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THE PLANKTON OF THE WEST COAST OF VANCOUVER ISLAND,
BRITISH COLUMBIA

Author

H.C. Williamson and G. H. Wailes

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The Plankton of the West Coast of Vancouver Island,
British Columbia

by

H.C. Williamson and G.H. Wailes
Pacific Biological Station, Nanaimo, B.C.

In connection with the investigation of the pilchard and herring fisheries along the west coast of Vancouver island, a study was made of the plankton in order to obtain some information concerning the productivity of the area with respect to the smaller organisms forming the basis of the food cycle. During the years 1927, 1928 and 1929 there were collected over a thousand samples of plankton many of which were taken for quantitative determinations. The present report deals with the material in a qualitative way only. The first author is responsible for the hydrographical data and the collection of the plankton samples. The second author is responsible for the identifications of the plankton organisms and the general account of them.

The only previous report on the plankton of this region is that by McMurrich (1916) who collected off Barkley sound and Nootka in 1912. Since the material reported upon in the present paper was collected, Hart and Wailes (1932) published an account of the food of the pilchard, Sardinops caerulea, which is a plankton feeding fish, and thereby contributed additional records of species for the area.

Methods.

The method adopted for taking plankton samples was to tow 6 nets attached to a long line, in pairs of one fine and one coarse net, the length of the line and the weights on it being so adjusted that the upper nets towed at or near the surface, then a pair at 5 to 10 fathoms depth and another pair at 10 to 15 fathoms; sometimes tows were made at greater depths, down to 40 or 50 fathoms. After January 1, 1928, fifteen minutes was the length of time during which the nets were towed. At the conclusion of the tow, vertical hauls were made with fine and coarse nets from a maximum depth of 100 fathoms. Closing nets were not used.

The fine nets were made of either mainsack or tarantulle, with a 12-inch diameter opening (equal to 7.3 square decimetres); the coarse nets were made of marquisette, and 30 inches in diameter (equal to .4559 square metres).

During the year 1927, various sized nets were used and towed for various lengths of time. In that year also, hauls with a coarse net were made by Mr. W.F. Baxter in Kyuquot sound from May to July, and by Mr. C. McC. Mottley with a fine net in Esperanza inlet during August. In all cases the samples of plankton were immediately preserved in formalin after being washed out from the nets.

By means of an Ericsson water bottle, fitted with a self-registering thermometer, samples of water were taken and the specific gravity, temperature, and pH recorded for different depths for each tow.

Hydrographical Conditions

The west coast of Vancouver island is considered as extending from cape Scott at its north-western extremity to Esquimalt harbour in the strait of Juan de Fuca. It is characterised by the large number of sounds that indent it, terminating in fiord-like inlets down whose precipitous shores run numerous small streams, torrents in winter and frequently mere trickles in late summer. These inlets have usually a depth of around 100 fathoms which is maintained nearly to their heads where the water shoals to more or less extensive tide flats, formed of the detritus brought down by a stream or small river. Consequently, great variations occur in the salinity of the water, the ocean water becoming less saline as an inlet is penetrated, until at the head the upper water will often have a layer of potable fresh water at the surface.

The tides rise 8 or 9 feet at neaps and 11 or 12 feet at springs, causing tidal currents of moderate strength except where narrows occur, when speeds of 6 or 8 knots may be attained. Off shore there is reported to be a constant current running north-west which is claimed to be stronger after winter storms but its speed and extent in width and depth have not been investigated.

The 100 - fathom contour line is about 35 miles off cape Beale, gradually approaching the coast until it is only 4 miles off cape Cook and about 7 miles off Triangle island.

The 1000-fathom contour line is some 60 miles off cape Beale and 20 miles off cape Cook. This may be taken as the edge of the continental shelf whence the bottom drops to the floor of the Pacific Ocean.

The farthest off-shore observations were 30 miles off Amphitrite point, 4 1/2 miles S. 20°W. of Solander island off cape Cook, and 3 1/2 miles north of Triangle island off cape Scott.

