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A QUANTITATIVE STUDY OF THE PLANKTON OF THE SHALLOW BAYS OF LAKE NIPIGON

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An intensive study of the stomach contents of fish in Lake Nipigon in 1921 (Clemens and others, 1923) had revealed the fact that the open-water plankton, with the exception of the crustacean, *Mysis relicta*, did not directly form a large item in the diet of the different species of fish inhabiting the lake. On the other hand, the shallow-water plankton was found to enter very extensively into the food of the young of all species of fish examined, and to some extent contributed to the food of larger fish. Therefore, the following year it was decided to extend the quantitative studies to the shallow-water plankton, in conjunction with the deep open-water investigations of a similar nature. The data for this preliminary report were collected by the writer during the summers of 1922 and 1923. Briefly, the purpose of this investigation may be summed up as follows: to obtain some idea (1) of the quantity of the net plankton, its distribution, and the limiting factors involved; and (2) of the relation between fish and food supply. With this end in view a permanent station, Station V, was located at the foot of Pijitawabic Bay (Orient Bay) in 1922. In 1923 three stations, V, VI, and VII, were maintained in this bay, and for purposes of comparison plankton catches were taken in several other bays widely distributed, so as to include as many different conditions as possible.

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Methods of Obtaining and Enumerating

Plankton catches were made by means of a vertical closing net, which consisted of an upper truncated cone of heavy cotton, and a lower straining cone of No. 20 silk bolting cloth. When thoroughly shrunken, this silk gauze possesses more than 6,000 meshes per square centimetre with the area of the openings varying from 0.001 sq. mm. to 0.003 sq. mm. The lower end of the straining cone bore a cylindrical metal bucket to which was attached a removable piece of silk bolting cloth. In making a haul in water of considerable depth, the net was lowered (by means of a small steel cable wound on a windlass), slowly at first, in order to allow the net to fill with water that had filtered through the bolting cloth. In this way any abnormal amount of plankton (which might occur on a surface rich in plankton) was prevented from filling the net without first being strained. Theoretically, on the way down the net took in no water except what was filtered through the silk bolting cloth, and on the way up it filtered a column of water, the cross-section of which was that of the opening of the guard, and the height of which was equal to the distance through which the net was drawn. For depths of approximately 20 metres the net was hauled through a 5-metre stratum for each catch, the rate being about one-half a metre per second. Depth was measured, directly, by means of a counting machine over which the cable passed. The net was closed at any depth by means of a release and split-messenger. (For further description see Juday, 1916.) When the net was raised out of the water, and before the process of filtering was complete, some water was sprayed against it, so as to wash down any organisms that might have been adhering to the inside. When the filtering process was complete, the detachable silk

was removed and the catch transferred to a large-mouthed two-ounce bottle, and enough formalin added to preserve it. In very shallow water, for example at 0.5 metres, the net was lowered to the bottom keeping the mouth of the guard above the surface of the water, until the débris raised had settled down. The guard was then lowered to one side of the bucket. This was accelerated by attaching leads to the lower rim of the guard. When the upper rim was placed within an inch of the bottom, the net was raised at a uniform velocity, and the sample washed and preserved as described above. From two to five catches were made in the immediate vicinity in quick succession, and the average number of planktonts per cubic metre for each haul was deduced. It is admitted that this method did not permit of extreme exactness in the collection of the shallow water plankton, but when several catches were taken at intervals during the season with identical apparatus, and uniform methods, the results would be comparable with each other, quantitatively, and general conclusions might, then, be drawn concerning the system of this minute life in the lake from year to year.

The whole column of water through which the net passes is not strained. This makes it necessary to determine the efficiency of the net, or the coefficient which serves as a factor for calculating the total number of organisms in the column of water. The coefficient was determined by means of a large brass cylinder of the same diameter as the plankton net, and one yard in length. The bottom of the cylinder opened and closed by means of a piston-like arrangement. The bottom was pushed open, and the cylinder was slowly lowered, perpendicularly, into the water, until the mouth of the cylinder reached the surface. Practically, the cylinder had thus fitted over a column of water. It was then closed and raised out of the water. After the water was strained, the inside of the cylinder was washed with filtered water, and the catch which accumulated on the silk was removed and preserved in formalin. Simultaneously, the plankton net was thrown into operation, and a comparative haul made through the same stratum, at the rate of one-half a metre per second. The organisms in each catch were enumerated, their ratio determined, and the efficiency of the net deduced therefrom. The net used in 1922 gave a coefficient of 1.5 and that in 1923 a coefficient of 1.2.

The efficiency varies with the age of the net and with the abundance of the plankton. The silk bolting cloth is subject to shrinkage. Besides, the organisms tend to clog its meshes, permanently, in spite of careful washing, and in making a haul, especially in plankton-rich waters, the coefficient decreases as the net approaches the surface. Nevertheless, when the methods employed throughout the year are uniform, satisfactory comparative results should be obtained.

For the purpose of counting, a catch was concentrated to 10 c.c. or diluted to a larger volume, and 2 c.c. were removed with a stempel pipette to a counting cell, and the crustaceans, rotifers, and certain protozoans (*e.g.*, *Ceratium*, *Difflugia* and *Arcella*), therein, were counted with a binocular dissecting microscope. When a larger dilution was used, for example 50 c.c., the volume used for counting was increased to 5 c.c. The number obtained in this count multiplied by 5 or 10 gave the total number for the catch. The concentrated sample was again shaken, and 1 c.c. of the material was transferred to a Sedgwick-Rafter cell for the enumeration of the Protozoa and Protophyta. A compound microscope was used for this count, and the number of organisms was ascertained in 20 different squares on the counting cell. The area of these squares was known so that the total number of organisms in each catch could be readily determined. All the results were finally computed to the number of individuals per cubic metre of water.

No data were secured for the nannoplankton organisms which pass through the meshes of the net.

PHYSICAL CONDITIONS OF LAKE NIPIGON

Since the physical features of the lake have already been described (Clemens, 1923-1924), only a few general statements need be made here.

(1) The region surrounding the lake is typically Archaean, rugged bluffs and highlands rising as high as 600 feet above the lake.

(2) The open shores, when exposed to wave-action, tend to become rocky and sandy, but among the islands and protected bays, mud conditions prevail with the accompanying development of large aquatic vegetation. The latter areas are limited in Lake Nipigon. The northern shores are more extensively marshy than the southern ones.

(3) The variation in temperatures during the period of these investigations may be found in Table VI.

(4) The summer period is short. The advent of spring is four to five weeks later than along the north shore of Lake Ontario with a correspondingly earlier setting in of winter. The lakes and streams are free from ice generally in mid-May, and are closed again early in November.

(5) The total amount of rainfall per annum is considerable. Wilson (1910) has suggested that it lies between 20″ and 25″, and the average precipitation is probably greater than in the south-eastern portion of Ontario.

CHEMICAL CONDITIONS

Chemical analyses of water samples were carried out at Orient Bay (Stations V, VI and VII), Bell's Bay, and McL. Bay, at the same time that plankton catches and temperature readings were made. See Table IV, page 192. For these bays the following general statements may be made.

(1) Covering the period of these investigations there was always a large supply of oxygen ranging from 88.2% to 136.0% saturation. The latter maximum, when the water was supersaturated, occurred on Sept. 11, 1923.

(2) The amount of carbon dioxide was negligible.
(3) The amount of bicarbonate was always high.
(4) Acidity and alkalinity, small traces.
(5) Hydrogen ion concentration was high.

Distribution of the Plankton

Chief's Bay

This small bay is situated in the southwest corner of the lake. It has a maximum depth of 15 metres, approximately. The bottom, which is almost entirely mud, shows a considerable quantity of rooted-vegetation, chiefly *Potamogeton*.

The maximum amount of net plankton per cubic metre of water was concentrated in the 10-13 m. stratum. It appears that there was sufficient dissolved oxygen in this zone to meet the needs of its numerous and varied inhabitants. Unfortunately, no direct evidence of this was obtained.

Diaptomus minutus and *Daphnia longispina* var. *hyalina* predominated among the Crustacea. Ninety-three per cent. of the *Diaptomus minutus*, 72 per cent. of the *Cyclops bicuspidatus*, 71 per cent. of the *Bosmina longirostris* and 81 per cent. of the *Daphnia longispina* var. *hyalina* occurred in the 10-13 metre stratum. *Epischura lacustris* occurred in small numbers at all depths. A few specimens of *Limnocalanus macrurus* were obtained from the 5-10 and 10-13 metre strata. The nauplii, which were found at all depths, and increased gradually from surface to bottom, reached a maximum of 87.5 per cent. per cubic metre of water in the 10-13 metre stratum.

The rotifers, likewise, had the same general distribution as the Crustacea and nauplii, 56 per cent. occurring in the 10-13 metre stratum. *Anuraea aculeata* and *A. cochlearis* were predominant, and comprised 60 per cent. of the total number of rotifers. *Notholca* and *Asplanchna* were fairly abundant. The former was found at all depths, and the latter in the 5-10 and 10-13 metre strata.

Dinobryon was most abundant in the 0-5 zone, 1,356 colonies per litre being found. *Codonella* and *Euglypha* occurred in small numbers in the 0-5 metre stratum.

The Algae, exclusive of the diatoms, were represented by a few filaments of *Anabaena* in the 10-13 metre stratum. Diatoms were present in considerable numbers at all depths. *Melosira* predominated, 5,270 filaments per litre being found in the 10-13 metre stratum.

Black Sturgeon Bay

Black Sturgeon Bay is the most southerly portion of Grand Bay and lies southeast of Chief's Bay to which it is connected by a narrow channel. The higher aquatic vegetation included: *Acorus calamus* L., *Carex filiformis* L., *Carex riparia* W. Curtis, *Potamogeton compressus* L., *Ranunculus aquatilis* L., *Scirpus acutus* (=*S. occidentalis*), *Sium cicutaefolium* Schrank.

