# REPORT FROM THE "OSHORO MARU" ON OCEANOGRAPHIC AND BIOLOGICAL INVESTIGATIONS IN THE BERING SEA AND NORTHERN NORTH PACIFIC IN THE SUMMER OF 1955

## IV. Diatom Associations as Observed by Underway Samplings[1)]

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## I. Introduction

During the cruise of the "Oshoro Maru" which participated in the Norpac project from June to August 1955, samples of surface plankton were taken while the ship was underway (Motoda & Fujii, 1956). Sixty-five stations were occupied on the outgoing track from Hakodate, Japan, to Seattle, Washington, U.S.A., with the ship following a meandering course through the greater part of the Bering Sea. On the homebound course samples were taken at thirty-seven stations directly traversing the North Pacific (Fig. 1). The instrument employed was the Handy Underway Plankton Catcher, Model II (Motoda, 1954), installed with a small conical net made of fine-meshed bolting silk, XX 13 (approximately 0.094 mm mesh size). It was not equipped with a current meter, so that exact quantitative studies were not possible. The approximate volume and weight of catches calculated for 20 minutes' tow have been given in the *Data Record* of that cruise (Anonymous, 1957, pp. 99-105).

The present studies have attempted to observe how the composition of diatom associations differs with localities, and to look for a relationship between the characteristics of the diatom associations and those of water masses. Since the analysis of oceanographic data on the 1955 cruise has not been completed, it is necessary to refer to the work of Uda (1935), Watanabe (1954), Fleming (1955) and Mishima & Nishizawa (1955) which deal with the hydrography of the various localities in the North Pacific and the Bering Sea.

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## II. Results of Observations

Relative abundance of important species of diatoms in the samples is expressed in percentage of total diatoms present (Sts. 1-49 in Table 1, Sts. 50-65 in Table 2, and

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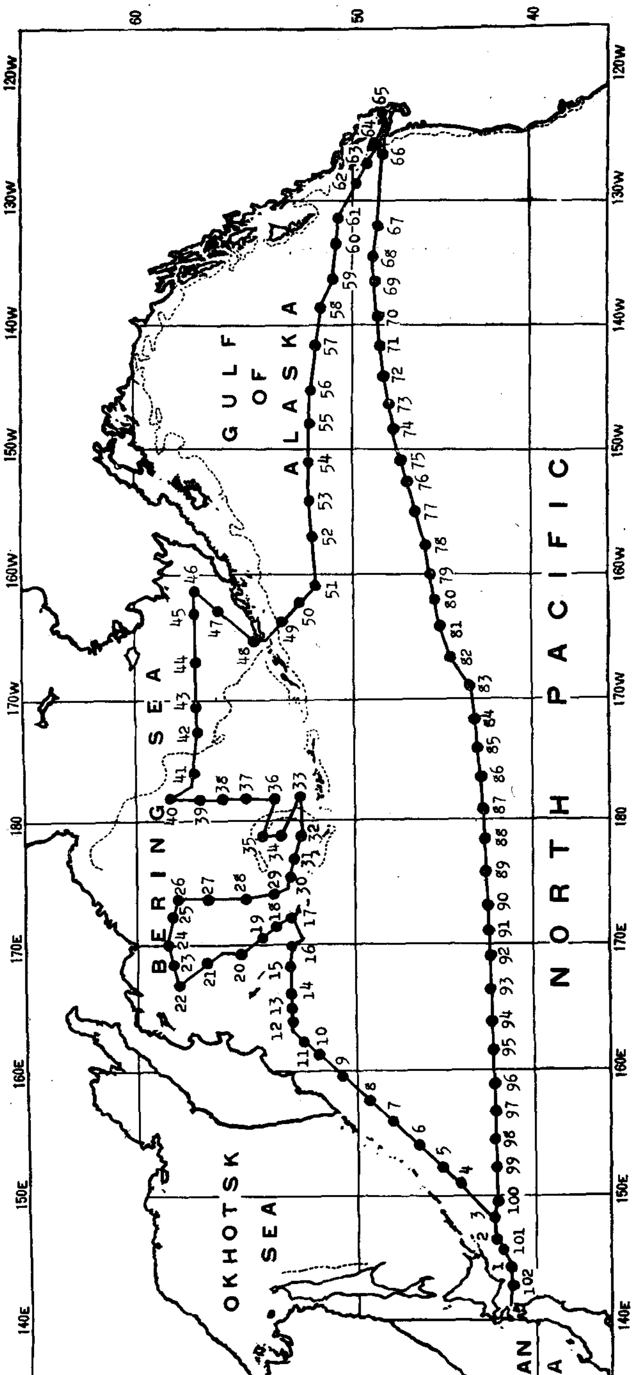


Fig. 1. Stations of underway plankton sampling occupied by "Oshoro Maru" on 1955 cruise

Sts. 66-102 in Table 3).

(1) Off Hokkaido (St. 1)

Oceanic species such as *Chaetoceros atlanticus* and *Rhizosolenia hebetata* f. *semispina* are most abundant, together comprising more than 70 per cent. The cold oceanic character of the water is reflected.

(2) Southeast off Kurile Islands (Sts. 2-9)

Similar associations are found, but the difference from St. 1 is the greater number of *Thalassiothrix longissima* and *Coscinodiscus* spp., reflecting the prevalence of cold Oyashio water. The similarity in plankton associations at these stations to those in western Bering Sea (ref. (3)) suggests that the Oyashio Current, at least a portion of it, is flowing from the Bering Sea (cf. Kawarada & Ohwada, 1957).

(3) Kamchatka side of the western Bering Sea (Sts. 11-13, 21, 22)

*Thalassiothrix longissima* is exceedingly dominant. In addition, a few *Rhizosolenia hebetata* f. *hiemalis* are present. They are representatives of cold oceanic water.

(4) South of Komandorskii Islands (Sts. 14, 15)

Differing from above-mentioned oceanic areas, the cold oceanic form, *Phaeoceros*, is more abundant (about 40%) than *Thalassiothrix*.

(5) Western Bering Sea from Cape Olyutorskii to Rat Islands and southeast of Kamchatka (Sts.10, 16–20, 23–28)

Southeast of Kamchatka (St. 10) and south of Cape Olyutorskii (Sts. 23–28) are exclusively dominated by subgenus *Hyalochaete* which is composed of *Chaetoceros debilis*, *Ch. radicans*, *Ch. compressus*, *Ch. seiracanthus*, *Ch. furcellatus* and *Ch. decipiens*. This fact indicates that these areas are strongly affected by cold neritic water. The associations in the west (Sts. 16–20) are represented by *Nitzschia seriata* with a certain number of *Hyalochaete*, this also indicating the neritic character of water.

