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THE COMPOSITION, ABUNDANCE, AND DEPTH DISTRIBUTION OF THE 1957 SUMMER NET ZOOPLANKTON OF BARE LAKE, ALASKA, AFTER FERTILIZATION

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ABSTRACT

Bare Lake was artificially fertilized with various phosphates and sodium nitrate each summer over a 7-year period (1950-56). During the third season of fertilization (1952), it was found that although many factors in the lake's ecology had changed, the zooplankton population had remained remarkably stable. In 1957, the zooplankton was again examined and was found to have increased at least threefold in abundance over the 1952 population. In addition, although the lake has a maximum depth of only 7.5 meters, the distribution of zooplankters by species showed a definite change with depth.

INTRODUCTION

Bare Lake is a small, unstratified lake located on southwest Kodiak Island (fig. 1). It occupies an oval-shaped basin with a maximum length of 1,222 meters and a maximum width of 495 meters, a total area of approximately 49 hectares. It has a maximum depth of 7.5 meters and a mean depth of 4 meters (fig. 2).

The lake was artificially fertilized with diammonium phosphate and sodium nitrate each summer from 1950 through 1956 by the U.S Fish and Wildlife Service, Bureau of Commercial Fisheries. The amount of fertilizer added was calculated to increase the nitrate nitrogen concentration of the water 0.25 mg./l. and the phosphate phosphorus concentration 0.05 mg./l. Primarily, the fertilization study was designed to determine if the addition of inorganic nutrients to the lake waters would increase the food supply and, subsequently, the growth and survival of juvenile sockeye salmon, *Oncorhynchus nerka* (Walbaum), before their seaward migration.

According to Nelson and Edmondson (1955), preliminary results, 1950 through 1953, indicated that fertilization had (1) increased the rate of photosynthesis during the 10-day period after fertilization by a factor of 2.5 to 7 as compared with the 10-day period before fertilization, (2) increased the phytoplankton population manyfold, (3) increased the pH of the water, and (4) decreased transparency, but (5) had little or no detectable effect on the zooplankton population.

The same authors state (1955, p. 434): "Some rotifers seemed to show an effect of increased food supply, in that egg production

Figure 1.--Aerial photograph of Bare Lake, Alaska.

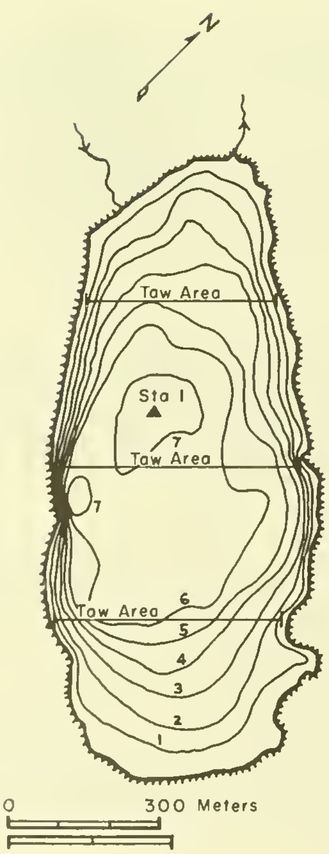

Figure 2.--Bare Lake, Kodiak Island, Alaska. Depth contour intervals in meters.

was apparently accelerated. The planktonic crustaceans did not show a significant increase in population size from 1950 to 1952, possibly as a combined result of their long life cycle and effective predation." The potential importance of the increased egg production is discussed in detail by Edmondson (1960).

The 1957 study deals with the zooplankton population, its species composition, seasonal variations in abundance, and depth distribution of the component species. All of the fish species in Bare Lake are directly dependent at times in their life cycle on the zooplankton population as a major source of food. Since zooplankton is an important link in the food chain, the study is of value in determining the effects of fertilizing Bare Lake.

The 1957 findings are compared with the results of the 1952 Bare Lake zooplankton work of Nelson and Edmondson, with the zooplankton populations of five small unfertilized lakes of similar origin (glacial) in Colorado (Pennak, 1944), and with the effect of increased nutrients on zooplankton production of two Michigan ponds (Waters, 1956).