The temperature of the ocean surface water varies from about 7° to 8°C. in February to about 14°C. in August. In the inlets the range may be from 6° to 20°C. or more.

The following data taken outside the entrance to Barkley sound indicate the off-shore conditions there.

	off cape Beale February, 1928			off Amphitrite point May, 1928		
	T.	Sp. G.	pH	T.	Sp. G.	pH
Surface	8.1°		8.5	10.8°	23.9	8.5
2 fath.	8.0°	24.3	8.5	10.8°	23.6	8.6
5 "	8.3°	24.4	8.5	10.6°	23.6	8.6
10 "	9.0°	24.8	8.5	8.5°	24.0	8.1
25 "	9.1°	25.0	8.4			
35 "		25.1		7.3°	24.8	7.8
50 "	8.6°					

	off Amphitrite point July, 1928			off Amphitrite point December, 1928		
	T.	Sp. G.	pH	T.	Sp. G.	pH
Surface	14.2°	24.3	8.5	9.2°	24.6	8.3
2 fath.	13.7°	24.2	8.5	9.2°	24.3	8.3
5 "	11.6°	24.5	8.5	9.5°	24.6	8.3
10 "	9.6°	25.0	8.1	9.6°	24.8	8.3
25 "	8.7°	25.2	8.0	9.7°	25.0	8.3

The specific gravity figures are parts per thousand reduced to 15.6°C.

At depths from 50 to 100 fathoms the temperature varies from about 6° to 8°C. according to the time of year. Off Cape Cook at 200 fathoms the temperature was 5°C. (May 27, 1929).

The specific gravity of the off-shore water reduced to 15.6° varies from 1.023-25 at the surface to 1.025-27 at 50 fathoms depth.

The Plankton Material

The material which has been studied consisted of 1047 samples. The region from which it was collected may, for convenience, be divided into eight districts. The following are the number of samples taken in each and the periods covered:

Cape Scott: # 1/2 miles N. of Triangle island; 6 samples taken April 20, 1929.

Quatsino sound: from 4 miles off the entrance to the heads of the various arms; 161 samples from January 13, 1927, to July 25, 1929.

Cape Cook: off Solander island; 15 samples from September, 1928, to July 24, 1929.

Klaskish inlet; 7 samples on July 26, 1929.

Nasparti inlet: 4 samples on September 24, 1929.

Kyuquot sound: from off the entrance to the heads of the various inlets; 178 samples from April 4, 1927, to July 24, 1929.

Nootka area: Esperanza inlet north of Nootka island and Nootka sound, from off the entrance to heads of arms; 109 samples from July 12, 1927, to July 21, 1929.

Clayoquot sound: from off Estevan point to Wreck bay and to heads of inlets; 135 samples from August 12, 1927, to July 24, 1929.

Barkley sound: from 30 miles off Amphitrite point to off cape Beale and to heads of the various inlets and bays; 391 samples from January 25, 1927, to September 13, 1929.

Cape Flattery area: from Swiftsure bank to off Sheringham; 41 samples from February 23 to November 22, 1928.

The Plankton Organisms

The plankton organisms identified in the collections are given in the following lists. Obviously, in a field so vast, it has been impossible to give a balanced treatment throughout the various groups. The taxonomic status of some groups is much more advanced than that of others and until such time as more investigators are available, our knowledge of the numbers of species in certain groups must remain incomplete. The species comprised in the collections of fish larvae and ova, crustacean larvae, Appendicularia and Pteropoda have not yet been identified.

The authors wish to thank the following for the trouble and care they have taken in identifying specimens submitted to them.

Dr. H.H. Gran (Diatomaceae); Mrs. Edith Berkeley (Polychaeta); Mr. H.K. Haring (Rotifera); Mr. J.O. Malony (Isopoda); Dr. W.T. Calman and Dr. Isabella Gordon (Gumacea); Dr. W.L. Schmitt (Crustacea); Dr. W.M. Tattersall (Schizopoda); Prof. A. Willey, Mr. Andrew Scott and Miss M.H. Campbell (Gopepoda); Mr. Clarence R. Shoemaker (Amphipoda); Miss A. Berkeley (Natantia) and other workers at the Pacific Biological Station for their assistance.

