Diatoms from Marine Environments of Peninsular Malaysia and Singapore

T.T. Wah, Y.C. Wee and S.M. Phang
Department of Botany, National University of Singapore, Singapore 0511, Republic of Singapore
1Institute of Advanced Studies, University of Malaya, 59100 Kuala Lumpur, Malaysia

EFFECTIVE PUBLICATION DATE: 15 MAR 1993

Abstract
A total of 230 taxa of diatoms belonging to 58 genera were recorded from 12 locations in Peninsular Malaysia and 14 locations in Singapore. The most common genera are Navicula and Nitzschia.

Introduction
For a long time now the only detailed studies on the marine diatoms of the Southeast Asian region have been those by Mann (1925) and Allen & Cupp (1935) on the Philippines Islands and the Java Sea, respectively. More recent studies include those by Takano (1960) who collected from the Arafura and eastern Timor Seas; Wood (1963) who listed many species from the Indonesian waters; Podzorski & Håkansson (1987) on the freshwater and marine diatoms of Palawan, Philippines; and Wah & Wee (1988) on the diatoms of mangrove environments of Singapore and southern Peninsular Malaysia. This paper gives an account on the diatoms of marine environments of Peninsular Malaysia and Singapore.

Materials and Methods
Materials collected for diatoms were from seaweeds obtained from the littoral and sublittoral zones of coastal areas. In addition, sand, molluscs, stones, debris and sediments were also collected. A total of 12 locations in Peninsular Malaysia and 14 locations in Singapore were visited during 1986–87 (Fig. 1). Samples of planktonic diatoms came from the Zoological Raffles Collection of the National University of Singapore. These were collected from the vicinity of Sisters Island in 1968–69. Permanent slides were prepared after the method of Gerloff & Natour (1982), details of which are described in an earlier publication (Wah & Wee, 1988). All taxa were identified from the prepared slides using the classical criteria of size, shape and ornamentation. Relative abundance of the taxa refers to the abundance of the diatoms in the slides referred to. Details of slide numbers giving collection locations and substrata are tabulated in Table I. Slides were deposited in the Cryptogamic Herbarium of the Botany Department, National University of Singapore.

Results
A total of 230 taxa of diatoms belonging to 58 genera were recorded from 12 locations in Peninsular Malaysia and 14 locations in Singapore. Only five genera were
Fig. 1a. Map of Peninsular Malaysia showing collecting sites (CR: Cape Rachado; La: Pulau Langkawi; Po: Pontian; PB: Pulau Besar; PD: Port Dickson; PK: Pulau Kapas; PP: Pulau Perhentian; PPa: Pulau Pangkor; PPa: Pulau Redang; PT: Pulau Tioman; PTe: Pulau Tenggul; Sm: Sementa).
Fig. 1b. Map of Singapore showing collecting sites (C: Changi; CS: Changi seawfarm; E: East Coast Park; L: Labrador Park; Lo: Loyang; Pr: Pasir Ris; PR: Pulau Retan Laut; PU: Pulau Ubin; S: Sentosa; Se: Sembawang; SI: Sisters Island; T: Tuas; W: West Coast Park).
<table>
<thead>
<tr>
<th>No.</th>
<th>Locations</th>
<th>Materials</th>
</tr>
</thead>
<tbody>
<tr>
<td>1, 2, 3, 4</td>
<td>East Coast Park</td>
<td>seaweeds</td>
</tr>
<tr>
<td>12</td>
<td>Changi</td>
<td>seaweeds</td>
</tr>
<tr>
<td>17</td>
<td>Kranji</td>
<td>mollusc</td>
</tr>
<tr>
<td>19</td>
<td>Loyang</td>
<td>stones</td>
</tr>
<tr>
<td>31</td>
<td>Pulau Ubin</td>
<td>roots and algae</td>
</tr>
<tr>
<td>33</td>
<td>Pulau Ubin</td>
<td>mud</td>
</tr>
<tr>
<td>37, 38</td>
<td>Pulau Ubin</td>
<td>sand</td>
</tr>
<tr>
<td>40</td>
<td>Pulau Ubin</td>
<td>reddish sand</td>
</tr>
<tr>
<td>43</td>
<td>Pulau Ubin</td>
<td>rock</td>
</tr>
<tr>
<td>47, 48</td>
<td>East Coast Park</td>
<td>seaweeds</td>
</tr>
<tr>
<td>49</td>
<td>Changi</td>
<td>seaweeds</td>
</tr>
<tr>
<td>75</td>
<td>Labrador Park</td>
<td>red algae</td>
</tr>
<tr>
<td>79, 80</td>
<td>Labrador Park</td>
<td>sediment</td>
</tr>
<tr>
<td>81</td>
<td>Labrador Park</td>
<td>seaweeds</td>
</tr>
<tr>
<td>91</td>
<td>Port Dickson</td>
<td>sediment and sand</td>
</tr>
<tr>
<td>93</td>
<td>Port Dickson</td>
<td>seaweeds</td>
</tr>
<tr>
<td>95</td>
<td>Pasir Ris</td>
<td>sand</td>
</tr>
<tr>
<td>100</td>
<td>Pasir Ris</td>
<td>seaweeds</td>
</tr>
<tr>
<td>116</td>
<td>Pulau Retan Laut</td>
<td>seaweeds</td>
</tr>
<tr>
<td>119, 120</td>
<td>Pulau Tioman</td>
<td>molluscs</td>
</tr>
<tr>
<td>122</td>
<td>Pulau Tioman</td>
<td>debris</td>
</tr>
<tr>
<td>124</td>
<td>Pulau Tioman</td>
<td>seaweeds</td>
</tr>
<tr>
<td>125</td>
<td>Pulau Tioman</td>
<td>water</td>
</tr>
<tr>
<td>129, 130</td>
<td>Pulau Tioman</td>
<td>sand</td>
</tr>
<tr>
<td>132</td>
<td>Pulau Tioman</td>
<td>black sediment</td>
</tr>
<tr>
<td>135, 138</td>
<td>Pulau Tioman</td>
<td>pole</td>
</tr>
<tr>
<td>141</td>
<td>Changi</td>
<td>seafarm debris</td>
</tr>
<tr>
<td>175</td>
<td>Sembawang</td>
<td>foam</td>
</tr>
<tr>
<td>183</td>
<td>Sembawang</td>
<td>seaweeds</td>
</tr>
<tr>
<td>257</td>
<td>West Coast Park</td>
<td>seaweeds</td>
</tr>
<tr>
<td>259</td>
<td>West Coast Park</td>
<td>sand</td>
</tr>
<tr>
<td>273</td>
<td>Sentosa</td>
<td>sand</td>
</tr>
<tr>
<td>278</td>
<td>Sentosa</td>
<td>submerged grasses</td>
</tr>
<tr>
<td>297</td>
<td>Pontian</td>
<td>sandy mud</td>
</tr>
<tr>
<td>315</td>
<td>Around Sisters Island</td>
<td>surface pumping, 16.4.68</td>
</tr>
<tr>
<td>317</td>
<td>Around Sisters Island</td>
<td>bottom pumping, 16.4.68</td>
</tr>
<tr>
<td>319</td>
<td>Around Sisters Island</td>
<td>surface towing, 21.5.68</td>
</tr>
<tr>
<td>321</td>
<td>Around Sisters Island</td>
<td>surface pumping, 14.1.69</td>
</tr>
<tr>
<td>323</td>
<td>Around Sisters Island</td>
<td>bottom pumping, 14.1.69</td>
</tr>
<tr>
<td>333</td>
<td>Pulau Kapas</td>
<td>seaweeds</td>
</tr>
<tr>
<td>335</td>
<td>Pulau Redang</td>
<td>seaweeds</td>
</tr>
<tr>
<td>337</td>
<td>Pulau Pangkor</td>
<td>seaweeds</td>
</tr>
<tr>
<td>339</td>
<td>Sementa</td>
<td>red algae</td>
</tr>
<tr>
<td>341</td>
<td>Pulau Langkawi</td>
<td>water sample</td>
</tr>
<tr>
<td>343</td>
<td>Pulau Besar</td>
<td>seaweeds</td>
</tr>
<tr>
<td>345</td>
<td>Pulau Tenggul</td>
<td>coral</td>
</tr>
<tr>
<td>347</td>
<td>Cape Rachado</td>
<td>seaweeds</td>
</tr>
<tr>
<td>350</td>
<td>Pulau Perhentian</td>
<td>seaweeds</td>
</tr>
<tr>
<td>351</td>
<td>Tugas</td>
<td>sand</td>
</tr>
<tr>
<td>353</td>
<td>Tugas</td>
<td>seaweeds</td>
</tr>
<tr>
<td>355</td>
<td>Tugas</td>
<td>filamentous algae</td>
</tr>
<tr>
<td>357, 359</td>
<td>Tugas</td>
<td>debris, stone</td>
</tr>
</tbody>
</table>
represented by ten or more taxa, and these were *Amphora* (14), *Diploneis* (21), *Navicula* (29), *Nitzschia* (20) and *Pleurosigma* (11). The most common genera were *Navicula* and *Nitzschia*, the former represented by 27 species and the latter by 19 species.

**Systematics**

For the sake of convenience, the list of taxa presented here is arranged alphabetically by genus with species and their varieties listed alphabetically within each genus. Figures are given for all taxa.

*Achnanthes* Bory 1822

*A. brevipes* var. *intermedia* (Kütz.) Cl. Figs. 2–3


Description: Length 25–42 μm, breadth 9–10 μm, 8–10 striae in 10 μm. United into short filament.


Comments: A cosmopolitan species.

*A. hauckiana* Grun. Figs. 4–5


Description: Length 16–25 μm, breadth 8–10 μm, 7–10 striae in 10 μm.

Distribution: Common. Found on slides 125, 353.

Comments: A cosmopolitan species. Freshwater to brackish.

*A. lewisiana* Patr. Figs. 6–7


Description: Length 14 μm, breadth 6 μm, 15 striae in 10 μm.


Comments: Freshwater species.

*A. longipes* Ag. Figs. 8–9

References: Cleve 1894–95, 27(3), p. 195; Hendey 1964, p. 174, pl. 28, figs. 1–6; pl. 42, fig. 2.

Description: Length 62–69 μm, breadth 11–14 μm, 6–7 costae and 9–10 striae in 10 μm. Solitary or joined into filament; attached by mucous stipe.

Distribution: Very common. Found on slides 12, 116.

Comments: A cosmopolitan species.

*Actinocyclus* Ehrenb. 1838

*A. ehrenbergii* var. *sparsa* (Greg.) Hust. Figs. 10

References: Hendey 1964, p. 84; Foged 1984, p. 15, pl. 19, fig. 3.

Description: Diameter 37–66 μm, 5–6 areolae and 9–11 marginal striae in 10 μm.


Comments: A cosmopolitan species.

*A. octonarius* Ehrenb. Figs. 11

References: Hendey 1964, p. 83, pl. 24, fig. 3; Priddle & Fryxell 1985, p. 108.

Description: Diameter 60 μm, 7 areolae and 16 marginal striae in 10 μm.
Distribution: Not common. Found on slides 95, 339.
Comments: A cosmopolitan species.

*A. platensis* Müll. Melchers.  
References: Hendey 1958, p. 43, pl. 5, figs. 1, 2.
Description: Diameter 56–77 μm, 20 marginal striae in 10 μm.
Distribution: Common. Found on slide 3.

**Actinoptychus** Ehrenb. 1839

*A. senarius* (Ehrenb.) Ehrenb.  
References: Hendey 1964, p. 95, pl. 23, figs 1 and 2; Priddle & Fryxell 1985, p. 110, fig. A.
Description: Diameter 39 μm.
Comments: A cosmopolitan species.

