

TRANSACTIONS
OF THE
ROYAL SOCIETY OF NEW ZEALAND

BIOLOGICAL SCIENCES

Vol. 12

No. 14

5 OCTOBER 1970

A Preliminary Annotated Check List of Diatoms from
New Zealand Coastal Waters

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[Received by the Editor, 6 August 1968]

Abstract

THIS check list, with localities, has been compiled from the published literature, with the addition of a few unpublished records. It covers the coastal waters of the three main islands, but not the outlying islands. A total of 420 taxa are listed. An effort has been made to bring the nomenclature up to date and taxonomic comments are included in an appendix. Another appendix lists predominantly fresh-water algae recorded from marine habitats.

THIS check list covers the marine and brackish water diatoms that have been recorded from the shores and coastal waters of New Zealand. It does not include fossil diatoms which will be dealt with in a forthcoming publication from the Geological Survey. A few predominantly freshwater diatoms which have been recorded from marine habitats are included in Appendix III. The marine list consists of 420 taxa (species and varieties) in 92 genera. The relatively low number of taxa is almost certainly a reflection of the lack of attention paid to marine diatoms. Although a number of investigations have been made of the planktonic forms, there are relatively few records, and no systematic studies, of the littoral and epiphytic forms. The list includes all recorded species with the addition of a few personal unpublished records. No attempt has been made to check the identifications, and it has not been possible to check all of Grunow's records. It is not the intention to provide final decisions on taxonomic rank here, but to collate the records and bring the nomenclature into line with currently accepted names as a first stage in a more detailed study of the New Zealand marine diatom flora.

The classification of Hendey (1937; 1954; 1964) has been adopted, but with the modification that the diatoms are regarded as consisting of the Class BACILLARIOPHYCEAE, one of the nine classes of the Phylum CHROMOPHYTA (*sensu* Christensen, 1962). This is not the place for a complete justification of this classification. It may simply be said that the present author considers these two schemes as being the most sensible.

Within the Class BACILLARIOPHYCEAE the diatoms comprise the single order BACILLARIALES, which is divided into ten sub-orders. The classification is essentially the same as that adopted by Crosby and Wood (1958; 1959) in their

Published by the Royal Society of New Zealand, c/o Victoria University of
Wellington, P.O. Box 196, Wellington.

Trans. R. Soc. N.Z., Biol. Sci., Vol. 12, No. 14, pp. 153-174.

account of the Australian and New Zealand diatoms. The major changes have been in the names of the sub-orders, which are now as given in Hendeby (1964).

Within families, genera are listed in alphabetical order, and within genera the species are also listed alphabetically. The varieties and forms cited are used in the generally accepted senses except where noted. In the majority of cases the synonyms listed are simply the names under which the organism was recorded by other workers. Specific epithets are decapitalized and, in the case of varieties, Article 35 of the International Code of Botanical Nomenclature (1952) is followed. This states that when any infra-specific taxon which includes the nomenclatural type of the epithet of the next higher taxon is mentioned by a subdivisional name, that name must repeat the epithet of the next higher taxon unaltered, without citation of an author's name. Taxonomic notes are placed in Appendix I, and are indicated in the list by a *superior number* after the taxon. Where a taxon has been described from New Zealand waters, this is indicated by (TYPE) after the locality. When the original description cites more than one locality (in some cases the others are outside New Zealand), the first-named locality is treated as the type locality.

The list is confined to species recorded from the coasts of the three main islands, and not from the outlying islands. The locality lists have been prepared in the following order. Firstly, North Island, starting at North Cape, passing down the east coast, along Cook Strait, and up the west coast. Secondly, Cook Strait itself. Thirdly, South Island, starting from Marlborough Sounds, passing down the east coast and up the west coast. Records of marine species from Lake Ellesmere, which may be more or less brackish according to the regulation of the inflow of sea water, are omitted. Where a species has been recorded from more than eight widely separated localities, no detailed locality lists are normally given.

Cassie (1960) listed species from four stations in the Hauraki Gulf area, ranging from Rangitoto Channel, near Auckland, to Colville Passage, outside the Hauraki Gulf proper. Although differences in the plankton populations might be expected, she reported them all as "Hauraki Gulf". Her lumping together of two stations in Wellington Harbour, and two stations 20 miles apart in Cook Strait, is less serious.

Moreira (1966) in a survey of diatoms found in agar from different countries, has listed those found in five samples of New Zealand agar. Some of these species have not been otherwise recorded from New Zealand and are included here. Correspondence with the agar manufacturers shows that the *Pterocladia* spp. used come mainly from the North Island, and on only two occasions has imported seaweed been blended with it. Filtration through diatomaceous earth from Southern California of Miocene age is used in processing, but the species listed here have not been found in samples of this diatomaceous earth.

A large number of New Zealand records are due to Wood and his associates. Unfortunately these papers contain a number of errors. They do, however, contain brief descriptions and illustrations of most of the New Zealand marine diatom flora.

The more common references in the main body of the text are abbreviated as follows:

- B—Brewin (1952).
- C1—Cassie, V. (1960).
- C2—Cassie, V. (1961).
- C3—Cassie, V. (1966).
- CC—Cassie, R. M. and Cassie, V. (1960).
- CW1—Crosby and Wood (1958).
- CW2—Crosby and Wood (1959).
- M—Moreira (1966).

P—Petit (1877).

T—Taylor (unpublished).

W1—Wood (1961a).

W2—Wood (1961b).

W3—Wood (1963).

WCC—Wood, Crosby and Cassie, V. (1959).

A paper by Maxwell (1956) on the diatoms of Cook Strait does not give identifications beyond genera, while Cassie (1959) provides a general account of marine diatoms and gives no further records.

Species marked with an *asterisk* (*) are predominantly planktonic. Species marked with a *dagger* (†) are characteristically brackish-water organisms (but may be found in fully marine habitats).

The compiler does not claim finality. He would be grateful to hear of the inevitable errors and omissions, and also the whereabouts of unpublished collections of New Zealand material in other countries. He wishes to express his thanks to Mr N. Ingram Hendey for his comments on various species.

This check list was compiled during the tenure of a Butland Research Fellowship in Planktonology, and the author wishes to thank Sir Jack Butland for his financial assistance.

Note added in proof: This check list was completed before S. L. van Landingham—"Catalogue of the fossil and recent genera and species of diatoms and their synonyms" (1968, J. Cramer, Lehre) became available.

Phylum: CHROMOPHYTA

Class BACILLARIOPHYCEAE

Order BACILLARIALES

Sub-order COSCINODISCINEAE

Family COSCINODISCACEAE

Actinocyclus Ehrenb.¹

A. barklyi (Coates) Grun. var. **aggregatus** Ratt.—Anderson's Bay, Dunedin, W2; Bruce's Rocks, Dunedin, W2; Brighton, W2.

***A. octonarius** Ehrenb. var. **octonarius** (*A. ehrenbergii* Ralfs ex Pritch.)—Lyll Bay, P; Bruce's Rocks, Dunedin, W2; Kakanui Beach, Dunedin, W2; Portobello, W2.

***A. octonarius** Ehrenb. var. **ralfsii** (W. Sm.) Hendey. (*A. ralfsii* Ralfs ex Pritch.)—Foveaux Strait, P.

***A. octonarius** Ehrenb. var. **sparsus** (Greg.) Hendey (*A. ralfsii* Ralfs ex Pritch. var. *sparsus* Greg.)—Lyll Bay, P.

***A. octonarius** Ehrenb. var. **tenellus** (de Bréb.) Hendey (*A. moniliformis* Ralfs ex Pritch.; *Eupodiscus tenellus* de Bréb.; *E. minutus* Hantsch. in Rabenh.)—Lyll Bay, P (three records, as *A. moniliformis*, *E. minutus*, and *E. tenellus*); Goat Island, Otago Harbour, W2; Foveaux Strait, P.

Coscinodiscus Ehrenb.

C. argus Ehrenb. (*C. radiatus* Ehrenb. 1854, non *C. radiatus* Ehrenb. 1839)—Goat Island Bay, Leigh, T; Hauraki Gulf, CW2; Auckland Harbour, CW2; Lyll Bay, P.

***C. asteromphalus** Ehrenb.—Goat Island Bay, Leigh, T; Hauraki Gulf, C1; Wellington Harbour, C1; Cook Strait, C1; Otago Peninsula, WCC, C2.