EQUIPMENT AND SAMPLING PROCEDURES

Zooplankton collections at Bare Lake from 1950 to 1952 were taken with a Clarke-Bumpus

Plankton sampler, using both the No. 10 and No. 20 silk bolting cloth plankton nets and cups and a 3-liter Kemmerer water sampler. The methods of collection, however, changed to some extent during the study period. For instance, the 1950 samples were collected by oblique hauls with the No. 20 net Clarke-Bumpus sampler only. In 1951 through July 23, sampling was continued as in 1950. After that date, oblique tows were made with the No. 10 net, and, in addition, surface samples were collected with the 3-liter Kemmerer bottle and strained through the No. 20 net. The 1952 samples were also collected with the 3-liter Kemmerer bottle at each meter depth, surface through 6 meters. Samples from the various depths were combined and poured through the No. 20 net. At the same time, oblique tows were made with the No. 10 net Clarke-Bumpus sampler, as in 1951.

Since the 1957 study was concerned with estimating the abundance of zooplankton, it was decided to use the No. 10 net and cup with the Clarke-Bumpus sampler. Ricker (1938a, p. 22) states, "A mesh 20 net, used to take several hauls in succession, decreases in efficiency throughout the first few. The efficiency of a mesh 20 net decreases with age."

In contrast, concerning the No. 10 net Ricker (1938a, p. 25) states,". . . (1) there appears to be no change in its efficiency when a series of as many as 20 hauls are taken in quick succession, and (2) over a period of service of a year and a half, no significant change in efficiency occurred, although toward the close of that period the trend appears to be toward a slight reduction." For these reasons the No. 10 silk bolting cloth net was selected in preference to the No. 20 net, although Ricker further observes that copepod nauplii, small rotifers, and protozoa can to a varying degree, depending on their size, pass through the meshes of a No. 10 net.

To achieve comparable data between oblique hauls and Kemmerer bottle samples, it was decided to strain all Kemmerer samples through the No. 10 net. The water samples from each meter depth were collected with the 3-liter Kemmerer water sampler as in the past.

To increase the reliability of the Kemmerer bottle samples and perhaps provide a check on the reliability of the oblique haul quantitative data, the size of samples taken with the Kemmerer bottle was increased from 3 to 9 liters at each meter depth. In addition, to obtain depth distribution data, each meter depth sample was kept separate. It was realized at the time that the Kemmerer bottle samples might not give reliable quantitative data because of the small sample size, the single centrally located collection station, and the possibility of avoidance of the Kemmerer bottle by active zooplankters. In practice an additional unforeseen factor biased the quantitative data collected by the Kemmerer bottle to an even greater extent than those listed above. Because of clogging, as the metered net collected plankton, it became increasingly efficient at collecting the smaller organisms that normally would have passed through the meshes. This gave the metered samples a higher and more representative count of smaller organisms than the Kemmerer bottle samples. Samples were collected in the early afternoon each sample day.

Although there was a possibility of avoidance of the Kemmerer bottle by some zooplankters, it was assumed to be comparable for all depths, as Bare Lake is shallow and unstratified. Hence, the Kemmerer samples should yield qualitative and quantitative data for interspecific comparison at all depths and thus give valid vertical distribution data by species. All of the Kemmerer samples were collected at station 1 (fig. 2).

The Clarke-Bumpus sampler was a nonclosing type, and hauls were made in the following manner. As soon as the desired towing speed was attained the plankton sampler was allowed to enter the surface of the lake. The sampler was lowered at a slow, uniform rate until it arrived close to the bottom of the lake and was retrieved at the same rate so as to sample all depths uniformly. The revolutions of the meter were recorded, the sample transferred to a jar, and the net thoroughly washed before the sampling meter was taken to a different station. Nelson and Edmondson (1955, p. 420) observed: "The samples taken with a No. 10 net present no problems of adjustment. The tows were made at an approximate speed of 2.2 miles (3.6 kilometers) per hour and were ordinarily of 5 minutes duration." The 1957 oblique hauls ranged from 2.0 to 2.5 miles per hour and were from 4.5 to 5.5 minutes in duration.

The Clarke-Bumpus meter was calibrated by hauling it over a measured 122-foot (37.2 m.) distance six times and recording the revolutions. Each revolution of the meter represented 4.9 liters of water strained by the net.

