



Title	未利用湖沼樺招の生物調査並びに養魚上支笏湖生物相との比較
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A BIOLOGICAL SURVEY OF LAKE KABA, AN UNCULTIVATED LAKE, COMPARING IT WITH LAKE SHIKOTSU, FOR THE PURPOSE OF CULTIVATION FOR FISHERY

BY

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(With One Text-figure)



Hokkaido is blessed with lakes of various kinds, a few of which have been utilized for fishery while most of them still remain in the natural untouched state. The economical value of the latter, if cultivated, is by no means small. So, the Government Fishery Experimental Station has succeeded in cultivating Lake Shikotsu introducing *Oncorhynchus nerka* (WALBAUM) and *Salmo irideus* GIBBONS and at the same time a kind of freshwater shrimp for the nutrition of the fishes from other lakes. At present the lake has become even famous for the production of those kinds of fishes.

In the hope to ascertain means for the utilization of a lake the present study was undertaken. It is to determine first whether the lake in question has any economical value and next to see subsequent changes, if any, caused by the cultivation. Fortunately Mr. J. TANAKA was very kind to us in offering an uncultivated lake of his own, named Lake Kaba, for our experiment.

Lake Kaba lies to the south of Lake Shikotsu having Mt. Tarumae between them and empties into one of the branches of the River Nishitappu which flows from the eastern foot of the mountain toward the sea. The lake has an area of about 1000 square meters forming two long gulfs, surrounded by bushes to the south-west. The north-eastern side of the lake is bordered with even ground where reeds and reedlings grow thick. The bottom is nearly flat covered mostly with darkbrown saprobel and partly with brown sand or volcanic pebbles in the neck part. It is deepest in the central part measuring 4 meters, other parts being less than 4 meters in depth. At the neck part the depth is about ten centi-meters only.

The water of the lake is not stagnant but always runs out through the narrow mouth of 4 meters width. Recently we have made an artificial float-gate in this part in order to separate the lake from the river part.

The maximum temperature of the lake appears in August showing about 18–19°C. Usually in the summer season the air temperature measures about 5–6°C higher than that of the lake. Toward winter the divergency in the temperatures decreases gradually until at last in late December the condition becomes reversed. In this season the atmospheric temperature falls below 4°C, while the water temperature of the lake shows an almost constant, 4°C. Of course under heavy snowfall the water temperature temporarily declines below 4°C and sometimes a part of the surface of the lake is frozen by the severe cold.

The following table shows the observations on temperature of the water at 1 p. m. at twenty centi-meters depth last year.

Table I. The water temperature of Lake Kaba

Date Temp.(°C)	July		August	September			October			November					December				Janu- ary
	25	26		13	22	30	7	15	22	1	9	15	23	28	2	12	18	21	16
A. T.	17	24		24	22	20	19	18	18	17	14.5	13	11	9.5	8.5	5.5	3	2	-6
W. T.	14	18		17.5	16	15.5	15.5	14.5	14	13	11.5	11	10	9	7.5	5	3.5	3	5

A. T., Atmospheric temperature; W. T., Water temperature.

No doubt, in the lake the water is usually gushing out in a considerable amount all the year round. So far as the physical condition of the lake is concerned, it is quite fitted for salmon-trout farming.

It is a well known fact that the economic value of the lake is determined on the other hand mainly by its plankton life as the method of supplying artificial food has not yet much advanced.

The inhabitants examined in Lake Kaba in the summer season were identified as follows:

Porifera

Spongilla sp. in July abounds in the western gulf only.

Nematoda

Lamellibranchia

Anodonta sp. very common in the southern side of the Lake.

Crustacea

Cambaroides japonicus (DE HAAN) at the neck, very common.

Pisces

Leuciscus hakonensis GÜNTHER not so frequent.

Leuciscus sp. (*Yachiugui*) very common but species name undetermined; the fish is very voracious but of least value.

PLANKTON**Flagellata**

Peridinium sp. very frequent.

Glenodinium sp.

Rhizopoda

Nuclearia sp.

Ciliata

Dinobryon sertularia EHRENBERG

Codonella crateva (LEIDY)

Rotifera

Anuraea cochlearis GOSSE

Ploesoma hudsoni IMHOF

Polyarthra platyptera EHRENBERG

Asplanchna priodonta GOSSE

Crustacea

Nauplius

Bosmina longirostris (O. F. MÜLLER)

Bacillariaceae

Fragilaria sp. *Asterionella* sp.

Synedra sp. *Epithemia* sp.

Surirella sp. *Melosira* sp.

Cocconema sp.

Chlorophyceae

Oedogonium sp.

From the above we know that in the lake many fishes have been accustomed to live naturally with the above mentioned plankton which is to be considered sufficient for them. But in consideration of the farming of salmon-trout, it is necessary to compare the life in the lake with that of Lake Shikotsu.

