevei* (Grunow) Bukhtiyarova 1999

(*Achnanthes clevei* Grunow 1880; *Achnanthidium clevei* (Grunow) Czarnecki in Czarnecki & Edlund 1995)

Freshwater. Episammic, NSH, MSH.

*Lemnicola exigua* (Grunow) Kulikovskiy, Witkowski & Plinski in Plinski & Witkowski 2011

(*Achnanthes exigua* Grunow 1880; *Achnanthidium exiguum* (Grunow) Czarnecki 1994)

Freshwater. Epiphytic, benthic, NSH, MSH.

*Lemnicola hungarica* (Grunow) Round & Basson 1997

(*Achnanthes hungarica* (Grunow) Grunow 1880)

Freshwater. Epiphytic, NSH, MSH.

*Planothidium delicatulum* (Kützing) Round & Bukhtiyarova 1996

(*Achnanthidium delicatulum* Kützing 1844)

Brackish to marine waters species. Epiphytic, epilithic, episammic, NSH, MSH, SSH.

## Family Cocconeidaceae Kützing 1844

*Cocconeis convexa* Giffen 1967

Marine species. Benthic, SSH.

*Cocconeis heteroidea* Hantzsch in Rabenhorst 1863

Marine. Benthic, SSH.

*Cocconeis lineata* Ehrenberg 1849

Freshwater. Benthic, NSH, MSH.



- Cocconeis pediculus* Ehrenberg 1838  
Fresh to brackish water. Planktonic, epipelagic, epiphytic, epilithic, NSH, MSH, SSH.
- Cocconeis pellucida* Grunow 1863  
Marine. Benthic, SSH.
- Cocconeis placentula* Ehrenberg 1838  
Fresh to brackish water. Planktonic, epipelagic, epiphytic, episammic, epilithic, NSH, MSH, SSH.
- Cocconeis euglypta* Ehrenberg 1854  
(*Cocconeis placentula* var. *euglypta* (Ehrenberg) Grunow 1884)  
Fresh to brackish water. Planktonic, epipelagic, epiphytic, epilithic, episammic, NSH, MSH, SSH.
- Cocconeis scutellum* Ehrenberg 1838  
Brackish water to marine. Benthic, SSH.
- Order Naviculales Bessey 1907 in Silva & De Reviere 2000.  
Family Berkeleyaceae D.G. Mann in Round et al. 1990
- Berkeleya rutilans* (Trentepohl ex Roth) Grunow 1880  
(*Amphipleura rutilans* (Trentepohl ex Roth) Cleve 1894)  
Marine to brackish water. Epiphytic, benthic, MSH, SSH.
- Berkeleya scopulorum* (Brébisson ex Kützing) Cox, 1979  
Brackish to marine water. Planktonic, epipelagic, SSH.
- Family Cavinulaceae D.G. Mann in Round et al. 1990
- Cavinula cocconeiformis* (Gregory ex Greville) D.G. Mann & Stickle in Round et al. 1990  
(*Navicula cocconeiformis* Gregory ex Greville in Greville 1855)  
Freshwater. Epipelagic, NSH, MSH.
- Prestauroneis crucicula* (W. Smith) Genkal & Yarushina 2017  
(*Navicula crucicula* (W. Smith) Donkin 1871; *Parlibellus crucicula* (W. Smith) Witkowski, Lange-Bertalot & Metzeltin 2000)  
Brackish water to marine. Planktonic, epipelagic, epiphytic, episammic, NSH, MSH, SSH.
- Prestauroneis cruciculoides* (Witkowski, Lange-Bertalot & Metzeltin) Al-Handal & Al-Shaheen 2019  
(*Parlibellus cruciculoides* (C. Brockmann) Witkowski, Lange-Bertalot & Metzeltin 2000).  
Brackish water to marine. Benthic, MSH, SSH.
- Family Amphipleuraceae Grunow 1862
- Amphipleura pellucida* (Kützing) Kützing 1844  
Freshwater. Benthic, NSH, MSH.
- Frickea lewisiana* (Greville) Heiden in Schmidt 1906  
Brackish water. Planktonic, epipelagic, MSH, SSH.

*Frustulia rhomboides* (Ehrenberg) De Toni 1891

Freshwater. Benthic, NSH.

*Frustulia vulgaris* (Thwaites) De Toni 1891

Freshwater to slightly brackish. Benthic, NSH, MSH.

Family Diadesmidaceae D.G. Mann in Round et al. 1990

*Diadesmis confervacea* Kützing 1844

Freshwater. Epiphytic, benthic, NSH, MSH.

*Humidophila laevisissima* (Cleve) Lowe, Kociolek, Johansen, Van de Vijver, Lange-Bertalot & Kopalová 2014

(*Navicula gallica* var. *laevisissima* (Cleve) Lange-Bertalot in Krammer & Lange-Bertalot 1985)

Fresh and brackish water. Planktonic, epiphytic, epipelagic, epilithic, episammic, NSH, MSH.

*Luticola mutica* (Kützing) D.G. Mann in Round et al. 1990

(*Navicula mutica* (Kützing) Frenguelli 1924)

Fresh and brackish water. Planktonic, epiphytic, benthic, NSH, MSH, SSH.

*Luticola nivalis* (Ehrenberg) D.G. Mann in Round et al. 1990

(*Navicula nivalis* Ehrenberg 1853; *Navicula mutica* f. *nivalis* (Ehrenberg) Werff & Huls 1960)

Brackish water. Planktonic, epipelagic, epiphytic, epilithic, NSH, MSH.