The literature contains many references about the horizontal distribution of plankton organisms and the choice of plankton sampling sites on a lake (Ricker, 1938a and 1938b; Rawson, 1953; Langford, 1953). Southern and Gardiner (1926) observed large differences in horizontal distribution of plankton organisms between different stations on Lough Derg, Ireland, which perhaps could be expected from its irregular depth contours and the effect of the large volume of water entering from the River Shannon. Ricker (1938a) cites experiments reported by Naber (1933) to the effect that the mean number and variability of distribution of various plankters in eight hauls from different stations in the pelagic region of the Lake of Plön, Germany, did not significantly exceed the mean and variability in six hauls from a single station. Ricker found that choosing a central station to represent the entire pelagic area of Cultus Lake, British Columbia, was in general quite satisfactory, although *Cyclops*, *Daphnia*, *Bosmina*, and *Notholca* appeared to have a somewhat irregular rather than a random distribution.

Because of the small size and rather uniform depth contours of Bare Lake, three towing areas, one at each end and one in the center, were established (fig. 2). They were believed to be adequate to yield quantitative and qualitative data from the metered hauls. Samples were collected approximately every tenth day from May 26 through September 4, 1957. All samples were preserved by adding formalin until a 3- to 5-percent solution was achieved.

Almost without exception in plankton enumeration studies, only a fraction of a sample is counted. There are, however, several methods used in fractioning a sample. Ricker (1938a) found by testing that the volumetric methods of fractioning approached the ideal, but that fractioning on a slide was not satisfactory. He further observed (1938a, p. 31), "As the collection itself is subject to a sampling error of as great or greater magnitude, the error of fractioning does not introduce additional uncertainty into a count of given size, as long as the technique used is accurate, i.e. purely random."

The 1957 samples were all fractioned in the following manner. Each metered sample was increased in volume to a standard 100 ml. by adding 5-percent formalin until the desired volume was attained. Since plankton organisms were far less abundant in Kemmerer samples, each of these samples was standardized at 9 ml. Also, since the total sample consisted of 9 liters of lake water, a 1-ml. fraction of the 9-ml. concentrated sample would represent 1 liter of lake water. The samples were then fractioned by (1) bubbling air through the sample until the organisms appeared to be thoroughly and evenly dispersed, (2) immediately extracting 1 ml. of the sample with a Stempel plankton pipette. The 1-ml. sample was then transferred to a Sedgewick Rafter Counting Cell, and the entire cell was counted. Replicate counts were made of all samples and where the observed variability warranted, a third count was made. Approximately one-third of the Kemmerer samples were counted in total. Also, several samples were refractioned and counted by another worker. Kutkuhn (1958) found that for macroplankton a high degree of precision could be obtained from one or two cell counts.

The zooplankton species encountered were tentatively identified in the laboratory, and the identifications were later checked by recognized workers in the respective fields. The zooplankton population consisted of: *Keratella canadensis* Berzins, *Keratella cochlearis* (Gosse), *Kellicottia longispina* (Kellicott), *Ploesoma hudsoni* (Imhoff), *Conochilus unicornis* (Rousselet), *Asplanchna priodonta* (Gosse), *Epischura nevadensis* (Lilljeborg), *Bosmina coregoni* (Baird), *Bosmina longirostris* (Müller), and *Ceratium hirundinella* (Müller).

Also occasionally occurring in the samples were: *Polyarthra vulgaris* Carlin, an unidentified ostracod, and an unidentified hydracarina. Photographs of seven of the species are shown in figure 3.

RESULTS AND DISCUSSION

Depth Distribution

Although Bare Lake is relatively shallow (7.5 m.), a difference was found among the vertical distribution patterns of individual species of zooplankton organisms. The vertical distribution of zooplankton as a whole was fairly uniform however (table 1, fig. 4). Temperature apparently has little effect on vertical distribution at Bare Lake, as there was rarely more than 1.5°C. of variation from surface to bottom throughout the study period. The water was found to be saturated with oxygen at all depths throughout the season. Samples were collected about the same time each sample day. Trophic relations of zooplankton organisms, although little studied in fresh-water species, might offer a possible explanation of the distribution pattern exhibited at Bare Lake.