**Amphora** Ehrenb. 1840

*A. acutiuscula* Kütz.  
References: Prowse 1962, p. 55, pl. 17, figs. e–f, n, q, v–w; pl. 18, fig. b; Patrick & Reimer 1975, p. 77, pl. 14, figs. 9, 10.
Description: Length 35–55 μm, breadth 6–13 μm, 11-12 dorsal, 18–20 ventral striae in 10 μm.
Distribution: Common. Found on slides 12, 17, 43, 297.
Comments: A freshwater species.

*A. angusta* var. *eulensteinii* Grun.  
Description: Length 81 μm, breadth 15 μm, 11 dorsal and 14 ventral striae in 10 μm.
Distribution: Not common. Found on slides 100, 357.
Comments: A cosmopolitan species.

*A. angusta* var. *oblongella* Grun.  
Description: Length 52–57 μm, breadth 8–10 μm, 12–15 striae in 10 μm.
Distribution: Rare. Found on slides 183, 353.

*A. angusta* var. *ventricosa* (Greg.) Cl.  
Description: Length 49–58 μm, breadth 10–13 μm, 14–15 striae in 10 μm.
Distribution: Common. Found on slides 335, 355.

*A. coffeiformis* (Ag.) Kütz.  
References: Prowse 1962, p. 56, pl. 17, figs. h, o.
Description: Length 30–33 μm, breadth 6–7 μm, 18–20 striae in 10 μm.
Distribution: Not common. Found on slides 1, 257, 335. Freshwater to brackish.
Comments: A cosmopolitan species.
A. crassa Greg.
Description: Length 132 μm, breadth 18 μm, 5 dorsal, 6 ventra costae in 10 μm.
Distribution: Rare. Found on slide 93.
Comments: A cosmopolitan species.

A. decipiens Cl.
Description: Length 41 μm, breadth 17 μm, 12 striae in 10 μm.
Distribution: Rare. Found on slide 12.

A. graeffi var. minor Perag.
References: Hendey 1964, p. 263, pl. 37, fig. 8.
Description: Length 38 μm, breadth 9 μm, 11–12 striae in 10 μm.
Distribution: Rare. Found on slides 2, 12.

A. holsatica Hust.
References: Caljon 1983, p. 119, pl. 21, figs. 2–8.
Description: Length 18–42 μm, breadth at girdle view 8–14 μm and at valve view 5 μm, 12–20 striae in 10 μm.
Comments: A cosmopolitan species. Freshwater to brackish.

A. ostrearia Bréb.
Description: Length 58 μm, breadth 15 in valve view, 38 μm in girdle view, 11–12 striae in 10 μm.
Distribution: Rare. Found on slide 38.
Comments: A cosmopolitan species. Freshwater to marine.

A. proteus Greg.
References: Prowse 1962, p. 58, pl. 17, fig. u; pl. 18, fig. a; Cleve 1894–95, 27(3), p. 103.
Description: Length 56 μm, breadth 8 in valve view, 20 μm in girdle view, 9–12 striae in 10 μm.
Distribution: Rare. Found on slide 3.
Comments: A cosmopolitan species.

A. turgida Greg.
Description: Length 32 μm, breadth 9–10 μm, 15 striae in 10 μm.
Distribution: Rare. Found on slides 273, 333, 341, 351.
Comments: A cosmopolitan species. Marine to brackish.

A. valida Perag.
Description: Length 82 μm, breadth 16–18 μm in valve, 50 μm in girdle view, 7 striae in 10 μm.
Distribution: Rare. Found on slide 124.
Figs. 2–29 (horizontal common scale bar and those of Figs. 12, 13, 15, 19, 21–24, 27 and 28 = 10 μm)

Figs. 2–3. *Achnanthes brevipes* var. *intermedia*, raphe valve and rapheless valve. Figs. 4–5. *A. hauckiana*, raphe valve and rapheless valve. Figs. 6–7. *A. lewisi*ana, raphe valve and rapheless valve. Figs. 8–9. *A. longipes*, raphe valve and girdle view. Fig. 10. *Actinocyclus ehrenbergii* var. *sparsa*. Fig. 11. *A. octonarius*. Fig. 12. *A. platensis*. Fig. 13. *Actinoptychus senarius*. Figs. 14–15. *Amphora acutiuscula*. Fig. 16. *A. angusta* var. *eulensteini*. Fig. 17. *A. angusta* var. *oblongella*. Fig. 18. *A. angusta* var. *ventricosa*. Fig. 19. *A. coffeiformis*. Fig. 20. *A. crassa*. Fig. 21. *A. decipiens*. Fig. 22. *A. graeffi* var. *minor*. Figs. 23–26. *A. holsatica*. Fig. 27. *A. ostrearia*. Fig. 28. *A. proteus*. Fig. 29. *A. turgida*. 
A. *wisei* (Salah) Simonsen.

References: Foged 1975, p. 12, pl. 26, fig. 11.
Description: Length 14 μm, breadth 5 μm, 16 striae in 10 μm.
Distribution: Rare. Found on slide 273.
Comments: A cosmopolitan (?) species.

**Asterionella** Hassall 1855

*A. japonica* Cl. & Möll.

References: Cupp 1943, p. 188, fig. 138; Hendey 1964, p. 158, pl. 21, fig. 1.
Description: Length 92–104 μm, inflated length 22–24 μm, inflated breadth 11–12 μm.
Distribution: Not common. Found on slide 321.

**Bacillaria** Gmelin 1788

*B. paradoxa* var. *tumidula* Grun.

Description: Length 106–149 μm, breadth 10–13 μm, 15–20 striae, 7–9 keel puncta in 10 μm.
Distribution: Common. Found on slide 2.
Comments: A cosmopolitan species. Freshwater to marine.

**Bacteriastrom** Schad bolt 1853

*B. delicatulum* Cl.

References: Gran & Angst 1931, p. 463, fig. 46a–b; Hendey 1964, p. 139, pl. 6, fig. 2.
Description: Diameter 16 μm, 9 bristles. United to form chains.
Distribution: Not common. Found on slide 317.
Comments: Common in temperate waters.

*B. elongatum* Cl.

References: Cupp 1943, p. 99, fig. 57; Hendey 1964, p. 139, pl. 6, fig. 3.
Description: Diameter 14 μm, 9 bristles.
Distribution: Not common. Found on slide 339.
Comments: Common in tropical seas.

*B. hyalinum* Lauder.

References: Cupp 1943, p. 96, fig. 56(A); Hendey 1964, p. 139, pl. 6, fig. 1.
Description: Diameter 24–39 μm, 14–27 bristles. United to form chains.
Distribution: Common. Found on slide 317.

**Biddulphia** Gray 1821

*B. biddulphiana* (Smith) Boyer (*B. pulchella* Gray).

References: Hendey 1964, p. 101, pl. 25, fig. 1.
Description: Length 76–101 μm, breadth 69–82 μm in pervalvar axis; length 77–90 μm, breadth 38–58 μm in top view. Colonial, united with their processes to form short chains.
Distribution: Common. Found on slides 12, 355.
Comments: A cosmopolitan species.
B. mobiliensis (Bailey) Grun.  
References: Gran & Angst 1931, p. 490, fig. 74; Cupp 1943, p. 153, fig. 110; Hendey 1964, p. 104, pl. 22, fig. 3.
Description: Length 69 μm in apical axis, breadth 44 μm, 11 striae in 10 μm. Solitary or in chains.
Distribution: Rare. Found on slide 323.

B. petiiana (Leud.-Fortm.) Mann.  
References: Mann 1925, p. 43, pl. 10, figs. 4, 5.
Description: Length 70 μm in pervalvar axis; length 66 μm, breadth 38 μm in top view.
Distribution: Rare. Found on slide 75.

B. recticulata Roper.  
Description: Length 88–96 μm, breadth 68–96 μm in pervalvar axis (girdle view).
Distribution: Rare. Found on slide 333.
Comments: A cosmopolitan species (?).

B. vesiculosa (Ag.) Boyer.  
References: Lebour 1930, p. 181, pl. 4, fig. 1.
Description: Length 91–104 μm, breadth 52 μm in pervalvar axis (girdle view).
Distribution: Rare. Found on slides 4, 278.

Caloneis Cleve 1891

C. alpestris (Grun.) Cl.  
References: Patrick & Reimer 1966, p. 587, pl. 54, fig. 9.
Description: Length 73 μm, breadth 15 μm, 20 striae in 10 μm.
Distribution: Rare. Found on slide 12.

C. bacillum (Grun.) Cl.  
References: Cleve-Euler 1955, 5(4), p. 102, fig. 1147 a–c; Patrick & Reimer 1966, p. 586, pl. 54, fig. 8.
Description: Length 21–25 μm, breadth 10–12 μm, 21–23 striae in 10 μm.
Distribution: Not common. Found on slides 341, 350.
Comments: A cosmopolitan species. Freshwater.

C. egna (A. Sch.) Cl.  
References: Cleve 1894–95, 26(2) p. 66; Foged 1984, p. 24, pl. 44, fig. 10.
Description: Length 25 μm, breadth 6 μm.
Distribution: Rare. Found on slide 345.

C. liber (W. Sm.) Cl.  
References: Cleve 1894–95, 26(2) p. 54; Hendey 1964, p. 229, pl. 29, fig. 2.
Description: Length 39 μm, breadth 11 μm, 18 striae in 10 μm.
Distribution: Rare. Slide 31.

C. linearis (Grun.) Boyer.  
References: Hendey 1964, p. 230, pl. 29, fig. 3; Foged 1984, p. 26, pl. 44, figs. 4, 5.
Figs. 30–40  (horizontal common scale bar and those of Figs. 33, 36 and 40 = 10 μm)

Fig. 30. *Amphora valida*. Fig. 31. *A. wisel*. Fig. 32. *Asterionella japonica*. Fig. 33. *Bacillaria paradoxa* var. *tunicula*. Fig. 34. *Bacillariastrum delicatulum*. Fig. 35. *B. elongatum*. Fig. 36. *B. hyalinum*. Fig. 37. *Bid-dulphia mobilensis*, girdle view. Figs. 38–39. *B. petitianna*, valve view and girdle view. Fig. 40. *B. biddulphiana*, valve view.
Description: Length 48 \( \mu \text{m} \), breadth 8 \( \mu \text{m} \).
Distribution: Not common. Found on slide 345.
Comments: A cosmopolitan species.

**Campylodiscus** Ehrenb. 1841

**C. fastuosus** Ehrenb.

References: Hendey 1964, p. 290, pl. 40, fig. 13.
Description: Diameter 54–68 \( \mu \text{m} \).
Distribution: Not common. Found on slides 141, 339, 343, 345, 357.
Comments: Common on sandy beaches of all North Sea coasts (Hendey, 1964).

**C. hypodromus** Brun & Tempère.

References: Hendey 1964, p. 291.
Description: Diameter 62–113 \( \mu \text{m} \), 2–3 costae in 10 \( \mu \text{m} \).
Distribution: Rare. Found on slide 345.

**C. ralfsii** W. Sm.

Description: Diameter 28–56 \( \mu \text{m} \), 2–3 costae in 10 \( \mu \text{m} \).
Distribution: Not common. Found on slides 79, 345, 347.

**Chaetoceros** Ehrenb. 1844

**C. danicum** Cl.

References: Hendey 1964, p. 122, pl. 10, fig. 5.
Description: Diameter 25–31 \( \mu \text{m} \). Solitary or in chains.
Distribution: Common. Found on slide 317.

**C. lorenzianum** Grun.

References: Gran 1905, p. 76, fig. 90; Hendey 1964, p. 124, pl. 26, fig. 1.
Description: Diameter 17 \( \mu \text{m} \). Solitary or in chains.
Distribution: Not common. Found on slide 323.
Comments: A cosmopolitan species.