*Luticola ventricosa* (Kützing) D.G. Mann in Round et al. 1990

(*Navicula mutica* var. *ventricosa* (Kützing) Cleve & Grunow 1880; *Luticola mutica* var. *ventricosa* (Kützing) Hamilton in Hamilton et al. 1994;

*Luticola mutica* f. *ventricosa* (Kützing) Bukhtiyarova 1995)

Freshwater. Epipelagic, epiphytic, epilithic, NSH, MSH.

*Luticola saxophila* (W. Bock ex Hustedt) Mann in Round et al. 1990

Brackish water. Epiphytic, NSH, MSH.

Family Brachysiraceae D.G. Mann in Round et al. 1990

*Brachysira aponina* Kützing 1836

Brackish water. Epiphytic, epipelagic, MSH.

*Brachysira exilis* (Kützing) Round & D.G. Mann 1981

(*Navicula exilis* Kützing 1844)

Freshwater. Epiphytic, benthic, NSH, MSH.

Family Neidiaceae Mereschkowsky 1903

*Neidium dubium* (Ehrenberg) Cleve 1894

Freshwater. Benthic, NSH.

*Neidium iridis* (Ehrenberg) Cleve 1894

Freshwater. Benthic, NSH.

Family Scoliotropidaceae Mereschkowsky 1903

*Biremis sigmoidea* Al-Handal 2019 in Al-Handal & Al-Shaheen 2019

Marine species. Epipelagic, SSH.

- Scoliopleura Basraensis* Al-Handal & Pennesi 2019 in Al-Handal Al-Shaheen 2019  
Brackish water. Epipellic, SSH.
- Scoliopleura peisonis* Grunow 1860  
Brackish water. Epipellic, SSH.
- Scoliopleura schneideri* (Grunow) Cleve 1894  
Brackish water. Epipellic, SSH.

Family Sellaphoraceae Mereschkowsky 1902

- Fallacia floriniae* (Møller) Witkowski 1993  
(*Fallacia oculiformis* (Hustedt) D. G. Mann in Round et al. 1990)  
Brackish water to marine. Benthic, MSH, SSH.
- Fallacia pygmaea* (Kützing) Stickle & D.G. Mann in Round et al. 1990  
(*Navicula pygmaea* Kützing 1849)  
Freshwater. Epipellic, NSH, MSH.
- Pseudofallacia tenera* (Hustedt) Liu, Kociolek, Fan & Wang 2012  
(*Navicula tenera* Hustedt in Schmidt 1936; *Fallacia tenera* (Hustedt) D.G. Mann in Round et al. 1990)  
Fresh to brackish water. Epiphytic, epipellic, epilithic, episammic, NSH, MSH, SSH.
- Sellaphora bacillum* (Ehrenberg) D.G. Mann in Reichardt 2018  
(*Navicula bacillum* Ehrenberg 1839)  
Freshwater. Epipellic, NSH, MSH.
- Sellaphora pupula* (Kützing) Mereschkowsky 1902  
Freshwater. Epiphytic, benthic, NSH, MSH.
- Sieminskia zeta* (Cleve) Metzeltin & Lange-Bertalot 1998  
Brackish water. Epipellic, epiphytic, epilithic, episammic, NSH, MSH, SSH.

Family Pinnulariaceae D.G. Mann in Round et al. 1990

- Pinnularia appendiculata* (Agardh) Schaarschmidt 1881  
Freshwater. Epipellic, NSH, MSH.
- Pinnularia brebissonii* (Kützing) Rabenhorst 1864  
Freshwater. Epipellic, NSH, MSH.
- Pinnularia borealis* Ehrenberg 1843  
Freshwater, terrestrial species. Aerophilic, epiphytic, epipellic, epilithic, NSH, MSH.
- Pinnularia cruciformis* (Donkin) Cleve 1895  
Marine. Epipellic, benthic, MSH, SSH.
- Pinnularia divergens* W. Smith 1853  
Freshwater. Benthic, NSH.
- Pinnularia gibba* Ehrenberg 1843  
Freshwater. Benthic, NSH.
- Pinnularia interrupta* W. Smith 1853  
Freshwater. Epiphytic, benthic, NSH, MSH.

## Family Diploneidaceae D.G. Mann in Round et al. 1990

- Diploneis chersonensis* (Grunow) Cleve in Schmidt 1892  
Marine. Benthic, SSH.
- Diploneis crabro* (Ehrenberg) Ehrenberg 1854  
Marine. Benthic, SSH.
- Diploneis dalmatica* (Grunow) Cleve 1894  
Marine. Epipelagic, SSH.
- Diploneis didymus* (Ehrenberg) Ehrenberg 1845  
Marine. Epipelagic, SSH.
- Diploneis elliptica* (Kützing) Cleve 1894  
Brackish water. Benthic, NSH, MSH.
- Diploneis interrupta* (Kützing) Cleve 1894  
Marine. Epipelagic, SSH.
- Diploneis oblongella* (Nägeli ex Kützing) Cleve-Euler 1922  
Fresh to brackish water. Benthic, NSH, MSH.
- Diploneis ovalis* (Hilse) Cleve 1891  
Freshwater. Benthic, NSH, MSH.
- Diploneis smithii* (Brébisson) Cleve 1894  
Brackish water. Epiphytic, epipelagic, epilithic, NSH, MSH.
- Diploneis suborbicularis* (Gregory) Cleve 1894  
Marine. Benthic, SSH.
- Diploneis weissflogii* (Schmidt) Cleve 1894  
Marine. Benthic, SSH.