Although the problem was not studied at Bare Lake, it is of interest to note that Pennak (1944) found a diurnal vertical migration of 12 zooplankters in a study of five shallow lakes in Colorado. At least five of the species exhibiting this phenomenon in the Colorado lakes studied by Pennak are present in Bare Lake.

Seasonal Variations in Abundance

The rapid embryonic development and brief egg production cycle of many of the rotifers enable them to respond rapidly to environmental changes. Hence, seasonal peaks of abundance for some zooplankton organisms may follow quite closely optimal seasonal conditions. According to Edmondson (1957, pp. 238-9): "The rotifer *Keratella cochlearis* (Gosse) attaches a newly laid egg to the lorica and carries it until hatched. Ordinarily the length of embryonic period is shorter than the interval between the production of eggs . . . . In Bare Lake during one of the years of investigation, the egg : female ratio for *Keratella cochlearis* was 0.33 before fertilization and 0.73 one week after fertilization. By this time there had been a distinct increase in the quantity of phytoplankton, and the implication is that the rotifer population was responding to increased food supply by the increasing reproductive rate."

Conversely, entomostracans have been observed to have a more extended life cycle and their response may be much more delayed. It is interesting to note that the similar seasonal variation patterns of *Keratella cochlearis* and *K. canadensis*, as shown in figure 5, indicated a possible similarity in the ecology of these two closely related species. It was noted that, while *Kellicottia longispina* was most abundant as *Ceratium hirundinella* was declining in numbers, the *Keratella* species reached a peak earlier than *Ceratium*. *Ploesoma hudsoni* followed a similar pattern in relation to that of the *Keratella* species (fig. 5), possibly as a result of a trophic association.

The No. 10 net is admittedly not adequate to assess accurately the abundance of small organisms such as *Ceratium*, immature cladocerans, nauplii, and small rotifers. Still the seasonal variations in abundance found for these organisms as indicated in figure 5 were as might be expected. The one exception to this might be *Epischura nevadensis* whose apparent low numbers, small fluctuations in abundance, and long life cycle, coupled with the increasing ratio of nauplii to adults as the season progressed, cast doubt on the validity of the variations as indicated in figure 5. The average number per liter of the above zooplankters should therefore be interpreted as minimal figures rather than as true estimates of abundance. *Conochilus unicornis*, although a small rotifer, is of a colonial type and was probably sampled adequately by the No. 10 net.

Comparison of Zooplankton Abundance

The depth of a lake must be considered when comparing zooplankton production among lakes (Rawson, 1953, p. 230-232). Since zooplankton are usually most concentrated in the epilimnion, a shallow lake would have a decided advantage when compared to a deep

A

B

C

D

Figure 3.--Seven species of
A. *Keratella canadensis*, B. *Keratella cochlearis*, C. *Kellicottia longispina*, D. *Ceratium*

E

F

G

zooplankton found in Bare Lake, 1957.
hirundinella, E. *Bosmina longirostris*, F. *Bosmina coregoni*, G. *Epischura nevadensis.*