(6) Western Aleutian Waters (Sts. 29–32)

Differing considerably from the previous reports in which *Hyalochaete* was mentioned as being most dominant in these waters (Aikawa, 1940; Motoda & Kawarada, 1955; Kawarada, 1957), the present observations show mixed associations of subgenus *Phaeoceros*, subgenus *Hyalochaete*, *Nitzschia seriata*, *Thalassiothrix longissima*, and *Denticula* sp. Among them, subgenus *Phaeoceros* is most numerous (about 40%); it is mainly composed of *Chaetoceros atlanticus*. Composition of associations varied considerably by stations.

(7) Amchitka passage (Sts. 33, 36)

Amchitka Passage is densely populated by subgenus *Hyalochaete* in which *Chaetoceros debilis* is the most dominant constituent. *Rhizosolenia hebetata* f. *semispina* comprises about one-fifth of the total population. The dominance of neritic species and the density of the total population indicate the prevalence of neritic water.

(8) Central portion of the Bering Sea (Sts. 34, 35, 37–39, 41)

Sts. 34, 35, 37, 38 are located on the two sides of Bowers Bank; both sides are populated by *Rhizosolenia hebetata* f. *hiemalis* and *Thalassiothrix longissima*. On the other hand, *Rh. heb.* f. *semispina* is prevalent at St. 39, accompanied by *Chaetoceros concavicornis*. The form, *semispina*, is also prevalent at St. 41, but is accompanied by *Nitzschia seriata*. From this it is suggested that there is a trend towards the more oceanic types, progressively from south to north, on both sides of Bowers Bank.

(9) Northern Bering Sea (Sts. 40, 42)

St. 40 is populated by neritic associations such as *Hyalochaete* and *Nitzschia seriata*, showing a certain resemblance to the western area (Sts. 16–20), while St. 42 is populated by *Hyalochaete* and *Denticula* sp., showing oceanic influence (see discussion).

(10) Eastern Bering Sea and Bristol Bay (Sts. 43–47)

On the continental shelf of the eastern Bering Sea, the leading representative of diatom associations is subgenus *Phaeoceros*, in which *Chaetoceros concavicornis* is dominant, followed by *Ch. atlanticus*, *Coscinodiscus* spp., *Rhizosolenia hebetata* f. *semispina* and f. *hiemalis*. In addition, in the inner part of Bristol Bay, *Melosira sulcata* is important, constituting slightly less than one-fifth of the total (Sts. 46,47). The dominance of the above-named diatoms indicates prevalence of cold water of oceanic nature at these stations.

(11) Around Unimak Island (Sts. 48, 49)

This area is characterized by a rich population of the neritic *Hyalochaete*, in which *Chaetoceros radicans* comprises more than 60 percent of the total. This is a proof of the prevalence of neritic water, which is probably supplied from the Alaskan coast.

(12) Gulf of Alaska (Sts. 50-63)

The Gulf of Alaska in general is occupied by such oceanic species as are found in the Bering Sea. The major constituents are *Rhizosolenia hebetata* f. *semispina*, *Nitzschia seriata*, *Chaetoceros concavicornis*, *Ch. convolutus*, *Thalassiothrix longissima*, *Coscinodiscus* spp., *Denticula* sp. and *Fragilaria* spp. Sts. 50 and 51, located just south of Unimak Island, are entirely populated by *Rhizosolenia hebetata* f. *semispina* and *Nitzschia seriata*, while Sts. 61 and 62, more to the eastward, are dominated by *Phaeoceros*, and St. 63 by *Fragilaria* spp. These findings are considerably different from the data of Allen (1927), which indicated that the neritic species such as *Chaetoceros debilis*, *Ch. socialis*, *Skeletonema costatum* and *Eucampia zoodiacus* were common in the surface catches from Unimak Island to Vancouver Island in 1923.

(13) Strait of Juan de Fuca and Puget Sound (Sts. 64, 65).

Diatom associations are represented by *Skeletonema costatum*, *Coscinodiscus* spp. and *Thalassiosira* spp., indicating the neritic character of water. The first and the last species were previously reported from the adjacent waters of Puget Sound as representative constituents (Allen, 1924, 1927, 1930).

(14) Off Vancouver Island (Sts. 66, 67)

*Skeletonema costatum* and *Phaeoceros*, chiefly constituted of *Chaetoceros concavicornis* and *Ch. convolutus*, are representatives.

(15) Eastern portion of North Pacific (Sts. 68-81)

On the course between 133°W and 165°W oceanic diatoms are prevalent, among which *Nitzschia seriata* is the most abundant constituent at Sts. 68-72, followed by *Denticula* sp. and far less number of *Chaetoceros debilis*, *Ch. decipiens* and *Ch. seiracanthus*. *Thalassiothrix longissima* is most dominant at Sts. 73-81, together with *Coscinodiscus marginatus*, *Cos.* spp., *Chaetoceros atlanticus*, *Skeletonema costatum* and *Rhizosolenia styliformis* in certain numbers.

(16) Western portion of North Pacific (Sts. 82-95)

On the course from St. 82 to St. 91, i.e., from 160° W to 170°E, *Nitzschia seriata* is predominantly abundant; these stations are characterized by the appearance of warm water forms of *Phaeoceros*, such as *Chaetoceros peruvianus*, *Ch. coarctatus* (St. 90) and *Ch. dadayi* (St. 91). Although these forms occur only in small numbers, their appearance may indicate that there is an influence of warm current. On the other hand, ***Skeletonema costatum, Denticula*** sp., ***Nitzschia seriata*** and ***Rhizosolenia hebetata*** f. ***semispina*** compose the greater part of the populations at Sts. 92–95, from 171°E to 160°E, with the exception of St. 93 where ***Chaetoceros concavicornis*** was exclusively found.

(17) More western portion of North Pacific (Sts. 96–102)

The course including Sts. 96, 97 and 101 is populated by ***Hyalochaete***, consisting of such warm water species as ***Chaetoceros lorenzianus, Ch. didymus, Ch. messanensis*** and ***Ch. decipiens***, which comprise as much as 75 percent of the total populations. These species have been reported to be common in coastal Kuroshio water near Japan (Marumo, 1957), and therefore, their occurrence may indicate the invasion of Kuroshio water at these stations. On the other hand, at Sts. 98–100, sandwiched between above stations, populations are exclusively composed of ***Nitzschia*** inclusive of ***seriata, closterium*** and ***longissima***. At St. 100 ***Denticula*** sp., ***Chaetoceros peruvianus*** and ***Skeletonema costatum*** are also included. Thus these stations (Sts. 98–100) are of cold water nature.