**C. peruvianum** Brightw.

References: Hendey 1964, p. 123, pl. 9, fig. 3; Priddle & Fryxell 1985, p. 40.
Description: Diameter 30 \( \mu \text{m} \). Solitary or in chains.
Distribution: Not common. Found on slide 323.
Comments: A cosmopolitan species.

**C. tetrastichon** Cl.

References: Hendey 1964, p. 123, pl. 11, fig. 1.
Description: Diameter 16 \( \mu \text{m} \). United to form chains.
Distribution: Rare. Found on slide 323.

**Climacosphenia** Ehrenb. 1841

**C. moniligera** Ehrenb.

References: Cupp 1943, p. 178, fig. 128.
Figs. 41-52. (horizontal common scale bar and those of Figs. 41, 44 = 10 μm)

Figs. 41-42. Bidulphia bidulphiana, valve view and girdle view. Fig. 43. B. recticulata, girdle view. Fig. 44. B. vesiculosa, girdle view. Fig. 45. Caloneis alpestris. Fig. 46. C. bacillum. Fig. 47. C. egena. Fig. 48. C. liber. Fig. 49. C. linearis. Fig. 50. Campylodiscus fastuosus. Fig. 51. C. hypodromus. Fig. 52. C. rufus.
Description: Length 295–493 μm, broadest breadth 29–32 μm, 18–19 striae in 10 μm.
Solitary or in fan-shaped colonies.
Distribution: Common. Found on slides 1, 116, 343.

**Cocconeis** Ehrenb. 1838

*C. dirupta* Greg.  
Fig. 59

Description: Length 42–52 μm, breadth 28–35 μm, 17–20 striae in 10 μm.
Distribution: Common. Found on slides 175, 257, 335, 343, 350, 353.
Comments: A cosmopolitan species.

*C. disculoides* Hust.  
Fig. 60

References: Hendey 1964, p. 178, pl. 28, figs. 21, 22.
Description: Length 19–22 μm, breadth 11–13 μm, 8 costae in 10 μm.
Distribution: Not common. Found on slides 1, 93, 124, 257, 341, 350.

*C. heteroidea* Hantz.  
Fig. 61

Description: Length 48–64 μm, breadth 38–50 μm, 17–18 striae in 10 μm.
Distribution: Common. Found on slides 273, 278, 335, 350, 357.

*C. pelta* Schmidt.  
Fig. 62

Description: Length 25 μm, breadth 17 μm, 18 striae in 10 μm.
Distribution: Rare. Found on slide 12.

*C. placenta* var. *euglypta* (Ehrenb.) Cl.  
Fig. 63

Description: Length 17–19 μm, breadth 10–12 μm, 19 lower, 17 upper striae in 10 μm.
Distribution: Common. Found on slides 1, 12, 130, 339, 347, 350.
Comments: A cosmopolitan species. Freshwater to brackish to marine.

*C. pseudomarginata* var. *intermedia* Grun.  
Figs. 64–65

Description: Length 46–63 μm, breadth 32–46 μm, 11–17 striae in 10 μm.
Comments: A cosmopolitan species.

*C. speciosa* Greg.  
Figs. 66–67

References: Cleve-Euler 1953, 4(5), p. 7, fig. 489f, g; Hendey 1964, p. 180, pl. 28, fig. 18.
Description: Length 26 μm, breadth 17–18 μm, 5–7 striae in 10 μm.
Distribution: Common. Found on slides 130, 257, 335.
Figs. 53–68  (horizontal common scale bar and that of Fig. 62 = 10 μm)

Fig. 53. *Chaetoceros danicum*, valve view. Fig. 54. *C. lorenzianum*. Fig. 55. *C. peruvianum*. Fig. 56. *C. tetrasichon*. Figs. 57–58. *Climacosphenia moniliger*. Fig. 59. *Coconis dirupta*. Fig. 60. *C. disculoides*. Fig. 61. *C. heteroidea*. Fig. 62. *C. pelta*. Fig. 63. *C. placentula var. euglypta*. Figs. 64–65. *C. pseudomarginata var. intermedia*. Figs. 66–67. *C. speciosa*. Fig. 68. *C. sublittoralis*. 
C. sublittoralis Hend.
References: Hendey 1964, p. 181, pl. 28, figs. 14-17.
Description: Length 24-34 μm, breadth 10-22 μm, 5-6 lower, 6-7 upper areolae in 10 μm.
Distribution: Rare. Found on slide 33, 119.

Coscinodiscus Ehrenb. 1838

C. argus Ehrenb.
References: Prowse 1962, p. 8, pl. 1, figs. j, l-m.
Description: Diameter 64-100 μm, 5 small and 3 large areolae in 10 μm.
Distribution: Very common. Found on slides 12, 79, 81, 124, 359.

C. decipiens Grun.
References: Prowse 1962, p. 8, pl. 3, fig. c.
Description: Diameter 14-34 μm.
Distribution: Very common. Found on slides 12, 79, 273, 278.

C. decrescens Grun.
Description: Diameter 34 μm, 4 areolae in 10 μm in the middle.
Distribution: Rare. Found on slide 120.

C. marginatus Ehrenb.
References: Hendey 1964, p. 78, pl. 22, fig. 2.
Description: Diameter 72-78 μm, 9-10 striae in 10 μm.

C. nodulifer Schmidt.
References: Allen & Cupp 1935, p. 116, figs. 9, 9a; Hendey 1964, p. 77, pl. 22, fig. 10.
Description: Diameter 31-100 μm, 4-8 marginal striae in 10 μm.
Comments: A cosmopolitan species.

C. oculus-iridus Ehrenb.
References: Cupp 1943, p. 62, fig. 26; Hendey 1964, p. 78, pl. 24, fig. 1.
Description: Diameter 100 μm, 7-8 marginal striae in 10 μm.
Distribution: Not common. Found on slide 350.
Comments: A cosmopolitan species.

C. radiatus Ehrenb.
References: Cupp 1943, p. 56, fig. 20; Hendey 1964, p. 76, pl. 22, fig. 7.
Description: Diameter 78-88 μm, marginal striae 10-11, areolae 2-4 in 10 μm.
Comments: A cosmopolitan species.

C. wailesii Gran & Angst.
References: Gran & Angst. 1931, p. 448, fig. 26; Cupp 1943, p. 58, fig. 23.
Description: Diameter 221 μm, 6 areolae in 10 μm.
Distribution: Rare. Found on slide 323.
Figs. 69–78 (horizontal common scale bar and that of Fig. 70 = 10 μm)

Fig. 69. Coscinodiscus argus. Fig. 70. C. decipiens. Fig. 71. C. decrescens. Fig. 72. C. marginatus. Figs. 73–74. C. nodulifer. Fig. 75. C. oculus-iridus. Fig. 76. C. radiatus. Fig. 77. C. walesii. Fig. 78. Coscinodiscus oestrupii.
Coscinosira Gran 1900

\textit{C. oestrupii} Osten.

References: Hendey 1964, p. 89; Simonsen 1974, p. 10, pl. 1, figs. 3–5.
Description: Diameter 13–27 \( \mu \text{m} \), 4–9 areolae in 10 \( \mu \text{m} \).

Cyclotella (Kütz.) Bréb. 1834

\textit{C. kützingiana} Thw.

References: Hustedt 1930, 7(l), p. 338, fig. 171; Prowse 1962, p. 7, pl. 2, fig. i, j.
Description: Diameter 11–40 \( \mu \text{m} \), radial striae 7–10 in 10 \( \mu \text{m} \). Freshwater.

\textit{C. menghiniana} Kütz.

References: Prowse 1962, p. 7, pl. 1, fig. e, pl. 2, fig. h.
Description: Diameter 10–32 \( \mu \text{m} \), 8–10 radial striae in 10 \( \mu \text{m} \).
Distribution: Common. Found on slides 12, 351.
Comments: A cosmopolitan species. Freshwater to marine.

\textit{C. operculata} (Ag.) Kütz.

Description: Diameter 29 \( \mu \text{m} \), 10 radial striae in 10 \( \mu \text{m} \).
Distribution: Rare. Found on slide 12.
Comments: A cosmopolitan species (?). Freshwater to brackish.

\textit{C. striata} (Kütz.) Grun.

References: Prowse 1962, p. 8, pl. 1, fig. f, pl. 2, figs. b, g; Gerloff & Natour 1982, p. 160, pl. 1, figs. 5, 6.
Description: Diameter 23–58 \( \mu \text{m} \), radial striae 7–10 in 10 \( \mu \text{m} \).
Distribution: Common. Found on slides 12, 38, 79, 357.
Comments: A cosmopolitan species. Freshwater to marine.

\textit{C. stylorum} Brightw.

References: Hustedt 1927–66, p. 348, fig. 179; Foged 1975, p. 20, pl. 6, fig. 4.
Description: Diameter 41–87 \( \mu \text{m} \), 8–10 radial and 2–4 peripheral striae in 10 \( \mu \text{m} \).
Comments: A cosmopolitan species.

Cymatosira Grun. 1862

\textit{C. lorenziana} Grun.

References: Navarro 1982, p. 13, pl. 6, figs. 6–8; Foged 1984, p. 31, pl. 28, figs. 1–3, 7.
Description: Length 55 \( \mu \text{m} \), breadth 15 \( \mu \text{m} \), 6 striae in 10 \( \mu \text{m} \). Solitary or colonial.
Distribution: Rare. Found of slide 257.
Comments: A cosmopolitan species.

Cymbella Ag. 1830

\textit{C. pusilla} Grun.

References: Cleve 1894–95, 26(2) p. 162; Patrick & Reimer 1975. p. 25, pl. 3, fig. 18.
Description: Length 46–62 μm, breadth 8–12 μm, 18–20 dorsal, 15–16 ventral striae in 10 μm.  
Comments: A cosmopolitan species.  

**Delphineis** Kütz. 1844  
*D. surirella* (Ehrenb.) G.A. Andrews (=Rhaphoneis).  
Fig. 89–90  
Description: Length 16–26 μm, breadth 12–18 μm, 8–10 striae, 12 puncta, in 10 μm.  

**Denticula** Kütz. 1844  
*D. subtilis* Grun.  
Fig. 91  
References: Patrick & Reimer 1975, p. 172, pl. 22, figs. 10–11.  
Description: Length 11 μm, breadth 3 μm, 8 costae, 27–28 striae in 10 μm.  
Distribution: Found of slides 12, 339.  
Comments: A brackish species.  

**Diploneis** Ehrenb. 1844  
*D. bombiformis* Cl.  
Fig. 92–93  
References: Cleve 1894–95, 26(2) p. 87, pl. 1, fig. 26.  
Description: Length 40–42 μm, breadth 15–17 μm, 10–11 μm at the constriction, 7–8 striae in 10 μm.  

*D. bombus* Ehrenb.  
Fig. 94  
References: Patrick & Reimer 1966, p. 416, pl. 38, fig. 13; Hendey 1970, p. 140, pl. 5, fig. 49.  
Description: Length 56–86 μm, breadth 29–34 μm, 16–24 μm at constriction, 4–5 striae in 10 μm.  
Distribution: Not common. Found of slides 12, 175.  
Comments: A cosmopolitan species.  

*D. bombus* var. densestriata A.S.  
Fig. 95  
References: Cleve 1894–95, 26(2) p. 90.  
Description: Length 50 μm, breadth 21 μm, 12 μm at constriction, 7 striae in 10 μm.  
Distribution: Rare. Found of slide 12.  