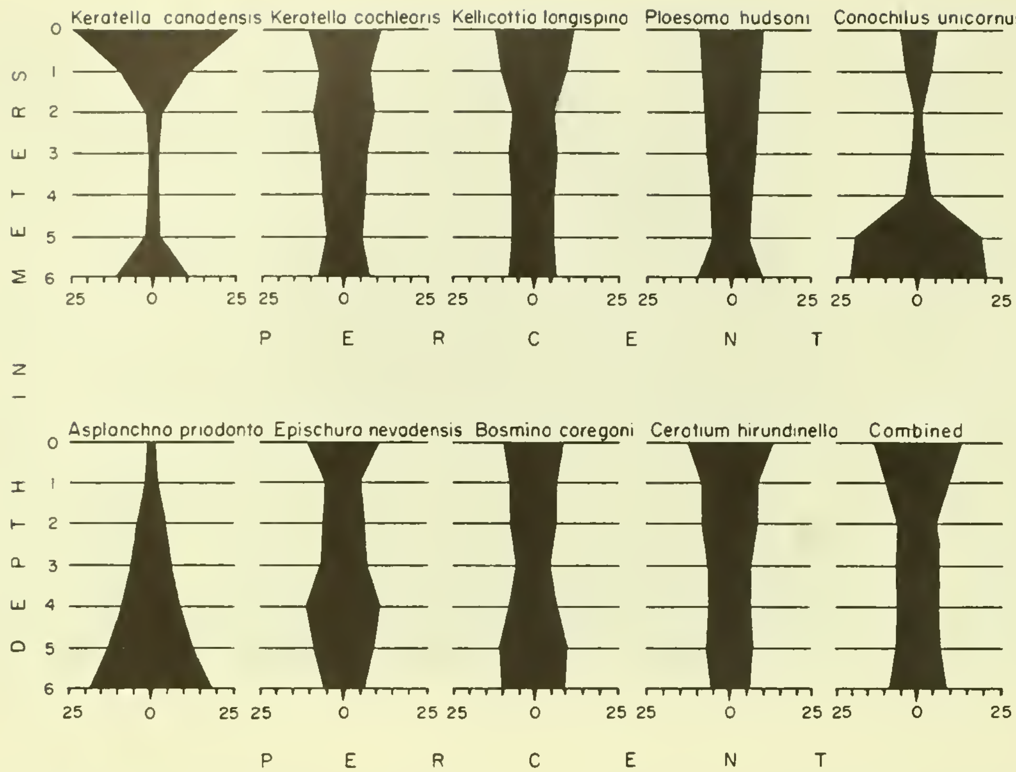

Figure 4.--Vertical distribution of zooplankton by species in Bare Lake, 1957, as a percentage at depth of the accumulated counts.

lake on an organism per liter basis. Also, in any comparison, the method of capture must be considered. A third consideration, rarely mentioned in plankton papers, is the presence and abundance of plankton predators such as populations of *Chaoborus* and fish. Edmondson wrote (1957, p. 239-240): "Although many animals are known to prey on zooplankton, little is known of the rate of predation or the effect on the zooplankton population."

As indicated in figure 6, Bare Lake apparently had about three times as many zooplankters per liter of water in the summer of 1957 as in the summer of 1952. The question arises as to why this was so. Did Bare Lake actually produce more zooplankton in 1957, or, perhaps because of a possible longer life expectancy, were zooplankton merely available for capture by the net over a longer period of time? Perhaps in 1952, the population was subjected to more intense grazing by predators than in 1957. Certainly the 1952 zooplankton had the advantage of inhabiting an environment enhanced by the addition of fertilizers. Bare Lake was then in its third summer of artificial fertilization with di-ammonium phosphate and sodium nitrate. The application of these fertilizers to the lake was discontinued after 1956. Unfortunately the exact abundance of each fish species inhabiting the lake is not known. Data are available however in unpublished records of the Fish and Wildlife Service that indicate relative abundance for all species present (table 2).

Essentially *Salmo gairdneri, Oncorhynchus tshawytscha,* and *Cottus aleuticus* are too few in number to affect seriously the zooplankton population and may be ignored. *O. nerka* appears to have been slightly (12 percent) more abundant in 1952 than in 1957. However, *Salvelinus malma* and *O. kisutch* appear to have been definitely on the increase throughout the study period (table 2). *S. malma* was quite likely twice as abundant in 1957 as in 1952. Although *Gasterosteus aculeatus* was known to be abundant there are no accurate estimates of numbers in the records, and it may be assumed that its abundance was unchanged over

Table 1.--Accumulated counts of individual zooplankters by species by depth, Bare Lake, 1957

Depth (m.)	Species				
	Keratella canadensis	*Keratella cochleari*	*Kelicottia longispisa*	*Conochilus unicornis*	*Asplanchna priodonta*
0	4,541	197	12,044	293	26
1	1,764	137	9,222	24	45
2	376	163	5,424	45	170
3	219	126	6,624	124	228
4	222	121	5,817	228	338
5	276	99	5,581	1,236	547
6	1,959	149	6,758	1,319	773