***C. centralis** Ehrenb.². Widely distributed. 11 records.

- **C. concinnus* W.Sm.³—Hauraki Gulf, C1; Auckland Harbour, CW1; Castle Point, C1; Wellington Harbour, C1, C2; Waitarere Beach, CC; Cook Strait, C1, C2; Marlborough Sounds, C2; Kaikoura, C1; Lyttelton Harbour, C1; Otago Peninsula, B, C1.
- **C. curvatus* Grun. in Schmidt—Auckland Harbour, CW1; Off New Plymouth, CW1.
- **C. eccentricus* Ehrenb.⁴—Plankton between Norfolk Island and Auckland, CW1; Hauraki Gulf, C1; Wellington Harbour, C1; Lyall Bay, P; Cook Strait, C1; Kaikoura, C1; Lyttelton Harbour, C2.
- **C. eccentricus* Ehrenb.⁴ forma *minor* (A. Schmidt) Perag.—Agar, M.
- **C. fimbriatus* Ehrenb. (*C. radiolatus* Ehrenb.)—Lyall Bay, P.
- **C. gigas* Ehrenb.⁵—Goat Island Bay, Leigh, T; Hauraki Gulf, CW1; Port Fitzroy, CW1; Company Bay, Dunedin, W2; Bruce's Rocks, Dunedin, W2.
- **C. grani* Gough³—Jellicoe Channel, C3, T; Hauraki Gulf, C1; Auckland Harbour, CW1; Wellington Harbour, C1, C2; Lyttelton Harbour, C2; Otago Peninsula, C2; Bligh Strait, C2.
- **C. janischii* A. Schmidt⁵—Widely distributed. 13 records.
- C. lacustris* Grun. Hooper's Inlet, Portobello, W2.
- **C. lineatus* Ehrenb.—Lyall Bay, P; Bruce's Rocks, Dunedin, W2; Foveaux Strait, P; Agar, M.
- **C. marginatus* Ehrenb.—Widely distributed. 8 records.
- **C. nitidus* Greg.—Bruce's Rocks, Dunedin, W2; Foveaux Strait, P.
- **C. normani* Greg. ex Grev. (*C. fasciculatus* A. Schmidt)—Lyall Bay, P.
- **C. oculus-iridis* Ehrenb.—Widely distributed. 14 records.
- **C. radiatus* Ehrenb. 1839 (non *C. radiatus* Ehrenb. 1854)—Widely distributed. 9 records.
- **C. subtilis* Ehrenb.—Castle Point, C1; Cook Strait, C1; Marlborough Sounds, C2; Foveaux Strait, P.
- **C. walesii* Gran & Angst.⁵—Widely distributed. 13 records.

Cosmiodiscus Grev.

- C. elegans* Grev.—Anderson's Bay, Otago Harbour, W2.

Cyclotella Kütz.

- C. stelligera* Cleve & Grun.—Agar, M.
- †*C. striata* (Kütz.) Grun. in Cleve & Grun.—Agar, M.
- C. stylorum* Brightw.—Agar, M.

Gossleriella Schütt

- †*G. punctata* Wood—Cook Strait, WCC, C2; Port Chalmers, WCC; Otago Peninsula, C2.

Haynaldiella Pantocksek

- H. antiqua* Pant. (*Coscinodiscus strigillatus* Witt.)—Wellington Harbour, WCC, C1.

Hyalodiscus Ehrenb.⁶

- H. maximus* Petit (non *Podosira maxima* (Kütz.) Grun.)—Bruce's Rocks, Dunedin, W2. (TYPE—Campbell Island, P).
- H. pustulatus* A. Schmidt—Anderson's Bay, Dunedin, W2.
- **H. subtilis* Bail.—Evansdale, Dunedin, W2; Dunedin, WCC; Foveaux Strait, P.

Melosira Agardh

- *†*M. granulata* (Ehrenb.) Kütz.—Wellington, WCC; Waitarere beach, CC.
- †*M. moniliformis* (O. Müll.) Agardh—Castle Point, C1; Kaikoura, C1.
- M. nummuloides* Agardh—Auckland Harbour, CW1.
- M. westii* W. Sm.—Goat Island Bay, Leigh, T.

Paralia Heiberg

P. sulcata (Ehrenb.) Cleve (*Melosira sulcata* (Ehrenb.) Kütz.)—Widely distributed. 14 records.

Planktoniella Schütt

***P. florea** Wood—Waitarere Beach, CC.

***P. sol** (Wall.) Schütt—Hauraki Gulf, C1; Hawke Bay, C2; Castle Point, C1; W of Hawera, C2; New Plymouth/Kawhia, C2.

Podosira Ehrenb.

P. hormoides (Mont.) Kütz. (*Hyalodiscus hormoides* Kütz.)—Lyll Bay, P.

***P. stelliger** (Bail.) Mann (*Hyalodiscus stelliger* Bail.; *H. maculata* W. Sm.)—Goat Island Bay, Leigh, T; Hauraki Gulf, C1; Auckland Harbour, CW1; Bay of Plenty, C2; Lyll Bay, P (as both *H. maculatus* and *H. stelliger*); W of Hawera, C2; Lyttelton Harbour, C2; Foveaux Strait, P.

Pyxidicula Ehrenb.

***P. cruciata** Ehrenb.—Auckland Harbour, CW1; Whangateau Harbour, T.

Skeletonema Grev.

***S. costatum** (Grev.) Cleve—Widely distributed. 15 records.

Stephanopyxis Ehrenb.

***S. orbicularis** Wood—Widely distributed. 16 records. (TYPE) The type locality given in WCC is "planktonic in New Zealand coastal waters".

***S. turris** (Grev. & Arnott) Ralfs—Widely distributed. 14 records.

Thalassiosira Cleve⁷

***T. condensata** Cleve—Widely distributed. 11 records.

***T. decipiens** (Grun.) Jørg.—Widely distributed. 12 records.

***T. hyalina** (Grun.) Gran—Widely distributed. 16 records.

***T. polychorda** (Gran) Proskina-Lavrenko (*Coscinosira polychorda* (Gran) Gran)—Hauraki Gulf, C1.

***T. rotula** Meunier—Widely distributed. 8 records.

***T. subtilis** (Ostenf.) Gran—NE coast, CW1.

Family HEMIDISCACEAE

Hemidiscus Wall.

***H. cuneiformis** Wall.—N of New Zealand, CW1; Hawke Bay, C2.

Family ACTINODISCACEAE

Actinocyclus Ehrenb.

***A. adriaticus** Grun.—Waitarere Beach, CC; New Plymouth/Kawhia, C2.

A. punctatus (Ehrenb.) Castr. (non *A. punctatus* Bail.)—Lyll Bay, P.

***A. senarius** (Ehrenb.) Ehrenb. (*Actinocyclus undulatus* Kütz.)—Widely distributed. 12 records.

***A. splendens** (Shad.) Ralfs ex Pritch.—Goat Island Bay, Leigh, T; Lyll Bay, P; Otago Peninsula, C2.

A. vulgaris Schum.—Smith's Bay, Dunedin, W2; Bruce's Rocks, Dunedin, W2; Goat Island, Dunedin, W2.

A. sp.—Bruce's Rocks, Dunedin, W2.

Asteromphalus Ehrenb.

***A. flabellatus** (de Bréb.) Grev.—Hauraki Gulf, WCC, C1, C2; Bay of Plenty, C2; Hawke Bay, C2; Lyll Bay, P.

***A. hookeri** Ehrenb.—Waitarere Beach, CC; Cook Strait, C1.

Sub-order AULACODISCINEAE

Family EUPODISCACEAE

Aulacodiscus Ehrenb.

- (*A. aucklandicus* Grun. ex Schmidt—Whangarei, CW1.) The reference given in CW1 to Schmidt's *Atlas*, is to this species from the Auckland Islands. I have been unable to trace a reference to Whangarei.
- A. *beeveriae* Johns. ex Pritch.—Anderson's Bay, Dunedin, W2; Bruce's Rocks, Dunedin, W2; Smith's Bay, Otago Harbour, W2.
- A. *brownei* Norman ex Pritch.—Portobello, W2.
- A. *kittoni* Arnott ex Ralfs in Pritch. var. *kittoni*—Bay of Islands, Rattray (1888). (TYPE); Pakiri Beach, T; Waitarere Beach, WCC, CC, C2; Muriwai Beach, WCC, C2; Manukau Harbour, WCC.
- A. *kittoni* Arnott ex Ralfs in Pritch. var. *johnsoni* Arnott ex Ralfs in Pritch.—Smith's Bay, Otago Harbour, W2; St Clair Beach, Dunedin, W2; Bruce's Rocks, Dunedin, W2.

Sub-order AULISCINEAE

Family AULISCACEAE

Auliscus Ehrenb.

- A. *pruinus* Bail.—Lyll Bay, P.
- A. *sculptus* (W. Sm.) Ralfs ex Pritch. (*A. caelatus* Bail.)—Lyll Bay, P; Smith's Bay, Otago Harbour, W2; Anderson's Bay, Dunedin, W2; Hooper's Inlet, Portobello, W2; Foveaux Strait, P (as *A. caelatus* var. *late costata* A. Schmidt).