Remarks on the Various Groups

Diatomaceae. Diatoms are abundant throughout the whole area except during the winter; in April, they become numerous and in May reacher their vernal maximum becoming less plentiful until they again increase during July to September. They are usually later in reacherg their greatest abundance within inlets than offshore but conditions in the inner channels are too diversified for general statements to be applicable.

The off-shore phytoplankton in summer consisted principally of species of Chaetoceros, three or four species forming the greater part of it, with other species of the genus present in smaller numbers. The predominant species were Chaetoceros decipiens, C. debilis, C. compressus and C. scolopendra. Others often present though in fewer numbers comprised C. lorenzianus, C. lacinosus, C. approximatus, C. didymus, C. densus and C. concavicornis; the two latter species and C. decipiens were noticeably persistent throughout the year and were often dominant in the sparse winter phytoplankton. Chaetoceros socialis was rarely observed.

The predominance (over 90%) of any one species in hauls was not of frequent occurrence but species so observed comprised Thalassiosira pacifica, T. nordenskioldi, Rhizosolenia alata, R. semispina, Skeletonema costatum, Coscinodiscus radiatus and Thalassiothrix longissima. In one instance when off-shore hauls were taken during July, 1929, at stations extending from Barkley sound to Nootka (80 miles) the predominant species in all the gatherings was Rhizosolenia alata. Four species recently described from this area by Gran (1931) were sufficiently numerous to give a distinctive character to the phytoplankton, they are Thalassiosira pacifica, Coscinodiscus wallei, Coscinodiscus angatii and Chaetoceros approximatus.

The species most frequently recorded, occurring probably in over 90% of the hauls were Ditylum brightwelli, Skeletonema costatum, Thalassiothrix nitzschoides, Chaetoceros decipiens, Thalassiosira pacifica, Coscinodiscus radiatus and Coscinodiscus excentricus; other species of very frequent occurrence are Asterionella japonica, Riddulphia arctica, E. aurita, E. longicurvis, Corethron hystrix, Eucampia zodiacus, Leptocylindrus danicus, Melosira moniliformis, Nitzschia seriata and Thalassiosira condensata. Pactyliosolen

mediterraneus was occasionally plentiful.

Species of the genus Thalassiosira were abundant, especially T. pacifica, but there was no evidence of their predominance in the plankton either over extensive areas or during lengthy periods. Biddulphia arctica was usually 3 or 4 sided but a pectagonal form occurred occasionally.

Other algae. Halosphaera minor, varying in diameter from 85 u to 250 u, occurred numerously but was seen most frequently during the winter months. It is a southern oceanic species that often drifts into northern latitudes.

A small unicellular alga, 3 u in diameter was abundant (January, 1928) in some of the bays in Barkley sound. It could not be identified in a preserved state and has been considered provisionally as ? Chlamydomonas. Its great abundance and small size may render it a valuable source of food for larval animals. Myxophyceae of fresh water origin occurred occasionally in the plankton but are not included in the list.

Dinoflagellata. The members of this subclass in the area under consideration belong almost wholly to the arctic and north temperate zones, only a very few southern species being present. In the list given, it will be noted that only four species belonging to the Gymnodinioidae (naked dinoflagellates) were recorded, this being undoubtedly due to their dissolution when placed in preservatives. In the strait of Georgia 26 species have been recorded (Fails, 1928) and there is no reason to suppose that these do not also occur in the West coast area. Of the five species here recorded from preserved samples, Gyrodinium glaucum although distorted was easily recognisable and the species of Polykrikos were occasionally identified by their nuclei and nematocysts.