The net plankton was concentrated in the 0-5 stratum. The Crustacea were much less abundant than in the neighbouring bay described above. Their vertical distribution was fairly uniform with the maximum number per cubic metre of water in the 0-5 stratum. It was found that 88 per cent. of the *Cyclops bicuspidatus* were limited to the 0-5 metre stratum. None was found below this region. Sixty-nine per cent. of the *Diaptomus minutus* occurred in the surface stratum. Two specimens of *Limnocalanus macrurus* were found in the 5-10 metre zone and four in the 15-22 metre zone. *Epischura lacustris*, in small numbers, occupied the 0-5 metre stratum. The maximum number of nauplii was found in the 0-5 metre stratum.

The rotifers were most abundant, also, between the surface and 5 metres. The frequent forms were *Anuraea aculeata* (51.5 per cent.), *Polyarthra platyptera* (19.3 per cent.), *Notholca longispina* (17.4 per cent.), *Ploesoma lenticulare* (1 per cent.), *Conochilus unicornis* (7.0 per cent.), and *Gastropus stylifer* (3.8 per cent.) of the total number of rotifers.

Dinobryon, the predominant protozoan, was found at all depths. *Ceratium* was also fairly common. *Difflugia* and *Codonella* occurred in small numbers to a depth of 10 metres. A few colonies of *Vorticella* were found in the surface zone.

Melosira and *Tabellaria* were the predominant diatoms, and occurred at all depths. They were most abundant in the 0-5 metre stratum.

Gull Bay

This bay lies to the north and west of Grand Bay, and is nearly three times as large as Chief's Bay. Near the north-east shore the bottom is sandy, but about 800 yards out the bottom is muddy. The bottom of the southeast end is chiefly clay. The plankton sample was taken at the north-east end, and about the middle of this portion of the bay.

The limnetic zooplankton consisted largely of *Daphnia longispina* var. *hyalina* and *Diaptomus minutus*. The Crustacea, generally, were most abundant above the thermocline, that is, in the 0-5 metre stratum. Ninety-six per cent. of the total number of Cladocera were *Daphnia longispina* var. *hyalina*. *Bosmina longirostris* occurred in small numbers to the depth of 15 metres. *Diaphanosoma brachyurum* was found only in the 0-5 metre stratum and in small numbers. *Diaptomus minutus* contributed 86.6 per cent. of the total number of Copepoda. *Cyclops* was represented by two species, *leuckarti* and *bicuspidatus*, in about equal proportions, but not beyond the 15 metre depth. *Epischura lacustris* contributed 1,600 individuals per cubic metre of water in the 0-5 metre stratum, and 50 in the 5-10 m. depth. *Limnocalanus macrurus* occurred in small numbers below the 10 metre stratum.

The nauplii were uniformly distributed, the largest number occurring below the thermocline.

Notholca longispina was the most abundant rotifer and comprised 57.5 per cent. and *Conochilus unicornis* 18.8 per cent. of the total number of rotifers.

The green and blue-green Algae occurred in fairly large numbers reaching their maximum in the 0-5 stratum. None was found below the 15 m. depth. *Aphanocapsa* and *Anabaena* were the most abundant. *Chroococcus* and *Microcystis* were about equally numerous. *Sphaerocystis* was fairly abundant in the 0-5 m. stratum. *Staurastrum* was common, and about equally distributed to the depth of 15 metres.

Tabellaria fenestrata was the most abundant diatom, 1,850 filaments per litre occurring in the 0-5 metre stratum.

Humboldt Bay

Humboldt Bay is situated at the northeast side of the lake. It comprises two bays, really, a deep outer bay, the maximum depth of which is 60 metres, approximately, and a shallow inner bay with a maximum depth of five metres. Greater silting has occurred in the inner bay, with an accompanying profusion of plant and animal life. The chief aquatic plants found were *Potamogeton filiformis*, *Potamogeton heterophyllus*, *Potamogeton pectinatus* and *Elodea* (*canadensis*?).

(1) *Outer Bay*. The Cladocera were not abundant. The 0-5 m. stratum contained a few specimens of *Bosmina*, and the 5-10 m. stratum a few *daphnids*. The Crustacea, with the exception of the immature nauplii, were not abundant. About twice as many nauplii occurred in the 0-5 metre stratum as in the 5-10 metre stratum. *Cyclops* and *Diaptomus minutus* and *Diaptomus sicilis* occurred in small numbers.

Anuraea cochlearis was the most abundant rotifer. The 0-5 metre stratum contained six times as many as the 5-10 metre stratum.

Ceratium and *Dinobryon* were predominant among the protozoans, four-fifths of the *Ceratium* specimens and all the *Dinobryon* occurring in the 0-5 metre stratum. *Codonella* was represented.

Aphanizomenon was the only blue-green in measurable quantity. *Asterionella* was the most abundant diatom.

(2) *Inner Bay*. This bay was a striking contrast to the one just described. There were over four times as many Cladocera and Copepoda, twice as many nauplii and nearly four times as many rotifers obtained from an 0-1 metre haul than from the combined 0-5 and 5-10 metre hauls in the outer bay.

The Protozoa, also, showed a considerable increase as compared with the total haul through ten metres. Curiously enough, the phytoplankton showed some decline in numbers. Algae with the exception of diatomaceous flora were absent.

The predominant copepod was *Diaptomus*, two species *oregonensis* and *minutus*. A few immature females of *Senecella calanoides* were found. This is very interesting in view of the fact that this organism is usually thought to occur only in deep water. *Epischura lacustris* occurred in small numbers. *Diaphanosoma brachyurum* (predominant), *Sida crystallina*, and *Daphnia longispina* var. *hyalina* represented the Cladocera.

Ombabika Bay. This very shallow bay is situated at the northeast corner of the lake. A narrow channel connects it with the main body of water. The bottom is muddy near shore, but clayey in the central region. Marshy conditions prevail at the extreme northern end.

The Crustacea were present in small numbers. Ninety-five per cent. of the Cladocera were *Daphnia longispina* var. *hyalina*, and these were most abundant in the 5-13 metre stratum. *Bosmina longirostris* and *Diaphanosoma brachyurum* occurred in small numbers in the 0-5 metre zone. The copepods were represented by *Cyclops bicuspidatus* and *Diaptomus minutus*, the majority being in the 0-5 metre stratum.

The nauplii were about equally distributed.

The rotifers occurred in small numbers. *Notholca longispina* and *Anuraea cochlearis* were predominant, and occurred most abundantly in the 0-5 metre stratum. *Ceratium* was the most abundant protozoan (85.7 per cent.). *Codonella* contributed 14.3 per cent. of the total number.

The Algae were represented by *Aphanizomenon*, *Chroococcus* and *Dictyosphaerium*. *Aphanizomenon* predominated.

Tabellaria was the most abundant diatom.

South of the Windigo Islands. This plankton haul was taken just east of the Whitesand river, where the water is very shallow. The numbers of copepods were typical.

The Cladocera were represented by *Bosmina longirostris* and *Daphnia longispina* var. *hyalina*, almost three times as many of the latter. *Cyclops bicuspidatus* and *Diaptomus minutus* were the predominant Copepoda and were present

in equal numbers, approximately. *Diaptomus ashlandi* occurred in small numbers. *Epischura lacustris* contributed about 10 per cent.

Nauplii were fairly abundant.

Rotifers were present in small numbers. *Conochilus unicornis* and *Notholca longispina* were the predominant forms.

Vorticella was the most abundant of the Protozoa.

Aphanizomenon was the numerous alga. *Anabaena* was, also, fairly common.

Asterionella was the predominant diatom.

Wabinosh Bay. This plankton catch was taken about the centre of the bay where the water was deepest. With the exception of the Algae, all the planktonts were most numerous in the 0-5 metre stratum.

Bosmina longirostris occurred throughout all depths and contributed 52 per cent. of the total number of Cladocera. The remaining 48 per cent. were *Daphnia longispina* var. *hyalina*, the majority of which were in the 0-5 metre stratum. The copepods were fairly abundant, and were represented by *Cyclops* sp., *Diaptomus* sp., and *Epischura lacustris*. *Cyclops* and *Diaptomus* occurred in nearly equal proportions.

More than half the nauplii were in the 0-5 metre stratum.

Notholca longispina, which occurred throughout, was the most abundant rotifer, 64 per cent. occurring in the 0-5 metre stratum. *Anuraea cochlearis* and *Conochilus unicornis* occurred in smaller quantities throughout. *Polyarthra platyptera* did not occur below the 15-metre depth. A few specimens of *Rattulus cylindricus* were found in the 5-10 metre stratum.

McL. Bay. Considerable mud had accumulated in this small bay, which gave rise to the development of some large aquatic vegetation. Those occurring most commonly were: *Equisetum limosum* L., *Potamogeton heterophyllus* Schreb., *Potamogeton richardsonii* (Bennett) Rydb., *Sparganium angustifolium* Michx.

Bosmina longirostris was fairly abundant, considering the amount of water strained. Extremely shallow water (.18 m.) appeared to be avoided. The nauplii, on the other hand, appeared to increase toward shore.

The rotifers were numerous and varied. *Ploesoma lenticulare* and *Polyarthra platyptera* were the predominant forms, and were more abundant at .43 metres.

The Protozoa were scarce, the most abundant being *Ceratium hirundinella.*

The Algae, with the exception of the diatoms, were not as abundant as one might expect. The diatoms were very abundant, *Navicula* predominated. *Synedra* and *Fragilaria* were, also, very abundant.

Bell's Bay

Equisetum limosum (L.) and *Eleocharis palustris* (L.) R. & S. var. *vigens* Bailey, were the most numerous large aquatic plants in this bay. Some silting had taken place.

The alkalinity of the waters was the highest of any determined, namely, 3 parts per million. The hydrogen ion concentration, also, was high (8.5).

The limnetic Crustacea were represented by *Cyclops* in fairly large numbers. No other adult Crustacea were found in this bay.

The nauplii were less abundant than in McL. Bay, less than half as many per cubic metre occurring.

Rotifers were abundant and varied. *Ploesoma lenticulare* predominated. *Anuraea cochlearis* was nearly equally numerous. *Polyarthra platyptera* was, also, abundant.

The Protozoa were much more numerous than in McL. Bay (a week previous). This is accounted for by the large numbers of *Dinobryon.*

Three hundred and twelve filaments of *Mougeotia*, 21 filaments of *Zygnema* and 156 colonies of *Merismopedium* per litre were found.

Diatoms were very numerous. *Asterionella* predominated.