## Family Naviculaceae Kützing 1844

- Caloneis amphisbaena* (Bory) Cleve 1894  
Fresh to brackish water. Planktonic, epipelagic, NSH, MSH, SSH.
- Caloneis amphisbaena* var. *subsalina* (Donkin) Cleve 1894  
Fresh to brackish water. Planktonic, epipelagic, NSH, MSH, SSH.
- Caloneis bacillum* (Grunow) Cleve 1894  
Brackish water. Benthic, NSH, MSH.
- Caloneis elongata* (Grunow) Boyer 1927  
Marine species. Benthic, SSH.
- Caloneis latiuscula* (Kützing) Cleve 1894  
Freshwater. Benthic, NSH, MSH.
- Caloneis leptosoma* (Grunow) Krammer in Krammer & Lange-Bertalot 1985  
(*Navicula leptosoma* Grunow 1880; *Pinnularia leptosoma* (Grunow) Cleve 1895)  
Freshwater. Benthic, NSH, MSH.
- Caloneis liber* (W. Smith) Cleve 1894  
Marine. Benthic, SSH.
- Caloneis limosa* (Kützing) Patrick in Patrick & Reimer 1966  
Freshwater. Benthic, NSH, MSH.

- Caloneis permagna* (Bailey) Cleve 1894  
Brackish water. Planktonic, epipelagic, epiphytic, epilithic, NSH, MSH, SSH.
- Caloneis silicula* (Ehrenberg) Cleve 1894  
Freshwater. Epiphytic, benthic, NSH, MSH.
- Caloneis westii* (W. Smith) Hendey 1964  
Marine. Benthic, SSH.
- Envekadea metzeltinii* Lee, Tobias & Van de Vijver 2013  
Brackish water to marine. Epiphytic, MSH, SSH.
- Fogedia finmarchica* (Cleve & Grunow) Witkowski, Metzeltin & Lange-Bertalot 1997  
(*Navicula finmarchica* (Cleve & Grunow) Cleve 1895)  
Brackish water to marine. Benthic, MSH, SSH.
- Haslea spicula* (Hickie) Bukhtiyarova 1995  
(*Navicula spicula* (Hickie) Cleve 1894; *Schizonema spicula* (Hickie) Kuntze 1898)  
Brackish water to marine. Epiphytic, benthic, MSH.
- Hippodonta capitata* (Ehrenberg) Lange-Bertalot, Metzeltin & Witkowski 1996  
(*Navicula capitata* (Ehrenberg) Ross 1947; *Navicula hungarica* f. *capitata* (Ehrenberg) Hustedt 1957)  
Freshwater. Epiphytic, benthic, NSH, MSH.
- Mayamaea atomus* (Kützing) Lange-Bertalot 1997  
(*Navicula atomus* (Kützing) Grunow 1860)  
Freshwater. Benthic, NSH, MSH.
- Navicula arenaria* Donkin 1861  
Marine. Benthic, SSH.
- Navicula carinifera* Grunow in Schmidt 1874  
Marine. Benthic, SSH.
- Navicula cryptocephala* Kützing 1844  
Brackish water. Benthic, NSH, MSH, SSH.
- Navicula digitoradiata* (Gregory) Ralfs in Pritchard 1861  
Brackish water to marine. Planktonic, epiphytic, epipelagic, epilithic, episammic, NSH, MSH, SSH.
- Navicula distans* (Smith) Brébisson 1854  
Marine. Benthic, SSH.
- Navicula gregaria* Donkin 1861  
Fresh and brackish water. Benthic, NSH, MSH.
- Navicula johncarteri* Williams in Williams & Reid 2001  
(*Navicula lanceolata* var. *cymbula* (Donkin) Cleve 1895)  
Freshwater. Benthic, NSH, MSH.
- Navicula kefvingensis* (Ehrenberg) Kützing 1844  
Brackish water. Benthic, MSH.
- Navicula lanceolata* Ehrenberg 1838  
Freshwater. Benthic, NSH, MSH.

- Navicula menisculus* Schumann 1867  
Freshwater. Epipellic, NSH, MSH.
- Navicula oblonga* (Kützing) Kützing 1844  
Freshwater. Epipellic, NSH, MSH.
- Navicula perrhombus* Hustedt ex Simonsen in Simonsen 1987  
Marine. Benthic, SSH.
- Navicula radiosa* Kützing 1844  
Freshwater. Epiphytic, epipellic, epilithic, NSH, MSH.
- Navicula rhynchocephala* Kützing 1844  
Freshwater species. Planktonic, epiphytic, epipellic, episammic, NSH, MSH.
- Navicula rostellata* Kützing 1844  
Freshwater. Epiphytic, benthic, NSH, MSH.
- Navicula salinarum* Grunow 1880  
Brackish to freshwater. Planktonic, epipellic, epiphytic, epilithic, episammic, NSH, MSH.
- Navicula schroeteri* F. Meister 1932  
Fresh to brackish waters. Epipellic, epiphytic, epilithic, episammic, NSH, MSH, SSH.
- Navicula subrhynchocephala* Hustedt 1935  
Freshwater. Epipellic, epiphytic, epilithic, episammic, NSH, MSH, SSH.
- Navicula tripunctata* (Müller) Bory 1822  
Freshwater. Epilithic, NSH, MSH.
- Navicula veneta* Kützing 1844  
Brackish and freshwater, Epiphytic, epipellic, epilithic, episammic, NSH, MSH, SSH.
- Navicula viridula* (Kützing) Ehrenberg 1836  
Freshwater. Epiphytic, epipellic, NSH, MSH.
- Trachyneis antillarum* (Cleve & Grunow) Cleve 1894  
Marine. Planktonic, SSH.
- Trachyneis aspera* (Ehrenberg) Cleve 1894  
Marine. Planktonic, benthic, SSH.
- Trachyneis debyi* (Leuduger-Fortmorel) Cleve 1894  
Marine. Planktonic, benthic, SSH.
- Order Lyrellales D.G. Mann in Round et al. 1990  
Family Lyrellaceae D.G. Mann in Round et al. 1990
- Lyrella abrupta* (Gregory) D.G. Mann in Round et al. 1990  
Marine. Benthic, SSH.
- Family Pleurosigmataceae Mereschkowsky 1903
- Gyrosigma acuminatum* (Kützing) Rabenhorst 1853  
Fresh to brackish water. Planktonic, epiphytic, epipellic, episammic, NSH, MSH.
- Gyrosigma attenuatum* (Kützing) Rabenhorst 1853