The westernmost station (St. 102) is dominated by ***Thalassionema nitzschioides***, and warm water oceanic forms, such as ***Chaetoceros coarctatus, Climacodium Frauenfeldianum*** and several species of ***Hyalochaete***. This probably indicates the influence of the warm Tsugaru Current flowing out from Tsugaru Straits.

## III. Discussion

In the Bering Sea and Kurile waters, the present samples, in general, include cold water diatoms that have been reported previously (Cleve, 1883; Aikawa, 1932, 1935, 1936; Kanno, 1936; Aikawa, 1938, 1940; Yanagisawa, 1942; Tsuruta & Chiba, 1954; Motoda & Kawarada, 1955; Marumo, 1956).

Cleve (1883) reported a number of pennate diatoms from East Cape, west coast of Bering Straits, but these diatoms are scarce in the present offshore samples. ***Rhizosolenia hebetata*** f. ***hiemalis*** is known to prefer colder water when compared with another form, ***semispina***. It is found in the present observations that the former form is restricted to the cold region in the Kurile Chain area and the Bering Sea, as has been reported by Marumo (1956).

The microplankton observations based upon dip-water samplings made on the present cruise have been reported by Kawarada (1957). There are some inconsistencies between his data and the present observations. He reported that the western Bering Sea is widely dominated by ***Nitzschia seriata***, showing neritic nature of water, but in the present underway samples the populations of diatoms are greatly dominated by ***Thalassiothrix longissima*** on Kamchatka side. Also in the central portion of the Bering Sea, ***Rhizosolenia hebetata*** f. ***semispina*** and ***hiemalis*** and also ***Thalassiothrix longissima*** are predominant in the present samples, while Kawarada (1957) reported that *Denticula* sp. is widely prevalent there. Dominance of this species is found only at St. 42 in the present observations. These inconsistencies may have resulted from differences in depth of samplings. The present samples were obtained with the underway sampler which may have been towed at a depth of several feet, while the samples by dipping were collected at the very surface.

On the other hand, the results obtained by net hauls of 0–50 meters on hydrographic stations of the present cruise also vary greatly from the results of both the underway samplings and dip-water samplings (Karohji, 1958). Comparing the data obtained from the three sampling methods used on this cruise, it is suggested that: (1) *Hyalochaete* tends to be concentrated in the surface layer, decreasing in the subsurface water, as observed near the south of Cape Olyutorskii (Sts. 23–28) and also at Amchitka Passage (Sts. 33, 36); (2) *Chaetoceros didymus* occurs scarcely in the surface water around Unimak Island (Sts. 47, 48) but in greater abundance in subsurface water, and (3) at St. 10 *Chaetoceros furcellatus* predominates in rather deep water, and does not appear at the surface (cf. St. Os 13, in Kawarada, 1957). The last species is known as a boreo-arctic form and thus as a shade form in the southern area.

From the results of the present observations, it is suggested that the neritic areas represented by *Hyalochaete* cover (1) southeast of Kamchatka, (2) western Bering Sea from Cape Olyutorskii to Rat Islands (along longitude 174°E), (3) Amchitka Passage, (4) central portion (Sts. 40, 42) of northern Bering Sea and (5) coast of Alaska Peninsula (Sts. 48–49). Among them the areas southeast of Kamchatka (1) and western Bering Sea (2) are cold regions as suggested by the presence of a boreo-arctic species, *Chaetoceros furcellatus*. Moreover, the area in the western Bering Sea populated by a neritic form *Nitzschia seriata*, is suggested to be somewhat different in nature from other neritic areas.

Oceanic nature of water is suggested in areas such as: (1) Kamchatka side of western Bering Sea as represented by *Thalassiothrix longissima*, (2) central Bering Sea as represented by *Thalassiothrix longissima* and *Rhizosolenia hebetata*, and (3) eastern Bering Sea and Bristol Bay as represented by *Phaeoceros*.

There is found a restricted area south of the Komandorskii Islands where an isolated population of *Phaeoceros* exists. Kawarada (1957) also observed such isolation of cold nature association in this area and suggested that an upwelling of deep cold water may be taking place.

Along the course between latitudes 41°N and 49°N in the North Pacific, diatom associations are in general of the cold water type as far as to longitude 160°E from the west coast of North America. Marumo (1955) reported similar associations along latitude 40°N for about the same range of longitudes in May–June 1954.

According to the statement of Fleming (1955), general patterns of water masses in the northern Pacific are considered as follows:

Boreal Zone: Kamchatka - Kurile coastal region
Western gyral region
American coastal region
Alaskan coastal region
Alaskan gyral region
Subarctic Zone: Subarctic water region

From the present observations on the surface microplankton, the nature of water in the above masses may be discussed as follows: (1) in the region of mixing of Kuroshio and Oyashio, west of long. 159°E, the Kuroshio component exceeds the Oyashio component in the areas 157°E-159°E and around 146°E as reflected by the prevalence of the warm water forms of *Hyalochaete*. In the waters between 146°E and 157°E the diatom associations are represented by *Nitzschia* spp., *Denticula* sp., *Skeletonema costatum* and some others which indicate the prevalence of the Oyashio component. (2) Subarctic water which covers the greater part of the North Pacific, 131°W-162°E, is indicated by the presence of cold oceanic diatoms, but there is a warm oceanic diatom association in the region between 172°E and 166°W indicating the invasion of the Kuroshio extension. These facts possibly reflected the meandering of Kuroshio extension. (3) The region of the Alaskan gyral is represented by cold water *Phaeoceros*, as in the region of Subarctic water. The associations of diatom there indicate that the water is much colder than in the Subarctic water region. Fleming (1955) stated that the Subarctic water splits into northern and southern branches off America approximately at 50°N in the summer. The course of the ship ranging between 49°N and 52°N may correspond to the northern portion of the Subarctic water mass. (4) The Puget Sound region is represented by neritic diatoms as reported by Allen (1924, 1927, 1930).

## IV. Summary

The distribution of diatoms in the surface waters of the Bering Sea and the northern North Pacific was observed from materials obtained by underway samplings on the "Oshoro Maru" cruise in the summer of 1955.

Oceanic populations are prevalent in Kurile waters and in the westernmost part, central part and on the eastern shallow shelf of the Bering Sea. The representative species are *Thalassiothrix longissima*, *Rhizosolenia hebetata*, *Denticula* sp., *Coscinodiscus* spp., and *Phaeoceros* (mainly *Chaetoceros atlanticus*, *Ch. concavicornis* and *Ch. convolutus*).