Bay of the Nipigon River

This bay is small, shallow, and well sheltered from strong wave-action. Its borders are marshy, and a luxuriant aquatic vegetation exists. The most frequently occurring plants were four species of *Potamogeton.*

With the exception of a few *Alona guttata*, adult Crustacea were not found. Nauplii, on the other hand, were very abundant, and the haul made in a little over half a metre gave the largest number of nauplii found at any time during the period of these investigations.

The rotifers were numerous and varied. *Anuraea cochlearis* was predominant, 291 per litre.

Dinobryon was the most abundant protozoan, 1,017 colonies per litre occurring.

The Algae were represented by an unidentified filamentous form and the desmid *Euastrum.*

Diatoms were very abundant. *Asterionella* was predominant and as many as 10,345 colonies per litre were found. *Fragilaria*, *Navicula* and *Synedra* were, also, very abundant.

Orient Bay

Orient Bay, which is situated in the southeast corner of the lake, is 9 miles long, and has a maximum width of 1½ miles. Highlands of columnar diabase rise abruptly on both sides. The Pustagone River is the only large inlet. Strong north winds cause a considerable heaping up of the waters of the bay, and strong south winds produce a slight lowering. The bay, however, is fairly well protected from the violent gales that sometimes sweep over the lake. Silting has taken place to some extent along its borders. The stages in the evolution from the more-primitive to the more-evolved shore conditions are very strikingly illustrated in this region (Pearsall, 1920 and 1921).

Station V. The water at Station V is very shallow, the greatest depth not being more than three metres. The higher aquatic vegetation is a mixture of types characteristic of the transition from primitive to evolved conditions (Pearsall, *loc. cit.*). The vegetation includes: *Chara*, *Carex*, *Equisetum limosum*, *Scirpus occidentalis*, *Eriocaulon septangulare*, *Sparganium angustifolium*, *S. diversifolium*, *Sagittaria cuneata*, *Hippuris vulgaris*, *Myriophyllum*, *Nymphozanthus rubrodiscus*, *N. variegatus*, *Utricularia intermedia*, *Eleocharis palustris*, var. *vigens*, *Phragmites*, *Potamogeton richardsonii* and *P. heterophyllus*. *Nymphozanthus*, *Scirpus*, *Phragmites* and *Potamogeton* are more abundant where there is less organic decay and more silting. On the other hand, *Carex* sp., *Eleocharis palustris*, and *Equisetum limosum* appear to thrive best on organic soil.

In studying the plankton of this community, it was thought best to take a series of vertical hauls in quick succession, in relatively different environs, in the immediate vicinity, and to compare their quantities. With this end in view in 1922, the sub-stations chosen and their physical features were as follows:

Sub-station A—Near *Potamogeton*. Sand bottom.
" B—Among *Eleocharis palustris*, chiefly. Considerable vegetable debris.
" C—Mixed vegetation. Combination of conditions in A and B.
" D—No vegetation. Gravel bottom.
" E—No vegetation. Sand bottom.

The results of this experiment are condensed in the following table. The total plankton numbers are per litre of water, and indicate the standing crop at the different stations on the dates specified.

TABLE I—Orient Bay, Station V, 1922
Comparative Total Plankton Per Litre

Sub-station	June 30/22	July 14/22	Aug. 1/22	Aug. 3/22	Aug. 19/22
A	6,790	25,030	13,150	14,880	12,380
B	**18,269,550**	26,300	15,070	16,900	12,370
C	....	**27,560**	**23,860**	11,050	**20,390**
D	8,322,840	17,400	17,080	3,410	5,910
E	8,489,560	8,080	7,470	**24,900**	7,960

Note.—Navicula has not been included in the above counts, Table I.

An examination of the tables shows that sub-station C, where mixed conditions prevail, is the most productive of plankton. Sub-station B corresponds closely with sub-station C. Sub-station D over gravel and no vegetation is least productive. Increased production, without exception, is correlated with the increase of the phytoplankton. The Crustacea do not appear to be limited to any one type of community described above. This is probably due to the fact that these organisms can move about at their own volition.

In 1923 the experiment was continued and the results are embodied in Table II. This summer only three sub-stations were operated.

Sub-station (1) Sand and slightly gravelly bottom. Pond lilies 2-4 yards distant.
" (2) Sand bottom. *Potamogeton* and pond lilies 2-4 yards distant.
" (3) Mixed conditions. Higher aquatic flora consisted of *Eleocharis*, *Potamogeton* and pond lilies. Vegetable debris.

TABLE II—Orient Bay, Station V, 1923
Comparative Total Plankton Per Litre

Sub-station	July 4/23	July 12/23	July 19/23	July 31/23	Aug. 13/23	Aug. 19/23	Sept. 11/23
1	2,390	8,670	3,620	4,510	15,070	**47,320**	**11,170**
2	10,430	9,110	**13,410**	4,290	19,540	47,150	3,620
3	**32,860**	**9,570**	9,570	**19,350**	**30,520**	28,500	5,940

Note.—Navicula has not been included in the above counts, Table II.

The plankton quantities given above for sub-station 2, July 19, and for sub-stations 1 and 2, August 19, and for sub-station 1, September 11, appear to discredit the statement made above to the effect that plankton is most abundant in areas where there is a mixture of types of higher aquatic plants. This apparent inconsistency may be due to the controlling influence of the wind on the plankton at these stations. On July 19, the wind blew from the northwest and on August 19 and September 11 from the north. This directly affected sub-stations 1 and 2 by stirring up the waters, and causing some mixing with the more open-waters of the bay with a consequent abnormal increase in diatoms. Also, on July 19 and September 11 the blue-green Algae driven by the force of the north wind accumulated at these stations.

It is apparent, then, that a mixture of higher aquatic vegetation favours a richer development of phytoplankton. This increase of the phytoplankton is, also, correlated with an increase in the Entomostraca.

The Organisms (Station V). The Cladocera were numerous and varied. The predominant forms, indicated in Table V, were *Bosmina longirostris*, *Daphnia longispina* var. *hyalina*, *Daphnia retrocurva*, *Acroperus harpae*, *Alonella nana*, and *Sida crystallina*. Of these *Bosmina longirostris* was the most numerous. *Alona*, *Chydorus*, *Polyphemus pediculus*, *Ceriodaphnia*, *Diaphanosoma* and *Eurycercus lamellatus* occurred in small quantities. *Sida crystallina* gave a fairly large number at sub-station E, July 14, 1922. In 1923, *Bosmina longirostris* and *Daphnia* were the most predominant crustaceans. *Sida*, *Alona*, *Rhynchotalona*, and *Polyphemus* occurred in small quantities. *Cyclops* was the most abundant copepod during the period of these investigations. *Diaptomus* was much less abundant during both seasons. *Canthocamptus* was infrequent. *Epischura lacustris* was fairly common in 1923. A few specimens of immature females of *Senecella calanoides* were obtained. The largest number of nauplii were obtained at sub-station B, August 3, 1922, 33,200 individuals per cubic metre being found. In the summer of 1923 they reached a maximum of 126,990 per cubic metre of water.

The Rotifers were numerous and varied. *Notholca longispina* and *Anuraea cochlearis* were predominant. *Ploesoma lenticulare*, *Polyarthra platyptera*, *Monostyla lunaris*, and a Bdelloid rotifer were common. During the summer of 1923 *Polyarthra platyptera* was the most abundant rotifer.

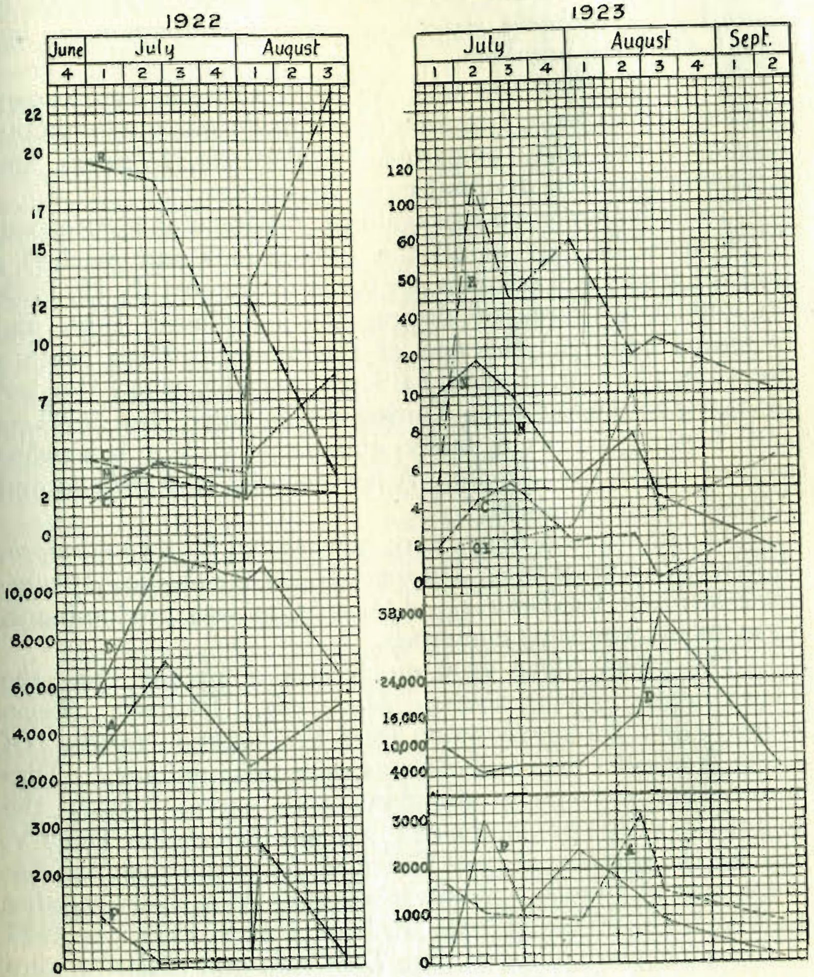

Figure I.—Curves illustrating the variation in the numbers of plankton organisms per litre of water at Station V, Orient Bay, Lake Nipigon, at weekly intervals during the summers of 1922 and 1923. A.—Algae; C.—Copepods; Cl.—Cladocera; D.—Diatoms; N.—Nauplii; P.—Protozoa; R.—Rotifers.