Sub-order BIDDULPHINEAE

Family BIDDULPHIACEAE⁸

Biddulphia Gray

- B. *alternans* (Bail.) van Heurck (*Triceratium alternans* Bail.)—Widely distributed. 18 records.
- *B. *aurita* (Lyngb.) de Bréb.—Auckland Harbour, CW1; Waitarere Beach, CC; Company Bay, Otago Harbour, W2; Portobello, W2; Hooper's Inlet, Portobello, W2.
- B. *brachiolatum* (Brightw.) Taylor⁹ (*Triceratium brachiolatum* Bright.)—Foveaux Strait, P.
- *B. *mobiliensis* (Bail.) Grun. ex van Heurck—Widely distributed. 18 records.
- *B. *obtusa* (Kütz.) Ralfs ex Pritch. (*B. aurita* (Lyngb.) de Bréb. var. *obtusa* Kütz.)—Hauraki Gulf, C1; Wellington Harbour, WCC, C1; Cook Strait, C1; Bruce's Rocks, Dunedin, W2.
- B. *pentacrinus* (Ehrenb.) Boyer (*Triceratium pentacrinus* Wall.)—Agar, M.
- B. *picturatum* (Grev.) Taylor⁹ (*Triceratium picturatum* Grev.)—Dunedin, W3.
- B. *pulchella* Grey—Auckland Harbour, CW1; Bruce's Rocks, Dunedin, W2; Foveaux Strait, P.
- B. *reticulata* Roper var. *reticulata*—Auckland Harbour, CW1; Bruce's Rocks, Dunedin, W2; Kakanui Beach, Dunedin, W2; Foveaux Strait, P.
- B. *reticulata* Roper var. *rawsonii* Wood—Bruce's Rocks, Dunedin, W2 (TYPE).
- B. *reticulum* (Ehrenb.) Boyer (*Triceratium reticulum* Ehrenb., *T. sculptum* Shadb., *T. obtusum* Kütz., *T. punctatum* Brightw.)—Goat Island Bay, Leigh, T; Lyll Bay, P (as *T. punctatum* and *T. obtusum*); New Plymouth/Hawera, C2; Smith's Bay, Otago Harbour, W2; Bruce's Rocks, Dunedin, W2; Portobello, W2; Foveaux Strait, P.
- *B. *sinensis* Grev.¹⁰—Widely distributed. 25 records.
- B. *tuomeyi* (Bail.) Roper—Lyll Bay, P.

Cerataulina Perag.

- *C. *pelagica* (Cleve) Hendey—Widely distributed. 12 records.

Cerataulus Ehrenb.

C. turgidus (Ehrenb.) Ehrenb. (*Biddulphia turgida* (Ehrenb.) W. Sm.)—Smith's Bay, Otago Harbour, W2; Bruce's Rocks, Dunedin, W2.

Ditylum Bail.

***D. brightwelli** (T. West) Grun. ex van Heurck—Widely distributed. 17 records.

Eucampia Ehrenb.

***E. zoodiacus** Ehrenb.—Widely distributed. 21 records.

Hemiaulus Ehrenb.

***H. hauckii** Grun. ex van Heurck—Jellicoe Channel, C3; Hauraki Gulf, CW1, C1, C2; Wellington Harbour, C1, C2; New Plymouth/Kawhia, C2.

***H. sinensis** Grev.—Widely distributed. 9 records.

Lithodesmium Ehrenb.

***L. undulatum** Ehrenb.—Jellicoe Channel, C3; Hauraki Gulf, C1; near New Plymouth, CW1; New Plymouth/Kawhia, C2; Otago Peninsula, C2.

Streptothecca Shrubs.

***S. indica** Karsten—Wellington Harbour, CW1; Milford Sound, CW1.

***S. tamesis** Shrubs.¹¹—Widely distributed. 17 records.

Terpinosö Ehrenb.

T. americana (Bail.) Ralfs ex Pritch.—Hooper's Inlet, Portobello, W2.

T. trifoliata Cleve (*Triceratium trifoliatum* Cleve)—New Zealand, Cleve (1881).

Triceratium Ehrenb.

T. biquadratum Janisch—Dunedin area, W3.

***T. favus** Ehrenb.¹² (*T. fimbriatum* Wall.)—Wellington Harbour, CW1; Cook Strait, C1; Smith's Bay, Otago Harbour, W2; Bruce's Rocks, Dunedin, W2; Otago Peninsula, C2; Foveaux Strait, P (as both *T. favus* and *T. fimbriatum*).

T. obtusum Ehrenb.—Lyll Bay, P.

T. robertsonianum Grev.—Otago Peninsula, C2.

T. spinosum Bail. (*T. armatum* Roper)—Lyll Bay, P.

T. sp.—Bruce's Rocks, Dunedin, W2.

Family ANAULACEAE

Anaulus Ehrenb.

A. birostratus Grun. ex van Heurck (*Biddulphia birostrata* Grun.)—Lyll Bay, P.

A. mediterraneus Grun.—Auckland, Schmidt (1893).

Family CHAETOCERACEAE

Chaetoceros Ehrenb.

***C. affine** Lauder—Widely distributed. 14 records.

***C. armatum** T. West (*C.* sp.nov. in Cassie & Cassie (1960), Cassie (1961))¹³—Waitare Beach, CC, C2; Muriwai Beach, C2; Moeraki Beach, C2, W2; Oreti Beach, C2.

***C. atlanticum** Cleve—Hauraki Gulf, C1; New Plymouth/Kawhia, C2 (as forma *audax*).

***C. boreale** Bail.—Goat Island Bay, Leigh, T.

***C. breve** Schütt—Bay of Plenty, C2; Foveaux Strait, C2.

***C. compressum** Lauder—Widely distributed. 9 records.

***C. concavicornis** Mangin—Widely distributed. 14 records.

***C. convolutum** Castr.—Widely distributed. 12 records.

***C. costatum** Pavill.—Hauraki Gulf, C1; Bay of Plenty, C2; Cook Strait, C2; Marlborough Sounds, C2.

- **C. criophilum* Castr.—Waitarere Beach, CC; New Plymouth/Kawhia, C2.
 **C. danicum* Cleve¹⁴—Goat Island Bay, Leigh, T; Cook Strait, C2; Lyttelton Harbour, C2 (p. 23); Otago Peninsula, C2; Milford Sound, CW1.
 **C. debile* Cleve—Jellicoe Channel, C3; Hauraki Gulf, C1; Cook Strait, C2; Marlborough Sounds, C2; Otago Peninsula, C2.
 **C. decipiens* Cleve—Widely distributed. 18 records.
 **C. diadema* (Ehrenb.) Gran (*C. subsecundum* (Grun.)) Hust.—Goat Island Bay, Leigh, T; Otago Peninsula, C2.
 **C. dictyota* Ehrenb.—Hawke Bay, C2; W. of Hawera, C2.
 **C. didymum* Ehrenb. var. *didymum*—Widely distributed. 8 records.
 **C. didymum* Ehrenb. var. *anglica* (Grun.) Gran—Hawke Bay, C2.
 **C. didymum* Ehrenb. var. *protuberans* (Lauder) Gran & Yendo—Bay of Plenty, C2; Wellington Harbour, C2; Cook Strait, C1; Otago Peninsula, C2; Foveaux Strait, C2.
 **C. difficile* Cleve—Goat Island Bay, Leigh, T; New Plymouth/Kawhia, C2.
 **C. eibenii* (Grun.) Meun. ex van Heurck—Goat Island Bay, Leigh, T; Hauraki Gulf, C1, C2; Wellington Harbour, C1, C2; Otago Peninsula, C2; Foveaux Strait, C2.
 **C. lacinosum* Schütt—Hauraki Gulf, C1; Bay of Plenty, C2; Hawke Bay, C2; Wellington Harbour, C1; Cook Strait, C1, C2; Otago Peninsula, C2.
 **C. lorentianum* Grun.—Goat Island Bay, Leigh, T; Jellicoe Channel, C3; Hauraki Gulf, C1; Whangateau Harbour, T; Auckland Harbour, CW1; Castle Point, C1; Wellington Harbour, C1.
 **C. pseudocurvisetum* Mangin—Hauraki Gulf, C1; Otago Harbour, B.
 **C. secundum* Cleve¹⁵—Widely distributed. 17 records.
 **C. simile* Cleve—Widely distributed. 14 records.
 **C. simplex* Ostenf.—Goat Island Bay, Leigh, T; Wellington Harbour, WCC.
 **C. sociale* Lauder—Hauraki Gulf, C1; Castle Point, C1; Wellington Harbour, C1; Otago Peninsula, B, C2.
 **C. teres* Cleve—Widely distributed. 8 records.
 **C. vanheurckii* Gran—Hauraki Gulf, C1; Hawke Bay, C2; Cook Strait, C1; Otago Peninsula, C2; Bligh Sound, C2; Milford Sound, CW1.
 **C. vistulae* Apstein—Wellington Harbour, C2; N.W. of New Plymouth, C2, WCC; Kaikoura, C1.
 **C. sp.*¹⁶—Foveaux Strait, C2; Bligh Sound, C2.

Sub-order RHIZOLENIIINEAE

Family BACTERIASTRACEAE

Bacteriastrum Shadb.

- **B. delicatulum* Cleve—W. of Hawera, C2; Otago Peninsula, C2.
 **B. furcatum* Shadb. (*B. varians* Lauder)—Bay of Plenty, C2.
 **B. hyalinum* Lauder—New Plymouth/Kawhia, C2; N.W. of New Plymouth, WCC.

Family LEPTOCYLINDRACEAE

Dactyliosolen Castr.

- **D. mediterraneus* Perag.—Hauraki Gulf, C1; Whangateau Harbour, T; Bay of Plenty, C2; Wellington Harbour, C1; New Plymouth/Kawhia, C2; Cook Strait, C2; Marlborough Sounds, C2; Kaikoura, C1.

Guinardia Perag.

- **G. flaccida* (Castr.) Perag.—Goat Island Bay, Leigh, T; Hauraki Gulf, CW1.

Lauderia Cleve

- **L. borealis* Gran (*L. annulata* Cleve)—Widely distributed. 19 records.

Leptocylindrus Cleve

- **L. danicus* Cleve—Widely distributed. 22 records. Also recorded from freshwater—Wellington water supply, Wainui, CW1.

Schroderella Pavill.

- **S. delicatula* (Perag.) Pavill.—Hauraki Gulf, CW1; Milford Sound, CW1.