Neritic populations are observed in the western part and north-central part of the Bering Sea, east of southern Kamchatka, and on the coast of Alaska Peninsula in Bristol Bay. The representatives are *Hyalochaete*, consisting of *Chaetoceros debilis*, *Ch. radicans*,

*Ch. seiracanthus, Ch. furcellatus* and *Ch. decipiens. Skeletonema costatum* is dominant on the coast of the State of Washington.

Mixed associations of oceanic and neritic forms are found in the western Aleutian waters.

The greater part of the northern North Pacific is also occupied by cold oceanic diatom associations which include *Nitzschia seriata* as a representative species. In addition, *Skeletonema costatum* is common in the western portion.

Warm water forms of *Hyalochaete* (*Chaetoceros lorenzianus, Ch. didymus, Ch. messanensis*) and several other warm water species are prevalent west of longitude 159°E. However, *Nitzschia* associations (*N. seriata, N. closterium* and *N. longissima*) are found in a certain isolated place, indicating the invasion of cold water.

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Table 1. Relative abundance of diatom species in each sample - Kurile waters and the Bering Sea (percent of cell number)

| Species \ Station no. | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| Corresponding no. of hydrographic station (Os) | | | | | | | | | | |
| *Biddulphia aurita* (Lyngbye) Brebisson | | | | | | | | | | |
| *Chaetoceros atlanticus* Cleve | 65 | 5 | 7 | 2 | 4 | 22 | 3 | 1 | 6 | 1 |
| *Ch. concavicornis* Mangin | | | | | | | | | | |
| *Ch. convolutus* Castracane | 5 | 1 | 3 | 4 | 1 | | | | | |
| *Ch. compressus* Lauder | | | | | | | | | | |
| *Ch. constrictus* Gran | | | | | | | | | | 4 |
| *Ch. debilis* Cleve | | | | | | | | | | 45 |
| *Ch. decipiens* Cleve | | | | | | | | | | |
| *Ch. didymus* Ehrenberg | | | | | | | | | | |
| *Ch. furcellatus* Bailey | | | | | | | | | | 6 |
| *Ch. distans* Cleve | | | | | | | | | | 1 |
| *Ch. radicans* Schütt | | | | | | | | | | 2 |
| *Ch. seiracanthus* Gran | | | | | | | | | | 2 |
| *Ch. subsecundus* (Grunow) Hustedt | | | | | | | | | | |
| *Ch.-Hyalochaete* spp. | | | | | | | | | | |
| *Corethron hystrix* Hensen | 1 | | 1 | | | | | | 3 | 2 |
| *Coscinodiscus excentricus* Ehrenberg | | | | | | | | | | |
| *Cos. oculus-iridis* Ehrenberg | | | | | | | | | | |
| *Cos. marginatus* Ehrenberg | | | | | | | | | | |
| *Cos.* spp. | 2 | 8 | 46 | 76 | 48 | 13 | 18 | 8 | 27 | 2 |
| *Denticula* sp. | 2 | 7 | 2 | + | 1 | 6 | 1 | 2 | 1 | |
| *Fragilaria oceanica* Cleve | | | | | | | | | | |
| *F.* spp. | | | | | | | | | | |
| *Melosira sulcata* (Ehrenberg) Kützing | | | | | | | | | | |
| *Nitzschia seriata* Cleve | | | | | | | | | | |
| *N. longissima* (Brebisson) Ralfs | | | | | | | | | | |
| *N. closterium* W. Smith | | | | | | | | | | |
| *N. delicatissima* Cleve | | | | | | | | | | |
| *Rhizosolenia alata* Brightwell | | | | | | | | | | |
| *Rh. alata* f. *inermis* (Castracane) Hustedt | | | | | | | | | | |
| *Rh. alata* f. *curvirostris* Gran | | | | | | | | | | |
| *Rh. imbricata* Brightwell | 1 | + | + | | 1 | + | | | | |
| *Rh. hebetata* f. *semispina* Gran | 24 | 1 | 2 | | 2 | 1 | | | | |
| *Rh. hebetata* f. *hiemalis* Gran | | 7 | 2 | 4 | 3 | 4 | 3 | 4 | 8 | |
| *Rh. flagilissima* Bergon | | | | | | | | | | |
| *Skeletonema costatum* (Greville) Cleve | | | | | | | | | | |
| *Stephanopyxis nipponica* Gran & Yendo | | + | | | | | | | | |
| *Thalassiosira decipiens* (Grunow) Jörgensen | | | | | | | | | | |
| *Th. nordenskiöldii* Cleve | | | | | | | | | | |
| *Th.* spp. | | | | | | | | | | |
| *Thalassiothrix longissima* Cleve & Grunow | | 70 | 37 | 14 | 40 | 55 | 75 | 85 | 55 | 35 |
| *Tropidoneis* spp. | + | | | | | | | | | |