Notholca and *Anuraea* were numerous and about equal in quantity. *Synchaeta stylata* occurred less frequently, but usually in large numbers.

In 1922 *Dinobryon* was the most abundant protozoan. Excluding this form, *Ceratium hirundinella* was predominant. *Euglypha* was fairly numerous. *Cyphoderia*, *Difflugia*, and *Codonella* occurred in about equal quantities.

In 1923 *Dinobryon* was again the predominant protozoan. It occurred in July at all the sub-stations and reached a maximum of 4,436 colonies per cubic metre on July 12, 1923. Its numbers decreased during the middle of July, and increased again at the end of the month. Then came a decrease which continued to September 11, when the last plankton haul was made. During this summer, also, *Difflugia* and *Centropyxis* were fairly abundant with a somewhat smaller number of *Arcella*. A few colonies of *Vorticella* and *Epistylis* were obtained.

The blue-green Algae were represented by *Aphanocapsa*, *Microcystis*, *Chroococcus*, *Merismopedium*, *Anabaena*, *Aphanizomenon*, and *Oscillatoria*. *Aphanocapsa* was predominant. *Chroococcus* was very numerous.

The green Algae were much less abundant than the blue-greens. *Sphaerocystis*, *Mougeotia*, *Ulothrix*, *Scenedesmus*, and *Dictyosphaerium* were the common forms. Of these *Mougeotia* and *Scenedesmus* were predominant. Diatoms were extremely abundant and varied. Only the quantities of the predominant forms are included in Table V. During the summer of 1922 *Tabellaria fenestrata* and *Navicula* were most numerous. *Navicula* was present in overwhelming numbers, 46,740 individuals per litre, July 4, 1923. In 1923 *Asterionella* predominated, but *Tabellaria* and *Melosira* were also very abundant.

The curves shown in Figure 1 express the variation in the quantity of the plankton groups during the periods covered by these investigations. The first week of July, 1922, there was an increase in the numbers of cyclops and nauplii. This was followed by a decrease, which continued until July 31. About August 3 a very sudden and large increase in the number of nauplii took place, followed by a more gradual decrease, tending towards a minimum, which probably occurred the middle of the last week of August. The Cladocera were still tending toward a higher maximum on August 19, when operations were suspended. The form responsible for this rise was *Bosmina longirostris*. The Copepoda were most numerous the end of June. Then followed a decrease. A smaller peak occurred on August 3, when all forms showed a general increase. The Rotifera remained, approximately, constant in numbers from the end of June to about mid-July, when there was a rather sudden decline, which applied to all the planktonts. This decrease was more sharply defined in the case of the rotifers, on account of the larger numbers involved. The rotifers affecting the change were *Anuraea cochlearis* and *Notholca longispina*. The Protozoa reached a maximum on August 3. This increase was correlated with increased numbers of *Dinobryon* and *Ceratium*.

The Algae and diatoms reached their maxima on July 14. *Tabellaria*, *Navicula*, *Asterionella*, *Aphanocapsa*, and *Chroococcus* were responsible for this.

The curves for 1923 are more regular and definite. Rotifera, nauplii, and Protozoa reached a maximum about July 12, the Copepoda July 19. The Cladocera, on the other hand, reached a maximum the second week of August. This corresponds with what occurred in 1922. The organisms responsible for the increase were *Bosmina longirostris* and *Daphnia*. *Polyarthra platyptera* caused the increase among the rotifers. *Dinobryon* and *Cyclops* were responsible for increases among the Protozoa and Copepoda, respectively.

The Algae and the diatoms showed their maxima between the second and third week of August. *Aphanocapsa*, *Chroococcus*, *Navicula*, *Asterionella* and *Tabellaria* were responsible for these increases.

Comparison of Stations V, VI, and VII, Orient Bay. During the month of August, 1923, Stations VI (Aviator's Bay), and VII (Refuse Bay) were operated in conjunction with Station V for purposes of comparison, for they appeared to offer some interesting data in regard to the study of quantitative plankton.

Station VI is to some extent a land-locked portion of Orient Bay. The maximum depth is, approximately, 1.5 metres. The water is deeply-coloured brown, due to the large organic content, which is brought down by small streams, entering at its north and south ends. The low peninsula which encloses the bay has been undermined to some extent to form bayous, which connect Station VI with the open waters of Orient Bay.

The higher aquatic vegetation is much more prolific here than at Station V. This is due, probably, to the greater protection against wave-action. The higher aquatic vegetation includes: *Equisetum limosum*, *Eleocharis acicularis*, *Hippurus vulgaris*, *Isoetes echinospora*, *Juncus alpinus*, *Juncus radiosus*, *Myriophyllum* (*verticillatum* probably), *Phragmites communis*, *Potamogeton heterophyllus*, *Potamogeton richardsonii*, *Sagittaria latifolia*, *Sagittaria cuneata*, *Scirpus subterminalis*?, *Sium cicutaefolium*, *Sparganium angustifolium*, and *Utricularia intermedia*.

It would appear that silting and organic decay are going on here hand in hand. It is, also, probable that the silt-requiring plants are replacing the ones that thrive best in organic soil, namely, *Carex* and *Equisetum* (Pearsall, *loc. cit.*). *Isoetes braunii* was fairly abundant along the water margin of sub-station I (Station VI).

Station VII, a very small bay, is practically open water. The transparency of the water is high, as compared with Stations V and VI, and compares favourably with that of Cayuga Lake (Birge and Juday, 1914). The shores are rocky, and the only vegetation noticed was a large submerged species of *Potamogeton*. These occurred where there was an accumulation of silt over the rocks. The north shore was used by the fishermen, as a dumping ground for the entrails of fishes, with the result that there was an accumulation of the products of their decay in the adjacent water. A chemical analysis of the water showed that the north side was comparable with the south. This was probably

TABLE III—Total Average Planktonts Per Cubic Metre of Water
Orient Bay (Stations V, VI, and VII), Lake Nipigon, August, 1923

	Station V		Station VI		Station VII	
Nauplii		6,210		14,975		2,470
Cladocera	*Bosmina*	5,920	*Bosmina*	3,245	*Bosmina*	1,180
	Daphnia	625	*Chydorus*	155	*Daphnia*	50
	Alona	470	*Alonella*	185		
	Alonella	325				
Copepoda	*Cyclops*	1,600	*Cyclops*	1,615	*Cyclops*	11,880
	Diaptomus	240			*Diaptomus*	265
Rotifera	*Anuraea*	9,560	*Polyarthra*	51,120	*Polyarthra*	34,740
	Polyarthra	8,390	*Anuraea*	36,600	*Anuraea*	7,850
	Notholca	4,940	*Synchaeta*	30,790	*Ploesoma*	7,850
	Gastropus	1,420	*Gastropus*	11,120	*Gastropus*	6,670
	Monostyla	795	*Ploesoma*	8,325	*Notholca*	750
			Conochilus	6,795		
			Monostyla	1,700		
			Notholca	1,070		
Protozoa	*Dinobryon*	925,000	*Dinobryon*	3,289,500	*Dinobryon*	43,000
	Ceratium	28,000	*Ceratium*	12,600	*Ceratium*	35,500
	Arcella	4,000	*Arcella*	1,860	*Codonella*	1,340
	Epistylis	3,190	*Difflugia*	1,145		
	Centropyxis	1,875	*Euglypha*	640		
	Euglypha	1,480	*Codonella*	410		
	Cyphoderia	1,250				
	Difflugia	760				

TABLE III—Total Average Planktonts—*Continued.*

	Station V		Station VI		Station VII	
Algae	*Mougeotia*	1,570,800	*Dictyosphaerium*	356,100	*Oscillatoria*	43,000
	Chroococcus	398,000	*Microcystis*	321,600	*Oocystis*	43,000
	Melosira	142,500	*Merismopedium*	280,450	*Aphanizomenon*	21,500
			Chroococcus	119,150	*Chroococcus*	21,500
			Mougeotia	86,725		
Diatoms	*Asterionella*	16,414,500	*Asterionella*	3,105,800	*Asterionella*	1,290,800
	Navicula	6,380,000	*Navicula*	2,440,600	*Fragilaria*	215 100
	Tabellaria	4,498,000	*Tabellaria*	1,003,400	*Tabellaria*	86,000
	Melosira	4,089,000	*Synedra*	809,700	*Synedra*	64,500
	Fragilaria	1,055,000	*Melosira*	802,100		
	Cocconema	850,000	*Fragilaria*	325,000		
	Synedra	482,200	*Cymbella*	161,300		
			Cocconema	120,970		

due to the current circulating in the bay, which not only equalized conditions, but also prevented stagnation of the waters.

Table III gives the average quantities of the planktonts taken at Stations V, VI and VII during the month of August, 1923.

Analysis of the Organisms, Orient Bay.

Cladocera. An examination of Table III shows that *Bosmina longirostris* was the most abundant cladoceran, and that at Station V this organism was the most abundant. Daphnia was present in relatively smaller numbers at Stations V and VII.

Copepoda. The largest number of copepods occurred at Station VII. Representatives of the genus Cyclops were mainly responsible for this. The increase was probably correlated with the high hydrogen ion concentration and bicarbonate occurring in this locality in August. *Diaptomus* was infrequent.

Rotifera. Stations VI and VII gave the highest number of rotifers. At Station VI they were not only most abundant, but also occurred in the greatest variety of forms. *Polyarthra platyptera* was predominant. This may be correlated also with the high hydrogen ion concentration, occurring at these stations at the time these large catches were made. *Anuraea cochlearis* was most numerous at Station V, but *Polyarthra platyptera* was also as abundant relatively. The frequency of the other organisms is indicated in Table III.

Protozoa. Station VI gave the largest average number of protozoans. This was due to the large numbers of *Dinobryon*. *Ceratium hirundinella* was most abundant at Station VII, probably for the reason that this form prefers more open water conditions.

Algae. The *Algae* were most numerous at Station V. This was due to the abundance of the green-alga, *Mougeotia*.