Depth (m.)	Species				
	Ploesoma hudsoni	*Epischura nevadensis*	*Ceratium hirundinella*	*Bosmina coregoni*	Combined
0	23	503	1,621	426	19,674
1	22	226	989	332	12,761
2	20	269	968	338	7,773
3	18	335	678	236	8,588
4	15	533	709	342	8,325
5	13	446	825	493	9,516
6	20	284	656	465	12,383

the study period. If any change in abundance occurred, it probably would involve an increase in numbers under lake fertilization conditions. Hence, it would appear that the 1957 zooplankton population was probably grazed as intensely as the 1952 zooplankton population or more so. It is therefore concluded that the lake did produce at least three times as many zooplankters in the summer of 1957 as in 1952. It is also speculated that since (1) the 1957 zooplankton population was three times as abundant as the 1952 population, (2) the number of predators increased in the same period, and (3) the grazing on plankton at both times was probably heavy, the increase in zooplankton as a result of fertilization may have been delayed by heavy predation. Thus, only in recent years has the zooplankton reached an abundance consistent with the raised levels of productivity occasioned by fertilizing. This hypothesis was not tested, but is offered as a reasonable explanation for the delay observed, based on the data collected.

Table 3 shows the 1957 Bare Lake net zooplankton population abundance in comparison with the summer abundance in five Colorado lakes studied by Pennak (1944). The lakes in both studies are of similar origin (glacial), and all are comparatively small and have several zooplankton species in common. The comparison was made on the basis of the number of organisms per liter. Protozoa are not included in the table.

These data indicate that Bare Lake is near the median of the five lakes in abundance of Entomostraca and Rotatoria. However, the zooplankton at Bare Lake were collected with