| Species \ Station no. | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
|---|---|---|---|---|---|---|---|---|---|---|
| Corresponding no. of hydrographic station (Os) | | | | 4 | 5 | 6 | 7 | 8 | | 9 |
| *Biddulphia aurita* (Lyngbye) Brebisson | | | | | | | | | | |
| *Chaetoceros atlanticus* Cleve | 2 | 2 | 3 | 3 | 2 | 1 | 1 | | 12 | 6 |
| *Ch. concavicornis* Mangin | | | | 25 | 6 | | | | | |
| *Ch. convolutus* Castracane | 1 | 3 | 2 | 11 | 30 | 15 | 10 | 10 | | |
| *Ch. compressus* Lauder | | | | | | | | | | |
| *Ch. constrictus* Gran | | | | | | | | | | |
| *Ch. debilis* Cleve | | | | | | 2 | 23 | 15 | | |
| *Ch. decipiens* Cleve | | | | | | 3 | | 1 | | |
| *Ch. didymus* Ehrenberg | | | | | | | | 1 | | |
| *Ch. furcellatus* Bailey | | | | | | 2 | | | | |
| *Ch. distans* Cleve | | | | | | | | | | |
| *Ch. radicans* Schütt | | | | | | | 2 | 1 | | |
| *Ch. seiracanthus* Gran | | | | | | | | 1 | | |
| *Ch. subsecundus* (Grunow) Hustedt | | | | | | | | | | |
| *Ch.-Hyalochaete* spp. | | | | 1 | | | | | | |
| *Corethron hystrix* Hensen | | 3 | 1 | 3 | 4 | 1 | | | | |
| *Coscinodiscus excentricus* Ehrenberg | | | | | | | | | | |
| *Cos. oculus-iridis* Ehrenberg | | | | | | 1 | | | 2 | 2 |
| *Cos. marginatus* Ehrenberg | | | | 1 | | | | | | |
| *Cos.* spp. | 2 | 1 | | | | | | | | 2 |
| *Denticula* sp. | 13 | 6 | 22 | 21 | 3 | 13 | 1 | 3 | 12 | 9 |
| *Fragilaria oceanica* Cleve | | | | | | | | | | |
| *F.* spp. | | | | | | | | | | 17 |
| *Melosira sulcata* (Ehrenberg) Kützing | | | | | | | | | | |
| *Nitzschia seriata* Cleve | | | 6 | 3 | 22 | 67 | 50 | 60 | 20 | |
| *N. longissima* (Brebisson) Ralfs | | | | | | | | | | |
| *N. closterium* W. Smith | | | | | | | | | | |
| *N. delicatissima* Cleve | | | | | | | | | | |
| *Rhizosolenia alata* Brightwell | | | | | | | | | | |
| *Rh. alata* f. *inermis* (Castracane) Hustedt | | | | | | | | | | |
| *Rh. alata* f. *curvirostris* Gran | | | | | | | | | | |
| *Rh. imbricata* Brightwell | | | | | | | | | | |
| *Rh. hebetata* f. *semispina* Gran | | | | 1 | | 1 | | 1 | 2 | |
| *Rh. hebetata* f. *hiemalis* Gran | 2 | 1 | | 1 | | 1 | | 2 | 6 | 6 |
| *Rh. flagilissima* Bergon | | | | | | | | | | |
| *Skeletonema costatum* (Greville) Cleve | | | | | | | | | | |
| *Stephanopyxis nipponica* Gran & Yendo | | | | | | | | | | |
| *Thalassiosira decipiens* (Grunow) Jörgensen | | | | | | | | | | |
| *Th. nordenskiöldii* Cleve | | | | | | | | | | |
| *Th.* spp. | | | | | | | | | | |
| *Thalassiothrix longissima* Cleve & Grunow | 81 | 84 | 66 | 30 | 32 | 35 | 14 | 5 | 46 | 58 |
| *Tropidoneis* spp. | | | | | | | | | | |

| Species \ Station no. | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 |
|---|---|---|---|---|---|---|---|---|---|---|
| Corresponding no. of hydrographic station (Os) | 10 | 11 | | 12 | | 13 | | 15 | 16 | 17 |
| *Biddulphia aurita* (Lyngbye) Brebisson | | | | | | | | | | |
| *Chaetoceros atlanticus* Cleve | 1 | 1 | 5 | | 1 | 2 | 2 | 1 | 37 | 22 |
| *Ch. concavicornis* Mangin | 1 | | | | | 6 | 4 | | | |
| *Ch. convolutus* Castracane | 1 | | 2 | 19 | 3 | 12 | 3 | 2 | | |
| *Ch. compressus* Lauder | | | 3 | 2 | 14 | 12 | 3 | 3 | 2 | + |
| *Ch. constrictus* Gran | | | | | | | | | | |
| *Ch. debilis* Cleve | | | 24 | 30 | 20 | 10 | 17 | 28 | 11 | 2 |
| *Ch. decipiens* Cleve | 1 | 1 | 3 | 6 | 4 | 4 | 12 | 1 | 1 | 1 |
| *Ch. didymus* Ehrenberg | | | | | | | | | 2 | |
| *Ch. furcellatus* Bailey | | | | 16 | 14 | 20 | 9 | + | | |
| *Ch. distans* Cleve | | | | | | | | 2 | 2 | 1 |
| *Ch. radicans* Schütt | | | | 2 | | 2 | | | 2 | |
| *Ch. seiracanthus* Gran | 1 | | | 2 | 3 | 3 | | 13 | 3 | 2 |
| *Ch. subsecundus* (Grunow) Hustedt | 1 | | 2 | 8 | 5 | | | | | |
| *Ch.-Hyalochaete* spp. | | | | 8 | 14 | | 5 | 1 | 3 | 2 |
| *Corethron hystrix* Hensen | | | | | | | | | | |
| *Coscinodiscus excentricus* Ehrenberg | | | | | | | | | | |
| *Cos. oculus-iridis* Ehrenberg | | | | | | | | | | |
| *Cos. marginatus* Ehrenberg | | | | | | | | | | |
| *Cos.* spp. | 2 | 1 | 6 | 1 | 1 | 5 | | | | |
| *Denticula* sp. | 5 | 2 | 5 | 1 | | 2 | 20 | 1 | 11 | 18 |
| *Fragilaria oceanica* Cleve | | | | | | | | | | |
| *F.* spp. | | | | | | | | | | |
| *Melosira sulcata* (Ehrenberg) Kützing | | | | | | | | | | |
| *Nitzschia seriata* Cleve | 1 | 3 | | 2 | | | 8 | 47 | 9 | 29 |
| *N. longissima* (Brebisson) Ralfs | 1 | 3 | | 2 | | | 3 | 1 | | |
| *N. closterium* W. Smith | | | | | | | | | | |
| *N. delicatissima* Cleve | | | | | | | 5 | | | |
| *Rhizosolenia alata* Brightwell | | | | | | | | | | 2 |
| *Rh. alata* f. *inermis* (Castracane) Hustedt | | | | 1 | 14 | | | | | |
| *Rh. alata* f. *curvirostris* Gran | | | | | | | | | | |
| *Rh. imbricata* Brightwell | | | | | | | | | | 2 |
| *Rh. hebetata* f. *semispina* Gran | | | | | | | | | 7 | 5 |
| *Rh. hebetata* f. *hiemalis* Gran | + | 1 | | | | | | | 1 | 4 |
| *Rh. flagilissima* Bergon | | | | | | | | | 2 | |
| *Skeletonema costatum* (Greville) Cleve | | | | | | | | | | |
| *Stephanopyxis nipponica* Gran & Yendo | | | | | | | | | | |
| *Thalassiosira decipiens* (Grunow) Jörgensen | | | | | | | | | | |
| *Th. nordenskiöldii* Cleve | 1 | | | + | 1 | | | | | |
| *Th.* spp. | | | | | | | | | | |
| *Thalassiothrix longissima* Cleve & Grunow | 84 | 91 | 50 | 2 | 6 | 17 | 9 | + | 6 | 10 |
| *Tropidoneis* spp. | | + | | | | | | | | |