TABLE IV—Water Analyses of the Shallow Bays of Lake Nipigon during the Month of August, 1923

Station	Date	pH	CO_2	O_2	Bicar-bonate	Acidity	Temp. air °C.	Temp. water at surface	Temp. bottom water
Orient Bay	Aug. 13/23								
Station V	1. Among weeds	8.0	1.0	6.6	90	3	14.7	16.3	16.3
	2. Open water	7.8	.5	6.0	93	2	"	"	"
	Aug. 19/23								
	1. Among weeds	8.2	trace	6.9	90	2	15.0	17.2	17.0
	2. Open water	8.2	trace	6.9	89	2	"	"	"
Orient Bay	Aug. 7/23	8.3	1.0	7.1	93	. .	16.2	17.0	17.0
Station VI	Aug. 19/23 West arm	8.0	trace	6.7	95	4	13.8	17.5	17.0
	Aug. 29/23	7.9	1.0	6.4	95	4	17.7	17.0	16.5
Orient Bay	Aug. 18/23								
Station VII	1. North shore	8.4	no trace	7.1	106	. .	19.3	16.5	15.4
McL. Bay	Aug. 10/23	7.9	1.0	6.8	101	2	14.5	14.0	14.0
Bell's Bay	Aug. 17/23	8.5	no trace	7.4	107		15.5	17.1	17.1

CO_2, Acidity, Bicarbonate and Alkalinity—parts per million.
O_2—number of c.c. per litre.

I am indebted to Dr. W. A. Clemens, Department of Biology, University of Toronto, for the above water analyses. The depths from which plankton was taken at the same time as the water samples given above may be had by reference to Table V.

Blue-greens at Station VI were responsible for large quantities. This is probably due to their being able to thrive best in warm, shallow, protected bays. *Oscillatoria* was abundant at Station VII, particularly near the dock where the decaying fish offal made possible a development of aquatic fungi.

Diatoms. Diatoms were most abundant at Station V. The preponderance here was due to the overwhelmingly large numbers of *Asterionella*. These colonies were also predominant in the material taken from Stations VI and VII. The greatest variety and largest quantities occurred in the more protected regions, rather than in the more-open water areas.

Limiting Factors

The factors limiting the amount of plankton in Lake Nipigon are twofold:

1. The amount of shallow water where higher aquatic vegetation thrives best is limited. Hence, the phytoplankton is limited. Hence, the zooplankton is limited. In other words, Lake Nipigon may be classified as a deep, rocky (primitive) lake, as compared with a shallow, silted (more-evolved lake). (Pearsall, *loc. cit.*) and (Marsh, 1901, 1903). The resistant character of the rocks along the shore operates against the formation of fine silts. Agriculture is not carried on to any extent in the surrounding district and so silts are not brought down by rivers in large quantities.

2. The short summer period prevents the prolific development of plankton even in shallow bays that might be possible were the summer period longer.

Conclusions

1. The plankton of the shallow bays of Lake Nipigon is varied and comparatively rich, with the exception of the adult Entomostraca.

2. The quantitative balance is considerably on the side of the Rotifera, Protozoa, and phytoplankton, but it is

possible that if plankton catches were made later in the season the adult crustacean population might be considerably larger.

3. A mixture of higher aquatic vegetation appears to favour a richer development of phytoplankton, and the greatest variety and largest quantity occur in the more-protected rather than in more-open water areas.

4. Maximum plankton production ranges from the middle of July to the middle of August. Whether or not this is the maximum for the year, or the autumn maximum, is still open for investigation.

TABLE V—ANALYSIS OF PLANKTON CATCHES

The results indicate the number of individuals or colonies per cubic metre of water at the various depths.

The different forms found in the net plankton are designated as follows:

Cladocera
- Ac—*Acroperus*
- A —*Alona*
- Al —*Alonella*
- B —*Bosmina*
- Ce—*Ceriodaphnia*
- D —*Daphnia*
- Di—*Diaphanosoma*
- E —*Eurycercus*
- P —*Polyphemus*
- R —*Rhynchotalona*
- S —*Sida*

Copepoda
- Ca—*Canthocamptus*
- C —*Cyclops*
- D —*Diaptomus*
- E —*Epischura*
- L —*Limnocalanus*
- S —*Senecella*

Rotifera
- An—*Anuraea* = *Keratella*
- As—*Asplanchna*
- Bd—Bdelloid rotifer
- Ca—*Cathypna* = *Lecane*
- Co—*Colurus*
- C —*Conochilus*
- E —*Euchlanis*
- G —*Gastropus*
- L —*Lepadella*
- M —*Monostyla*
- N —*Notholca*
- Pl —*Ploesoma*
- P —*Polyarthra*
- R —*Rattulus* = *Trichocerca*
- S —*Synchaeta*

Protozoa
- A —*Arcella*
- Ce—*Centropyxis*
- C —*Ceratium*
- Co—*Codonella*
- Cy—*Cyphoderia*
- D —*Difflugia*
- Di—*Dinobryon*
- Ep—*Epistylis*
- E —*Euglypha*
- V —*Vorticella*

Green Algae
- D —*Dictyosphaerium*
- E —*Euastrum*
- Mo —*Mougeotia*
- Sc —*Scenedesmus*
- Sp —*Sphaerocystis*
- S —*Staurastrum*
- U —*Ulothrix*
- Z —*Zygnema*
- —Green Alga (unidentified)

Blue-Green Algae
- An —*Anabaena*
- Aph—*Aphanizomenon*
- Ap —*Aphanocapsa*
- A —*Aphanothece*
- C —*Chroococcus*
- Me —*Merismopedium*
- M —*Microcystis*
- O —*Oocystis*
- Os —*Oscillatoria*

Diatoms—
- Am —*Amphora*
- A —*Asterionella*
- Co —*Cocconema*
- Cy —*Cymbella*
- E —*Epithemia*
- F —*Fragilaria*
- G —*Gomphonema*
- M —*Melosira*
- N —*Navicula*
- Ni —*Nitzschia*
- P —*Pinnularia*
- St —*Stephanodiscus*
- Su —*Surirella*
- Sy —*Synedra*
- T —*Tabellaria*

TABLE V—Analysis of Plankton Catches

Bay of Nipigon River, September 3, 1923

Depth (metres)	Cladocera	Copepoda	Nauplii	Rotifera	Protozoa	Green and blue-green Algae	Diatoms
0–.58	A 678		80,720	An 291,500	C 82,100	678,000	A 10,345,000
							E 340,000
				Ca 680	Co 13,560	E 339,000	F 2,883,000
				G 680	D 2,030		N 1,865,000
							St 170,000
				L 680	Di 1,017,000		Sy 2,035,000
				M 680	Ep 339,200		T 340,000
				N 2,030			
				Pl 4,060			
				P 57,660			
				S 4,060			

TABLE V—*Continued*

Bell's Bay, August 17, 1923

Depth (metres)	Cladocera	Copepoda	Nauplii	Rotifera	Protozoa	Green and blue-green Algae	Diatoms
0–.43		C 855	10,200	An 35,900	C 3,400	Z 21,300	A 1,069,000
				G 855	Co 3,400		F 427,000
				N 2,560	Di 427,000		N 427,000
				Pl 46,190			
				P 14,540			
0–.58		C 2,030	10,170	An 32,560	C 9,490		A 3,561,000
				G 1,350	Co 6,780		Co 508,000
				N 680	Cy 678		F 1,017,000
				Pl 38,670	Di 169,000		N 2,035,000
				P 10,170			
				S 2,700			
0–.63	A 620	C 2,490	16,240	An 81,840	C 2,490	Me 156,000	A 1,872,000
						Mo 312,000	
	Al 620			C 60	Co 11,160		E 624,000
				G 1,860	Di 156,000		F 1,092,000
				M 1,860			N 1,404,000
				N 1,240			Sy 780,000
				Pl 79,980			
				P 38,440			
				S 6,820			

TABLE V—*Continued*

Black Sturgeon Bay, July 21, 1922

Depth (metres)	Cladocera	Copepoda	Nauplii	Rotifera	Protozoa	Green and blue-green Algae	Diatoms
0–5	B 970	C 5,500	7,850	An 14,000	C 74,000	D 43,000	A 387,300
	D 860	D 1,180		As 100	Co 2,250	M 43,000	F 602,600
				C 1,900	D 3,380	O 172,000	M 1,420,000
					Di 2,150,000		Sy 43,000
				G 970			T 2,023,000
				N 4,300			
				Pl 200			
				P 6,000			
5–10	B 160	C 750	1,500	An 1,930	C 7,300	An 21,000	A 129,100
	D 320	D 210		C 320	Co 160	O 21,000	F 118,400
		E 50		N 1,070	D 110		M 624,000
				Pl 50	Di 344,000		Sy 10,700
				P 110	V 10,700		T 366,000
10–15	D 50	D 270	160	An 160	C 700	An 10,000	A 10,700
				N 50	Di 43,000		F 21,500
				Pl 50			M 150,600
							Sy 21,500
							T 32,200
15–22	B 40	D 30	300	An 150	Di 30,700		A 7,600
		L 75		N 110			F 7,600
				Pl 35			M 668,500
							T 15,300

TABLE V—*Continued*

Chief's Bay, July 20, 1922

Depth (metres)	Cladocera	Copepoda	Nauplii	Rotifera	Protozoa	Green and blue-green Algae	Diatoms
0–5	B 210	C 1,340	2,580	An 3,600	C 480		A 107,600
	D 480	D 700		N 2,000	Co 430		F 301,300
				P 430	D 160		M 903,800
					Di 1,356,000		T 495,000
					E 50		
5–10	B 430	C 1,180	4,890	An 3,000	Di 172,000		A 86,100
	D 320	D 650		As 100			F 129,200
				N 1,400			M 495,100
				P 160			T 215,300
10–13	B 1,600	C 6,700	49,000	An 8,400	Di 538,000		A 287,100
	D 3,500	D 18,000		As 2,400			F 179,400
				C 2,000			M 5,270,000
				N 1,880			T 788,900