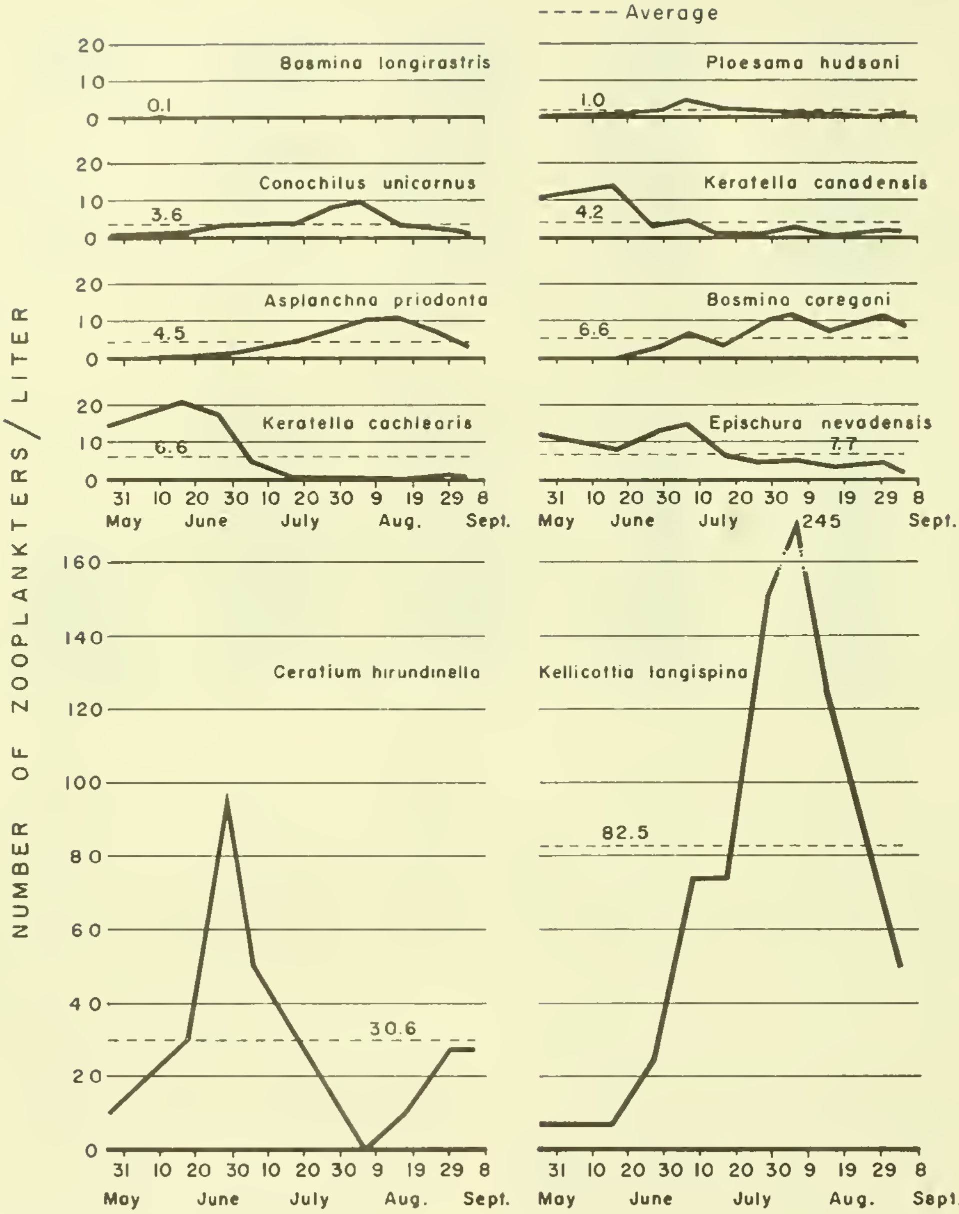

Figure 5.--Seasonal variations in abundance of zooplankton by species from plankton tow data, Bare Lake, 1957.

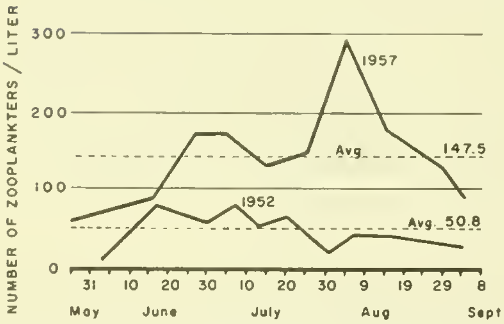

Figure 6.--Seasonal zooplankton abundance, Bare Lake, 1952 and 1957 (oblique tows No. 10 net).

a No. 10 net, while those in the Colorado lakes were collected with a Juday-Foerst plankton trap. Pennak does not mention the possible presence of a fish population in any of the lakes studied, whereas Bare Lake has a relatively large population of fish which actively crop the zooplankton population. This factor, along with the longer growing season and the higher rate of solar radiation in Colorado lakes, indicates a higher level of productivity in Bare Lake relative to the Colorado lakes than is shown in the table.

Table 2.--Comparative abundance of fish in Bare Lake, 1952 and 1957

Species	Abundance		Comment
	1952	1957	
Oncorhynchus nerka	8,620	7,611	From outmigration counts.
O. kisutch	1,781	2,664	From outmigration counts.
O. tshawytscha	Rare	Rare	Rarely captured.
Gasterosteus aculeatus	Abundant	Abundant	No records of abundance.
Salvelinus malma	Unknown	8,200	(1/)
Salmo gairdneri	Few	Few	No apparent population change.
Cottus aleuticus	Few	Few	No apparent population change.

1/ The *S. malma* population was assessed in 1955 at 4,200, 1956 at 6,100, and 1957 at 8,200, using the Schnabel method.

Table 3.--Comparison of zooplankton abundance in Bare Lake with five Colorado lakes

Lake	Area in hectares	Depth in meters	Average number zooplankters per liter	
			Entomostraca	Rotatoria
Grand	205.2	62.0	8.8	38.5
Big	5.9	7.6	15.9	3.6
Bear	4.5	9.6	79.9	661.3
Silver	50.6	11.9	118.5	348.3
Summit	11.1	13.8	3.7	241.6
Bare	49.0	7.5	14.5	102.4

It was intended to compare the response of Bare Lake zooplankton to fertilization with the response of zooplankton to fertilization in similar studies, but little information could be found on the population dynamics of zooplankton in a fertilized environment. Waters (1956) followed the dynamics of both the phytoplankton and the zooplankton populations of two Michigan bog ponds for 3 years after the application of hydrated lime. There are essential differences between applying fertilizer and applying lime to a body of water. In applying fertilizer, nutrient materials are added directly to the water, whereas in applying lime, chemically bound nutrients already present are released for use by increasing the alkalinity of acid waters. In both cases the purpose is to increase the productivity of the lake, and in this respect both methods produce rapid results. Waters applied the hydrated lime in two applications, one in the summer and the other in the fall of 1953. Immediately after the lime treatment, he observed a partial destruction of some species of the phytoplankton population followed closely by a heavy bloom of *Mycrocystis aeruginosa*, a blue-green alga form. Zooplankton however did not show any response to treatment until 1955, over 2 years after treatment had ceased. The Bare Lake zooplankton has exhibited a similar pattern of delayed response that was perhaps further obscured by effective cropping by predators.