Dinoflagellates were the cause of a large proportion of the more or less extensive areas of coloured water (up to 40 miles in extent) of which

samples were obtained; Noctiluca was the most frequent cause, other species were Peridinium trochoideum, Peridinium triquetra and in one instance Ceratium fusus accompanied by C. furca in lesser numbers. The only species predominant in the ordinary net collections were Noctiluca (frequently) and in a few cases Prorocentrum gracile, Ceratium fusus and C. furca but these latter only occurred when the gatherings did not exceed a few cubic centimetres in bulk; Prorocentrum gracile was the only species seen of that genus and it was present in a large proportion of the hauls. There was no evidence of the general prevalence at any time of a ceratium type of plankton; C. tripos was scarce, but the tripos group was fairly numerously represented by C. divaricatum and C. azoricum. Ceratium macroceros was common but never abundant while C. lineatum was common and generally distributed. Up the inlets, C. hirundinella, a fresh water species, occurred occasionally.

The species of Peridinium most frequently recorded were P. depressum and P. oblongum. They were also the most persistent being recorded during every month of the year. Peridinium divergens was scarce. Peridinium asperum was abundant in July and August. Two southern species namely Oxytoxum diplococcus var. fusiformis, and Podolempas palmipes are recorded, the former being seen often, the latter rarely.

Tintinnocinea. These were represented more or less numerously in nearly all the hauls, the species that occurred most frequently being Favella franciscana, Stenocemella ventricosa, Ptychocylis urnula, Parafavella gigantea and P. parumdentata. Tintinnus rectus was common while T. lusus-undae was rare. Species of the genus Dictyocysta were rare.

Copepoda. Thirty species were identified in the plankton hauls examined. Of these, twenty-three species have a circumpolar distribution. Of the remain-

ing eight species, Tortanus discaudatus (Herdman, 1898) occurs off the east and west coasts of North America; Euchaeta japonica in the North Pacific only; Paralabidocera amphitrites has been found in the Behring sea (Willey, 1920) and San Francisco bay (Esterly, 1924); Microsetella rosea ranges from the latitude of Vancouver island southwards in the Atlantic and Pacific oceans. Five species have up till now been recorded only from British Columbia waters, namely, Centropages mcMurrichi (Willey, 1920), Eurytemora transversalis (Campbell, 1930), Gandacia columbiae (Campbell, 1929), Corycaeus affinis (McMurrich, 1916) and Diosaccus spinatus (Campbell, 1929).

Acartia clausi was occasionally numerous in association with A. longiremis and more abundant than off the east coast of Vancouver island; Calanus tonsus is less plentiful on the west coast than on the east coast of Vancouver island; Eurytemora hirundoides occurred in only a few hauls; Paracalanus parvus was sometimes abundant and the dominant species in shallow hauls; Corycaeus affinis was plentiful in the deeper hauls throughout the area; C. anglicus was identified by Professor A. Willey in a haul from Quatsino sound. Oncaea borealis and O. subtilis were seldom seen. The most generally abundant species in shallow hauls were Acartia longiremis, Pseudocalanus elongatus, Oithona helgolandica and Centropages mcMurrichi, whilst in deep hauls Calanus finmarchicus was most numerous.

Schizopoda. Adults of this group were captured mostly in the period between January and July but larvae occurred throughout the year. The latter were especially numerous in some hauls made in May, September and October. Euphausia pacifica and Thysanoessa spinifera are the most abundant species throughout the area; Thysanoessa longipes is scarce but was found at Kyuquot, Nootka, and Barkley sounds. Necysis franciscorum was the only species obtained

in the single haul made off Cape Scott. It occurred also in Gutsino and Clayoquot sounds. Holmesiella anomala is rare but widely distributed, there were only one or two records of the other species in the list.

One or two new species were taken and these are being described by Dr. W.M. Tattersall in a forthcoming paper.

Amphipoda. The collection of these has not yet been completely worked over. Twenty species were identified and the remainder reserved for detailed examination, many of which are probably hitherto undescribed species.

The species most frequently found were Themisto abyssorum, Calliopius laeviusculus, Hyperia galba with Cyphocaris challengeri and Euprimno macropus. The three former are arctic and subarctic species with a southern limit about the latitude of Vancouver island; E. macropus is tropical and subtropical with a known range from 36°S. lat. to 49°N. lat.; Cyphocaris challengeri, first recorded from the North Pacific in 39°N. lat. (Stebbing, 1888), is a most abundant species here, especially at depths of 50 fathoms or more.