Family CORETHRONACEAE

Corethron Castr.

- **C. criophilum* Castr.—Widely distributed. 15 records.

Family RHIZOLENIACEAE

Rhizolenia Brightw.

- **R. alata* Brightw. forma *alata*—Goat Island Bay, T; Jellicoe Channel, C3; Hauraki Gulf, C1, C2, CW1; Wellington Harbour, C1; Cook Strait, C1; Otago Peninsula, C2.
- **R. alata* Brightw. forma *gracillima* (Cleve) Grun.—N. of North Island, CW1; Hauraki Gulf, CW1; N.E. of Napier, CW1.
- **R. alata* Brightw. forma *indica* (Perag.) Gran—S. of Dunedin, CW1.
- **R. calcar-avis* Schultze—N. of New Zealand, CW1.
- **R. delicatula* Cleve—Goat Island Bay, Leigh, T.
- **R. hebetata* Bail. forma *hiemalis* Gran—Hauraki Gulf, CW1; E. of Napier, CW1; Wellington Harbour, CW1.
- **R. hebetata* Bail. forma *semispina* (Hensen) Gran—Goat Island Bay, Leigh, T; Hauraki Gulf, CW1; Hawke Bay, C2.
- **R. imbricata* Brightw. var. *imbricata*—Waitarere Beach, CC.
- **R. imbricata* Brightw. var. *shrubsolei* (Cleve) Schröder¹⁷—Widely distributed. 18 records.
- **R. robusta* Norman ex Pritch.—Goat Island Bay, Leigh, T; Hauraki Gulf, C1; Bay of Plenty, C2; Hawke Bay, C2; off Napier, CW1; Marlborough Sounds, C2.
- **R. setigera* Brightw.—Widely distributed. 15 records.
- **R. stouterfothii* Perag.¹⁸—Widely distributed. 9 records, but only one from South Island—Kaikoura, C1.
- **R. styliformis* Brightw.—Widely distributed. 9 records.

Sub-order FRAGILARIINEAE

Family FRAGILARIACEAE

Asterionella Hass.

- A. bleakeleyi* W. Sm.—Cook Strait, W1.
- **A. japonica* Cleve & Möll. ex Gran—Widely distributed. 12 records.
- **A. kariana* Grun. in Cleve & Grun.—Cook Strait, C1; Lyttelton Harbour, C2; Milford Sound, CW2.

Climacosphenia Ehrenb.

- C. moniligera* Ehrenb.—Lyll Bay, P; Agar, M.

Diatomella Grev.

- **D. balfouriana* Grev.—Auckland Harbour, CW2.

Dimeregramma Ralfs¹⁹

- D. australe* (Petit) Boyer (*Rhaphoneis surirella* (Ehrenb.) Grun. ex van Heurck var. *australis* Petit; *R. fasciola* Greg. var. *australis* Petit; non *R. australis* H.L. Sm.)—Lyll Bay, P (TYPE); Otago, W1; Bruce's Rocks, Dunedin, W2.
- D. minor* (Grev.) Ralfs ex Pritch.—Bruce's Rocks, Dunedin, W2.

Entopyla Ehrenb.

- E. australis** Ehrenb. (*Gephyra incurvata* Arnott)—Lyall Bay, P; Kakanui Beach, Dunedin, W2; Bruce's Rocks, Dunedin, W2.
E. ocellata (Arnott) Grun. var. **calaritana** Fricke—Agar, M. (indicator species for New Zealand agar).
E. ocellata (Arnott) Grun. var. **pulchella** (Arnott) Grun. (*Eupleuria pulchella* Arnott)—Lyall Bay, P; Dunedin, W2.

Fragilaria Lyngb.

- F. oceanica** Cleve—New Zealand waters, CW2; New Plymouth/Kawhia, C2; Otago Peninsula, C2.
F. pinnata Ehrenb.—Lyall Bay, P.
F. striatula Lyngb.—New Zealand waters, CW2.

Grammatophora Ehrenb.

- G. angulosa** Ehrenb.—Wellington Harbour, W1; Lyall Bay, P; Agar, M.
G. arcuata Ehrenb.—Lyall Bay, P.
G. arnottii Grun. ex van Heurck—New Zealand, Grunow in van Heurck (1885) (TYPE).
G. gibberula Kütz.—Lyall Bay, P.
G. hamulifera Kütz.—Agar, M.
G. longissima Petit—Lyall Bay, P, (TYPE).
G. macilenta W. Sm.—Auckland Harbour, CW2.
G. marina (Lyngb.) Kütz. var. **marina**—Auckland Harbour, CW2; Wellington Harbour, C1; Lyall Bay, P; Cook Strait, C1; Otago Peninsula, B, C2; Bruce's Rocks, Dunedin, W2.
G. marina (Lyngb.) Kütz. unnamed var.²⁰—Foveaux Strait, P.
G. oceanica Ehrenb. var. **oceanica**—Agar, M.
G. oceanica Ehrenb. var. **subtilissima** (Bail.) de Toni—Auckland Harbour, CW2.
G. serpentina Ehrenb.—Lyall Bay, P; Otago Harbour, B.
G. undulata Ehrenb.—Lyall Bay, P.
G. sp.—Waitare Beach, CC.

Licmophora Agardh

- L. flabellata** (Grev.) Agardh—Hauraki Gulf, C1; Auckland Harbour, CW2; Wellington Harbour, C1; Cook Strait, C1, C2; Kaikoura, C1; Otago Peninsula, C2.
L. gracilis (Ehrenb.) Grun.—Goat Island Bay, Leigh, T.
L. luxuriosa Heiden & Kolbe—Wellington Harbour, W1.
L. lyngbei (Kütz.) Grun. ex van Heurck (*L. abbreviata* Agardh)—Hauraki Gulf, C1; Auckland Harbour, CW2; Wellington Harbour, C1; Cook Strait, Crawford (1947); Otago Harbour, B.
L. tinctoria (Agardh) Grun. (*Podosphenia tinctoria* Agardh)—Lyall Bay, P.

Plagiogramma Grev.

- P. adriaticum** Grun.—Otago, Schmidt (1896).
P. pulchellum Grev.—listed by P without locality.
P. pygmaeum Grev.—Lyall Bay, P.
P. robertsiana Grev.—Smith's Bay, Otago Harbour, W2.
P. staurophorum (Greg.) Heidberg—Waitare Beach, C2.
P. validum Grev.—Foveaux Strait, P.

Podocystis Bail. ex W. Sm.

- P. adriatica** (Kütz.) Ralfs ex Pritch.²¹—Bruce's Rocks, Dunedin, W2; St Clair Beach, Dunedin, W2.
P. spathulatum (Shadb.) van Heurck²¹ (*Euphyllodium spathulatum* Shadb.)—Lyall Bay, P.

Opephora Petit

O. pinnata (Jan. & Rabh.) Petit—New Zealand, Petit (1888).

Rhabdonema Kütz.

R. adriaticum Kütz.—Hauraki Gulf, C1; Auckland Harbour, CW2; Wellington Harbour, C1; Lyall Bay, P.

R. crozieri Ehrenb.—Lyall Bay, P.

R. hamuliferum Kitt. ex Petit—Lyall Bay, P, (TYPE).

R. minutum Kütz.—Bruce's Rocks, Dunedin, W2.

Rhaphoneis Ehrenb.

R. amphiceros Ehrenb. (*R. rhombus* Ehrenb.)—Lyall Bay, P; Foveaux Strait, P.

R. belgica Grun ex van Heurck—Bruce's Rocks, Dunedin, W2.

R. fasciolata Greg. var. *fasciolata*—Lyall Bay, P.

R. fasciolata Greg. var. *australis* Petit—Lyall Bay, P, (TYPE).

Striatella Agardh

***S. unipunctata** (Lyngb.) Agardh—Goat Island Bay, Leigh, T; Wellington Harbour, CW2; Otago Harbour, B.

Synedra Ehrenb.

S. frauenfeldii Grun.—Waitarere Beach, CC.

S. fulgens (Grev.) W. Sm.—Goat Island Bay, Leigh, T; Hauraki Gulf, CW2, C1; Auckland Harbour, CW2; Castle Point, C1; Wellington Harbour, C1; Cook Strait, C1; Anderson's Bay, Dunedin, W2.

S. gaillonii (Bory.) Ehrenb.—Hauraki Gulf, CW2; Lyall Bay, P.

S. superba Kütz.—Lyall Bay, P.

†**S. tabulata** (Agardh) Kütz.—Agar, M.

S. undulata (Bail.) Greg.—Hauraki Gulf, C1; Dunedin, CW2; Portobello, W2.

Thalassionema (Grun.) Hust.²²

***T. nitzschioides** (Grun.) Hust. (*Thalassiothrix nitzschioides* Grun. ex van Heurck)
—Widely distributed. 22 records.

Thalassiothrix Cleve & Grun.

***T. frauenfeldii** Grun.—Widely distributed. 10 records.

***T. longissima** Cleve & Grun.—New Zealand waters, CW2; Jellicoe Channel, C3; New Plymouth/Kawhia, C2; Marlborough Sounds, C2.