TABLE V—*Continued*

Gull Bay, July 23, 1922

Depth (metres)	Cladocera	Copepoda	Nauplii	Rotifera	Protozoa	Green and blue-green Algae	Diatoms
0–5	B 110 D 7,500 Di 50	C 3,700 D 6,500 E 1,600	5,600	An 540 C 2,300 N 5,480 S 50	C 1,130 Co 100 D 1,670	An 150,600 Aph 516,400 C 172,000 M 172,000 S 21,500 Sp 129,100	A 107,600 F 107,600 T 1,850,000
5–10	B 160 D 910	C 1,180 D 370 E 50	2,580	An 370 N 1,240 P 210	C 210 Co 50	An 161,400 Aph 113,000 C 48,400 M 48,400 S 16,100	A 64,500 F 64,500 M 64,500 Sy 32,200 T 871,600
10–15	B 50 D 910	C 160 D 320 L 320	5,000	An 750 N 320	D 50	An 10,760 Aph 32,200 S 10,750	A 32,200 F 64,500 M 96,800 T 280,000
15–18	D 90	D 270 L 360	3,500	An 980 C 90 N 270 P 90	Co 90		A 53,800 F 53,800 M 35,860 Sy 17,900 T 340,700

TABLE V—Analysis of Plankton Catches—*Continued*

Humboldt Bay (Outer), August 8, 1922

Depth (metres)	Cladocera	Copepoda	Nauplii	Rotifera	Protozoa	Green and blue-green Algae	Diatoms
0–5	B 320	C 3,000 D 1,180	5,480	An 28,080 G 540 N 2,800 Pl 110 P 3,120 S 110	C 55,300 Co 7,850 Di 53,700	Aph 134,400	A 1,291,000 F 242,000 T 295,800
5–10	D 50	C 1,070 D 860	2,740	An 4,950 G 50 N 700	C 11,940 Co 2,150	Aph 32,280	A 505,800 F 86,080 M 43,040 T 107,600

Humboldt Bay (Inner), August 8, 1922

Depth (metres)	Cladocera	Copepoda	Nauplii	Rotifera	Protozoa	Green and blue-green Algae	Diatoms
0–1	A 540 Di 800 S 270	C 6,990 D 20,170 E 270	17,480	An 130,400 C 8,070 N 7,530 Pl 540 P 8,800	C 234,500 Co 1,340 D 3,500		A 322,700 F 107,500 T 322,700

TABLE V—Analysis of Plankton Catches—*Continued*

McL. Bay, August 11, 1923

Depth (metres)	Cladocera	Copepoda	Nauplii	Rotifera	Protozoa	Green and blue-green Algae	Diatoms
0–.18		C 2,180	45,900	An 2,180	C 4,370	38,240	Cy 546,000
				M 2,180	Go 2,180		F 1,092,000
				N 6,550			N 2,185,000
				Pl 6,550			Sy 1,092,000
				P 10,930			
0–.18			48,100	N 2,180	C 4,370		A 1,092,000
				Pl 4,370			Co 546,000
				P 13,120			N 3,824,000
							Sy 2,732,000
0–.43	B 1,700	C 4,280	23,950	An 855	C 15,400		A 1,924,000
				G 855	D 1,700		Co 855,000
				M 855	Co 1,700		F 1,282,000
				N 855			N 2,351,000
				Pl 18,820			Sy 1,069,000
				P 39,360			
				S 3,400			

TABLE V—Analysis of Plankton Catches—*Continued*

Ombabika Bay, August 9, 1922

Depth (metres)	Cladocera	Copepoda	Nauplii	Rotifera	Protozoa	Green and blue-green Algae	Diatoms
0–5	B 110	C 1,700	2,960	An 3,340	C 5,760	Aph 107,600	A 150,600
	D 50	D 2,470		N 4,220	Co 650	C 64,560	F 172,200
	Di 50			P 590			T 688,700
				R 320			
5–13	D 170	C 170	2,420	An 3,360	C 300	Ap 33,620	A 215,200
		D 440		N 840	Co 340	D 6,700	F 47,000
				P 230			Sy 20,170
				R 30			T 107,600

TABLE V—Analysis of Plankton Catches—*Continued*

Orient Bay (Station V), 1922

Station	Date	Depth, metres	Cladocera	Copepoda	Nauplii	Rotifera	Protozoa	Green and blue-green Algae	Diatoms
V A	June 30/22	.58	B 850			An 3,400			N 13,985,400 T 2,540
V B	June 30/22	.58	B 850	C 5,000	1,690	An 23,740 Co 850 M 8,480 N 1,700	Co 850 Cy 1,700 D 850 Di 423,800 E 2,540	M 423,800 Os 3,814,200	M 211,900 N 16,528,000 Sy 847,600 T 12,500,000
V D	June 30/22	.58	B 3,390 D 850	C 8,480	7,630	An 12,720 Ca 3,390 M 5,930 N 9,320 P 850	C 850 Cy 2,540 D 2,540 E 850	Ap 635,700 C 1,271,400	A 635,700 F 1,695,200 M 1,059,500 N 47,889,000 T 2,966,000
V E	June 30/22	.58	Di 850	C 2,540	850	An 2,540 M 4,240 N 850	E 1,690	M 5,085,600 S 423,800	F 423,800 M 423,800 N 79,674,000 T 2,119,000

TABLE V—Analysis of Plankton Catches—*Continued*

Orient Bay (Station V), 1922

Station	Date	Depth, metres	Cladocera	Copepoda	Nauplii	Rotifera	Protozoa	Green and blue-green Algae	Diatoms
V A	July 14/22	.58	B 1,690	C 5,940	7,630	An 7,630 M 15,260 N 10,170	C 11,870 Cy 4,240 E 12,720	Ap 2,119,000 C 423,800 Me 423,800 M 1,695,000 Os 2,119,000	A 423,800 F 847,600 M 3,814,200 N 55,000,000 Sy 1,271,000 T 11,816,000
V B	July 14/22	.58	Ac 2,540 A 850			An 2,540 M 3,390 N 10,170	C 8,480 E 4,240	Ap 847,600 C 423,800 Me 1,271,400 N 1,271,400 Os 4,661,800	F 1,271,400 M 2,119,000 N 47,041,000 Sy 3,814,200 T 10,595,000
V C	July 14/22	.67	Ac 1,470 Al 1,470 B 3,670	C 730 D 1,470	3,670	An 4,400 M 2,930 N 9,540	C 9,540	Ap 2,936,000 C 1,835,000 Me 734,000 M 1,100,000 Mo 367,000	F 3,303,000 N 81,474,000 T 17,250,000

TABLE V—Analysis of Plankton Catches—*Continued*

Orient Bay (Station V), 1922

Station	Date	Depth, metres	Cladocera	Copepoda	Nauplii	Rotifera	Protozoa	Green and blue-green Algae	Diatoms
V D	July 14/22	.58	B 1,690	C 5,080 D 850	6,780	An 3,390 M 2,540 N 14,400	C 4,200 E 2,540	Ap 5,085,600 A 847,600 C 1,271,400 Me 1,271,000 M 2,119,000	F 2,119,000 M 1,695,000 N 119,088,000 P 1,271,000 T 1,695,000
V E	July 14/22	.58	Ce 850 P 850 S 3,400	C 850	850	N 5,930	C 12,720 E 4,240	Ap 1,271,000 C 423,800 Me 423,800 M 847,600	M 2,542,800 N 60,180,000 Sy 847,600 T 1,695,000
V A	Aug. 1/22	.58	Ac 1,690 A 850 Al 850 E 850	C 2,540	4,240	An 4,200 M 1,690	D 2,540 E 1,690	Ap 1,483,000 C 847,000 Me 423,800 1,695,000 S 423,000	A 428,800 F 1,059,000 M 212,000 N 27,547,000 Sy 1,059,000 T 5,509,000
V B	Aug. 1/22	.58	Ac 850 A 850 Al 850 B 3,390 Di 850	C 1,690	3,390	An 1,690 Bd 1,690 M 3,390 N 5,080 Pl 1,690	D 2,540 E 3,390	An 847,500 Ap 1,695,000 Me 423,800 M 423,800	A 423,800 F 423,800 M 212,000 N 14,409,000 Sy 1,271,000 T 9,323,600

TABLE V—Analysis of Plankton Catches—*Continued*

Orient Bay (Station V), 1922

Station	Date	Depth, metres	Cladocera	Copepoda	Nauplii	Rotifera	Protozoa	Green and blue-green Algae	Diatoms
V C	Aug. 1/22	.58	Ac 850 Al 850 E 850	Ca 850 C 2,540	1,690	An 1,690 Bd 4,240 M 4,240	C 3,390 Cy 5,930 D 4,240 E 9,320	An 423,800 Ap 1,695,000 Me 212,000 Mo 847,600	A 212,000 F 847,600 N 18,647,000 Sy 2,966,000 T 21,613,000
V D	Aug. 1/22	.58		C 850		M 850	C 10,170 E 850		N 4,661,800 Sy 635,700 T 1,059,500
V E	Aug. 1/22	.58	Al 1,690 B 850	C 850	850	An 1,690 Bd 3,400	C 24,590 Cy 6,780 D 3,390 E 11,870	C 423,800 Me 847,600	F 3,390,000 N 56,365,000 Sy 635,700 T 2,119,000
V A	Aug. 3/22	.58	Ac 2,540 A 850 Al 850	C 4,240	11,000	An 2,540 Ca 2,540 M 2,540 N 6,780 P 2,540	C 12,700 Di 1,059,000 D 1,690 E 3,390	Ap 3,390,000 C 1,271,000 Me 423,800 M 1,059,000	F 1,059,000 N 34,752,000 T 6,568,000
V B	Aug. 3/22	.58	A 830 Al 830 B 830	C 1,660 D 830	33,200	An 11,600 G 3,300 N 5,800	C 5,800 Cy 1,660 Di 207,800 D 2,500 E 2,500	Ap 415,600 C 1,870,000 M 415,600 Sp 831,200 1,039,000	N 12,468,000 T 12,050,000