The record of Oxycephalus clausi is of interest as it is a tropical and subtropical species but is occasionally carried by currents as far north as off Ireland in the Atlantic and previously only recorded in the North Pacific from between Japan and Honolulu (Stebbing, 1888). Only two specimens were found here, both off the north end of Vancouver island.

The ranges of the above species are noted as they corroborate what is one of the outstanding features of the composition of the Vancouver Island marine fauna and flora, namely that here we have overlapping the most southerly limits of many arctic species and the most northerly limits of various subtropical and south temperate zone species.

General Discussion

The factors affecting the production and growth of plankton are very different offshore from those obtaining within the sounds. In the merittic area off the west coast of Vancouver island, the mineral substances are probably supplied by the influx of undepleted oceanic water either from seaward or by upwelling from below, supplemented by efflux of fresh water from the sounds. The latter may however already have been more or less depleted by the growth of plankton in the inner areas.

The sounds and inlets present very different conditions. There rivers and streams are constantly bringing down various mineral matters and producing favourable growth conditions for the phytoplankton. The shores are very extensive in proportion to the size of the bodies of water enclosed and so may not only contribute appreciably to the supply of mineral matters but by the decay of vegetation growing on them add soluble organic substances to the water. The tides ensure an admixture of ocean water. In addition to these natural factors there is an effluence of waste products from the various fishery plants which may be beneficial in enriching the water. The apparently abnormal amounts of diatoms in some hauls taken during the winter may possibly be accounted for by such enrichment of the water.

On the other hand many of the inlets are narrow with high steep shores and in consequence the hours of sunlight on the water are limited and the production of phytoplankton probably curtailed.

A large amount of data is now available as to the salinity and temperature of the various depths throughout the West coast area during most of the months for a period of two years or more and it may be possible to establish definite correlations when the material is completely studied. During some

years abnormal conditions may obtain. Thus in the autumn of 1926 and in the spring of 1927 oceanic surface temperatures were above normal along the coast and that period was signalised by a great influx of *Velella*, salps and other southern forms over the whole extent of the British Columbia coast. During the year 1929 these forms were not found.

It is hoped that the study may serve as a basis for future systematic, quantitative, distributional and ecological investigations.

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Diatomeae

- Melosira juergensi* Agardh
" *moniliformis* (Miller)
" *nusculoides* (Dillwyn)
" *sulcata* (Ehrenberg)
Hyalodiscus subtilis Bailey
" *stelliger* Bailey
Stephanopyxis nipponica Gran & Yenda
" *palmeriana* (Greville)
Skeletonema costatum (Greville)
Coscinosira polychorda (Gran)
Thalassiosira condensata Cleve
" *decipiens* (Grunow)
" *mordenskioidi* Cleve
" *rotula* Munier
" *pacifica* Gran
Coscinodiscus excentricus Ehrenberg
" *stellaris* Roper
" *radiatus* Ehrenberg
" *centralis* var. *pacifica* Gran
" *grani* Cough
" *subbuliens* Joergensen
" *wallesi* Gran
" *angstii* Gran & Angst
Planktoniella sol (Wallich)
Arachnoidiscus ehrenbergi Bailey

- Actinoptychus spleniens* (Shadbolt)
" *undulatus* (Bailey)
Asteromphalus heptactis (Brebisson)
Corethron hystrix Hensen
Dactyliosolen mediterraneus Peragallo
Lauderia annulata Cleve
Leptocylindricus danicus Cleve
" *minimus* Cleve
Rhizosolenia alata Brightwell
" " *f. gracillima* Cleve
" *fragilissima* Bergon
" *hebetata* Bailey
" *semispina* Hensen
" *stolterfothi* Peragallo
" *styliformis* Brightwell
Bacteriastrum delicatulum Cleve
Chaetoceros atlanticus Cleve
" *danicus* Cleve
" *concavicornis* Mangin
" *convolutus* Castracane
" *densus* Cleve
" *lorenzianus* Grunow
" *decipiens* Cleve
" *teres* Cleve
" *compressus* Cleve
" *didymus* Kirenberg