Trachysphenia Petit

T. australis Petit—Lyall Bay, P, (TYPE): North-east Harbour, Dunedin, W1, W2.

Sub-order ACHNANTHINEAE

Family ACHNANTHACEAE

Achnanthes Bory

†**A. brevipes** Agardh—Hauraki Gulf, C1; Auckland Harbour, CW2; Castle Point, C1; Lyall Bay, P; Anderson's Bay, Dunedin, W2.

A. glabrata Grun. var. *glabrata*—Lyall Bay, P.

A. glabrata Grun. var. *aucklandica* Grun.—Auckland, Cleve & Grunow (1880).

A. longipes Agardh—Widely distributed. 10 records.

†**A. subsessilis** Kütz.—Lyall Bay, P.

Campyloneis Grun.

C. grevillei (W. Sm.) Grun. (*C. argus* Grun.)—Lyall Bay, P; Smith's Bay, Dunedin, W2; Bruce's Rocks, Dunedin, W2. The Lyall Bay record is of *C. argus*; Petit also records *C. grevillei* but without locality.

Cocconeis Ehrenb.

- C. australis* Petit—Lyall Bay, P, (TYPE).
C. costata Greg. var. *costata*—Auckland, Cleve (1896).
C. costata Greg. var. *pacifica* (Grun.) Cleve (*C. pacifica* Grun.)—Lyall Bay, P.
C. dirupta Greg. var. *dirupta*—Lyall Bay, P.
C. dirupta Greg. var. *antarctica* Grun.—New Zealand, Cleve & Grunow (1881).
C. distans Greg.—Lyall Bay, P.
C. heteroidea Hantz.—Auckland Harbour, CW2; Lyall Bay, P.
C. interrupta Greg. (*C. crux* Ehrenb.)—Lyall Bay, P.
C. notata Petit—Lyall Bay, P, (TYPE).
C. pellucida Grun.—Lyall Bay, P; Agar, M.
C. pseudomarginata Greg. var. *pseudomarginata* (*C. major* Greg.)—Lyall Bay, P.
C. pseudomarginata Greg. var. *intermedia* Grun.—Lyall Bay, P; Agar, M.
C. quarnerensis (Grun.) A. Schmidt (*Navicula ovulum* A. Schmidt)—Lyall Bay, P.
C. saint-paulii Heiden & Kolbe—Bruce's Rocks, Dunedin, W2.
C. scutellum Ehrenb. (*C. adriatica* Kütz., *C. mediterranea* Kütz.)—Lyall Bay, P (as *C. adriatica*, *C. mediterranea*, and *C. scutellum*); Smith's Bay, Otago Harbour, W2; Anderson's Bay, Dunedin, W2 (as *C. scutellum* var.); Portobello, W2; Foveaux Strait, P.
C. scutellum Ehrenb. var. *stauroneiformis* W.Sm.—New Zealand, Grunow (record from Cleve 1896).

Rhoicosphenia Grun.

- †*R. curvata* (Kütz.) Grun.—Lyall Bay, P; Bruce's Rocks, Dunedin, W2.

Sub-order NAVICULINEAE

Family NAVICULACEAE²³

Amphipleura Kütz.

- A. micans* (Lyngb.) Cleve var. *micans*—Goat Island Bay, Leigh, T.
A. micans (Lyngb.) Cleve var. *fragilis* (Grev.) Cleve (*Berkeleya fragilis* Grev.)—Lyall Bay, P.
A. pellucida Kütz.—Agar, M.
A. rutilans (Trent.) Cleve var. *antarctica* (Harv.) Grun. (*Berkeleya harveyana* Grun.) Lyall Bay, P.

Amphiprora Ehrenb.

- A. alata* (Ehrenb.) Kütz.—Goat Island Bay, Leigh, T; Hauraki Gulf, C1; Lyttelton Harbour, C2.
A. kjellmanii Cleve var. *kariana* (Grun.) Cleve (*A. kariana* Grun.)—Otago Peninsula, C2 (with a query).
A. pulchra Bail. (*A. alata* (Ehrenb.) Kütz. var. *pulchra* (Bail.) Cleve)—Waitati, W2.
A. sp.—Waitarere Beach, CC.

Anomoneis Pfitz.

- †*A. sculpta* (Ehrenb.) Cleve—New Zealand, record in Cleve (1896).

Caloneis Cleve

- C. biseriata* (Petit) Cleve (*Navicula biseriata* Petit)—Foveaux Strait, P, (TYPE).
C. liber (W. Sm.) Cleve var. *liber* (*Navicula liber* W. Sm.)—Lyall Bay, P.
C. liber (W. Sm.) Cleve var. *genuina* Cleve (*Navicula maxima* Greg.)—Foveaux Strait, P.
C. linearis (Grun.) Boyer (*Navicula linearis* Grun.)—Foveaux Strait, P.
C. silicula Ehrenb. var. *inflata* (Grun.) Cleve—Hooper's Inlet, Portobello, W2.
†*C. westii* (W. Sm.) Hendey (*C. formosa* (Greg.) Cleve)—Evansdale, W2.

Diploneis Ehrenb.

- D. bombus* (Ehrenb.) Cleve—Agar, M.
D. campylo-discus Grun. (*Cocconeis caelata* Arnott)—Lyll Bay, P.
D. constricta (Grun.) Cleve—Bruce's Rocks, Dunedin, W2.
D. crabro Ehrenb. var. *crabro* (*Navicula crabro* Ehrenb.)—Waitarere Beach, CC; Lyll Bay, P; Anderson's Bay, Dunedin, W2; Foveaux Strait, P.
D. crabro Ehrenb. var. *pandura* (de Bréb.) Cleve (*Navicula pandura* de Bréb.)—Hauraki Gulf, CW2; Bruce's Rocks, Dunedin, W2; Portobello, W2.
D. fusca (Greg.) Cleve (*Navicula fusca* (Greg.) Perag.)—Anderson's Bay, Dunedin, W2; Foveaux Strait, P.
D. gemmata (Grev.) Cleve (*Navicula gemmata* Grev.)—Foveaux Strait, P.
D. entodon Ehrenb.—Foveaux Strait, P.
D. graeffii (Grun.) Cleve (*Navicula graeffii* Grun.)—Lyll Bay, P.
D. incurvata (Greg.) Cleve (*Navicula incurvata* Greg.)—Foveaux Strait, P.
D. interrupta (Kütz.) Cleve (*Navicula interrupta* Kütz. var. *novae seelandiae* A. Schmidt)—Auckland, Grunow (record from Cleve (1894)).
D. littoralis (Donk.) Cleve (*Navicula ovulum* Grun.)—Lyll Bay, P.
D. mediterranea (Grun.) Cleve (*Navicula gemmata* Grev. var. *mediterranea* Grun.)—Foveaux Strait, P.
D. nitescens (Greg.) Cleve (*Navicula nitescens* Greg.)—Foveaux Strait, P.
D. notabilis (Grev.) Cleve (*Navicula notabilis* Grev.)—Foveaux Strait, P.
†*D. smithii* (de Bréb.) Cleve var. *smithii* (*Navicula smithii* de Bréb.)—Lyll Bay, P; Portobello, W2; Evansdale, W2; Foveaux Strait, P.
D. smithii (de Bréb.) Cleve var. *minor* (Petit) Taylor²⁴ (*Navicula smithii* de Bréb var. *minor* Petit)—Lyll Bay, P, (TYPE).
D. smithii (de Bréb.) Cleve var. *rhombica* Mereschowsky—Waitati, W2.
D. splendida (Greg.) Cleve (*Navicula splendida* Greg.)—Foveaux Strait, P.
D. weissflogii (A. Schmidt) Cleve (*Navicula weissflogii* A. Schmidt)—Auckland Harbour, CW2; Lyll Bay, P; Foveaux Strait, P.

Frustulia Agardh

- F. weinholdii* Hust. ex A. Schmidt—Evansdale, W2.

Gyrosigma Hass.²⁵

- G. balticum* (Ehrenb.) Cleve (*Pleurosigma balticum* (Ehrenb.) W. Sm.)—Hauraki Gulf, CW1, C1; Bay of Plenty, C2; Castle Point, C1; Wellington Harbour, C1.
G. distortum (W. Sm.) Cleve var. *parkerii* (Harv.) Cleve (*Pleurosigma parkerii* Harv.)—St. Leonards, W2.
G. hippocampus (Ehrenb.) Hass. (*Pleurosigma hippocampus* (Ehrenb.) W. Sm.)—Anderson's Bay, W2.

Mastogloia Thwaites ex W. Smith²⁶

- M. binotata* (Grun.) Cleve—Agar, M.
M. exigua Lewis—Lyll Bay, P.
M. marginulata Grun.—New Zealand, Grunow (1868).
M. rhombus (Petit) Cleve & Grove (*Navicula rhombus* Petit)—Foveaux Strait, P, (TYPE).
†*M. smithii* Thwaites ex W. Sm.—Evansdale, W2.
M. wrightii (O'Meara) Cleve (*Cocconeis wrightii* O'Meara)—Lyll Bay, P; Agar, M.

Navicula Bory²⁷

- N. approximata* Grev. forma *manca* (A. Schmidt) Hust. (*N. hennedyi* W. Sm. forma *manca* A. Schmidt)—Smith's Bay, Otago Harbour, W2.
N. atlantica A. Schmidt (*N. lyra* Ehrenb. var. *atlantica* (A. Schmidt) Cleve)—Lyll Bay, P.