| Species \ Station no. | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 |
|---|---|---|---|---|---|---|---|---|---|---|
| Corresponding no. of hydrographic station (Os) | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 |
| *Biddulphia aurita* (Lyngbye) Brebisson | | | | | | + | | | | |
| *Chaetoceros atlanticus* Cleve | 17 | 44 | 2 | 12 | 14 | + | 5 | 2 | 11 | 1 |
| *Ch. concavicornis* Mangin | | | | | | + | | | 26 | |
| *Ch. convolutus* Castracane | | | | | | + | | | | 3 |
| *Ch. compressus* Lauder | | | | | | 2 | | | | |
| *Ch. constrictus* Gran | | | 2 | | | 2 | | | | 1 |
| *Ch. debilis* Cleve | 14 | + | 42 | + | 2 | 54 | 1 | | | 42 |
| *Ch. decipiens* Cleve | | | | | | | | | | 1 |
| *Ch. didymus* Ehrenberg | | | | | | | | | | |
| *Ch. furcellatus* Bailey | | | | | | | | | + | 3 |
| *Ch. distans* Cleve | | | 1 | | | 1 | | | | |
| *Ch. radicans* Schütt | | | 6 | | | 4 | + | | | 3 |
| *Ch. seiracanthus* Gran | | | 7 | | | 8 | | | | 3 |
| *Ch. subsecundus* (Grunow) Hustedt | | | | | | 2 | | | | 9 |
| *Ch.-Hyalochaete* spp. | 2 | 1 | | 1 | | | | | | |
| *Corethron hystrix* Hensen | | | | | | + | | | | 1 |
| *Coscinodiscus excentricus* Ehrenberg | | | | | | | | | | |
| *Cos. oculus-iridis* Ehrenberg | | | | | | | | | | |
| *Cos. marginatus* Ehrenberg | | | | | | | | | | |
| *Cos.* spp. | | | | 4 | | + | | 11 | | 1 |
| *Denticula* sp. | 15 | 10 | | 3 | 12 | | 5 | 6 | 7 | 1 |
| *Fragilaria oceanica* Cleve | | | | | | | | | | |
| *F.* spp. | | | | | | | | | + | |
| *Melosira sulcata* (Ehrenberg) Kützing | | | | | | | | | | |
| *Nitzschia seriata* Cleve | 15 | 1 | 3 | 1 | 14 | | 8 | | + | 29 |
| *N. longissima* (Brebisson) Ralfs | | | + | | | + | + | | | |
| *N. closterium* W. Smith | | | | | | + | | | | |
| *N. delicatissima* Cleve | | | | | | | | | | |
| *Rhizosolenia alata* Brightwell | | + | + | | | | | | | |
| *Rh. alata* f. *inermis* (Castracane) Hustedt | 2 | | | | 2 | | | | 4 | |
| *Rh. alata* f. *curvirostris* Gran | | | | | | | | | | |
| *Rh. imbricata* Brightwell | + | | | | | + | | | | |
| *Rh. hebetata* f. *semispina* Gran | 10 | 2 | 35 | 4 | 3 | 26 | 2 | 3 | 39 | |
| *Rh. hebetata* f. *hiemalis* Gran | 3 | 26 | 1 | 68 | 35 | | 26 | 34 | | |
| *Rh. flagilissima* Bergon | | | | | | | | | | |
| *Skeletonema costatum* (Greville) Cleve | | | | | | | | | | |
| *Stephanopyxis nipponica* Gran & Yendo | | | | | | + | | | | |
| *Thalassiosira decipiens* (Grunow) Jörgensen | | | | | | | | | | |
| *Th. nordenskiöldii* Cleve | | | | | | | | | | |
| *Th.* spp. | | | | | | | | | | |
| *Thalassiothrix longissima* Cleve & Grunow | 17 | 15 | | 8 | 18 | + | 48 | 54 | 13 | 2 |
| *Tropidoneis* spp. | | | | | | | | | | |

| Species \ Station no. | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 |
|---|---|---|---|---|---|---|---|---|---|
| Corresponding no. of hydrographic station (Os) | | | 29 | 30 | 31 | 32 | 33 | 34 | 35 |
| *Biddulphia aurita* (Lyngbye) Brebisson | | | | | | 2 | | | |
| *Chaetoceros atlanticus* Cleve | 4 | 3 | | | 3 | 5 | 11 | 1 | 8 |
| *Ch. concavicornis* Mangin | | | 91 | 76 | 30 | 30 | 21 | + | |
| *Ch. convolutus* Castracane | 2 | 7 | | | | | | + | 1 |
| *Ch. compressus* Lauder | | | | | | | | | |
| *Ch. constrictus* Gran | | | | | | | | 4 | |
| *Ch. debilis* Cleve | 4 | | | | | | | 4 | |
| *Ch. decipiens* Cleve | | | | | | | | 1 | 1 |
| *Ch. didymus* Ehrenberg | | | | | | | | 2 | |
| *Ch. furcellatus* Bailey | | | | | | | | | |
| *Ch. distans* Cleve | | | | | | | | | |
| *Ch. radicans* Schütt | 2 | 59 | | 1 | | | | 57 | 63 |
| *Ch. seiracanthus* Gran | | | | | | | | | |
| *Ch. subsecundus* (Grunow) Hustedt | | | | | | | | 1 | |
| *Ch.-Hyalochaete* spp. | | | | | | | | | |
| *Corethron hystrix* Hensen | 5 | | | | | | 3 | | |
| *Coscinodiscus excentricus* Ehrenberg | | | | | | | | | |
| *Cos. oculus-iridis* Ehrenberg | 11 | | | | | | | | |
| *Cos. marginatus* Ehrenberg | | | | | | | | | |
| *Cos.* spp. | | | 8 | 10 | 23 | 40 | 39 | 8 | 13 |
| *Denticula* sp. | 2 | 22 | | | | | | 1 | 1 |
| *Fragilaria oceanica* Cleve | | | | | | | | | |
| *F.* spp. | | | | | | | | | |
| *Melosira sulcata* (Ehrenberg) Kützing | | | | | | 18 | 14 | | |
| *Nitzschia seriata* Cleve | 35 | 2 | | + | | | | 1 | |
| *N. longissima* (Brebisson) Ralfs | | | | | | | | | |
| *N. closterium* W. Smith | | | | | | | | 1 | |
| *N. delicatissima* Cleve | | | | | | | | | |
| *Rhizosolenia alata* Brightwell | | | | | | | | | |
| *Rh. alata* f. *inermis* (Castracane) Hustedt | | | | + | | | | | |
| *Rh. alata* f. *curvirostris* Gran | | | | | | | | | |
| *Rh. imbricata* Brightwell | | | | | | 1 | | | |
| *Rh. hebetata* f. *semispina* Gran | 24 | 2 | | 8 | 5 | 2 | | 16 | 8 |
| *Rh. hebetata* f. *hiemalis* Gran | 3 | 2 | 1 | 3 | 10 | 1 | | + | |
| *Rh. flagilissima* Bergon | | | | | | | | | |
| *Skeletonema costatum* (Greville) Cleve | | | | | | | | 1 | |
| *Stephanopyxis nipponica* Gran & Yendo | | | | | | | | | |
| *Thalassiosira decipiens* (Grunow) Jörgensen | | | | | | | | + | |
| *Th. nordenskiöldii* Cleve | | | | | | | | | |
| *Th.* spp. | | | | | | | | | |
| *Thalassiothrix longissima* Cleve & Grunow | 6 | 3 | | 1 | 30 | | 10 | 2 | 5 |
| *Tropidoneis* spp. | 2 | | | | | | | | |