- Fresh to brackish water. Planktonic, epiphytic, epipellic, epilithic, episammic, NSH, MSH, SSH.
- Gyrosigma balticum* (Ehrenberg) Rabenhorst 1853  
Brackish water to marine. Planktonic, SSH.
- Gyrosigma distortum* (W. Smith) Griffith & Henfrey 1856  
Marine. Benthic, SSH.
- Gyrosigma eximium* (Thwaites) Boyer 1927  
Fresh to brackish water. Planktonic, epiphytic, benthic, NSH, MSH.
- Gyrosigma fasciola* (Ehrenberg) Griffith & Henfrey 1856  
Brackish to marine. Planktonic, epipellic, benthic, NSH, MSH, SSH.
- Gyrosigma macrum* (W. Smith) Griffith & Henfrey 1856  
Brackish water to marine. Planktonic, epiphytic, epipellic, NSH, MSH, SSH.
- Gyrosigma scalproides* (Rabenhorst) Cleve 1894  
Freshwater. Planktonic, epiphytic, epipellic, epilithic, episammic, NSH, MSH, SSH.
- Gyrosigma sinense* (Ehrenberg) Desikachary 1988  
(*Gyrosigma balticum* var. *sinense* (Ehrenberg) Cleve 1894)  
Marine. Planktonic, epiphytic, epipellic, epilithic, episammic, NSH, MSH, SSH.
- Gyrosigma strigilis* (W. Smith) Griffith & Henfrey 1856  
Brackish water. Epipellic, NSH, MSH.
- Gyrosigma wansbeckii* (Donkin) Cleve 1894  
Marine. Epiphytic, benthic, SSH.
- Gyrosigma wormleyi* (Sullivant) Boyer 1922  
Fresh to brackish water. Planktonic, epiphytic, epipellic, NSH, MSH, SSH.
- Pleurosigma angulatum* (Quekett) W. Smith 1852  
Brackish water to marine. Epiphytic, benthic, MSH, SSH.
- Pleurosigma delicatulum* W. Smith 1852  
Marine. Benthic, SSH.
- Pleurosigma diverse-striatum* Meister 1934  
Marine. Epipellic, benthic, SSH.
- Pleurosigma elongatum* W. Smith 1852  
Brackish water. Planktonic, epiphytic, epipellic, epilithic, NSH, MSH, SSH.
- Pleurosigma formosum* W. Smith 1852  
Marine. Planktonic, benthic, SSH.
- Pleurosigma normanii* Ralfs in Pritchard 1861  
Marine. Planktonic, Epipellic, SSH.
- Pleurosigma salinarum* (Grunow) Grunow 1880  
Marine. Epipellic, SSH.
- Family Plagiotropidaceae D.G. Mann in Round et al. 1990
- Plagiotropis vitrea* (W. Smith) Grunow 1880  
Brackish water to marine. Benthic, MSH, SSH.

## Family Stauroneidaceae D.G. Mann in Round et al. 1990

- Craticula ambigua* (Ehrenberg) D.G. Mann in Round et al. 1990  
(*Navicula cuspidata* var. *ambigua* (Ehrenberg) Kirchner 1878  
Fresh to brackish water. Epipelagic, NSH, MSH.
- Craticula cuspidata* (Kützing) D.G. Mann in Round et al. 1990  
(*Navicula cuspidata* (Kützing) Kützing 1844  
Fresh to brackish water. Planktonic, epiphytic, epipelagic, NSH, MSH, SSH.
- Craticula halophila* (Grunow) D.G. Mann in Round et al. 1990  
(*Navicula halophila* (Grunow) Cleve 1894  
Fresh to brackish water. Epiphytic, benthic, NSH, MSH, SSH.
- Craticula perrotettii* Grunow 1868  
(*Navicula perrotettii* (Grunow) Grunow 1877  
Freshwater. Epiphytic, NSH, MSH.
- Craticula submolesta* (Hustedt) Lange-Bertalot in Lange-Bertalot & Metzeltin 1996  
(*Navicula submolesta* Hustedt 1949)  
Freshwater. Epiphytic, NSH, MSH.
- Stauroneis anceps* Ehrenberg 1843  
Freshwater. Benthic, NSH, MSH.
- Stauroneis phoenicenteron* (Nitzsch) Ehrenberg 1843  
Freshwater. Benthic, NSH, MSH.
- Dorofeyukea kotschyi* (Grunow) Kulikovskiy, Kociolek, Tusset & Ludwig in  
Kulikovskiy et al. 2019  
(*Navicula kotschyi* Grunow 1860; *Luticola kotschyi* (Grunow) Taylor,  
Harding & Archibald 2007)  
Freshwater. Benthic, NSH, MSH.