- N. aucklandica* Grun.—Auckland, Grunow (1863) (TYPE).
N. cancellata Donk. var. *cancellata*—Foveaux Strait, P.
N. cancellata Donk. var. *retusa* (de Bréb.) Cleve (*N. retusa* de Bréb.; non *N. retusa* Grun.)²⁸—Lyll Bay, P.
N. centraster Cleve—Auckland, Cleve (1896) (TYPE).
N. crucigera (W. Sm.) Cleve—Anderson's Bay, Dunedin, W2.
N. decussata (Ehrenb.) Petit—Lyll Bay, P.
N. digito-radiata (Greg.) Cleve (*N. cryrinus* (Ehrenb.) W. Sm.)—Wellington Harbour, C1.
N. directa (W. Sm.) Ralfs ex Pritch. var. *remota* Cleve (*N. longa* Greg.)—Foveaux Strait, P.
N. distans (W. Sm.) A. Schmidt var.²⁹—Foveaux Strait, P.
N. elegans W. Sm.—Bruce's Rocks, Dunedin, W2.
N. granulata Bail.—Auckland Harbour, CW2.
N. grevilleana Hendey (*N. grevillei* (Agardh) Cleve)—“Widely distributed”, CW2; Goat Island Bay, Leigh, T.
N. hennedyii W. Sm. var. *hennedyii*—Foveaux Strait, P.
N. hennedyii W. Sm. var. *circumsecta* (Grun.) Cleve—Anderson's Bay, Dunedin, W2; Bruce's Rocks, Dunedin, W2.
N. hochstetteri Grun.—Foveaux Strait, P.
N. humerosa de Bréb. ex W. Sm.—Hooper's Inlet, Portobello, W2.
N. inflexa (Greg.) Donk.—Lyll Bay, P.
N. inhalata A. Schmidt—Lyll Bay, P.
N. latissima Greg.—Anderson's Bay, Dunedin, W2.
N. luxuriosa Grev.—Company Bay, Otago Harbour, W2.
N. lyra Ehrenb. var. *lyra*—Hauraki Gulf, C1; Waitarere Beach, CC; Anderson's Bay, Dunedin, W2; Hooper's Inlet, Portobello, W2.
N. marina Ralfs ex Pritch. var. *novae zealandiae* Grun. (*N. punctulata* W. Sm. var. *novae zealandiae* (Grun.) Cleve)—New Zealand, Grunow (1884) (TYPE).
N. novaeselandiae Hust.—Foveaux Strait, Hustedt (1964) (TYPE).
†*N. peregrina* (Ehrenb.) Kütz. (*Pinnularia peregrina* Ehrenb.)—New Zealand, Ehrenberg (1869).
N. pinnata Pant.—Bruce's Rocks, Dunedin, W2.
N. praetexta Ehrenb.—Foveaux Strait, P.
†*N. pusilla* W. Sm. var. *capitata* Boyer—Evansdale, W2.
N. scopulorum de Bréb. ex Kütz.—Waitati, W2.
N. subcarinata (Grun.) Hendey—Auckland Harbour, CW2.
N. subirroratoides Hust.—Foveaux Strait, Hustedt (1964) (TYPE).
N. sulcifera Hust. var.³⁰—Anderson's Bay, Dunedin, W2.
N. yarensis Grun. ex A. Schmidt—Anderson's Bay, Dunedin, W2; Hooper's Inlet, Portobello, W2; Evansdale, W2.
N. sp.—Waitarere Beach, CC.

Neidium Pfitz.

- N. iridis* (Ehrenb.) Cleve (*Navicula firma* Kütz.)—Bruce's Rocks, Dunedin, W2; Evansdale, W2; Foveaux Strait, P.

Pinnularia Ehrenb.

- P. trevelyana* (Donk.) Rabenh.—St Leonards, W2.

Pleurosigma W. Sm.²⁵

- †*P. angulatum* (Quek.) W. Sm. (incl. var. *quadratum* (W. Sm.) van Heurck)³¹—Widely distributed. 10 records.
P. australe Grun.—New Zealand, Grunow (1867) (TYPE).
P. directum Grun.—Hauraki Gulf, W1.
P. formosum W. Sm.—Goat Island Bay, Leigh, T; Hauraki Gulf, CW2, C1.

- P. intermedium* W. Sm.—Lyll Bay, P.
P. marinum Donk.—Lyll Bay, P.
P. naviculaceum de Bréb.—Widely distributed. 10 records.
P. normanii Ralfs ex Pritch. (*P. affine* Grun. in Cleve & Grun.)—Hauraki Gulf, C1; Hawke Bay, C2; Castle Point, C1; Wellington Harbour, C1, C2; Cook Strait, C1, C2; Otago Peninsula, C2.
P. rhombeum Grun. in Cleve & Grun.—Auckland, Cleve & Grunow (1880) (TYPE).
P. rigidum W. Sm. var. *rigidum*—Portobello, W2.
P. rigidum W. Sm. var. *giganteum* (Grun.) Cleve (*P. validum* Shadb.)—Lyll Bay, P; Foveaux Strait, P.
P. sp.—Waitarere Beach, CC.

Rhoiconeis Grun.

- R. genuflexa* (Kütz.) Grun.—New Zealand, Grunow (1863).

Scoliopleura Grun.

- †*S. tumida* (de Bréb. ex Kütz.) Rabenh. (*Navicula tumida* de Bréb. ex Kütz.)—Evansdale, W2.

Stauroneis Ehrenb.

- S. membranacea* (Cleve) Hust. (*Navicula membranacea* Cleve)—Widely distributed. 9 records.

Toxonidea Donk.³²

- T. falcatum* Donk.—Foveaux Strait, P.

Trachyneis Cleve

- T. aspera* (Ehrenb.) Cleve var. *aspera* (*Stauroneis aspera* Ehrenb.; *S. pulchella* W. Sm.; *T. aspera* (Ehrenb.) Cleve var. *pulchella* (W. Sm.) Cleve)³³—Lyll Bay, P (as *S. aspera* and *S. pulchella*); Anderson's Bay, Dunedin, W2; Smith's Bay, Otago Harbour, W2; Portobello, W2; Foveaux Strait, P (as *S. aspera* and *S. pulchella*).
T. aspera (Ehrenb.) Cleve var. *oblonga* (Bail.) Cleve (*Stauroneis oblonga* Bail.)—Lyll Bay, P.
T. aspera (Ehrenb.) Cleve var. *robusta* (Petit) Cleve (*Stauroneis robusta* Petit)—Foveaux Strait, P, (TYPE).
T. johnsoniana (Grev.) Cleve (*Navicula johnsoniana* Grev.)—New Zealand, Greville (1863) (TYPE).

Tropidoneis Cleve

- T. lepidoptera* (Greg.) Cleve—Hauraki Gulf, C1; Wellington Harbour, C1; Anderson's Bay, Dunedin, W2; Portobello, W2; Otago Peninsula, C2.

Family GOMPHONEMACEAE

Gomphonema Hust.

- G. sp.*—Waitarere Beach, CC.

Family CYMBELLACEAE

Amphora Ehrenb.

- A. acuta* Greg.—Foveaux Strait, P.
A. acutiuscula Kütz. (*A. lineata* Greg.)—Lyll Bay, P.
A. angusta (Greg.) Cleve var. *eulensteinii* Grun. (*A. eulensteinii* A. Schmidt)—Foveaux Strait, P.
A. arcta A. Schmidt—Auckland Harbour, CW2.
A. aspera Petit—Foveaux Strait, P, (TYPE).
A. bigibba Grun.—Lyll Bay, P.

- A. coffaeiformis* (Agardh) Cleve (*A. aponina* Kütz.)—Lyall Bay, P.
A. crassa Greg.—Hauraki Gulf, C1; Foveaux Strait, P.
A. cristata Petit—Foveaux Strait, P, (TYPE).
A. cymbifera Greg.³⁴—Lyall Bay, P.
A. foveauxiana (Petit) Taylor³⁵ (*A. schmidtii* Petit)—Foveaux Strait, P, (TYPE).
A. graeffi (Grun.) Cleve—Foveaux Strait, P.
A. hyalina Kütz.—Wellington, CW2.
A. janischii A. Schmidt (*A. contracta* Grun.)—Lyall Bay, P.
A. lineolata Ehrenb. var. *sinensis* (A. Schmidt) Cleve (*A. chinensis* A. Schmidt)—Goat Island Bay, Leigh, T; Jellicoe Channel, C3; Hauraki Gulf, C1; Waitemata Harbour, C3.
A. marina W. Sm. emend van Heurck—Foveaux Strait, P.
A. mexicana A. Schmidt—Foveaux Strait, P.
A. obtusa Greg.—Bruce's Rocks, Dunedin, W2.
A. proboscidea Greg.—Foveaux Strait, P.
A. proteus Greg.—Lyall Bay, P; Smith's Bay, Otago Harbour, W2.
A. robusta Greg.—Lyall Bay, P; Foveaux Strait, P.
A. sarniensis Grev. var. *sinuata* (Grev.) Cleve (*A. sinuata* Grev.)—Foveaux Strait, P.
A. spectabilis Greg.—Foveaux Strait, P.
A. terroris Ehrenb.—Wellington Harbour, W1; Lyall Bay, P.
A. turgida Greg.—Lyall Bay, P.
†*A. veneta* Kütz.—New Zealand, Cleve (1895).
A. weissflogii A. Schmidt—Foveaux Strait, P.
A. sp.—Waitarere Beach, CC.