TABLE V—Analysis of Plankton Catches—*Continued*

Orient Bay (Station V), 1922

Station	Date	Depth, metres	Cladocera	Copepoda	Nauplii	Rotifera	Protozoa	Green and blue-green Algae	Diatoms
V C	Aug. 3/22	.58	Al 4,980 B 1,660 D 830	C 1,660 D 1,660	6,640	An 6,640 Bd 1,660 M 2,500 N 2,500	C 7,500 Cy 830 E 1,660	Ap 1,039,000 M 415,600 Mo 623,400	N 8,312,000 T 8,935,000
V D	Aug. 3/22	.58	Al 850 B 3,400	C 1,700	1,700	An 4,240 N 4,240	C 6,780 E 3,400	Ap 212,000 Me 423,800	F 2,119,000 N 15,681,000 T 635,700
V E	Aug. 3/22	.58	Ac 850 Al 850	C 850	8,500	An 4,240 N 2,540	C 15,260	Ap 423,800	F 22,754,000 N 18,223,000 T 1,695,000
V A	Aug. 19/22	.52	Ac 950 B 8,500 D 950 Di 950 P 950	C 1,890 D 2,840	4,730	An 17,000 Ca 1,900 N 22,700 Pl 5,670	C 7,570 Cy 1,900 D 5,670	Ap 946,000 Me 946,000 M 946,000 U 473,000	A 473,000 F 473,000 M 946,000 N 17,500,000 P 1,419,000 Sy 946,000 T 4,730,000

TABLE V—Analysis of Plankton Catches—*Continued*

Orient Bay (Station V), 1922

Station	Date	Depth, metres	Cladocera	Copepoda	Nauplii	Rotifera	Protozoa	Green and blue-green Algae	Diatoms
V B	Aug. 19/22	.50	Ac 980 B 3,900 E 980	C 1,960	5,000	An 4,900 N 12,800 Pl 4,900	C 2,950 Co 2,950 Cy 5,000 D 8,850 E 18,700	Ap 3,934,000 C 1,970,000 Mo 491,800	N 17,213,000 T 5,901,000
V C	Aug. 19/22	.52	Ac 950 Al 3,700 B 8,400	C 2,800	950	An 4,700 M 2,800 N 3,700	Cy 4,700 D 4,700 E 15,140	Ap 1,890,000 C 1,419,000 M 473,000 Mo 2,365,000 Sp 946,000	N 18,447,000 F 1,419,000 T 11,825,000
V D	Aug. 19/22	.46	B 4,200		2,120	An 7,400 N 8,500	C 3,180 Cy 1,000 D 2,100 E 6,400	Ap 2,675,000 C 1,600,000	N 11,770,000 F 1,070,000 T 535,000
V E	Aug. 19/22	.56	B 4,400	C 880	2,630	An 10,540 Bd 1,750 M 2,630 N 4,400	C 13,170 Co 2,630 D 5,270 E 9,660	Ap 4,390,000 Me 878,000	F 878,000 N 37,754,000 P 878,000 T 878,000

TABLE V—Analysis of Plankton Catches—*Continued*

Orient Bay (Station V), 1923

Station	Date	Depth, metres	Cladocera	Copepoda	Nauplii	Rotifera	Protozoa	Green and blue-green Algae	Diatoms
V 1	July 4/23	.58			7,460	An 680 N 1,350 P 680	C 8,120	An 508,800 A 848,000 Sc 169,600	Co 169,600 F 169,600 M 169,600 N 339,200 T 339,200
V 2	July 4/23	.58	D 680	C 1,350	6,100	N 3,390	C 12,890 D 1,350	An 339,200	N 169,600 Ni 169,600 T 508,800
V 3	July 4/23	.24	Al 1,640 P 1,640 R 1,640	C 3,280 D 1,640	18,000	M 6,560 N 3,280	C 6,560 Ce 4,920 Cy 3,280 D 3,280	Ap 820,000 Me 820,000 Sc 1,640,000	Am 820,000 Co 9,020,000 Cy 1,640,000 G 820,000 M 1,640,000 N 46,740,000 Ni 820,000 Sy 4,920,000 T 9,840,000

TABLE V—Analysis of Plankton Catches—*Continued*

Orient Bay (Station V), 1923

Station	Date	Depth, metres	Cladocera	Copepoda	Nauplii	Rotifera	Protozoa	Green and blue-green Algae	Diatoms
V 1	July 12/23	.51	B 3,000	C 2,300 D 770 E 1,500	26,990	An 5,400 G 3,850 M 9,260 N 16,970 P 133,450 S 26,230	A 1,500 Ce 4,500 C 108,760 D 6,170 Di 3,665,000 E 2,300 V 23,140	An 385,800 D 385,800	F 771,600 M 1,350,000 N 8,294,000 Sy 385,800 T 1,350,000
V 2	July 12/23	.47	B 700 D 700	C 3,480 E 700	18,830	An 14,250 M 2,790 N 8,230 P 63,490 S 23,720	A 2,000 C 73,950 D 9,000 Di 4,360,000	An 1,046,000 Os 348,800	A 1,046,000 Co 523,000 M 872,000 N 3,836,800 T 697,600
V 3	July 12/23	.25	D 1,570 S 1,570	C 4,700	11,000	N 12,590 P 25,180	Ce 3,100 C 69,250 D 3,100 Di 786,000	Ap 1,180,000	Co 1,573,600 F 786,800 M 1,967,000 N 1,180,000 Sy 1,573,600 T 1,573,600
V 1	July 19/23	.56	D 700	C 1,400 S 700	10,500	An 2,800 N 14,700 P 33,700	C 46,380 D 2,800 Di 527,000	An 175,000	A 351,400 Co 351,400 F 351,400 M 527,000 N 1,230,000 T 1,230,000

TABLE V—Analysis of Plankton Catches—*Continued*

Orient Bay (Station V), 1923

Station	Date	Depth, metres	Cladocera	Copepoda	Nauplii	Rotifera	Protozoa	Green and blue-green Algae	Diatoms
V 2	July 19/23	.46	D 1,700	C 5,130	11,900	An 6,800	A 7,700	An 213,800	A 427,600
			R 850	D 2,560		M 3,400	Ce 13,680	C 641,400	Co 855,200
			S 850	E 1,700		N 27,360	C 37,640	Os 427,600	Cy 855,200
						P 20,500	D 12,820	Sc 427,600	F 1,069,000
						S 5,100	Di 1,924,000		M 2,565,000
									N 13,469,000
									Su 641,400
									Sy 855,200
									T 2,352,000
V 3	July 19/23	.25	D 1,570	C 4,700	11,000	An 1,570	Ce 3,150	Ap 1,180,000	Co 1,573,600
			S 1,570			M 1,570	C 69,250		F 786,800
						N 12,590	D 3,150		M 1,967,000
						P 25,180	Di 786,800		N 1,180,000
									Sy 1,573,600
									T 1,573,600
V 1	July 31/23	.56	B 1,400	C 700	3,500	An 7,730	C 85,740	An 175,000	T 527,000
			D 700			G 9,830	Di 3,689,000		
						N 7,000			
						Pl 700			
						P 8,400			

TABLE V—Analysis of Plankton Catches—*Continued*

Orient Bay (Station V), 1923

Station	Date	Depth, metres	Cladocera	Copepoda	Nauplii	Rotifera	Protozoa	Green and blue-green Algae	Diatoms
V 2	July 31/23	.43	B 7,300	C 1,800	12,800	An 20,100	C 320,200	Sc 686,400	A 1,591,000
				E 4,570		G 22,860	D 3,650		M 686,400
						N 11,900	Ep 3,650		N 895,000
						P 102,500			Sy 447,600
									T 372,800
V 3	July 31/23	.23				An 30,790	Ce 3,400	C 855,000	A 427,700
						G 1,700	C 58,170	Mo 855,000	Co 2,138,500
						N 11,900	D 1,700		Cy 1,283,000
						Pl 1,700	Di 2,990,000		F 1,283,000
						P 3,400			G 1,710,800
									M 427,700
									N 8,981,000
									St 855,000
									Sy 2,138,000
									T 4,277,000
V 1	Aug. 13/23	.55	B 2,860	C 3,570	10,000	An 4,290	C 20,740	C 357,600	A 5,900,000
			D 2,860	D 1,430		G 2,140	Di 1,430,000		M 5,000,000
						N 7,150	Ep 2,140		N 357,000
						P 3,570			T 2,324,000
V 2	Aug. 13/23	.44	B 24,100	C 2,680	13,400	An 14,300	C 14,300	Mo 223,600	A 10,956,000
			D 900			N 8,000	Di 1,565,000		M 5,366,000
						P 9,800			N 1,118,000
									T 1,341,000

TABLE V—Analysis of Plankton Catches—*Continued*

Orient Bay (Station V), 1923

Station	Date	Depth, metres	Cladocera	Copepoda	Nauplii	Rotifera	Protozoa	Green and blue-green Algae	Diatoms
V 3	Aug. 13/23	.20	Al 1,960	C 1,960		An 5,960 M 1,960 N 3,930 P 3,930	A 3,900 C 7,860 Di 983,600 E 3,930	Mo 8,850,000	A 5,409,000 Co 1,475,000 F 1,475,000 M 1,475,000 N 16,721,000 T 10,817,000
V 1	Aug. 19/23	.55	B 4,290	C 1,430	5,700	An 17,880 G 6,400 N 7,150 P 15,740	A 2,860 Ce 3,570 C 55,000 Cy 2,140 D 2,860 Di 715,000	C 536,400	A 36,117,000 Co 357,600 F 2,503,000 M 2,860,000 N 4,291,000 Ni 357,600 Sy 357,600 T 3,397,000
V 2	Aug. 19/23	.46	B 4,270		2,560	An 9,400 N 3,420 P 14,500	A 10,260 Ce 7,690 C 54,720 Cy 2,560 Di 1,496,000 Ep 17,000 E 5,000	C 1,496,000 M 855,000 1,496,000	A 25,000,000 Co 2,565,000 F 2,352,000 M 4,917,000 N 8,765,000 Ni 641,400 P 855,000 St 1,069,000 Sy 427,600 T 3,848,000