*D. chersonensis* (Grun.) Cl.  
Fig. 96  
References: Cleve 1894–95, 26(2) p. 91; Hendey 1970, p. 142, pl. 5, fig. 48.  
Description: Length 65–76 μm, breadth 27–32 μm, 16–18 μm at constriction, 5–7 striae in 10 μm.  
Distribution: Rare. Found on slides 93, 124.  
Comments: A cosmopolitan species. According to Podzorski & Häkansson (1987), this species is widespread in all seas, with the larger specimens limited to tropical waters.
D. coffeiformis A.S.

References: Cleve 1894-95, 26(2) p. 81.

Description: Length 22-48 μm, breadth 11-24 μm, 8-12 striae in 10 μm.

Distribution: Very common. Found on slides 335, 341, 343, 347.

D. crabro Ehrenb.

References: Cleve 1894-95, 26(2) p. 100; Hendey 1970, p. 141, pl. 3, fig. 29.

Description: Length 69-82 μm, breadth 26-32 μm, 15-24 μm at constriction, 4-5 striae in 10 μm.


Comments: Common in tropical coastal waters.

D. exenta var. digrediens Cl.

References: Cleve 1894-95, 26(2) p. 86.

Description: Length 48-64 μm, breadth 18-20 μm, 10-11 μm at constriction, 7-9 striae in 10 μm.

Distribution: Common. Found on slides 125, 175, 335, 341.

D. gravelleana Hagelst.

References: Navarro 1982, p. 34, pl. 22, figs. 6-8; Foged 1984, p. 36, pl. 41, fig. 2.

Description: Length 19-30 μm, breadth 9-10 μm, 4-5 μm at constriction, 13-15 striae in 10 μm.

Distribution: Common. Found on slides 175, 335, 339.

D. incurvata (Greg.) Cl.

References: Cleve 1894-95, 26(2) p. 84.

Description: Length 58-71 μm, breadth 17 μm, 10 μm at constriction, 10-11 striae in 10 μm.

Distribution: Common. Found on slides 37, 91, 341, 351.

Comments: A cosmopolitan species (?).

D. interrupta (Kütz.) Cl.

References: Cleve 1894-95, 26(2) p. 84; Prowse 1962, p. 34, pl. 9, fig. k.

Description: Length 27-80 μm, breadth 10-24 μm, 7-13 μm at constriction, 7-8 striae in 10 μm.

Distribution: Rare. Found on slide 12.

Comments: A cosmopolitan species. Freshwater to marine.

D. interrupta var. gorjanovicii Pant.


Description: Length 24-42 μm, breadth 12-17 μm, 7-11 μm at the constriction, 8-13 striae in 10 μm.

Distribution: Very common. Found on slides 125, 259, 347.

Comments: Brackish to marine.

D. litoralis (Donk.) Cl.


Description: Length 35-36 μm, breadth 17-18 μm, 11-14 striae in 10 μm.
Figs. 79-104 (horizontal common scale bar and those of Figs. 82, 83, 89-91, 95, 101-103 = 10 µm)

Fig. 79. Cyclotella kützingiana. Figs. 80-81. C. menghiniana. Fig. 82. C. operculata. Figs. 83-85. C. striata. Fig. 86. C. stylorum. Fig. 87. Cymatosira lorenziana. Fig. 88. Cymbella pusilla. Figs. 89-90. Delphineis surirella. Fig. 91. Denticula subtilis. Fig. 92-93. Diploneis bombiformis. Fig. 94. D. bombus. Fig. 95. D. bombus var. densestriata. Fig. 96. D. chersonensis. Fig. 97. D. coffealiformis. Fig. 98. D. crabra. Fig. 99. D. exemta var. digrediens. Fig. 100. D. gravelleana. Fig. 101. D. incurvata. Figs. 102-103. D. interrupta. Fig. 104. D. interrupta var. gorjanovicii.
Distribution: Common. Found on slide 12.
Comments: A cosmopolitan species.

*D. nitescens* (Greg.) Cl.  
Fig. 107

Description: Length 48–54 μm, breadth 28–33 μm, 5–6 costae in 10 μm.
Distribution: Not common. Found on slides 120, 343.
Comments: A cosmopolitan species.

*D. notabilis* (Grev.) Cl.  
Fig. 108

References: Hendey 1964, p. 224, pl. 32, fig. 11.
Description: Length 54 μm, breadth 42 μm, 5–6 costae in 10 μm.
Distribution: Rare. Found on slide 119.
Comments: A cosmopolitan species (?). Freshwater.

*D. oculata* (Bréb.) Cl.  
Fig. 109

References: Patrick & Reimer 1966, p. 412, pl. 38, fig. 6.
Description: Length 17–18 μm, breadth 7–9 μm, 20–22 striae in 10 μm.
Distribution: Not common. Found on slide 343.
Comments: A cosmopolitan species. Freshwater.

*D. puella* (Schum.) Cl.  
Fig. 110

References: Cleve 1894–95, 26(2) p. 92; Patrick & Reimer 1966, p. 414, pl. 38, fig. 9.
Description: Length 27–34 μm, breadth 11–17 μm, 10–13 striae in 10 μm.
Distribution: Common. Found on slides 91, 350.

*D. smithii* (Bréb.) Cl.  
Figs. 111–112

References: Cleve 1894–95, 26(2) p. 96; Patrick & Reimer 1966, p. 410, pl. 38, fig. 2.
Description: Length 48–76 μm, breadth 22–36 μm, 5–9 costae in 10 μm.
Distribution: Not common. Found on slides 12, 93, 130, 175, 337, 345, 359.
Comments: A cosmopolitan species. Freshwater to marine.

*D. smithii* var. *rhombica* Meresch.  
Fig. 113

Description: Length 53 μm, breadth 23 μm, 9 to 11 costae in 10 μm towards poles.
Distribution: Rare. Found on slide 37.
Comments: A cosmopolitan species.

*D. subovalis* Cl.  
Fig. 114

References: Cleve 1894–95, 26(2) p. 96, pl. 1, fig. 27; Faged 1979, p. 45, pl. 21, figs. 5, 6 & 11.
Description: Length 31–49 μm, breadth 18–26 μm, 8–9 costae in 10 μm.
Distribution: Not common. Found on slides 125, 355, 357.
Comments: A cosmopolitan species. Freshwater to marine.

*D. vetula* Cl.  
Fig. 115

References: Cleve 1894–95, 26(2) p. 85; Hendey 1964, p. 224, fig. 6.
Description: Length 33 μm, breadth 12 μm, 10 μm at constriction, 10 costae in 10 μm.
Distribution: Not common. Found of slides 259, 341.
Comments: Podzorski & Hakansson (1987) report its presence in Palawan, although they state that it is common in the European coastal waters.

*D. weissflogii* (A.S.) Cl.  
Figs. 116–117

References: Cleve 1894–95, 26(2) p. 91; Hustedt 1959, 7(2), p. 703, fig. 1085.
Description: Length 29–74 µm, breadth 11–24 µm, 7–12 µm at constriction, 6–9 costae in 10 µm.
Comments: A cosmopolitan species.

**Donkinia** Ralfs 1888

*D. recta* (Donk.) Grun.  
Fig. 118

References: Cleve 1965, 26(2) p. 119; Hendey 1964, p. 251, pl. 35, fig. 7.
Description: Length 108–312 µm, breadth 22–38 µm, 18–20 striae in 10 µm.
Distribution: Rare. Found of slides 79, 93.
Comments: A cosmopolitan species.

**Eunotogramma** Weisse 1854

*E. laeve* Grun.  
Figs. 119–120

References: Foged 1979, p. 52, pl. 6, fig. 2.
Description: Length 25–35 µm, breadth 6–8 µm, 2–3 septa in 10 µm.
Distribution: Not common. Found on slides 120, 132.

**Fragilaria** Lyng. 1819

*F. cylindrus* Grun.  
Figs. 121–122

Description: Length 29–38 µm, breadth 5–6 µm, 8–12 striae in 10 µm. Colonial, united into ribbons; attached by mucilage stalk; rare.
Distribution: Common in the Arctic seas. Found on slide 12.

*F. lapponica* Grun.  
Fig. 123

References: Hustedt 1959, 7(2), p. 170, fig. 678; Patrick & Reimer 1966, p. 130, pl. 4, fig. 17.
Description: Length 38–66 µm, breadth 4–6 µm, 7–10 striae in 10 µm. Colonial, united into ribbons.
Distribution: Common. Found on slides 75, 273, 357.
Comments: Freshwater to marine.

*F. leptostauron var. dubia* (Grun.) Hust.  
Fig. 124

References: Cleve-Euler 1953, 4(1), p. 36, fig. 347p–u; Patrick & Reimer 1966, p. 124, pl. 4, fig. 3.
Description: Length 20 µm, breadth 6 µm, 5 costae in 10 µm. Colonial, united into straight to zigzag filamentous chains.
Distribution: Rare. Found on slide 48.
Comments: A cosmopolitan species.
F. oceanica Cl.

Description: Length 37 μm, breadth 5 μm, 11 costae in 10 μm. Colonial, united to form ribbon-like chains.
Distribution: Rare. Found on slide 12.
Comments: Common in the Arctic seas.

F. schulzi Brockmann.

References: Hendey 1964, p.154, pl. 26, fig. 16.
Description: Length 25 μm, breadth 5 μm, 13 striae in 10 μm.
Distribution: Rare. Found on slide 257.

Grammatophora Ehrenb. 1839

G. hamulifera Kütz.

References: Hendey 1964, p. 171.
Description: Length 17 μm, breadth at girdle 13 μm, 18 striae in 10 μm. Colonial.
Distribution: Very common. Found on slides 93, 337, 343, 347.
Comments: A cosmopolitan species.

G. marina var. adriatica Grun.

References: Cupp 1943, p. 174, fig. 125B.
Comments: A cosmopolitan species.

G. oceanica Ehrenb.

Distribution: Common. Found on slides 1, 116, 345.
Comments: A cosmopolitan species.

G. undulata Ehrenb.

References: Boyer 1926–27, p. 156; Foged 1984, p. 45, pl. 24, fig. 4.
Description: Length 40–48 μm, breadth 7–8 μm, 20–21 striae in 10 μm. Colonial.
Distribution: Rare. Found on slides 333, 337.
Comments: A cosmopolitan species.

Gyrosigma Hassall 1845

G. balticum (Ehrenb.) Rabh.

References: Hendey 1964, p. 248, pl. 35, fig. 9; Patrick & Reimer 1966, p. 324, pl. 25, fig. 1.
Description: Length 280–332 μm, breadth 28–30 μm, 11–12 transverse/longitudinal striae in 10 μm. Occurring in large colonies.
Distribution: Rare. Found on slide 95.
Comments: A cosmopolitan species.
Figs. 105-132  (horizontal common scale bar and those of Figs. 105, 106, 111, 113 and 129 = 10 μm)

Figs. 105-106. Diploneis littoralis. Fig. 107. D. nitescens. Fig. 108. D. notabilis. Fig. 109. D. oculata. Fig. 110. D. puella. Figs. 111-112. D. smithii. Figs. 113. D. smithii var. rhombica. Fig. 114. D. subovalis. Fig. 115. D. vetula. Figs. 116-117. D. weissflogi. Fig. 118. Donkinia recta. Figs. 119-120. Eunotogramma laeve, girdle and valve view. Figs. 121-122. Fragilaria cylindrus. Fig. 123. F. lapponica. Fig. 124. F. leptostauron var. dubia. Fig. 125. F. oceanica. Fig. 126. F. schulzi. Figs. 127-128. Grammatophora hamulifera, valve view and girdle view. Fig. 129. G. marina var. adriatica, two cells in girdle view. Figs. 130-131. G. oceanica. Fig. 132. G. undulata.
G. distortum (W. Sm.) Griff & Henfr.
References: Cleve 1894–95, 26(2) p. 116; Patrick & Reimer 1966, p. 324, pl. 24, fig. 6.
Description: Length 32 μm, breadth 9 μm, 23–24 transverse, 25–26 longitudinal striae in 10 μm. Solitary or colonial.
Distribution: Rare. Found on slide 12.