Cymbella Agardh

- †*C. yarrensii* A. Schmidt—Evansdale, W2.

Phaeodactylum Bohl.

- P. tricordatum* Bohl. (*Nitzschia closterium* (Ehrenb.) W. Sm., forma *minutissima* Allen & Nelson)³⁶—Goat Island Bay, Leigh, T; Jellicoe Channel, T.

Family EPITHEMIACEAE

Epithemia de Bréb.

- †*E. adnata* de Bréb. var. *proboscidea* (Kütz.) Hendey (*E. zebra* Kütz. var. *proboscidea* (Kütz.) Grun.)—Bruce's Rocks, Dunedin, W2.
E. monilifera Petit—Foveaux Strait, P, (TYPE).
E. musculus Kütz. var. *musculus* (*Rhopalodia musculus* (Kütz.) O. Müll.)—Lyall Bay, P.
E. musculus Kütz. var. *constricta* (de Bréb.) van Heurck (*Rhopalodia musculus* (Kütz.) O. Müll. var. *constricta* de Bréb.)—Lyall Bay, P.
†*E. sorex* Kütz.—Wellington, W1.
†*E. turgida* (Ehrenb.) Kütz. var. *granulata* (Ehrenb.) Grun. (*E. granulata* Kütz.)—Lyall Bay, P.

Rhopalodia O. Müll.

- †*R. gibba* (Ehrenb.) O. Müll. var. *ventricosa* (Kütz.) H. & M. Perag. (*R. ventricosa* (Kütz.) O. Müll.)—Bruce's Rocks, Dunedin, W2.
†*R. gibberula* (Kütz.) O. Müll. var. *gibberula* (*Epithemia gibberula* (Ehrenb.) Kütz.)—Wellington, W1.
†*R. gibberula* (Kütz.) O. Müll. var. *producta* (Grun.) Cleve-Euler (*Epithemia gibberula* (Ehrenb.) Kütz. var. *producta* Grun.)—Evansdale, W2.

Family BACILLARIACEAE

Bacillaria Gmelin

- B. paxillifer* (O. Müll.) Hendeby (*B. paradoxa* Gmelin)—“Widely distributed”, CW2; Goat Island Bay, Leigh, T; Hauraki Gulf, C1; Wellington Harbour, C1, C2.

Cylindrotheca Rabenh.

- **C. closterium* (Ehrenb.) Reimann & Lewin (*Nitzschia closterium* (Ehrenb.) W. Sm.)³⁷—Widely distributed. 15 records.

Hantzschia Grun.³⁸

- †*H. amphioxys* (Ehrenb.) Grun. (*Eunotia amphioxys* Ehrenb.)—New Zealand, Ehrenberg (1869); Agar, M.
H. virgata (Roper) Grun.—Portobello, W2.

Nitzschia Hass.

- N. acuminata* (W. Sm.) Grun.—Evansdale, W2.
N. australis (Perag.) Mann—Wellington Harbour, W1.
N. circumscuta (Bail.) Grun.—Bruce’s Rocks, Dunedin, W2.
N. compressa (Bail.) Boyer—Portobello, W2.
**N. fraudulenta* Cleve—Wellington Harbour, Hasle (1965).
N. granulata Grun.—Waitati, W2.
**N. longissima* (de Bréb. ex Kütz.) Ralfs in Pritch.—Goat Island Bay, Leigh, T; Cook Strait, C2; Otago Peninsula, C2.
N. panduriformis Greg. var. *panduriformis*—Lyll Bay, P; Bruce’s Rocks, Dunedin, W2; Foveaux Strait, P.
N. panduriformis Greg. var. *lata* (Witt.) Grun. (*N. lata* Witt.)—Lyll Bay, P.
N. polaris Grun.—Wellington Harbour, W1.
N. pseudoseriata Hasle—Goat Island Bay, Leigh, T; Jellicoe Channel, C3, T; Wellington Harbour, Hasle (1965).
N. pungens Grun. (incl. var. *atlantica* Cleve)—Jellicoe Channel, T; Hawke Bay, C2; Wellington Harbour, Hasle (1965); W. of Hawera, C2; Cook Strait, C2; Marlborough Sounds, C2.
†*N. sigma* (Kütz.) W. Sm. var. *sigma*—Lyll Bay, P (apparently from the synonymy listed; the name recognised by Petit is omitted from the text); Anderson’s Bay, Dunedin, W2.
N. sigma (Kütz.) W. Sm. var. *rigida* Grun. ex van Heurck—Wellington, W1.
**N. seriata* auct.³⁹—Widely distributed. 22 records.
N. subacuta Hust.—Wellington Harbour, W1.
†*N. tryblionella* Hantz. ex Rabenh. var. *tryblionella*—Anderson’s Bay, Dunedin, W2.
N. tryblionella Hantz. ex Rabenh. var. *yarrensensis* Grun.—Waitati, W2.

Sub-order SURIRELLINEAE

Family SURIRELLACEAE

Campylodiscus Ehrenb.

- †*C. echeneis* Ehrenb.—Evansdale, W2; Milford (Temuka), W2; Anderson’s Bay, Dunedin, W2; Otago, W1.
C. fastuosus Ehrenb. (*C. simulans* Greg.)—Lyll Bay, P.
C. impressus Grun. ex A. Schmidt—Portobello, W2.
C. incertus A. Schmidt (*C. samoensis* Grun.)—Auckland Harbour, CW2; Lyll Bay, P; Dunedin area (locality omitted), W2; Foveaux Strait, P.
C. ralfsii W. Sm.—Lyll Bay, P; Portobello, W2.
C. taeniatus A. Schmidt—Bruce’s Rocks, Dunedin, W2.
C. undulatus Grev.—Goat Island Bay, Leigh, T.

Surirella Turp.

- S. biseriata* de Bréb.—Evansdale, W2; Foveaux Strait, P.
S. contorta Kitt.⁴⁰—Evansdale, W2; St Clair Beach, Dunedin, W2.
S. eximia Grev.—Wellington Harbour, W1; Evansdale, W2.
S. fastuosa (Ehrenb.) Kütz.—Hauraki Gulf, CW2; Lyall Bay, P; Foveaux Strait, P.
S. filholii Petit—Bruce's Rocks, Dunedin, W2; Foveaux Strait, P, (TYPE).
S. gemma (Ehrenb.) Kütz.—Hauraki Gulf, CW2, C1; Wellington Harbour, C1; Cook Strait, C2; Anderson's Bay, Dunedin, W2.
S. hastata A. Schmidt—Wellington, W1.
S. intermedia Lewis—Lyall Bay, P.
S. neumeyeri Janisch—Cook Strait, W3.
S. recedens A. Schmidt—Smith's Bay, Otago Harbour, W2.
S. splendida W. Sm.—Company Bay, Otago Harbour, W2; Smith's Bay, Otago Harbour, W2.
†*S. striatula* Turp.—Evansdale, W2.

APPENDIX I—TAXONOMIC COMMENTS

- Actinocyclus* is placed in the Coscinodiscaceae by Hendey (1954; 1964) because the general valve structure resembles that of *Coscinodiscus*, and the small marginal ocellus is totally different from the ocelli found in the Eupodiscaceae where it is placed by Hustedt (1929) and Cleve-Euler (1951).
- Cleve-Euler (1951) makes this a variety of *C. asteromphalus*.
- Holmes and Reimann (1966) have shown that three morphological phases occur in the life cycle of *C. concinnus*. The post-auxospore valve is typical of *C. concinnus*, the pre-auxospore valve was previously undescribed, and the intermediate forms are typical of *C. grani*. This appears to confirm the views of the taxonomists Peragallo (1908: 425) and Pavillard (1931: 11) that *C. concinnus* and *C. grani* are not taxonomically distinct. However, Hendey (*in litt.*) has pointed out that the girdle of *C. grani* was described as simple and that of *C. concinnus* as complex (up to 12 annular rings), and the cells of *C. grani* are cuneate in girdle view. Holmes and Reimann do not appear to have examined the girdles of their specimens, and until this is clarified, the taxa are retained under their traditional epithets.
- Mis-spelt *excentricus* in Crosby and Wood (1958), Cassie (1961), and Moreira (1966). *C. excentricus* sensu A. Schmidt is a synonym of *Thalassiosira decipiens* (Grun. in van Heurck) Jørg.
- The taxonomy of the *C. gigas-janischii-pavillardii-walesii* complex is obscure. Some of them may turn out to be phase variations of a polymorphic species. R. W. Holmes (*in litt.*) finds that a clone of *C. walesii* undergoes considerable morphological modification with decreasing size. The components of this group are listed under their original determinations.
- Following Hustedt (1928), *Hyalodiscus* is used for those species which possess an umbilical line at about half the valve radius.
- Proskina-Lavrenko (1956) and Hasle (1960) have pointed out that the distinction between *Coscinosira* and *Thalassiosira* cannot be upheld.
- This family is still ill-defined in spite of the monograph by Boyer (1901). The treatment here follows Hendey (1964).
- Comb. nov.* See Appendix II. These two species are not *Triceratium* as understood here. Hendey (*in litt.*) suggested that they would fit best in *Biddulphia*.
- The specific name was originally *chinensis*, which is the spelling used by Crosby and Wood (1958) and Cassie (1960; 1961; 1966). Hendey (1964) corrected this orthographic variant to *sinensis* (which has been used by other authors as well) under the International Code (1952, Art. 82, p. 82).
- Mis-spelt *thamesis* by Crosby and Wood (1958) and Cassie (1960; 1961).
- Following Hendey (1964) this is restricted to species which possess cornutate processes and hexagonal areolation.
- Cassie (1961) and Cassie and Cassie (1960) regarded a form characteristic of surf beaches as a new species on the advice of Hendey, who commented that the differences between the New Zealand form and the English *C. armatum* were probably sufficient to justify a new species (flat valves with no circular foramen, short setae lacking basal spines, and no submarginal corona of spines). Earlier, this form had been assigned to *C. armatum*