## Order Thalassiophysales D.G. Mann in Round et al. 1990

## Family Catenulaceae Mereschkowsky 1902

- Amphora copulata* (Kützing) Schoeman & Archibald 1986  
Freshwater. Epiphytic, benthic, NSH, MSH.
- Amphora commutata* Grunow 1880  
Brackish water. Epipelagic, NSH, MSH, SSH.
- Amphora fluminensis* Grunow 1863  
Marine and freshwater. Planktonic, epipelagic, epiphytic, epilithic, episammic,  
NSH, MSH, SSH.
- Amphora ocellata* Donkin, 1861  
Marine. Epipelagic, MSH, SSH.
- Amphora ovalis* (Kützing) Kützing 1844  
Fresh to brackish water. Planktonic, epiphytic, epipelagic, NSH, MSH, SSH.
- Halamphora coffeiformis* (Agardh) Levkov 2009  
(*Amphora coffeiformis* (Agardh) Kützing 1844  
Brackish water. Benthic. MSH, SSH.



- Halamphora costata* (W. Smith) Levkov 2009  
(*Amphora costata* W. Smith 1853)  
Marine. Benthic. SSH.
- Halamphora exigua* (Gregory) Levkov 2009  
(*Amphora exigua* Gregory 1857)  
Brackish water to marine. Benthic. SSH.
- Halamphora ghanensis* Levkov 2009  
Freshwater. Planktonic, epipelagic, epiphytic, episammic, epilithic, NSH, MSH.
- Halamphora turgida* (Gregory) Levkov 2009  
(*Amphora turgida* Gregory 1857)  
Brackish water to marine. Benthic. SSH.
- Halamphora veneta* (Kützing) Levkov 2009  
(*Amphora veneta* Kützing 1844)  
Fresh and brackish water. Epiphytic, benthic, NSH, MSH.
- Halamphora paraveneta* (Lange-Bertalot, Cavacini, Tagliaventi & Alfinito 2003)  
Levkov 2009  
(*Amphora paraveneta* Lange-Bertalot, Cavacini, Tagliaventi & Alfinito 2003)  
Freshwater. Epiphytic, NSH.
- Seminavis robusta* Danielidis & D.G. Mann 2002  
Marine. Benthic. SSH.
- Seminavis strigosa* (Hustedt) Danielidis & Economou-Amilli in Danielidis & D.G. Mann 2003  
(*Amphora strigosa* Hustedt 1949)  
Marine. Planktonic, epiphytic, epipelagic, epilithic, episammic, NSH, MSH, SSH.

## Order Bacillariales Hendey 1937

## Family Bacillariaceae Ehrenberg 1831

- Bacillaria paxillifera* (Müller) Marsson 1901  
Marine and brackish water. Planktonic, epiphytic, epipelagic, epilithic, episammic, NSH, MSH, SSH.
- Denticula elegans* Kützing, 1844  
Fresh and brackish water. Epiphytic, NSH, MSH.
- Denticula subtilis* Grunow 1862  
Brackish water. Epiphytic, NSH, MSH.
- Giffenia cocconeiformis* (Grunow) Round & Basson 1997  
(*Tryblionella cocconeiformis* (Grunow) D.G. Mann in Round et al. 1990)  
Marine to brackish water. Planktonic, epipelagic, SSH.
- Gomphotheca clevei* (Grunow) Hendey & Sims 1982  
(*Gomphonitzschia clevei* Grunow 1880; *Nitzschia clevei* (Grunow) Peragallo & Peragallo 1900)  
Marine. Planktonic, SSH.
- Gomphotheca sinensis* (Skvortzov) Hendey & Sims 1982  
Marine. Planktonic, SSH.

- Hantzschia amphioxys* (Ehrenberg) Grunow 1880  
Freshwater and terrestrial. Epipellic, epilithic, NSH, MSH.
- Hantzschia spectabilis* (Ehrenberg) Hustedt 1959  
Marine to brackish water. Benthic, SSH.
- Hantzschia virgata* (Roper) Grunow 1880  
Marine to brackish water. Benthic, SSH.
- Hantzschia virgata* var. *capitellata* Hustedt, 1930  
Marine to brackish water. Benthic, SSH.
- Nitzschia acicularis* (Kützing) W. Smith 1853  
Marine to brackish water, also found in freshwater. Planktonic, epipellic, MSH, MSH, SSH.
- Nitzschia acula* (Kützing) Hantzsch in Rabenhorst 1861  
Freshwater. Benthic, NSH, MSH.
- Nitzschia adamata* Hustedt 1957  
Freshwater. Epipellic, epiphytic, epilithic, NSH, MSH, SSH.
- Nitzschia amphibia* Grunow 1862  
Freshwater. Epipellic, epiphytic, NSH, MSH.
- Nitzschia amplexans* Hustedt 1957  
Freshwater. Epipellic, epiphytic, epilithic, NSH, MSH.
- Nitzschia aurariae* Cholnoky 1966  
Freshwater to brackish water. Epipellic, NSH, MSH.
- Nitzschia behrei* Hustedt 1959  
Brackish water to marine. Planktonic, epipellic, SSH.
- Nitzschia bicapitata* Cleve 1901  
Marine. Epiphytic, epipellic, epilithic, NSH, MSH, SSH.
- Nitzschia bilobata* W. Smith 1853  
Marine. Planktonic, epiphytic, epipellic, epilithic, NSH, MSH, SSH.
- Nitzschia brevissima* Grunow 1880  
Brackish water. Epiphytic, epipellic, epilithic, MSH, SSH.
- Nitzschia capitellata* Hustedt 1930  
Brackish water to marine. Planktonic, epiphytic, epipellic, epilithic, episammic, NSH, MSH, SSH.
- Nitzschia clausii* Hantzsch 1860  
Brackish water to marine. Planktonic, epiphytic, epipellic, epilithic, NSH, MSH, SSH.
- Nitzschia communis* Rabenhorst in Rabenhorst 1848-1860  
Brackish water, epipellic, epilithic, MSH, SSH.
- Nitzschia denticula* Grunow 1880  
Freshwater. Benthic, NSH, MSH.
- Nitzschia dissipata* (Kützing) Rabenhorst in Rabenhorst 1848-1860  
Freshwater. Epiphytic, epipellic, epilithic, NSH, MSH.
- Nitzschia dubia* W. Smith 1853  
Marine to brackish water, also in freshwater. Planktonic, epiphytic, NSH, MSH, SSH.