G. exile (Grun.) Reim.
References: Patrick & Reimer 1966, p. 322, pl. 24, fig. 4.
Description: Length 46 μm, breadth 8 μm, 25–28 transverse, 30–32 longitudinal striae in 10 μm. Rare. Freshwater to brackish.
Distribution: Found on slide 12.

G. fasciola var. sulcata (Grun.) Cl.
References: Hendey 1964, p. 249; Patrick & Reimer 1966, p. 328, pl. 26, fig. 4.
Description: Length 52 μm, breadth 9 μm, 20 transverse, 17 longitudinal striae in 10 μm. Solitary or colonial.
Distribution: Rare. Found on slides 12, 351, 353.
Comments: A cosmopolitan species.

G. grovei Cl.
References: Cleve 1894–95, 26(2) p. 118.
Description: Length 163–351 μm, breadth 23–28 μm, 9–10 transverse, 12 longitudinal striae in 10 μm.
Distribution: Rare. Found on slides 19, 95, 353, 357.
Comments: Brackish to marine.

G. simile (Grun.) Boyer.
References: Hustedt 1955, p. 34, pl. 10, fig. 3.
Description: Length 54–71 μm, breadth 8–13 μm, 15 transverse, 16 longitudinal striae in 10 μm.
Distribution: Common. Found on slides 125, 357, 359.

Hantzscheia Grun. 1880

H. amphioxys var. capitata O. Müll.
References: Tiffany & Britten 1952, p. 289, pl. 75, fig. 887; Prowse 1962, p. 64, pl. 19, fig. t.
Description: Length 58–80 μm, breadth 10 μm, 16–24 striae, 5–7 fibulae in 10 μm.
Distribution: Rare. Found on slide 31.
Comments: A cosmopolitan species. Freshwater to marine.

H. virgata (Roper) Grun.
References: Hendey 1964, p. 285, pl. 39, fig. 1; Foged 1979, p. 63, pl. 40, fig. 10.
Description: Length 102 μm, breadth 10 μm, 14 striae, 5–6 fibulae in 10 μm.
Distribution: Rare. Found on slide 38.
Comments: A cosmopolitan and common littoral species of clean, sandy shores (Hendey, 1964).
**Huttoniella** Karsten 1928

*H. reichardtii* (Grun.) Hust.  
References: Hendey 1964, p. 114 (as *Huttonia reichardtii* Grun.); Foged 1984, p. 47, pl. 25, fig. 6.  
Description: Length 20 µm, breadth 15 µm.  
Distribution: Rare. Found on slide 91.

**Isthmia** Ag. 1827

*I. enervis* Ehrenb.  
References: Boyer 1926–27, p. 140; Hendey 1964, p. 110, pl. 25, fig. 2.  
Description: Length 200 µm, breadth 32 µm in girdle view, 3–4 areolae in 10 µm. United into short chain.  
Distribution: Common. Found on slides 1, 3, 116.  
Comments: A cosmopolitan species.

**Licmophora** Ag. 1827

*L. abbreviata* Ag.  
Description: Length 55–64 µm, 8–13 µm at broadest part, 10–16 striae in 10 µm. Solitary or colonial.  
Distribution: Common. Found on slides 1,3, 116, 337.  
Comments: A cosmopolitan species.

*L. ehrenbergii* (Kütz.) Grun.  
Description: Length 60–101 µm, 12–14 at the broadest part, 8–12 (middle), 12–14 (upper end) striae in 10 µm. Colonial.  
Distribution: Common. Found on slides 1, 91, 333.  
Comments: A cosmopolitan species.

*L. flabellata* (Carm.) Ag.  
References: Hendey 1964, p. 168, pl. 26, fig. 5; Foged 1975, p. 27, pl. 10, fig. 7.  
Description: Length 77 µm, breadth 15 µm (girdle), 6 µm (valve). In fan-shaped colonies.  
Distribution: Not common. Found on slide 347.  
Comments: A cosmopolitan species.

*L. gracils* (Ehrenb.) Grun.  
Description: Length 144 µm, breadth 24 µm (valve), 20 striae in 10 µm. In fan-shaped colonies, attached by a mucous stipe.  
Distribution: Rare. Found on slide 116.  
Comments: A cosmopolitan species.

**Mastogloia** Thwaites 1856

*M. angulata* Lewis  
References: Cleve 1894–95, 27(3), p. 147; Foged 1975, p. 28, pl. 12, fig. 2, pl. 13, figs. 1, 2.
Figs. 133-152  (horizontal common scale bar and those of Figs. 133, 135-137, 143, 144 and 145 = 10 μm)

Figs. 133–134. **Gyrosigma balticum**, valve view and details of striae. Fig. 135. **G. distortum**, Fig. 136. **G. exile**. Fig. 137. **G. fasciola** var. **sulcata**. Fig. 138. **G. grovei**. Fig. 139. **G. simile**. Fig. 140. **Hantzschia amphioxys** var. **capitata**. Fig. 141. **H. virgata**. Fig. 142. **Huttoniella richardii**, girdle view. Fig. 143. **Isthmia enervis**, girdle view. Figs. 144–145. **Licmophora abbreviata**, valve view and girdle view. Figs. 146–148. **L. ehrenbergii**, valve views and girdle view. Figs. 149–150. **L. flabellata**, valve view and girdle view. Figs. 151–152. **L. gracilis**, valve view and girdle view.
Description: Length 55–76 μm, breadth 28–34 μm, 8–10 striae, 1 loculi in 10 μm.
Distribution: Not common. Found on slides 125, 341.
Comments: A cosmopolitan species.

_M. binotata_ (Grun.) Cl.  
Fig. 154

References: Hendey 1964, pl. 37, fig. 11; Foged 1975, p. 29, pl. 12, figs. 6–9.
Description: Length 21–36 μm, breadth 15–23 μm, 12–13 striae, 11 puncta in 10 μm.
Distribution: Not common. Found on slides 93, 341, 343, 347.
Comments: Common in warm coastal and temperate waters.

_M. citrus_ Cl.  
Figs. 155–156

Description: Length 46 μm, breadth 21 μm, 18 middle and 22 polar striae, 7–8 loculi in 10 μm.
Distribution: Common. Found on slides 124, 335, 337, 345, 350.
Comments: Common in tropical seas.

_M. fimбриата_ (Brightw.) Cl.  
Fig. 157

Description: Length 47–63 μm, breadth 34–54 μm, 6–8 striae, 4–6 loculi in 10 μm.
Distribution: Very common. Found on slides 2, 124, 335, 343, 345, 347.
Comments: A cosmopolitan species.

_M. ovata_ Grun.  
Fig. 158

Description: Length 43 μm, breadth 32 μm, 15–16 striae, 3–4 loculi in 10 μm.
Distribution: Common. Found on slide 333.
Comments: Common in warm coastal waters.

_M. quinquecostata_ Grun.  
Fig. 159

Description: Length 38–56 μm, breadth 18 μm, 16 striae, 2–3 loculi in 10 μm.
Distribution: Not common. Found on slides 91, 341, 345.

_Melosira_ Ag. 1824

_M. granulata_ (Ehrenb.) Ralfs.  
Figs. 160–161

References: Prowse 1962, p. 6, pl. 1, figs. a–b.
Description: Length 10–22 μm, diameter 10–11 μm, 8–9 striae in 10 μm.
Distribution: Not common. Found on slide 175.
Comments: A cosmopolitan species. Freshwater to marine.

_M. nummuloides_ (Dillw.) Ag.  
Fig. 162

Description: Diameter 22–40 μm.
Comments: A cosmopolitan species.
Navicula Bory 1824

*N. brasiliensis* Grun.  
Fig. 163
Description: Length 52–98 μm, breadth 29–40 μm, 8–10 striae in 10 μm, 9–10 punctae in 10 μm.  
Distribution: Very common. Found on slides 37, 91, 175, 333, 357.

*N. clavata* Greg.  
Fig. 164
Description: Length 56–88 μm, breadth 30–38 μm, 9–12 striae in 10 μm, 8–10 punctae in 10 μm.  
Distribution: Common. Found on slides 12, 91, 93, 119.

*N. cuspidata* Kütz.  
Fig. 165
References: Cleve 1894–95, 26(2) p. 109.  
Description: Length 61 μm, breadth 14 μm, 13 transverse, 25 longitudinal striae in 10 μm.  
Distribution: Rare. Found on slide 350.  
Comments: A cosmopolitan species. Freshwater to marine.

*N. distans* W. Sm.  
Fig. 166
Description: Length 94 μm, breadth 17 μm, 4 striae, 21 lineae in 10 μm.  
Distribution: Rare. Found on slide 12.

*N. forcipata* var. *suborbicularis* Grun.  
Fig. 167
Description: Length 23 μm, breadth 14 μm, 15 striae in 10 μm.  
Distribution: Rare. Found on slide 273.  
Comments: A cosmopolitan species.

*N. glacialis* Cl.  
Fig. 168
Description: Length 84–98 μm, breadth 36–50 μm, 9–12 striae, 6–9 puncta in 10 μm.  
Distribution: Not common. Found on slides 93, 119.  
Comments: A cosmopolitan species.

*N. grundleri* Cl.  
Fig. 169
References: Cleve 1878, p.7, pl. 2, fig. 10; Cleve 1894–95, 27(3), p. 51.  
Description: Length 50–51 μm, breadth 12–13 μm, 10 striae, 11 puncta in 10 μm.  
Distribution: Common. Found on slides 12, 278, 337.

*N. halophila* (Grun.) Cl.  
Figs. 170–171
References: Cleve 1894–95, 26(2) p. 109; Patrick & Reimer 1966, p. 467, pl. 44, fig. 4.  
Description: Length 38–54 μm, breadth 10–11 μm, 15–25 striae in 10 μm.  
Distribution: Not common. Found on slides 12, 278.  
Comments: A cosmopolitan species. Freshwater.
N. lyra Ehrenb.  
References: Hendey 1964, p. 209, pl. 33, fig. 2; Patrick & Reimer 1966, p. 443, pl. 39, figs. 5-6.  
Description: Length 92-144 μm, breadth 39-61 μm, 9-10 striae, 8-11 puncta in 10 μm.  
Distribution: Common. Found on slide 125.  
Comments: A cosmopolitan species.

N. menaiana Hend.  
References: Hendey 1964, p. 207, pl. 31, fig. 13.  
Description: Length 52 μm, breadth 20 μm, 10 striae in 10 μm.  
Distribution: Common. Found on slide 38, 353.

N. monilifera Cl.  
Description: Length 50-83 μm, breadth 26-44 μm, 9-10 striae in 10 μm.  
Distribution: Very common. Found on slides 37, 93, 124, 138.  
Comments: A cosmopolitan species (?)..

N. monilifera var. constricta (Perag.) Hust.  
Description: Length 95-101 μm, breadth 49-50 μm, 7-8 striae, 6-8 puncta in 10 μm.  
Distribution: Common. Found on slides 2, 38, 122.  
Comments: This is a littoral species of the mediterranean and northern Europe (Podzorski & Håkansson, 1987).

N. nicaensis Perag.  
References: Cleve 1894-95, 27(3), p. 36.  
Description: Length 63 μm, breadth 15 μm, 8 striae in 10 μm.  
Distribution: Rare. Found on slide 12.

N. pennata A. Sch.  
Description: Length 54-74 μm, breadth 9-12 μm, 5-7 middle and 6-8 polar striae in 10 μm.  
Distribution: Found on slide 125.