The work of Ricker (1938a, 1938b), Langford (1953), Rawson (1953), Kutkuhn (1958), and many others provide ample guidance for avoiding many errors in collecting and analyzing plankton samples. A careful worker should encounter little difficulty in the proper selection of methods to meet his requirements. Although finding the right techniques presents no problem, the vertical and horizontal distribution of the plankton organisms must be considered when selecting the location and number of sampling stations at each new lake. The work at Bare Lake and Pennak's 1944 studies of five shallow lakes in Colorado have shown that even in relatively shallow lakes the zooplankton may display a definite variation in depth distribution when considered by species. As has been demonstrated in other zooplankton studies, the vertical distribution of the organisms may be a response to the physical or chemical environment of the lake, or it may be a response to a trophic interrelation, as was suggested for Bare Lake in 1957.

Studies of the trophic rates and relationships of fresh-water zooplankters offer much promise in applied as well as theoretical biology. For example, in fish farm pond work in Hungary, various cladocera species are being used to control detrimental phytoplankton blooms in fertilized ponds (Eugene Muzsi, letter, 1959). This type of biological control would offer more benefit to the fish population than the chemical controls now employed in the United States.

A somewhat cursory examination of the literature regarding lake fertilization studies has revealed that zooplankton studies per se have been largely disregarded by workers in this field. Possibly one reason for this is that phytoplankton life cycles are usually short, and thus their responses to fertilized environments are more accelerated, spectacular, and easily observed. A frequent approach in the analyses of fertilization results has been to proceed directly from the addition of the fertilizer to the waters to the subsequent measurement of the results in terms of fish growth or survival. Frequently the effect of increased nutrient supply on phytoplankton production is also included, and occasionally changes in bottom fauna are recorded. The zooplankton, however, are largely either ignored or lumped with other planktonic forms. The fact that zooplankton are usually one step nearer the fish than are the phytoplankton in the food chain, and, as indicated at Bare Lake, that the effect of fertilization on zooplankton may extend beyond the actual fertilization period, would argue for their importance in any study of this nature.

Short-term interpretation of zooplankton sampling results is often made difficult by the presence of predator populations. In the Bare Lake study, cropping by predators may have effectively masked the response of the zooplankton to the fertilizer-enhanced environment for a period of time beyond the lag normally expected. The fact that zooplankton production was accelerated however was eventually made evident by the growth and population increases observed in the fish biomass, as well as by the observable gain in numbers of zooplankton detected in 1957.

SUMMARY

1. Bare Lake, a small, shallow, unstratified lake on Kodiak Island, Alaska, was artificially fertilized with di-ammonium phosphate and sodium nitrate each summer from 1950 through 1956.

2. Nelson and Edmondson (1955) report that at the end of the third season of fertilization (1952), it was determined that fertilization had (1) increased the rate of photosynthesis, (2) increased the phytoplankton population manyfold, (3) increased the pH of the water, and (4) decreased the transparency, but (5) had little or no detectable effect on the net zooplankton population.

3. The 1957 zooplankton population, although inhabiting a shallow (7.5 m.) lake, displayed a definite variation in depth distribution when considered by species that was not apparent when the population was considered as an entity.

4. By 1957 the zooplankton had increased at least threefold over the 1952 abundance. The delay in increase observed may have been due to effective cropping by predators, perhaps complicated to some extent by the slow life cycle of the planktonic entomostraca. This same pattern of delayed response was recorded by Waters (1956) in a hydrated lime study in two Michigan ponds where predation may or may not have been a factor.

5. The Bare Lake zooplankton abundance for 1957 was comparable with the zooplankton abundance of five small Colorado lakes.

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Created in 1849, the Department of the Interior--America's Department of Natural Resources--is concerned with the management, conservation, and development of the Nation's water, fish, wildlife, mineral, forest, and park and recreational resources. It also has major responsibilities for Indian and Territorial affairs.

As the Nation's principal conservation agency, the Department works to assure that nonrenewable resources are developed and used wisely, that park and recreational resources are conserved for the future, and that renewable resources make their full contribution to the progress, prosperity, and security of the United States--now and in the future.