- Nitzschia elegantula* Grunow in Van Heurck 1881  
Brackish water to Marine. Epipellic, NSH, MSH, SSH.
- Nitzschia fasciculata* (Grunow) Grunow in Van Heurck 1881  
Brackish water to marine. Epiphytic, epipellic, NSH, MSH.
- Nitzschia filiformis* (W. Smith) Van Heurck 1896  
Brackish water to marine. Planktonic, epiphytic, epipellic, epilithic, NSH, MSH, SSH.
- Nitzschia fonticola* (Grunow) Grunow in Van Heurck 1881  
Freshwater. Benthic, NSH, MSH.
- Nitzschia frustulum* (Kützing) Grunow 1880  
Brackish water to marine, also in freshwater. Epilithic, NSH, MSH, SSH.
- Nitzschia fusiformis* Grunow 1880  
Marine. Planktonic, SSH.
- Nitzschia geitleri* Hustedt 1959  
Brackish water. Planktonic, epiphytic, epipellic, NSH, MSH, SSH.
- Nitzschia gracilis* Hantzsch 1860  
Fresh to brackish water. Benthic, NSH, MSH.
- Nitzschia grandis* Kitton 1874  
Brackish water. Benthic, MSH.
- Nitzschia intermedia* Hantzsch in Grunow 1880  
Fresh to brackish water. Benthic, NSH, MSH.
- Nitzschia hybrida* Grunow 1880  
Brackish water. Planktonic, epiphytic, epipellic, epilithic, NSH, MSH, SSH.
- Nitzschia incerta* (Grunow) M. Peragallo 1903  
Marine. Planktonic, epiphytic, epipellic, NSH, MSH, SSH.
- Nitzschia incurva* var. *lorenziana* Ross in Hartley et al. 1986  
(*Nitzschia lorenziana* Grunow in Cleve & Möller 1879)  
Brackish water to marine. Planktonic, epipellic, epiphytic, NSH, MSH, SSH.
- Nitzschia kurzeana* Rabenhorst 1873  
Fresh- to brackish water. Planktonic, epiphytic, epipellic, NSH, MSH, SSH.
- Nitzschia longissima* (Brébisson) Ralfs in Pritchard 1861  
Marine. Planktonic, SSH.
- Nitzschia macilenta* Gregory in Greville 1859  
Marine. Epiphytic, SSH.
- Nitzschia microcephala* Grunow 1880  
Marine. Epipellic, epilithic, SSH.
- Nitzschia obtusa* W. Smith 1853  
Brackish water. Planktonic, epiphytic, epipellic, NSH, MSH, SSH.
- Nitzschia palea* (Kützing) W. Smith 1856  
Freshwater. Epiphytic, epipellic, epilithic, NSH, MSH.
- Nitzschia paleacea* (Grunow) Grunow in Van Heurck 1881  
Freshwater. Epilithic, NSH, MSH.
- Nitzschia parvula* W. Smith 1853  
Brackish water. Epiphytic, NSH, MSH

- Nitzschia prolongata* Hustedt 1938  
Marine to brackish water. Planktonic, epiphytic, epipelic, epilithic, episammic, NSH, MSH, SSH.
- Nitzschia pusilla* Grunow 1862  
Freshwater. Epipelic, NSH, MSH.
- Nitzschia recta* Hantzsch ex Rabenhorst 1862  
Freshwater. Epiphytic, NSH, MSH, SSH.
- Nitzschia scalpelliformis* Grunow 1880  
Fresh to brackish water. Epiphytic, epipelic, NSH, MSH, SSH.
- Nitzschia sigma* (Kützing) W. Smith 1853  
Brackish water to marine. Planktonic, epiphytic, epipelic, epilithic, episammic, NSH, MSH, SSH.
- Nitzschia sigmoidea* (Nitzsch) W. Smith 1853  
Freshwater. Planktonic, epiphytic, NSH, MSH, SSH.
- Nitzschia spathulata* Brébisson ex W. Smith 1853  
Marine. Epipelic, SSH.
- Nitzschia subcohaerens* var. *scotica* (Grunow) Van Heurck 1896  
(Name of species not confirmed)  
Brackish water. Epiphytic, epipelic, epilithic, NSH, MSH, SSH.
- Nitzschia sublinearis* Hustedt 1930  
Freshwater. Benthic, NSH, MSH.
- Nitzschia umbonata* (Ehrenberg) Lange-Bertalot 1978  
Freshwater. Epiphytic, NSH, MSH.
- Nitzschia vermicularis* (Kützing) Hantzsch 1860  
Marine to freshwater. Epiphytic, NSH, MSH, SSH.
- Psammodictyon panduriforme* (Gregory) D.G. Mann in Round et al. 1990  
(*Nitzschia panduriformis* Gregory 1857)  
Marine. Epipelic, SSH.
- Tryblionella apiculata* Gregory 1857  
Marine. Planktonic, epiphytic, epipelic, epilithic, episammic, NSH, MSH, SSH.
- Tryblionella angustata* W. Smith 1853  
Marine. Benthic, SSH.
- Tryblionella calida* (Grunow) D.G. Mann in Round et al. 1990  
(*Nitzschia calida* Grunow 1880; *Nitzschia tryblionella* var. *calida* (Grunow) Van Heurck 1885; *Homoeocladia calida* (Grunow) Kuntze 1898)  
Brackish water. Benthic, MSH, SSH.
- Tryblionella circumscuta* (Bailey) Ralfs in Pritchard 1861  
Marine. Epipelic, SSH
- Tryblionella coarctata* (Grunow) D.G. Mann in Round et al. 1990  
(*Nitzschia coarctata* Grunow 1880)  
Marine to brackish water. Planktonic, epiphytic, epipelic, NSH, MSH, SSH.
- Tryblionella compressa* (Bailey) Poulin in Poulin et al. 1990  
(*Nitzschia compressa* (Bailey) Boyer 1916)  
Marine to brackish water. Epiphytic, epilithic, NSH, MSH, SSH.