N. pi Cl.  
Description: Length 64 μm, breadth 14 μm, 11 middle and 12 polar striae, 12 puncta in 10 μm.  
Distribution: Rare. Found on slide 81.

N. platessa Cl.  
References: Cleve 1894-95, 27(3), p. 36.  
Description: Length 25-43 μm, breadth 13-21 μm, 5-9 striae in 10 μm.  
Distribution: Very common. Found on slides 12, 38, 175, 259, 343, 350, 359.
Figs. 153–178 (horizontal common scale bar and those of Figs. 157, 163, 164, 166, 170, 172, 174 and 176 = 10 µm)

Fig. 153. *Mastogloia angulata*, internal valve view showing loculi. Fig. 154. *M. binotata*, internal valve view showing loculi. Figs. 155–156. *M. citrus*, internal valve view showing loculi and external valve view. Fig. 157. *M. fimbriata*, internal valve view showing loculi. Fig. 158. *M. ovata*, internal valve view showing loculi. Fig. 159. *M. quinquecostata*, internal valve view showing loculi. Figs. 160–161. *Melosira granulata*, cells showing colony formation. Fig. 162. *M. nummuloides*, cells showing colony formation. Fig. 163. *Navicula brasilensis*. Fig. 164. *N. clavata*. Fig. 165. *N. cuspidata*. Fig. 166. *N. distans*. Fig. 167. *N. forcipata* var. *suborbicularis*. Fig. 168. *N. glacialis*. Fig. 169. *N. grundleri*. Figs. 170–171. *N. halophila*. Fig. 172. *N. lyra*. Fig. 173. *N. menaiana*. Fig. 174. *N. monilifera*. Fig. 175. *N. monilifera* var. *constricta*. Fig. 176. *N. nicaensis*. Fig. 177. *N. pennata*. Fig. 178. *N. pi*. 
N. platyventris Meist.

References: Foged 1975, p. 41, pl. 20, fig. 17.
Description: Length 16 µm, breadth 7 µm, 9 striae in 10 µm.
Distribution: Rare. Found on slide 125.

N. plicata Donk.

Description: Length 74 µm, breadth 17 µm, 19 middle and 20–21 polar striae in 10 µm.
Distribution: Rare. Found on slide 116.

N. praetexta Ehrenb.

Description: Length 48 µm, breadth 26 µm, 8 striae in 10 µm.
Distribution: Rare. Found on slide 33.
Comments: A cosmopolitan species.

N. pusilla var. jamalinensis Grun.

Description: Length 50–56 µm, breadth 20–23 µm, 10–12 middle, 14–16 pole striae, 12 punctae in 10 µm.
Distribution: Not common. Found on slide 175.
Comments: A cosmopolitan species. Freshwater to marine.

N. radiosa Kütz.

Description: Length 42–55 µm, breadth 8–9 µm, 10–12 striae in 10 µm.
Distribution: Not common. Found on slide 339.
Comments: A cosmopolitan species. Freshwater to marine.

N. ramosissima (Ag.) Cl.

Description: Length 46–59 µm, breadth 10–12 µm, 11 striae in 10 µm.
Distribution: Not common. Found on slides 273, 345.
Comments: A cosmopolitan species.

N. ramosissima var. caspia Grun.

Description: Length 44 µm, breadth 7 µm, 12 striae in 10 µm.
Distribution: Common. Found on slide 259.
Comments: A cosmopolitan species.

N. reichardtii Grun.

Description: Length 21 µm, breadth 9 µm, 16 striae in 10 µm.
Distribution: Rare. Found on slide 273.
Comments: A cosmopolitan species.
N. rhaphoneis (Ehrenb.) Grun.

References: Cleve 1894–95, 27(3), p. 36, pl. 1, fig. 27; Foged 1975, p. 42, pl. 20, fig. 13.
Description: Length 19–36 μm, breadth 9–14 μm, 7–10 striae, 18–20 linolae in 10 μm.
Distribution: Common. Found on slides 12, 341, 351, 259.

N. transfuga Grun.

Description: Length 90–126 μm, breadth 40–61 μm, 8–10 striae and 6 puntae in 10 μm.
Distribution: Common. Found on slide 79.

N. transitans Cl.

References: Cleve 1894–95, 27(3), p. 27.
Description: Length 59–84 μm, breadth 12–16 μm, 7–8 striae in 10 μm.
Distribution: Not common. Found on slide 345.

N. yarrensis Grun.

References: Cleve 1894–95, 27(3), p. 69; Foged 1984, p. 72, pl. 46, fig. 1.
Description: Length 60–115 μm, breadth 18–33 μm, 3–5 middle and 5–7 polar striae in 10 μm.
Distribution: Rare. Found on slide 19.
Comments: A cosmopolitan species.

N. zosteretii Grun.

References: Cleve 1894–95, 27(3), p. 31; Foged 1984, p. 72, pl. 45, fig. 13 & pl. 46, figs. 3 & 4.
Description: Length 66–74 μm, breadth 13–17 μm, 6–8 striae in 10 μm.
Distribution: Common. Found on slides 12, 125, 175, 335, 337, 343.
Comments: A cosmopolitan species.

Nitzschia Hassall 1845

N. amphibia Grun.

References: Foged 1979, p. 85, pl. 42, fig. 6; pl. 43, figs. 10 & 11; Navarro 1982, p. 52, pl. 34, fig. 6.
Description: Length 19–22 μm, breadth 3–5 μm, 14–15 striae, 7–10 fibulae in 10 μm.
Distribution: Common. Found on slide 12.
Comments: A cosmopolitan species. Freshwater to marine.

N. apiculata (Greg.) Grun.

References: Hendey 1964, p. 279; Foged 1984, p. 74, pl. 24, fig. 10.
Description: Length 29–62 μm, breadth 8–10 μm, 16 striae, 13–14 fibulae in 10 μm.
Distribution: This species is common and widespread in muddy shores (Hendey, 1964).
Common. Found on slides 12, 333, 337.
Comments: A cosmopolitan species.

N. bilobata var. minor Grun.

References: Cupp 1943, p. 200, fig. 152.
Description: Length 99–160 μm, breadth 6–11 μm, 24–28 striae, 7–11 fibulae in 10 μm.
Distribution: Not common. Slide 278, 341.
Comments: Brackish to marine.
N. brebissonii var. borealis Grun.

References: Cleve 1896, p. 21, pl. 1, figs 28–32.
Description: Length 122 μm, breadth 10 μm, 16–18 striae, 6–7 fibulae in 10 μm.
Distribution: Not common. Found on slide 278.

N. cocconeiformis Grun.

References: Foged 1975, p. 45, pl. 29, fig. 6.
Description: Length 27–59 μm, breadth 16–26 μm, 4–6 costae, 4–6 fibulae in 10 μm.
Distribution: Rare. Found on slides 323, 339.
Comments: A cosmopolitan species. Freshwater to marine.

N. commutata Grun.

References: Tiffany & Britton 1952, p. 288, pl. 77, fig. 903.
Description: Length 30–80 μm, breadth 5–10 μm, 20–24 striae, 6–10 fibulae in 10 μm.
Distribution: Not common. Found on slide 337.
Comments: A cosmopolitan species. Freshwater.

N. constricta (Greg.) Grun.

References: Prowse 1962, p. 65, pl. 19, fig. d; Navarro 1982, p. 53, pl. 34, fig. 8.
Description: Length 16–31 μm, breadth 6–11 μm, 14–20 striae, 8–10 fibulae in 10 μm.
Distribution: Common. Found on slides 1, 2, 257, 273, 278, 341, 345, 347, 357.
Comments: A cosmopolitan species.

N. granulata Grun.

References: Hendey 1964, p. 278; Foged 1979, p. 87, pl. 40, figs. 14 & 15.
Description: Length 24–48 μm, breadth 14–17 μm, 4–6 puncta in 10 μm.
Distribution: Not common. Found on slides 339, 357.
Comments: A cosmopolitan species.

N. ignorata Krasske.

References: Foged 1966, p. 121, pl. 24, fig. 5; Foged 1979, p. 87, pl. 43, figs. 5 & 6.
Description: Length 87 μm, breadth 5 μm, 28 striae, 7–10 fibulae in 10 μm.
Distribution: Common. Found on slide 12.
Comments: A cosmopolitan species. Freshwater to marine.

N. longissima (Bréb.) Ralfs.

References: Hendey 1964, p. 283; Foged 1975, p. 46, pl. 29, fig. 7.
Description: Length 202–311 μm, breadth 10–13 μm, 6–12 fibulae in 10 μm.
Distribution: Common. Found on slides 1, 3.
Comments: A cosmopolitan species.

N. navicularis var. typica Mh.

Description: Length 34–37 μm, breadth 15–16 μm, 6–7 striae in 10 μm.
Distribution: Not common. Found on slides 129, 339.
Comments: A cosmopolitan species.
Figs. 179–180. Navicula platessa. Fig. 181. N. platyventris. Fig. 182. N. plicata. Fig. 183. N. praetexta. Fig. 184. N. pusilla var. jamalimensis. Fig. 185. N. radiosa. Fig. 186. N. ramosissima. Fig. 187. N. ramosissima var. caspia. Fig. 188. N. reichardtii. Fig. 189. N. raphoneis. Fig. 190. N. transfuga. Fig. 191. N. transitans. Figs. 192–193. N. yarrensis. Fig. 194. N. zosterei. Fig. 195–196. Nitzschia amphibia. Fig. 197. N. apiculata. Fig. 198. N. bilobata var. minor. Fig. 199. N. brebissonii var. borealis. Fig. 200. N. cocconeiformis. Fig. 201. N. commutata. Figs. 202–203. N. constricta. Figs. 204–206. N. granulata. Fig. 207. N. ignorata. Figs. 208–209. N. longissima, valve view and girdle view. Fig. 210. N. navicularis var. typica.
N. panduriformis Greg.

Description: Length 36–66 µm, breadth 13–30 µm, 14–16 striae, 6–10 fibulae in 10 µm.
Distribution: Common. Found on slides 100, 141, 343.
Comments: A cosmopolitan species.

N. parvula var. terricola Lund.

References: Foged 1979, p. 89; pl. 43, fig. 18.
Description: Length 40 μm, breadth 5 μm, 7–8 fibulae in 10 μm. Freshwater.
Distribution: Common. Found on slide 257.

N. punctata (W. Sm.) Grun.

References: Hendey 1964, p. 278. pl. 39, fig. 11; Foged 1979, p. 89, pl. 40, fig. 13; pl. 41, fig. 7; pl. 42, fig. 3.
Description: Length 32–33 µm, breadth 19–20 µm, 6 striae in 10 µm.
Distribution: Rare. Found on slide 95.
Comments: A cosmopolitan species.

N. punctata var. coarctata Grun.

References: Hendey 1964, p. 278; Foged 1984, p. 80, pl. 56, fig. 7.
Description: Length 28–35 µm, breadth 10–12 µm, 11–12 striae in 10 µm.
Distribution: Common. Found on slides 1, 259, 350, 353.
Comments: A cosmopolitan species. Occasionally found in freshwater.

N. sigma var. rigida (Kütz.) Grun.

Description: Length 43–108 µm, breadth 5–10 µm, 20 striae, 6–8 fibulae in 10 µm.
Distribution: Common. Found on slides 12, 93, 175, 333, 337, 341, 345, 347, 357, 359.
Comments: A cosmopolitan species.

N. sigmoidea (Ehrenb.) W. Sm.

Description: Length 164–331 µm, breadth 11–13 µm, 23–25 striae 5–7 fibulae in 10 µm.
Distribution: Not common. Found on slides 1, 175, 355.
Comments: A cosmopolitan species. Freshwater to marine.