Chaetoceros diadema (Ehrenberg)

- " *affinis* Laufer
- " *approximatus* Gran
- " *vanheurcki* Gran
- " *lacinosus* Schütt
- " *similis* Cleve
- " *pseudocrinitus* Ostenfeld
- " *curvisetus* Cleve
- " *debilis* Cleve
- " *amstomosans* Grunow
- " *scolopendra* Cleve
- " *cinctus* Gran
- " *socialis* Lauder
- " *gracilis* Schütt

Eucampia zodiacus Ehrenberg

Ditylum brightwelli (West)

Biddulphia arctica Brightwell

- " *aurita* (Lyngbye)
- " *longicurvata* Greville
- " *pulchella* Gray
- " *roperiana* Greville

Isthmia nervosa Kutzing

Gerataulena bergoni Peragallo

Striatella unipunctata (Lyngbye)

Tabellaria flocculosa (Roth)

Lichmophora flabellata Smith

Diatoma vulgare Rory

Fragillaria capucina Desm

Thalassiothrix longissima C. & G.

" *nitzschioides* Grunow

Asterionella japonica Cleve

" *kariana* Grunow

Tropidoneis antarctica var. *polyplasta* Gran & Angst

Pleurosigma elongatum Smith

Navicula distans Smith

Nitzschia closterium Smith

" *delicatissima* Cleve

" *longissima* (Rebisson)

" *paradoxa* Grunow

" *seriata* Cleve

Homoecladia filiformis Smith

" *capitata* H.L.S.

Other Algae

Halosphaera minor Ostenfeld

Heliozoa

Heterophrys marina H. & L.

Acanthocystis spinifera Graciff

" *aculeata* H. & L.

Radiolaria

Acanthometron pellucidum Muller

Phormacantha histrix (Joergensen)

Plectacantha cikiskos Joergensen

Diethyophimus histricosus Joergensen

Lithomalissa setosa Joergensen

Challengeron depauperatum Wailes

Protocystis tridens (Haeckel)

" *aurita* Wallich

Chromulinidae

Dinobryon balticum Schutt

Silicoflagellidae

Dietyocha fibula Ehrenberg

Distephanus speculum (Ehrenberg)

var. *regularis* Lemmermann

var. *aculeatus* (Ehrenberg)

var. *septenarius* (Ehrenberg)

Distephanus octangulatus Wailes

" *pentagonus* Wailes

Ebria tripartita Burgert

Minoflagellina

Exuviella spora Schiller

Prorocentrum gracile Schutt

Gyrodinium glaucum Lebour

Torodinium robustum K. & S.

Polykrikos kofoidi Chatton

" *schwarzii* Ritschli

Noctiluca scintillans (Macartney)

Pseudophalacrocoma nasutum (Stein)

Phalacroma rotundatum C. & L.

Dinophysis acuminata C. & L.

" *acuta* Ehrenberg

" *ellipsoides* Kofoid

" *hastata* Stein

" *lenticulata* Pavillard

" *norvegica* C. & L.

" *parva* Schiller

" *tripos* Gourret

Glenodinium danicum Paulsen

Protoceratium reticulatum (C. & L.)

Gonyaulax alaskensis Kofoid

" *digitale* (Pouchet)

" *longispina* Lebour

" *polygramma* Stein

" *scrippsae* Kofoid

" *spinifera* (C. & L.)