The lives in Lake Shikotsu at summer season were as follows:

Crustacea

Cambaroides japonicus (DE HAAN)

***Leander paucidens* (DE HAAN)**

Once Lake Shikotsu was conspicuous in having plenty of the crayfish. However at present hardly any crayfish can be found in the lake except in rivers or rivulets which empty into the lake. The evidence is very interesting as it closely correlates to the introduction of the shrimp. In 1918 and 1919 the shrimp was transplanted from Lake Osatsu about 10 kgr. respectively and since that time the crayfish has become to disappear from the lake gradually with the increase of the shrimp until 1928 when the lake seemed to be completely occupied by the shrimp.

Pisces

***Salvelinus pluvius* (HILGENDORF)**

***Cottus pollux* GÜNTHER**

***Oncorhynchus nerka* (WALBAUM)** the fish was introduced from Lake Akan in three successive years from 1894 with success. At present the fish has become more abundant in this lake than in the original.

***Salmo irideus* GIBBONS** the fish has been artificially cultured since 1920.

***Carassius auratus* (LINNÉ)** the fish was introduced seven years ago (1925) but at present it is rather rare in the lake.

PLANKTON

Flagellata

***Ceratium hirundinella* O. F. MÜLLER**

***Peridinium* sp.**

Ciliata

***Dinobryon serturaria* EHRENBERG**

Rotifera

***Anuraea aculeata* EHRENBERG**

***Anuraea cochlearis* GOSSE**

Crustacea

***Diaptomus denticornis* WIERZEJSKI var. *yezoensis* KOKUBO**

***Daphnia longispina hyalina* (LEYDIG)**

***Scapholeberis mucronata* (O. F. MÜLLER)**

Nauplius

Arachnoidea

***Hydrachna* sp.**

Bacillariaceae

Fragilaria sp.*Surirella* sp.*Epithemia* sp.*Synedra* sp.*Cocconema* sp.**Chlorophyceae***Oedogonium* sp.

As previously stated Lake Shikotsu is one of the lakes which has been successfully utilized for fish culture in Hokkaido, so the study of plankton of any unutilized lake in comparison with that of this lake qualitatively as well as quantitatively is by no means useless. Doing so we may have some suggestion for the cultivation of the new lake, as we have already learned that the physical condition of Lake Kaba is fitted for the fish.

Observation showed that in the summer season the plankton life in Lake Kaba is characterised by the abundant Rotifera while in Lake Shikotsu there are numerous Cladocera and Copepods. In Lake Kaba there is only one species of Cladocera, that is *Bosmina longirostris* (O. F. MÜLLER) which we found a few in the September plankton. UENO (1931) described the same species of Cladocera from Onuma, Konuma and Lake Kuttarush but in Lake Shikotsu other species, *Daphnia longispina hyalina* (LEYDIG) and *Scapholeberis mucronata* (O. F. MÜLLER) were said to be found. *Ceratium hirundinella* O. F. MÜLLER of Flagellata occurs only in Lake Shikotsu and the Nematoda is the particular life of Lake Kaba.

	vr	r	P	c	vc	vr	r	P	c	vc
Flagellata										
Heliozoa										
Ciliata										
Rotifera										
Crustacea										
Arachnoidea										
Bacillariaceae										
Chlorophyceae										
	Lake Shikotsu					Lake Kaba				

Fig. 1

Showing the quantitative relationship of the two lakes. vr, very rare; r, rare; p, present; c, common; vc, very common.

According to NAUMANN a lake belongs to either oligotrophic or eutrophic type according to the limnological condition. NORDQUIST (1921) differentiated two types according to the plankton life, showing that the oligotrophic lake abounds in Cladocera, with a few Copepods but in summer complete lacking of Rotifera while the eutrophic lake, on the other hand contains abundant Rotifera and Cyclops but only a few Cladocera.

Lake Shikotsu indicates the oligotrophic type as YOSHIMURA (1932) showed by the chemical character of the water. Lake Kaba belongs rather to the eutrophic type though not typical owing to the change of water due to the springs.

At any rate we can see that the oligotrophic type in respect to the plankton is better fitted to the culture of the salmon-trout than is the eutrophic. Under this supposition we are going to introduce *Diaptomus* into Lake Kaba which is for trouts considered to be one of the most important foods.

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摘 要

未利用湖沼樺沼の生物調査並びに養魚上
支笏湖生物相との比較

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北海道は各種の湖沼に富み水産上恵まれたる地方なれども、其の多くは未利用の状態に在り。之が利用研究の一端として未利用湖沼樺沼を見るに其の水溫湧水量共に鮭科魚類の養殖に適せり。依つて該湖に於ける生物調査を行ひ其の養殖價值を調べ、且つ魚類移植後に於ける生物相の變化に資すると共に相隣接せる利用湖支笏に於ける生物相と比較し、以つて該湖に於ける養魚計畫の資料となす。樺沼の生物相は榮養湖に近きを示し、支笏湖は貧榮養湖に屬すべきは其生物相のみならず吉村氏の水理學的調査に依るも明なり。而して支笏湖に於て鮭科魚類の飼料として最も重要な位置にある *Diaptomus* は樺沼に於て全く棲息せざる事を知りたれば、鮭科魚類の移植前提として同浮游生物の移植を計畫せり。

此の研究をなすに當り樺沼の使用を許されたる田中重兵衛氏の好意に深く感謝の意を表す。