N. subtilis (Kütz.) Grun.

References: Prowse 1962, p. 71, pl. 19, fig. p; pl. 20, fig. f.
Description: Length 56–127 µm, breadth 4–5 µm, 28–30 striae 8–10 fibulae in 10 µm.
Distribution: Not common. Found on slides 12, 257.
Comments: A cosmopolitan species (?). Freshwater.

N. tryblionella var. victoriae Grun.

References: Foged 1975, p. 47, pl. 28, fig. 4; Fungladda, Kaezmarska & Rushforth 1983, p. 44, fig. 274.
Description: Length 73 µm, breadth 40 µm, 5 costae, 16 striae, 9 fibulae in 10 µm.
Distribution: Rare. Found on slide 12.
Comments: A cosmopolitan species. Freshwater to marine.
N. vermicularis (Kütz.) Hantz.  

References: Tiffany & Britton 1952, p. 286, pl. 76, fig. 890. 
Description: Length 127 μm, breadth 4–5 μm, 7–9 fibulae in 10 μm. 
Distribution: Rare. Found on slides 1, 81, 333. 
Comments: A cosmopolitan species. Freshwater to brackish.

Odontella Ag. 1832

O. aurita (Lyngb.) Ag. (=Biddulphia)  
Figs. 223–225

Description: Length 27–54 μm, breadth 22 μm, puncta 9–12 in 10 μm. Usually in long chains, sometimes free-floating. 
Distribution: Very common. Found on slides 2, 3, 81, 100, 259, 278. 
Comments: A cosmopolitan species.

O. aurita var. obtusa (Kütz.) Hust. (=Biddulphia)  
Fig. 226

References: Caljon 1983, p. 107, pl. 15, fig. 21. 
Description: Length 42–56 μm, breadth 50–54 μm, puncta 9–10 in 10 μm. Solitary or united into long chains. 
Distribution: Common. Found on slides 278, 355. 
Comments: A cosmopolitan species.

Opephora Petit 1888

O. martyi Hérib.  
Figs. 227–228

References: Patrick & Reimer 1966, p. 115, pl. 3, fig. 3; Caljon 1983, p. 114, pl. 18, figs. 5, 6. 
Description: Length 14–30 μm, breadth 5–6 μm, 9–10 striae in 10 μm. 
Distribution: Rare. Found on slides 273. 
Comments: A cosmopolitan species.

O. schwartzii (Grun.) Petit.  
Fig. 229

References: Hendey 1964, p. 159, pl. 36, figs. 8,9; Patrick & Reimer 1966, p. 116, pl. 3, fig. 1. 
Description: Length 45–53 μm, breadth 10 μm, 4–5 striae in 10 μm. 
Distribution: Rare. Found on slides 38, 273. 
Comments: A cosmopolitan species (?).

Paralia Heiberg 1863

P. sulcata (Ehrenb.) Cl.  
Figs. 230–231

References: Boyer 1926–27, p. 25; Hendey 1964, p. 73, pl. 23, fig. 5. 
Description: Diameter 15–55 μm. 
Comments: A cosmopolitan species.

Plagiodiscus Grun. & Eulenst. 1867

P. nervatus Grun.  
Fig. 232

References: Hendey 1970, p. 160, pl. 4, fig. 39; Foged 1975, p. 49, pl. 31, figs. 4,5.
Description: Length 46–51 μm, breadth 24 μm, 3–4 costae, 12–13 striae in 10 μm.
Distribution: Not common. Found on slides 333, 345.

**Plagiogramma** Grev. 1859

*P. staurophorum* (Greg.) Heiberg.  
Fig. 233

References: Hendey 1964, p. 166, pl. 36, fig. 1.
Description: Length 35 μm, breadth 8 μm, 17 puncta in 10 μm. Solitary or colonial.
Distribution: Rare. Found on slides 38, 116.

**Pleurosigma** W. Sm. 1852

*P. aestivali* (Bréb.) W. Sm.  
Figs. 234–235

References: Cleve 1894–95, 26(2) p. 42; Hendey 1964, p. 247, pl. 36, fig. 5, pl. 41, fig. 5.
Description: Length 112–188 μm, breadth 26–40 μm, 19–21 striae in 10 μm.
Distribution: Not common. Found on slides 357, 359.
Comments: Common in temperate waters.

*P. delicatulum* W. Sm.  
Fig. 236

References: Cleve 1894–95, 26(2) p. 37; Patrick & Reimer 1966, p. 336, pl. 28, figs. 4a–b.
Description: Length 153 μm, breadth 15 μm, 25 striae in 10 μm.
Distribution: Rare. Found on slide 2.
Comments: A cosmopolitan species (?). Freshwater, brackish to marine.

*P. elongatum* W. Sm.  
Fig. 237

References: Gonzalves & Gandhi 1953, 2-p. 244, fig. 70; Patrick & Reimer 1966, p. 334, fig. 1a–c.
Description: Length 124–154 μm, breadth 23–26 μm, 17–19 transverse, 16–17 oblique striae in 10 μm.
Distribution: Not common. Found on slide 91.
Comments: A cosmopolitan species. Freshwater to marine.

*P. formosum* W. Sm.  
Fig. 238

Description: Length 125–326 μm, breadth 22–36 μm, 14–15 transverse, 10–14 oblique striae in 10 μm.
Distribution: Common. Found on slides 319, 343, 345, 347.
Comments: A cosmopolitan species.

*P. intermedium* W. Sm.  
Fig. 239

References: Cleve 1894–95, 26(2) p. 34, Hendey 1964, p. 244.
Description: Length 166–196 μm, breadth 17–19 μm, 20 striae in 10 μm.
Distribution: Common. Found on slide 278.
Comments: Common in temperate seas.

*P. majus* Grun.  
Figs. 240–241

References: Cleve 1894–95, 26(2) p. 44, pl. 4, fig. 15.
Description: Length 295–348 μm, breadth 40–45 μm, 15 transverse, 12 oblique striae in 10 μm.
Distribution: Rare. Found on slides 3, 79.
Figs. 211–235  (horizontal common scale bar and those of Figs. 211 and 218–222 = 10 μm)

Fig. 211. *Nitzschia panduriformis*. Fig. 212. *N. parvula* var. *terricola*. Fig. 213. *N. punctata*. Fig. 214. *N. punctata* var. *coarctata*. Figs. 215–218. *N. sigma* var. *rigida*, valve view, girdle view and colony formation. Fig. 219. *N. sigmoidea*. Figs. 220. *N. subtilis*. Figs. 221. *N. tryblionella* var. *victoriae*. Fig. 222. *N. vermicularis*. Figs. 223–225. *Odontella aurita*. Fig. 226. *O. aurita* var. *obtusa*. Figs. 227–228. *Opephora maryi*, valve view and girdle view. Fig. 229. *O. schwarzii*. Figs. 230–231. *Paralia sulcata*. Fig. 232. *Plagiogramma staurophorum*. Figs. 234–235. *Pleurosigma australi*. 
P. marinum Donk.

References: Cleve 1894–95, 26(2) p. 37; Hendey 1964, p. 247, pl. 35, fig. 8.
Description: Length 128 μm, breadth 27 μm, 21 transverse, 18 oblique striae in 10 μm.
Distribution: Not common. Found on slide 278.

P. normannii Ralfs.

References: Cleve 1894–95, 26(2) p. 40; Hendey 1964, p. 244.
Distribution: Rare. Found on slides 12, 183.

P. nubecula var. mauritiana Grun.

References: Cleve 1894–95, 26(2) p. 35.
Description: Length 127 μm, breadth 13 μm, 22 striae in 10 μm.
Distribution: Not common. Found on slide 2.
Comments: A cosmopolitan species (?) .

P. salinarum (Grun.) Cl.

References: Cleve 1894–95, 26(2) p. 39; Patrick & Reimer 1966, p. 333, pl. 27, figs. 2a–c.
Description: Length 107 μm, breadth 19 μm, 25 transverse, 30 oblique striae in 10 μm.
Distribution: Not common. Found on slides 2, 257.
Comments: A cosmopolitan species. Freshwater to brackish.

P. salinarum var. boyeri (Keeley) Reim.

References: Patrick & Reimer 1966, p. 334, pl. 27, figs. 4a–c.
Description: Length 92–100 μm, breadth 11–14 μm, 24–25 transverse, 30 oblique striae in 10 μm.
Distribution: Rare. Found on slide 116.
Comments: Freshwater to marine.

Podocyrtis Kütz. 1844

P. adriatica Kütz.

References: Hendey 1964, p. 169, pl. 27, fig. 4; Foged 1984, p. 89, pl. 28, fig. 9; pl. 30, figs. 7–8.
Description: Length 64–74 μm, breadth 48–57 μm, 3–4 costae, 5–7 areolae in 10 μm.
Distribution: Common. Found on slides 333, 345.
Comments: A cosmopolitan species.

Psammodiscus Kütz. 1844

P. nitidus (Greg.) Round & Mann.

References: Hendey 1964, p. 76, pl. 23, fig. 12; Round & Mann, 1980.
Description: Diameter 29–50 μm.
Distribution: Not common. Found on slides 12, 48, 120.
Comments: A cosmopolitan species.

Pyxidicula Ehrenb. 1833

P. africana Cholnoky.

References: Schoeman 1972, p. 86, figs. 7, 8.
Figs. 236–249  (horizontal common scale bar and those of Figs. 236, 240, 241, 245 and 247 = 10 μm)

Fig. 236. *Pleurosigma delicatulum*. Fig. 237. *P. elongatum*. Fig. 238. *P. formosum*. Fig. 239. *P. intermedium*. Figs. 240–241. *P. majus*. Fig. 242. *P. marinum*. Fig. 243. *P. normani*. Fig. 244. *P. nubecula var. mauritiana*. Figs. 245–246. *P. salinarum*, valve view and details of striations. Figs. 247–248. *P. salinarum var. boyeri*, valve view and details of striations. Fig. 249. *Podocystis adriatica*. 
Description: Diameter 22–48 μm, 5–7 rows of areolae and 12 marginal striae 10 μm.

**Rhabdonema** Kütz. 1844

*R. adriaticum* Kütz.

References: Hendey 1964, p. 172.
Description: Length 88 μm. Colonial.

**Rhaphoneis** Ehrenb. 1844

*R. amphiceros* Ehrenb.

References: Hendey 1964, p. 154, pl. 26, figs. 1–4; Navarro 1982, p. 24, pl. 13, fig. 9.
Description: Length 30–42 μm, breadth 16–28 μm, 5–8 striae in 10 μm.
Distribution: Common. Found on slides 49, 91, 93, 125.
Comments: A cosmopolitan species.

*R. amphiceros* var. *tetragona* Grun.

References: Hendey 1970, p. 122, pl. 4, fig. 41; Foged 1975, p. 51, pl. 11, figs. 10, 11.
Description: Length of side 32–36 μm, 6 striae in 10 μm.
Distribution: Not common. Found on slides 91, 119.

*R. castracanii* Grun.

References: Wood 1963, p. 279, pl. 11, fig; 228.
Description: Length 21–43 μm, breadth 21–26 μm, 4–6 striae in 10 μm.
Distribution: Not common. Found on slides 91, 132.

**Rhopalodia** O. Müller 1897

*R. gibba* var. *ventricosa* (Kütz.) H. & M. Perag.

References: Hendey 1964, p. 272; Patrick & Reimer 1975, p. 190, pl. 28, figs. 3, 4.
Description: Length 48–54 μm, breadth 12–15 μm, 5 costae, 12–13 striae in 10 μm.
Distribution: Common. Found on slide 12.
Comments: A cosmopolitan species. Freshwater to marine.

*R. gibberula* (Ehrenb.) O. Müll.