Table 2. Relative abundance of diatom species in each sample – Gulf of Alaska (percent of cell number)

| Species \ Station no. | 50 | 51 | 52 | 53 | 54 | 55 | 56 | 57 | 58 | 59 | 60 | 61 | 62 | 63 | 64 | 65 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Corresponding no. of hydrographic station(Os) | 36 | 37 | | | | | | | | | | | | | | |
| *Chaetoceros atlanticus* Cleve | 1 | | 2 | 2 | 2 | 2 | 5 | 3 | | | | | | | | |
| *Ch. concavicornis* Mangin | | 4 | 14 | 39 | 27 | 3 | 2 | 5 | 11 | 10 | 17 | 83 | 56 | 3 | 1 | + |
| *Ch. convolutus* Castracane | 5 | 5 | 7 | | 8 | 1 | | 4 | | | | 13 | 18 | 1 | | |
| *Ch. compressus* Lauder | | | | | | | | | | | | | | | | 1 |
| *Ch. constrictus* Gran | | 1 | | | | | | | | | | | | | | + |
| *Ch. debilis* Cleve | 12 | 8 | | | | | | | | | | | | | | 2 |
| *Ch. radicans* Schütt | | 1 | | | | | | 1 | | | | | | | 1 | 1 |
| *Corethron hystrix* Hensen | | | 1 | | | | | | 2 | | | | | | | |
| *Coscinodiscus* spp. | | | 1 | | | | 24 | 8 | 4 | 2 | 14 | | + | 1 | 93 | 16 |
| *Denticula* sp. | 12 | 1 | 26 | 42 | 42 | 47 | 18 | 3 | 3 | 3 | 7 | | 20 | 3 | | + |
| *Eucampia zoodiacus* Ehrenberg | | | | | | | | | | | | | | | | 1 |
| *Fragilaria oceanica* Cleve | | | | | 1 | 3 | | | | | | | 1 | 75 | | |
| *F.* spp. | | | | | 1 | | 6 | | 6 | 3 | 11 | | | | | |
| *Licmophora* spp. | | | | | | | | | 3 | | | | | | | |
| *Nitzschia seriata* Cleve | 52 | 42 | 43 | 16 | 16 | 30 | 19 | 21 | 27 | 63 | 16 | 2 | 4 | 16 | | + |
| *N. longissima* (Brebisson) Ralfs | | | | | | | + | | | | 3 | | + | | | + |
| *N. delicatissima* Cleve | | | | | | 4 | | | | | | | | | | |
| *N. paradoxa* (Gmelin) Grunow | | | | | | 5 | | | | | | | | | | |
| *Rhizosolenia alata* Brightwell | | | | | | | + | | + | | | | | | | |
| *Rh. alata* f. *inermis* (Castracane) Hustedt | | 1 | 1 | | | | | | + | | | | | | | |
| *Rh. alata* f. *curvirostris* Gran | | | | | | | | | + | | | | | | | |
| *Rh. styliformis* Brightwell | | + | + | | | | | | + | | 5 | | | | | |
| *Rh. hebetata* f. *semispina* (Hensen) Gran | 8 | 37 | 4 | 1 | 2 | 5 | + | 2 | 2 | 1 | | | | 1 | | |
| *Rh. hebetata* f. *hiemalis* Gran | | + | 1 | | + | | + | | 1 | | | | | | | |
| *Skeletonema costatum* (Greville) Cleve | | | | | | | | | | | | | | | 5 | 31 |
| *Thalassiosira decipiens* (Grunow) Jörgensen | | | | | | | | | | | | | | | | 45 |
| *Th. nordenskiöldii* Cleve | | | | | | | | | | | | | | | | 2 |
| *Thalassiothrix longissima* Cleve & Grunow | | | | | 1 | | 26 | 53 | 39 | 18 | 23 | 2 | | | | |
| *Tropidoneis* spp. | | | | | | | | | | | 4 | | | | | |

Table 3. Relative abundance of diatom species in each sample – northern North Pacific (percent of cell number)