- Tryblionella granulata* (Grunow) D.G. Mann in Round et al. 1990  
(*Nitzschia granulata* Grunow 1880)  
Marine. Epiphytic, epipellic, epilithic, NSH, MSH, SSH.
- Tryblionella hungarica* (Grunow) Frenguelli 1942  
Marine to brackish water. Planktonic, epipellic, epiphytic, epilithic, NSH, MSH.
- Tryblionella hantzschiana* Grunow 1862  
Brackish water. Benthic, MSH, SSH.
- Tryblionella levidensis* W. Smith 1856  
Marine to brackish water. Epiphytic, benthic, NSH, MSH, SSH.
- Tryblionella levidensis* W. Smith 1856  
Brackish water. Planktonic, epiphytic, epipellic, epilithic, episammic, NSH, MSH, SSH.
- Tryblionella littoralis* (Grunow) D.G. Mann in Round et al. 1990  
(*Nitzschia littoralis* Grunow 1880)  
Marine and brackish water. Planktonic, epiphytic, benthic, NSH, MSH
- Tryblionella navicularis* (Brébisson) Ralfs in Pritchard 1861  
(*Nitzschia navicularis* (Brébisson) Grunow 1880)  
Marine. Epipellic, SSH.
- Tryblionella punctata* W. Smith 1853  
Marine to freshwater species. Epipellic, NSH, MSH, SSH.
- Tryblionella scalaris* (Ehrenberg) Siver & Hamilton 2005  
(*Nitzschia scalaris* (Ehrenberg) W. Smith 1853)  
Brackish water. Planktonic, epiphytic, epipellic, NSH, MSH, SSH.
- Tryblionella victoriae* Grunow 1862  
Marine. Epipellic, SSH.

Order Rhopalodiales D.G. Mann in Round et al. 1990

Family Rhopalodiaceae (Karsten) Topachevs'kyj & Oksiyuk 1960

- Epithemia adnata* (Kützing) Brébisson 1838  
Freshwater. Planktonic, epiphytic, benthic, NSH, MSH, SSH.
- Epithemia gibba* (Ehrenberg) Kützing 1844  
(*Rhopalodia gibba* (Ehrenberg) Müller 1895)  
Freshwater. Planktonic, epiphytic, benthic, NSH, MSH, SSH.
- Epithemia parallela* (Grunow) Ruck & Nakov in Ruck et al. 2016  
(*Rhopalodia parallela* (Grunow) Müller 1895)  
Freshwater. Epiphytic, NSH, MSH.
- Epithemia sorex* Kützing 1844  
Freshwater. Epiphytic, benthic, NSH, MSH.
- Epithemia turgida* (Ehrenberg) Kützing 1844  
Freshwater. Planktonic, epiphytic, NSH, MSH.
- Rhopalodia musculus* (Kützing) Müller 1899  
Marine to brackish water. Epiphytic, benthic, NSH, MSH

*Rhopalodia gibba* var. *ventricosa* (Kützing) Peragallo & Peragallo 1900  
Marine to freshwater. Epiphytic, MSH, SSH.

Order Surirellales D.G. Mann in Round et al. 1990

Family Entomoneidaceae Reimer in Patrick & Reimer 1975

*Entomoneis alata* (Ehrenberg) Ehrenberg 1845

Brackish water. Planktonic, epiphytic, epipelic, epilithic, episammic, NSH, MSH, SSH.

*Entomoneis costata* (Hustedt) Reimer in Patrick & Reimer 1975

Marine. Benthic, SSH.

*Entomoneis corrugata* (Giffen) Witkowski, Lange-Bertalot & Metzeltin, 2000

Brackish water to marine. Planktonic, epiphytic, epipelic, epilithic, episammic, NSH, MSH, SSH.

*Entomoneis paludosa* (W. Smith) Reimer in Patrick & Reimer 1975

Brackish water to marine. Planktonic, epiphytic, epipelic, NSH, MSH, SSH.

*Amphiprora gigantea* var. *sulcata* (O'Meara) Cleve 1894

Marine. Planktonic, epipelic, SSH.

Family Surirellaceae Kützing 1844

*Campylodiscus bicostatus* W. Smith ex Roper in Roper 1854

Brackish water. Planktonic, epiphytic, epipelic, NSH, MSH, SSH.

*Campylodiscus clypeus* (Ehrenberg) Ehrenberg ex Kützing 1844

Marine to brackish water. Benthic, SSH.

*Campylodiscus echeneis* Ehrenberg ex Kützing 1844

Marine. Epipelic, SSH.

*Campylodiscus neofastuosus* Ruck & Nakov in Ruck et al. 2016

(*Surirella fastuosa* (Ehrenberg) Ehrenberg 1843)

Marine to brackish water. Benthic, MSH, SSH.