References: Prowse 1962, p. 62, pl. 22, fig. a; Patrick & Reimer 1975, p. 191, pl. 28, fig. 6.
Description: Length 28–55 μm, breadth 16–31 μm in girdle, 7–12 μm in valve, 3–5 costae, 16–17 striae in 10 μm.
Comments: A cosmopolitan species. Freshwater to marine.

*R. gibberula* var. *vanheurckii* O. Müll.

References: Patrick & Reimer 1975, p. 192, pl. 28, fig. 7.
Description: Length 20–38 μm, breadth 11–12 μm in girdle, 5–7 μm in valve, 2–5 costae, 14 striae in 10 μm.
Distribution: Rare. Found on slide 343.
Comments: A cosmopolitan species. Freshwater and brackish.
Stauroneis Ehrenb. 1841
S. membranacea (Cl.) Hust.
Description: Length 58 μm, pervalvar axis 55 μm, 25 striae in 10 μm.
Distribution: Rare. Found on slide 4.

Stephanopyxis Grun. 1884
S. turris var. polaris Grun.
References: Hustedt 1930, 7(l), p. 306, fig. 144.
Description: Diameter 65–72 μm, 1 1/2–1 3/4 areolae in 10 μm. Solitary or united to form short chains.
Distribution: Not common. Found on slides 95, 141.

Striatella Ag. 1832
S. unipunctata (Lyngh.) Ag.
Distribution: Rare. Found on slide 37.
Comments: A cosmopolitan species.

Surirella Turpin 1828
S. amoricana Perag.
References: Hendey 1964, p. 289, pl. 40, fig. 6; Foged 1975, p. 53, pl. 30, figs. 3–5.
Description: Length 34–56 μm, breadth 21–42 μm, 12–13 marginal striae, 1–3 costae in 10 μm.
Distribution: Common. Found on slides 75, 93, 345.

S. fastuosa (Ehrenb.) Kütz.
Description: Length 56–104 μm, breadth 42–66 μm, 14 marginal striae, 1–3 costae in 10 μm.
Comments: A cosmopolitan species.

S. fastuosa var. recedens (A. Sch.) Cl.
References: Cupp 1943, p. 208, fig. 160.
Description: Length 38–47 μm, breadth 24–34 μm, 16–18 marginal striae, 2–3 costae in 10 μm.
Distribution: Not common. Found on slides 1, 12, 138, 343.

Synedra Ehrenb. 1830
S. amphicephala Kütz.
References: Patrick & Reimer 1966, p. 138, pl. 5, fig. 7.
Description: Length 64–82 μm, breadth 5–6 μm, 12–13 striae in 10 μm.
Distribution: Not common. Found on slides 337, 351.
Comments: Freshwater.
Figs. 250-266 (horizontal common scale bar and those of Figs. 251, 252, 258, 261, 265 = 10 μm)

Figs. 250-251. *Psammodiscus nitidus*. Fig. 252. *Pyxidicula africana*. Fig. 253. *Rhabdonema adriaticum*, colony forming ribbon-like chain. Fig. 254. *Rhaphoneis amphiceros*. Fig. 255. *Rhaphoneis amphiceros* var. *tetragna*. Fig. 256. *R. castracanii*. Fig. 257. *Rhopalodia gibba* var. *ventricosa*. Figs. 258-259. *R. gibberula*. Fig. 260. *R. gibberula* var. *vanheurckii*. Fig. 261. *Stauroseis membranacea*, girdle view. Fig. 262. *Stephanopyxis turris* var. *polaris*. Fig. 263. *Striatella unipunctata*. Fig. 264. *Surirella americana*. Fig. 265. *S. fastuosa*. Fig. 266. *S. fastuosa* var. *recedens*. 
S. crystallina (Ag.) Kütz.
References: Hendey 1964, p. 164; Patrick & Reimer 1966, p. 157, pl. 8, figs. 4a–c.
Description: Length 110–195 µm, breadth 10–17 µm, 9 striae in 10 µm.
Distribution: Not common. Found on slides 1, 4.
Comments: A cosmopolitan species.

S. demerare Grun.
References: Boyer 1926–27, p. 206; Patrick & Reimer 1966, p. 139, pl. 5, fig. 10.
Description: Length 68–124 µm, breadth 6–9 µm (girdle), 8–9 striae in 10 µm.

S. fasciculata var. truncata (Grev.) Patr.
References: Patrick & Reimer 1966, p. 142, pl. 5, fig. 16.
Description: Length 42–54 µm, breadth 5–8 µm, 9–14 striae in 10 µm.
Distribution: Very common. Found on slides 1, 75, 257, 273, 335, 337, 355.
Comments: A cosmopolitan species. Freshwater to marine.

S. formosa Hantz.
Description: Length 280–614 µm, breadth 16–29 µm, 8–9 striae in 10 µm.
Distribution: Common. Found on slides 1, 116, 124, 335, 343, 350, 357.
Comments: A cosmopolitan species.

S. gaillonii (Bory) Ehrenb.
References: Hendey 1964, p. 163; Patrick & Reimer 1966, p. 148, pl. 6, fig. 16.
Description: Length 69–111 µm, breadth 5–6 µm, 9–10 striae in 10 µm.
Distribution: Rare. Found on slides 278, 335.
Comments: A cosmopolitan species.

S. henneydiana Greg.
References: Hendey 1964, p. 164, pl. 26, fig. 7.
Description: Length 809 µm, breadth 11 µm.
Distribution: Not common. Found on slides 1, 116, 132, 333.
Comments: A cosmopolitan species.

S. provincialis var. tortuosa Grun.
References: Foged 1975, p. 54, pl. 10, fig. 10.
Description: Length 94 µm, breadth 6 µm.
Distribution: Very common. Found on slide 341.

S. tabulata var. grandis Mereschk.
References: Hustedt 1959, 7(2), p. 219, fig. 710g.
Description: Length 155 µm, breadth 7 µm, 12 striae in 10 µm.
Distribution: Not common. Found on slide 350.
Comments: A cosmopolitan species.

Tabellaria Ehrenb. 1839

T. fenestrata (Lyng.) Kütz.
References: Patrick & Reimer 1966, p. 103, pl. 1, figs. 1–2.
Figs. 267–278  (horizontal common scale bar and those of Figs. 268 and 278 = 10 µm)

Fig. 267. Synedra amphigecephala. Fig. 268. S. crystallina. Fig. 269. S. demerare, a four-celled colony. Figs. 270–271. S. fasciculata var. truncata. Figs. 272–273. S. formosa. Fig. 274. S. gaillonii. Fig. 275. S. henmedyana. Fig. 276. S. provincialis var. tortuosa. Fig. 277. S. tabulata var. grandis. Fig. 278. Tabellaria fenestrata, cells in zig-zag chain, girdle view.
Description: Length 26–38 μm, 15–20 striae in 10 μm.
Comments: A cosmopolitan species.

**Thalassionema** Grun. 1880

*T. nitzschioides* Hust.  
Figs. 279–280
Description: Length 26–42 μm, breadth 4–5 μm, 8–12 puncta in 10 μm. Solitary or colonial.
Comments: A cosmopolitan species.

**Thalassiosira** Cl. 1873

*T. eccentrica* (Ehrenb.) Cl.  
Fig. 281
References: Foged 1979, p. 112, pl. 4, fig. 4.
Description: Diameter 24–60 μm, 10–17 marginal striae, 4–7 areolae in the middle and 6–9 near the margin, 2–4 irregular teeth in 10 μm.
Distribution: Common. Found on slides 3, 33, 278, 315; 351.
Comments: A cosmopolitan species. Fig. 45.

**Trachyneis** Cl. 1894

*T. antillarum* Cl.  
Fig. 282
References: Cleve 1878, p. 8, pl. 2, fig. 11; Cleve 1894–95, 26(2) p. 193.
Description: Length 149 μm, breadth 36 μm, 8 striae in 10 μm.
Distribution: Not common. Found on slide 359.
Comments: A cosmopolitan species (?)..

*T. antillarum* var. *kurzii* Grun.  
Fig. 283
References: Cleve 1878, p. 8, fig. 12a; Cleve 1894–95, 26(2) p. 193.
Description: Length 83–98 μm, breadth 37–40 μm, 9–11 striae in 10 μm.
Distribution: Common. Found on slides 345, 351, 353, 357.
Comments: Brackish to marine.

*T. aspera* (Ehrenb.) Cl.  
Figs. 284–285
References: Cleve 1894–95, 26(2) p. 191; Hendey 1970, p. 148, fig. 52.
Description: Length 50–126 μm, breadth 14–28 μm, 9–14 striae in 10 μm.
Comments: A cosmopolitan species.

*T. aspera* var. *intermedia* (Grun.) Cl.  
Fig. 286
References: Cleve 1894–95, 26(2) p. 192; Hendey 1964, p. 237.
Description: Length 111–182 μm, breadth 18–24 μm, 6–9 striae in 10 μm.
Distribution: Not common. Found on slides 100, 350.

*T. aspera* var. *pulchella* W. Sm.  
Fig. 287
References: Cleve 1894–95, 26(2) p. 191.
Description: Length 64–120 μm, breadth 17–22 μm, 11–12 striae in 10 μm.
Figs. 279–293  (horizontal common scale bar and those of Figs. 280, 284, 288, 289 = 10 μm)

Figs. 279–280. *Thalassionema nitzschioideae*. Fig. 281. *Thalassiosira eccentrica*. Fig. 282. *Trachyneis antillarum*. Fig. 283. *T. antillarum* var. *kurzti*. Figs. 284–285. *T. aspera*. Fig. 286. *T. aspera* var. *intermedia*. Fig. 287. *T. aspera* var. *pulchella*. Fig. 288. *Triceratium broeckii*. Figs. 289–290. *T. dubium*. Fig. 291. *T. zonulatum*. Fig. 292. *Tropidonemis maxiana*. Fig. 293. *Trybliophyllum cocconeiformis*. 
Distribution: Not common. Found on slides 116, 125, 175.
Comments: A cosmopolitan species.

**Triceratium** Ehrenb. 1841

*T. broeckii* Leud.-Fortm.  
Fig. 288

Description: Length of side 66–74 μm.
Comments: A cosmopolitan species (?).

*T. dubium* Brightw.  
Figs. 289–290

Description: Length of diagonal 33 μm.
Comments: A cosmopolitan species.

*T. zonulatum* Grev.  
Fig. 291

References: Foged 1975, p. 57, pl. 2, figs. 5, 6.
Description: Length of diagonal 34 μm.
Distribution: Rare. Found on slide 120.

**Tropidonoe** Cl. 1891

*T. maximus* (Greg.) Cl.  
Fig. 292

Description: Length 166 μm, breadth 38 μm, 11–12 striae in 10 μm.
Distribution: Rare. Found on slide 124.
Comments: A cosmopolitan (?) species.

**Trybliophychus** Hendey 1958

*T. cocconeiformis* (Cl.) Hend.  
Fig. 293

References: Hendey 1958, p. 46, pl. 2, fig. 10.
Description: Length 25 μm, breadth 22 μm, 8 puncta in 10 μm.
Distribution: Rare. Found on slides 116, 347.

**Acknowledgements**

We wish to thank Mrs C.M. Yang of the Zoological Reference Collection, National University of Singapore, for supplying the samples from around Sisters Island. Thanks are also due to Messrs Walter de Gruyter & Co. of Berlin for permission to reproduce Figs. 2–5, 8, 14, 15, 17, 18, 26, 69, 76, 79, 80, 84, 86, 88, 94, 97, 99, 100, 109, 110, 111, 114, 116, 121, 129, 133, 134, 139, 144, 145, 160, 162, 163, 172, 177, 181, 184, 190, 193, 204–206, 213, 216, 217, 223–225, 230, 237, 238, 243, 257, 264, 283 and 284 which appeared in Botanica Marina (1988) Vol. 31(4).

**References**