- (Wood, Crosby and Cassie, 1959), and Cassie has now (1967, pers. comm.) reverted to that view.
14. A *Chaetoceros* sp. from Lyttelton Harbour in Wood, Crosby and Cassie (1959) is placed here by Cassie (1961).
 15. Schütt (1893) united *C. secundum* with *C. curvisetus* Cleve. Cleve-Euler (1951) has pointed out that the two species are distinct. Since *Chaetoceros* is a neuter noun, the specific name has been treated accordingly, following the original use of the name (see International Code (1952) Art. 83, Rec. 83A).
 16. Figured in Cassie (1961). A single-celled species, somewhat like *C. gracile* Schütt, but differing in having more deeply curved setae which appear to originate from the corners of the valve.
 17. Hendey (1964: 149) has raised this to the rank of a species.
 18. Mis-spelt *stolterforthii* by Crosby and Wood (1958).
 19. Mis-spelt *Dimerogramma* by Crosby and Wood (1959).
 20. Differs from the type in the lines of the diaphragm being very arched.
 21. These two species were merged by Boyer (1927) under *P. adriatica*, but Mann (1925) has shown them to be separate. The differences are figured by Hendey (1964, Plate 27).
 22. Separated from *Thalassiothrix* on the basis of the poles being isopolar and not heteropolar as in that genus. Electron microscopy (Hasle and de Mendola, 1967) has not shown any further differences between the two genera.
 23. The treatment of this family follows in the main that of Cleve (1894-95).
 24. *Comb. nov.* See Appendix II.
 25. *Gyrosigma* is distinguished from *Pleurosigma* by the striae which in the former cross at right angles, and in the latter cross obliquely.
 26. Distinguished from *Navicula* by the presence of a loculiferous rim attached to the inside of the girdle. This often disappears during acid cleaning, when the valves are indistinguishable from *Navicula*.
 27. Cleve's (1894-95) treatment of this genus is supplemented by that of Hustedt (1961; 1962; 1964) in so far as it has been published.
 28. Crosby and Wood (1959) give Petit's record of *N. retusa* de Bréb. as a synonym of *Pinnularia ambigua* Cleve. In 1877 *N. retusa* would refer to *N. retusa* de Bréb. (1854) and not to *N. retusa* de Bréb. in Cleve (1883), which latter is the synonym of *P. ambigua*.
 29. Differs from the type in having a slightly constricted middle and slightly capitate ends.
 30. This is the variety figured by Schmidt (1874a, plate 3, fig. 2, p. 92).
 31. Wood (1961) has noted that the Australasian forms of this species do not have the striae extending to the extremities as does the northern hemisphere form. The var. *quadratum* is a broadly rhombic phase, and Hendey's (1964) experience is that it is always found with the type with intermediates, suggesting that it is not genetically distinct.
 32. Separated from *Pleurosigma* by its bow-shaped raphe.
 33. Hendey (1964: 236) has examined the type slide of *Stauroneis pulchella* W. Sm. and found it to be *Trachyneis aspera* var. *aspera*. Cleve based his variety on *S. pulchella*, and it therefore falls into synonymy. The taxon *T. aspera* var. *pulchella* of Peragallo (1897-1908) is not the same taxon, and has been designated *T. aspera* var. *elliptica* by Hendey (1964: 236).
 34. Cleve (1895) makes this a synonym of *A. terroris*. Hendey (1964) keeps them separate.
 35. *Nom. nov.* See Appendix II.
 36. Of the three forms, the oval, fusiform, and triradiate, the fusiform is the most common in the Leigh area.
 37. The transfer to *Cylindrotheca* by Reimann and Lewin (1964) was based on electron microscopy. Hasle (1964) has doubts about the advisability of the transfer without further study.
 38. *Hantzschia* is separated from *Nitzschia* because the raphe-bearing keels occupy adjacent margins of the frustule. Lauritis, Hemmingsen and Volcani (1967) found *Nitzschia alba* to produce *Hantzschia* type daughter cells, and suggest that the two genera may not be distinct.
 39. Cassie (pers. comm.) says that most of her records are probably of *N. pseudoseriata*.
 40. The type is from the Auckland Islands, not Auckland as stated in Wood (1959).

APPENDIX II—NEW COMBINATIONS

Four new combinations have become necessary as the result of this work. They are validated below by the synonymy and references.

Biddulphia brachiolatum (Brightw.) Taylor

Triceratium brachiolatum Brightw. *Quart. J. micr. Sci.* 1. P. 4, fig. 2, p. 228 (1853).

Biddulphia picturatum (Grev.) Taylor

Triceratium picturatum Grev. *Trans. micro. Soc.*, n.s., 14, Pl. 9, fig. 18, p. 83 (1866).

Diploneis smithii (de Bréb.) Cleve var. *minor* (Petit) Taylor

Navicula smithii de Bréb. var. *minor* Petit, *Fonds de la Mer* 3. 25 (1877).

Amphora foveauxiana Taylor

Amphora schmidtii Petit, *Fonds de la Mer* 3. 17 (1877).

Amphora sp. A. Schmidt, *Atlas der Diat.* Pl. XXVII, fig. 51 (1875).

Non *Amphora schmidtii* Grun., *Atlas der Diat.* Pl. XXVII, fig. 2, 3 (1875).

APPENDIX III—FRESHWATER SPECIES RECORDED FROM MARINE HABITATS

A number of freshwater species have been recorded from marine or presumed marine habitats. These presumed marine habitats are those from which the majority of records in the same paper are of marine diatoms. The list is in alphabetical and not systematic order.

Achnanthes inflata Kütz.—Andersons Bay, W2.

Asterionella formosa Hass.—Waitarere Beach, CC.

Asterionella gracillima (Hantz.) Heib.—Hauraki Gulf, C1; Wellington Harbour, C1; Cook Strait, C1; Kaikoura, C1.

Cocconeis placentula Ehrenb. var. *lineata* (Ehrenb.) Cleve—Lyll Bay, P.

Cyclotella stelligera Cleve & Grun.—Waitati, W2; Anderson's Bay, Otago Harbour, W2.

Cymbella aspera Ehrenb.—Waitati, W2.

C. ehrenbergi Kütz.—Bruce's Rocks, Dunedin, W2.

C. parva W. Sm. var. *hungarica* (Grun.) Cleve—Manukau Harbour, W1.

Epithemia muelleri Fricke—Waitati, W2.

Fragilaria virescens Ralfs ex Pritch.—Bruce's Rocks, Dunedin, W2.

Frustulia amphipleuroides (Grun.) Cleve (*F. rhomboides* (Ehrenb.) de Toni, var. *amphipleuroides* Grun.)—Evansdale, W2.

Gomphoneis herculeanum (Ehrenb.) Cleve—Company Bay, Otago Peninsula, W2.

G. mamilla (Ehrenb.) Cleve—Dunedin, W1.

G. manilla Ehrenb.—Waitati, W2.

Gomphonema constrictum Ehrenb.—Evansdale, W2.

Melosira crenulata (Ehrenb.) Kütz.—Hauraki Gulf, C1; Wellington Harbour, C1; New Plymouth/Kawhia, C2.

M. granulata (Ehrenb.) Ralfs ex Pritch. var. *angustissima* O. Müll.—Hauraki Gulf, C1; Wellington Harbour, C1, C2; Cook Strait, C1; Kaikoura, C1.

M. roeseana Rabenh.—Bruce's Rocks, Dunedin, W2.

Neidium affine Ehrenb. var. *undulata* (Grun.) Cleve—Lyll Bay, P.

Pinnularia nodosa Ehrenb.—St. Leonards, W2.

Stauroneis acuta W. Sm.—Foveaux Strait, P.

S. anceps Ehrenb.—Bruce's Rocks, Dunedin, W2; St Leonards, W2; Evansdale, W2.

S. fulmen Brightw. var. *capitata* Heid.—Bruce's Rocks, Dunedin, W2.

S. phoenicenteron Ehrenb.—Waitati, W2; Milford (Temuka), W2.

Stenopterobia intermedia (Lewis) Hust. (*Surirella intermedia* Lewis)—Wellington Harbour, W1; Lyll Bay, P; Waitarere Beach, CC; Portobello, W2.

Synedra ulna (Nitzsch.) Ehrenb. (incl. *S. salina* W. Sm.)—Auckland Harbour, CW2; Wellington Harbour, C1; Bruce's Bay (? misprint for Bruce's Rocks), W2; Foveaux Strait, P.

S. vaucheriae Kütz.—Hooper's Inlet, Portobello, W2.

Surirella rattrayi A. Schmidt—Evansdale, W2.

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