TABLE V—Analysis of Plankton Catches—*Continued*

Orient Bay (Station V), 1923

Station	Date	Depth, metres	Cladocera	Copepoda	Nauplii	Rotifera	Protozoa	Green and blue-green Algae	Diatoms
V 3	Aug. 19/23	.28	A 2,810		5,620	An 5,620 M 2,810 P 2,810	A 7,000 C 15,400 Cy 2,800	Mo 351,400	A 15,110,000 Co 702,800 M 4,919,600 N 7,028,000 Sy 2,108,000 T 5,271,000
V 1	Sept. 11/23	.50	B 9,440	C 2,360	2,360	An 7,870 N 6,290 P 3,930	A 3,140 Ce 1,570 C 63,740 Co 1,570 Di 196,700 E 2,360	An 196,700 Ap 196,700 M 590,000	A 2,360,000 Co 590,000 Cy 393,000 F 786,800 M 5,704,000 N 3,147,000 Sy 590,000 T 1,770,000
V 2	Sept. 11/23	.44	B 8,000	C 6,200	1,790	An 1,790 N 1,790 P 1,790	C 30,400		A 1,341,600 M 1,341,600 T 894,400
V 3	Sept. 11/23	.30	B 1,300 R 1,300	C 1,300	1,300	An 7,860 M 1,300	A 2,620 Ce 1,300 C 7,860 Ep 2,620 V 11,790	Ap 1,311,000 Mo 983,400	A 327,800 N 3,278,000 Sy 655,600 T 2,622,400

TABLE V—Analysis of Plankton Catches—*Continued*

Orient Bay (Station VI), 1923

Station	Date	Depth, metres	Cladocera	Copepoda	Nauplii	Rotifera	Protozoa	Green and blue-green Algae	Diatoms
VI 1	Aug. 4/23	.63	B 5,580	C 4,340	20,610	A 29,970	A 2,500	Ap 468,000	A 1,560,000
			C 620			C 23,740	C 16,240	C 156,000	F 312,000
						G 11,870	Co 1,000	D 624,000	M 312,000
						M 4,340	D 1,000	624,000	N 2,808,000
						N 3,720	Di 4,216,000	Me 156,000	St 312,000
						Pl 6,200			Sy 2,186,000
						P 63,080			T 1,872,000
						S 2,490			
VI 1†	Aug. 7/23	.57	B 4,000		5,700	A 6,880	A 1,100		A 1,115,000
						C 3,440	C 5,700	C 159,300	F 318,600
						G 5,730	D 2,300	D 477,900	M 477,000
						M 570	Di 3,500,000	Me 159,300	N 955,800
						N 570		M 318,600	Sy 318,600
						Pl 2,280			T 318,600
						P 20,000			
						S 13,770			
VI 2*	Aug. 7/23	.68	B 4,000		4,000	An 26,380	C 9,750		A 1,147,000
						C 570	Di 5,736,000		F 143,000
						G 26,380			M 143,000
						N 570			N 573,000
						Pl 7,450			Sy 286,700
						P 8,000			Co 430,000

†West arm, Station VI. *East arm, Station VI.

TABLE V—Analysis of Plankton Catches—*Continued*

Orient Bay (Station VI), 1923

Station	Date	Depth, metres	Cladocera	Copepoda	Nauplii	Rotifera	Protozoa	Green and blue-green Algae	Diatoms
VI 1	Aug. 19/23	.61	B 1,920	C 640	18,000	A 88,900	A 3,840	D 322,600	A 9,192,300
						G 26,880	C 26,240	Me 322,600	Co 483,900
						M 1,900	Co 640	M 483,900	Cy 645,200
						Pl 21,120	D 1,280	Me 161,300	F 483,900
						P 117,700	Di 4,514,000		M 2,419,500
						S 78,700	E 2,560		N 4,514,000
									T 1,451,700
									Sy 177,400
VI 2	Aug. 19/23	.61	Al 640	C 3,840	19,200	An 52,250	C 14,840	C 161,300	A 9,031,000
			B 4,480			G 14,190	Di 2,742,000	M 483,900	M 1,774,000
						N 1,920			N 2,257,000
						Pl 8,380			St 161,300
						P 171,600			Sy 161,300
						S 110,400			T 967,700
VI 2	Aug. 29/23	.53	B 740	C 740	8,900	An 9,650	C 1,500		A 928,000
						Pl 5,200	Di 1,300,000		M 371,200
						P 3,700			N 556,800
						S 32,670			Sy 556,800
									T 185,600

TABLE V—Analysis of Plankton Catches—*Continued*

Orient Bay (Station VI), 1923

Station	Date	Depth, metres	Cladocera	Copepoda	Nauplii	Rotifera	Protozoa	Green and blue-green Algae	Diatoms
VI 1	Aug. 29/23	.53	Al 740 B 1,480	C 1,480	15,590	An 20,780 Pl 3,700 P 3,700 S 28,200	C 2,230 Di 928,000	Mo 185,600	A 556,000 F 185,600 N 1,484,800 Sy 556,800 T 371,200
VI 1	Sept. 11/23	.49	B 1,600	C 1,600	4,800	An 5,620 N 1,600 P 4,000 S 4,800	Di 602,000 Ep 406,400	An 200,700 200,700	A 200,700 M 200,700 N 200,700
VI 2	Sept. 11/23	.49			6,400	An 13,650 P 1,600 S 7,230		An 200,700 200,700	N 200,700 Sy 602,000
VII 1	July 20/23	2	B 210	C 750 D 430	3,550	An 1,400 G 210 N 210 Pl 6,890 P 650	C 3,340 Co 650 D 320 Di 86,000	O 86,000 Os 731,600	A 129,100 N 43,000 Sy 86,000

TABLE V—Analysis of Plankton Catches—*Continued*

Orient Bay (Station VII), 1923

Station	Date	Depth, metres	Cladocera	Copepoda	Nauplii	Rotifera	Protozoa	Green and blue-green Algae	Diatoms
VII 2	July 20/23	4	B 2,850 P 160	C 910 D 650 E 50	11,350	An 2,000 E 110 G 210 N 110 Pl 9,360 P 2,200	C 1,350 Co 110 D 50 Di 64,560	An 64,560 Aph 21,500 O 43,000	A 322,800 Sy 21,500
VII 1	Aug. 18/23	2	B 1,180	C 18,500 D 430	1,500	An 10,330 G 2,580 N 1,600 Pl 3,000 P 8,600	C 26,250 Co 1,180 Di 43,000	C 43,000 O 86,000 Os 86,000	A 774,700 F 172,000 Sy 86,000 T 86,000
VII 2	Aug. 18/23	2	B 1,180 D 100	C 5,270 D 100	3,440	An 7,850 G 6,670 N 750 Pl 7,850 P 34,740	C 44,760 Co 1,500 Di 43,000	Aph 43,000	A 1,807,000 F 258,200 Sy 43,000 T 86,000

TABLE V—Analysis of Plankton Catches—*Continued*
South of Windigo Islands, July 27, 1923

Depth (metres)	Cladocera	Copepoda	Nauplii	Rotifera	Protozoa	Green and blue-green Algae	Diatoms
0–9	B 260	C 3,800	10,490	An 390	C 6,560	An 26,230	A 111,500
	D 720	D 4,980		C 2,400	Co 130	Aph 39,340	F 26,230
		E 980		N 2,100	D 4,060		Sy 26,230
				P 520	V 45,000		T 19,670

TABLE V—Analysis of Plankton Catches—*Continued*
Wabinosh Bay, July 28, 1923

Depth (metres)	Cladocera	Copepoda	Nauplii	Rotifera	Protozoa	Green and blue-green Algae	Diatoms
0–5	B 390	C 3,100	7,360	An 260	C 67,790	An 12,910	A 155,000
	D 510	D 3,620		C 1,810	Co 650	Aph 25,820	Sy 90,380
		E 770		N 5,040	D 260	M 25,820	T 232,500
				P 1,420	Di 38,740		
5–10	B 170	C 430	2,280	An 40	C 4,100		A 51,640
	D 40	D 300		C 260	Co 85		F 25,820
		E 40		N 1,250			St 8,600
				P 85			Sy 51,640
				R 40			T 43,040
10–15	B 40	C 650	2,020	An 390	C 1,680	An 4,300	A 60,240
		D 85		C 40	Co 40	O 8,600	F 8,600
				N 1,390	D 40	M 4,300	Sy 30,120
					E 85	43,040	T 8,600

TABLE VI—Variation in the Temperatures Covering the Period of Investigations (1922-23)

Date	Hour	Place	Temp. air °C.	Temp. water at surface, °C.
June 30/22	2.30 p.m.	Orient Bay, V	....	....
July 14/22	3.35 p.m.	" "	26.5	20.5
" 19/22	2.10 p.m.	Black Sturgeon Bay	20.0	17.0
" 20/22	11.00 a.m.	Chief's Bay	22.0	18.0
" 23/22	6.00 p.m.	Gull Bay	20.0	18.9
Aug. 1/22	2.45 p.m.	Orient Bay, V	24.5	23.5
" 3/22	3.00 p.m.	" "	22.0	22.5
" 8/22	4.40 p.m.	Humboldt Bay (Inner)	17.0	17.6
" 8/22	5.30 p.m.	Humboldt Bay (Outer)	15.0	15.8
" 9/22	3.30 p.m.	Ombabika Bay	16.6	18.6
" 19/22	2.15 p.m.	Orient Bay, V	17.5	20.3
July 4/23	3.00 p.m.	" "	23.	24.5
" 12/23	2.45 p.m.	" "	26.3	24.0
" 19/23	10.00 a.m.	" "	26.	21.0
" 20/23	4.35 p.m.	" " VII	26.	21.5
" 27/23	2.30 p.m.	South Windigo Islands	19.4	17.
" 28/23	10.20 a.m.	Wabinosh Bay	18.	19.4
" 31/23	10.10 a.m.	Orient Bay, V	23.	19.0
Aug. 4/23	11.00 a.m.	" " VI	18.	19.0
" 7/23	3.15 p.m.	" " VI	16.	17.0
" 10/23	10.30 a.m.	McL. Bay	14.	14.0
" 13/23	10.00 a.m.	Orient Bay, V	14.7	16.3
" 17/23	4.00 p.m.	Bell's Bay	15.5	17.1
" 18/23	1.15 p.m.	Orient Bay, VII	19.3	15.4
" 19/23	4.00 p.m.	" " V	15.	17.0
" 19/23	5.30 p.m.	" " VI	13.8	17.0
" 29/23	2.30 p.m.	" " VI	17.7	17.0
Sept. 3/23	3.00 p.m.	Bay of Nipigon R.	12.3	15.5
" 11/23	11.30 a.m.	Orient Bay, VI	11.0	11.8

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Plate 1—The highlands of Pijitawabic (Orient) Bay, Lake Nipigon

Plate 2—A more evolved shore (Station V) Pijitawabic Bay, Lake Nipigon.