" *triacantha* Joergensen

Peridiniopsis asymmetrica Mangin

" *rotunda* Lebour

Diplopeltopsis minor Lebour

" *var. occidentalis* Wailes

Peridinium thorianum Paulsen

" *triqueta* (Stein)

" *monospinum* Paulsen

" *minutum* Kofoid

" *discoides* Wailes

Peridinium avellana Meunier

- " *excentricum* Paulsen
- " *achromaticum* Levander
- " *conicoides* Paulsen
- " *conicum* (Gran)
- " *faeroense* Paulsen
- " *leonis* Pavillard
- " *pentagonum* Gran
- " *subinerme* Paulsen
- " *trochoideum* (Stein)
- " *depressum* Bailey
- " *saltans* Meunier
- " *oblongum* (Aurivillius)
- " *obtusum* Karsten
- " *claudicans* Paulsen
- " *punctulatum* Paulsen
- " *subpunctulatum* Wailes
- " *grani* Ostenfeld
- " *ovatum* (Pouchet)
- " *crassipes* Kofoid
- " *divergens* Ehrenberg
- " *brevipes* Paulsen
- " *cerasus* Paulsen
- " *decipiens* Joergensen
- " *micropium* Meunier
- " *monocanthus* Brock
- " *sub-curvipes* Lebour

Peridinium asperum Wailes

" *pallidum* Ostenfeld

" *pellucidum* (Bergh)

Minuscula bipes (Paulsen)

Pyrophacus horologicum Stein

Oxytoxum diploconus

var. *fusiformis* Okamura

Ceratium bucephalum (Cleve)

" *fuscus* (Ehrenberg)

" *furca* (Ehrenberg)

" *hirundinella* var. *carinthaceum* Zederbauer

" *lineatum* (Ehrenberg)

" *tripos* Müller

var. *atlantica* Ostenfeld

" *macroceros* (Ehrenberg)

" *longipes* (Bailey)

" *horridum* Gran

" *divaricatum* Lemmermann

" *azoricum* Cleve

" *pentagonum* Courret

Podolampas palmipes Stein

Tintinnoinea

Tintinnopsis bermudensis Brandt

" *beroides* Stein

" *cylindrica* Daday

" *karajacensis* Brandt

- Tintinnopsis laevigata* K. & C.
" *nitida* Brandt
" *parvula* Joergensen
" *sacculus* Brandt
" *wailesi* K. & C.
Stenosemella inflata K. & C.
" *nivalis* (Meunier)
" *pacifica* K. & C.
" *punctata* (Wailes)
" *steini* (Joergensen)
" *ventricosa* (C. & L.)
Helicostomella subulata (Ehrenberg)
" *kiliensis* (Laackmann)
Favella ehrenbergi (C. & L.)
" *franciscana* K. & C.
" *serrata* (Moebius)
Parafavella gigantea (Brandt)
" *parudentata* (Brandt)
Ptychocylis drygalskii Brandt
" *minor* Joergensen
" *urnula* (C. & L.)
Parundella lechmanni (Daday)
" *major* (Wailes)
" *minor* (Wailes)
" *translucens* (Wailes)
Proplectella columbiana (Wailes)

Dietyocysta elegans (Ehrenberg)

" *veticulata* K. & G.

Tintinnus lusus-undae Ertz

" *rectus* (Wailes

Salpingella acuminata (C. & L.)

Other Ciliate

Tiarina fusus (C. & L.)

Laboea acuminata Leegaard

" *conica* Lohmann

" *cornucopiae* Wailes

" *strobila* Lohmann

Incertum sedis

Trochiscia brachiolata (Moebius)

" *clevei* Lemmermann

" *moebiusi* Joergensen

" *dictyon* (Joergensen)

" *multispinosa* (Moebius)

" *ovata* (Pouchet)

Hydromedusae

Sarsia flammia Linko

" *mirabilis* Agassiz

Stomatoca atra Agassiz

Halimodusa typus Bigelow

Bougainvillia several species

Rathkea blumenbachii Rathke

Polyorchis penicillata Agassiz

Halistaurna cellularis (Agassiz)

Obelia several species

Clytia several species

Phialidium languidum

var. *gregarium* Agassiz

Aequorea aequorea Forskal

Gonionemus vertens Agassiz

Aglantha digitalis (Müller)

Aegina rosea Eschscholtz

Nineteen other species are recorded by Foerster (1923)
from this region.

Siphonophora

Velella lata C. & E.