*Campylodiscus noricus* Ehrenberg ex Kützing 1844

Freshwater species. Benthic, NSH, MSH.

*Coronia decora* (Brébisson) Ruck & Guiry 2016

(*Campylodiscus decorus* Brébisson 1854)

*Cymatopleura elliptica* (Brébisson) W. Smith 1851

Freshwater. Benthic, NSH, MSH

*Iconella capronii* (Brébisson & Kitton) Ruck & Nakov in Ruck et al. 2016

(*Surirella capronii* Brébisson & Kitton in Kitton 1869)

Freshwater. Epiphytic, benthic, NSH, MSH.

*Iconella curvula* (W. Smith) Ruck & Nakov in Ruck et al. 2016

(*Stenopterobia curvula* (W. Smith) Krammer in Lange-Bertalot & Krammer 1987)

Freshwater. Planktonic, epiphytic, epipelic, epilithic, NSH, MSH, SSH.

*Iconella hibernica* (Ehrenberg) Ruck & Nakov in Ruck et al. 2016

(*Campylodiscus hibernicus* Ehrenberg 1845)

Fresh to brackish water. Benthic, NSH, MSH.

- Iconella nervosa* (Schmidt) Cocquyt & Jahn in Jahn et al. 2017.  
(*Surirella tenera* var. *nervosa* Schmidt 1875)  
Freshwater. Benthic, epiphytic, MSH, SSH.
- Iconella tenera* (Gregory) Ruck & Nakov in Ruck et al. 2016  
(*Surirella tenera* Gregory 1856)  
Marine. Planktonic, epiphytic, epipelagic, NSH, MSH, SSH.
- Petrodictyon gemma* (Ehrenberg) D.G. Mann in Round et al. 1990  
(*Surirella gemma* (Ehrenberg) Kützing 1844)  
Marine to brackish water. Planktonic, epipelagic, epiphytic, MSH, SSH.
- Surirella brebissonii* Krammer & Lange-Bertalot 1987  
Brackish to freshwater. Planktonic, epiphytic, episammic, NSH, MSH, SSH.
- Surirella brightwellii* W. Smith 1853  
Brackish water. Benthic, MSH, SSH.
- Surirella fluminensis* Grunow 1862  
Marine species. Planktonic, epiphytic, epipelagic, MSH, SSH.
- Surirella librile* (Ehrenberg) Ehrenberg 1845  
(*Cymatopleura solea* (Brébisson) W. Smith 1851)  
Freshwater. Planktonic, epiphytic, epipelagic, NSH, MSH, SSH.
- Surirella ovalis* Brébisson 1838  
Freshwater to brackish. Planktonic, epiphytic, epipelagic, NSH, MSH, SSH.
- Surirella peisonis* Pantocsek 1902  
Brackish water. Epiphytic, epipelagic, epilithic, episammic, NSH, MSH, SSH.
- Surirella robusta* Ehrenberg in Ehrenberg 1840  
Freshwater. Planktonic, epiphytic, epipelagic, NSH, MSH, SSH.
- Surirella striatula* Turpin 1828  
Brackish water. Planktonic, epiphytic, epipelagic, epilithic, episammic, NSH, MSH, SSH.

### Species of Uncertain Identity

Several species were encountered during the course of our studies where identification was rather difficult either because of insufficient material for further examination or mismatch with published taxa. These species, however, were documented by description and illustration in Al-Shaheen (2016) and Al-Handal & Al-Shaheen (2019). The following list include these species with the references where description was made.

#### *Brachysira* sp.

(Al-Shaheen, 2016, p. 100, pl. 11, fig. 3)  
Brackish water. Benthic, epiphytic, MSH.

#### *Campylodiscus* sp.

(Al-Shaheen, 2016, p. 160, pl. 10, fig. 4, pl. 38, figs 4-5)  
Brackish water. Planktonic, benthic, epiphytic, NSH, MSH, SSH.

*Eunotia* sp.

(Al-Shaheen, 2016, p. 82, pl. 13, fig. 3)

Freshwater. Epiphytic, NSH.

*Mastogloia* sp.

(Al-Handal &amp; Al-Shaheen, 2019, p. 33, pl. 9, figs 13, 14)

Fresh to brackish water. Benthic, epiphytic, NSH, MSH).

*Neidium* sp.

(Al-Handal &amp; Al-Shaheen, 2019, p. 55, pl. 18, fig. 5)

Unknown environmental preference.

*Geissleria* sp.

(Al-Handal &amp; Al-Shaheen, 2019, p. 70, pl. 24, fig. 11)

Fresh to brackish water. Benthic, MSH

*Navicula* sp.

(Al-Handal &amp; Al-Shaheen, 2019, p. 76, pl. 26, fig. 7)

Brackish water. Benthic, SSH.

*Nitzschia* sp. 1

(Al-Handal &amp; Al-Shaheen, 2019, p. 98, pl. 35, fig. 12)

Fresh to brackish water. Benthic, epiphytic, NSH, MSH.

*Nitzschia* sp. 2

(Al-Handal &amp; Al-Shaheen, 2019, p. 98, pl. 36, fig. 1)

Brackish water. Benthic, SSH.

*Pleurosigma* sp.

(Al-Shaheen, 2016, p. 125, pl. 21, fig. 3)

Brackish water. Planktonic, benthic, epiphytic, NSH, MSH, SSH.

*Thalassiosira* sp.

(Al-Shaheen, 2016, p. 53, pl. 4, fig. 2, pl. 30, figs 5-8, pl. 31 figs 1-4)

Planktonic, NSH, MSH, SSH.

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