| Species \ Station no. | 66 | 67 | 68 | 69 | 70 | 71 | 72 | 73 | 74 | 75 | 76 | 77 | 78 | 79 | 80 | 81 | 82 | 83 | 84 | 85 | 86 | 87 | 88 | 89 | 90 | 91 | 92 | 93 | 94 | 95 | 96 | 97 | 98 | 99 | 100 | 101 | 102 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Chaetoceros atlanticus* Cleve | | | 1 | | | | | 1 | 14 | 21 | 4 | 1 | 1 | 6 | 2 | | | 1 | | | 1 | | | 1 | | | | | 1 | | | | | | | | |
| *Ch. atlanticus* v. *neapolitana* (Schröder) Hustedt | | | 2 | | | | | | | | | | | | 1 | | | | | | | | | | | | | | | | 1 | | | | | | |
| *Ch. concavicornis* Mangin | 41 | 2 | 6 | 2 | 2 | 5 | 5 | | 2 | 1 | 1 | 1 | 3 | 1 | 2 | 7 | 3 | 1 | 3 | 2 | 10 | | 2 | 4 | 10 | 2 | 5 | 28 | 1 | 3 | | | 1 | | 2 | | |
| *Ch. convolutus* Castracane | | | | | | | 2 | | | | | + | | | | | 1 | | | 2 | 1 | | | | | | | | | | | | 1 | | | | |
| *Ch. coarctatus* Lauder | | | | | | | | | | | | | | | | | | | | | | | | | 2 | | | | | | | | | | | | 3 |
| *Ch. peruvianus* Brightwell | | | | | | | | | | | | | | | | | | 5 | 5 | 26 | 3 | | 2 | 4 | 3 | | | | | | 2 | 1 | | 2 | 12 | | |
| *Ch. dadayi* Pavillard | | | | | | | | | | | | | | | | | | | | | | | | | | 4 | | | | | 1 | + | | | | 5 | |
| *Ch. affinis* Lauder | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 7 | |
| *Ch. constrictus* Gran | | | | | | | | | | | | | | | | | | | | | 1 | | | | | | | | | | | | | | | | |
| *Ch. debilis* Cleve | | 1 | 2 | | | | 3 | | | | | | | | | | | | | | 3 | | | | 1 | | | | | | | | 2 | | 2 | | |
| *Ch. decipiens* Cleve | | | | | | | 3 | | | | | | | | | | | | | | | | | | | | | | | | | 3 | | | | | |
| *Ch. didymus* Ehrenberg | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 9 | | | | 22 | 3 |
| *Ch. lorenzianus* Grunow | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 29 | 62 | | | 5 | 16 | 2 |
| *Ch. messanensis* Castracane | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 2 | 3 | | | | | |
| *Ch. paradoxum* Cleve | | | | | | | | | | | | | 1 | | | | | | | | | | | | | | | | | | | | | | | | |
| *Ch. radicans* Schütt | | | | | | | 2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| *Ch. seiracanthus* Gran | | | 2 | | | | | | | | | | 1 | | | | | | | | 5 | | | | | | | | | | | | | | | | |
| *Ch.-Hyalochaete* spp. | | | 7 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| *Climacodium Frauenfeldianum* Grunow | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 9 |
| *Coscinodiscus excentricus* Ehrenberg | | | 3 | | | | | | | 1 | 1 | 1 | + | | 1 | | | | | | | | | | | | 2 | 1 | | 2 | | | 1 | | | | |
| *Cos. lineatus* Ehrenberg | | | | | | | + | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| *Cos. radiatus* Ehrenberg | | | | | | | 2 | | | | | | | | | | | | 1 | | | | | | | | | | | 3 | | | | | | | |
| *Cos. oculus-iridis* Ehrenberg | | | | | | | | | 1 | | 1 | | 1 | | | | | | 1 | | | | | | | | | | | | | | 1 | | | | |
| *Cos. marginatus* Ehrenberg | | | | | | 1 | 2 | 3 | | 11 | 2 | 5 | 5 | 7 | 18 | 2 | | | | + | | 2 | | 1 | | 4 | | | | | | | | | | | |
| *Cos.* spp. | 7 | 17 | 6 | | 2 | | | 1 | 8 | | 1 | + | | 2 | + | | 1 | | 1 | | 1 | | | | | | | 2 | | 3 | | | | | | | |
| *Denticula* sp. | | 6 | 7 | 14 | 46 | 17 | 10 | 5 | | 5 | 1 | 2 | 4 | 6 | 1 | 1 | 4 | 1 | 13 | | 3 | 2 | 7 | 2 | 2 | 4 | | 28 | 22 | 2 | | | 5 | | 37 | | |
| *Eucampia zoodiacus* Ehrenberg | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 2 | | | | | | | | |
| *Fragilaria oceanica* Cleve | | | | | | | | | | | | | | | | 1 | | | | | | | | | | | | | | | | | | | | | |
| *F.* spp. | | | | | | | | 2 | | | 1 | | | | 2 | 1 | 1 | | | | | 6 | 2 | 2 | | | 15 | 4 | | 4 | | | 7 | | | | |
| *Melosira Borreri* Greville | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 3 | | |
| *Nitzshia seriata* Cleve | 2 | 10 | 36 | 69 | 31 | 47 | 34 | 6 | 17 | 3 | 1 | 1 | 4 | 2 | 1 | 3 | 50 | 60 | 54 | 21 | 21 | 44 | 25 | 5 | 10 | 20 | 20 | 5 | 16 | 27 | 44 | 10 | 57 | 18 | 26 | 11 | 3 |
| *N. longissima* (Brebisson) Ralfs | | | 4 | | | | | | | | | | | | | | | 1 | 4 | 2 | | 1 | | | | | | | 2 | | 4 | 2 | 1 | 54 | | 4 | 3 |
| *N. closterium* (Ehrneberg) W. Smith | | | 3 | | | | | | | | | | | | | | | + | | | | | | | | | | | | | 3 | 1 | | 26 | | | 20 |
| *N. delicatissima* Cleve | | | 13 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| *Planktoniella sol* (Wallich) Schütt | | | | | | | | | | | | | | | | | | | | | | | | | + | + | | | | | | | | | | | |
| *Rhizosolenia alata* Brightwell | | 1 | | | | | 1 | | | | | | | | | 2 | | 1 | + | 1 | + | | | 27 | 3 | 2 | 1 | | | 5 | | | 1 | | 1 | 8 | |
| *Rh. alata* f. *inermis* (Castracane) Hustedt | | | | | | | | | | | | | | | | | | | | | | | | | | | 1 | | | | | | | | | | |
| *Rh. alata* f. *curvirostris* Gran | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 3 | | | | | | | |
| *Rh. styliformis* Brightwell | | 11 | 7 | 2 | 1 | 1 | | | | 3 | 1 | 1 | | 9 | 4 | 20 | 3 | 1 | 1 | + | | | | | | | 2 | | 2 | 5 | | | 1 | | 1 | | |
| *Rh. imbricata* Brightwell | | | | | | | | | | | | | | | | | | | | | | | | | | | 1 | | | | | | | | | | |
| *Rh. hebetata* f. *semispina* (Hensen) Gran | | | | | 1 | 1 | 1 | 1 | | 1 | | | | | | | | | 1 | | 2 | | | | 1 | 2 | | 3 | 9 | 4 | | | 4 | | 2 | 17 | |
| *Rh. hebetata* f. *hiemalis* Gran | | | | | | | | 1 | | 1 | | | | | | | | | | | 1 | | | | | | | | | | | | 1 | | | | |
| *Rh. calcar-avis* M. Schültze | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | + | | | | 10 | |
| *Skeletonema costatum* (Greville) Cleve | 50 | 36 | | | | | | | | | | 4 | 1 | | 2 | 10 | 4 | 3 | | 2 | 1 | 2 | | 4 | 10 | 6 | | 10 | 39 | 33 | | | | | 8 | | |
| *Stephanopyxis nipponica* Gran & Yendo | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 4 | | | | |
| *Thalassionema nitzschioides* Grunow | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 57 |
| *Thalassiosira decipiens* (Grunow) Jörgensen | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 1 | | |
| *Th. nordenskiöldii* Cleve | | 12 | | | | | | | | | | | | | | | | | | | | | | | | | | | 1 | 4 | | | | | | | |
| *Th.* spp. | | 4 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| *Thalassiothrix longissima* Cleve & Grunow | | | 1 | 13 | 17 | 28 | 35 | 80 | 51 | 53 | 85 | 84 | 79 | 66 | 76 | 53 | 33 | 26 | 16 | 43 | 47 | 43 | 62 | 52 | 56 | 56 | 53 | 19 | 4 | 2 | 14 | 8 | 12 | | | | |

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