Eiphyes appendiculata Eschscholtz

Coleolaria truncata (Sars)

Scyphomedusae

Chrysaora melanaster var. *gilberti* Kishinouye

Cyanea capillata Eschscholtz

Aurelia aurita (Linnaeus)

Ctenophora

Pleurobrachia pileus (Fabricius)

Chaetognatha

Sagitta elegans Verrill

" *lyra* Krohn

Polychaeta

Sagitella kowalewskii Wagner

Typhlogiola mulleri Busch

Annotrypene aulogaster Rathke

Nereis notomacula Treadwell

Spionid, Syllid, Polynoid and Magelona larval forms.

Rotifera

Keratella cruciformis (Thompson)

Notholca striata Muller

Synchaeta baltica Ehrenberg

Trichocera marina Daday

Cladocera

Evadne nordmanni Loven

" *turgestina* Claus

Podon leuckarti Sars

" *polyphemoides* Leuckart

Ostracoda

Conchoecia sp1 near *C. elegans* Sars

Copepoda

Calanus cristatus Kroyer

" *tonsus* Brody

- Calanus finmarchius* (Gunner)
Eucalanus elongatus (Dana)
Paracalanus parvus (Claus)
Pseudocalanus elongatus (Boeck)
Scolecithricella minor (Brody)
Microcalanus pusillus Sars
Actidius armatus (Boeck)
Euchirella rostrata (Claus)
Euchaeta japonica Marukawa
Centropages momurrichi Willey
Eurytemora hirundoides (Nordquist)
Eurytemora transversalis Campbell
Metridia longa (Lubbock)
" *lucens* Boeck
Candacia columbinae Campbell
Paralabidocera amphitrites McMurrich
Acartia clausi Giesbrecht
" *longiremis* (Lilljeborg)
Tortanus discaudatus (Thompson & Scott)
Microsetella rosea (Dana)
Harpacticus uniremis Kroyer
Idya fureata (Baird)
Diosaccus spinatus Campbell)
Oithona spirostris Claus
" *helgolandica* Claus
Corycaeus affinis McMurrich
" *anglicus* Lubbock

Oncaeca subtilis Giesbrecht

" *borealis* Sars

Cirripedia

Lepas hilli Leach

Lepas fascicularis E. & S.

Schizopoda

Ruphausia pacifica Holmes

Thysanoessa spinifera Holmes

" *longipes* Brandt

" *raschii* Sars

Holmesiella anomala Ortmann

Pseudosia truncatum Smith

Metherythrope robusta (Smith)

Neomysis franciscorum Holmes

" *macropsis* Tattersall

Cumacea

Leucon nasica (Kroyer)

Cumella vulgaris Hart

Amphipoda

Hyperia galba (Montagu)

Themisto abyssorum Boeck

Kurpinano macropus Guerin

Oxycephalus clausi Bovallius

Cyphocaris challengerii Stebbing

Ampelisca macrocephala Lilljeborg

Harpinia affinis Holmes
" *oculata* Holmes
Nicippe tumida (Bruzellius)
Westwoodilla caecula Bate
Monoculodes carinata Bate
Calliopus laeviusculus (Kroyer)
Melphidippa sp. near *goesi*
Eusirus leptocarpus Sars
Rhachotropis inflata (Sars)
" *helleri* (Boeck)
Pontogenia inermis (Kroyer)
Melita palmata (Montagu)
Mnera dubia Calman
Eurystheus tenuicornis (Holmes)

Also undetermined species belonging to the following genera:

Bathemedon, *Bruzellia*, *Dulichia*, *Erichthonius*, *Haliereion*, *Metopa*,
Monoculopsis, *Oediceropsis*, *Pardalissa*, *Phippsiella*, *Scina*,
Synchelidium, *Sympleustes* and *Syrrhoë*.

Decapoda

Pasiphaea pacifica Rathbun
Macrura, *Anomura* and *Brachyura* larvae

Pteropoda

Clione sp.
Helicina sp.

Appendicularia

Oikopleura dioica Fol

Fritillaria sp.

Salpides

Salpa mucronata Forskal

" maxima Forskal