far no experiments have been made with the view to ascertain which of the algæ forming the "water-bloom" exercise an injurious influence on fish. It is, therefore, very desirable that careful observation should be made in this respect.

The *Saprolegnieæ*, a low variety of fungus, which are injurious to fish eggs, are also frequently found in ponds on full-grown fish. They probably adhere only to sore places on the fish, and, spreading more and more, frequently cover large portions of the body of the fish with a thick slimy cover of a whitish color. This disease has been especially noticed in fish kept in small basins, and often destroys a great many fish; but even when in a state of freedom in open waters fish are frequently attacked by this epidemic, and in the English rivers the salmon frequently die of this disease by thousands. The purer and cooler the water is, and the more air it contains, the less will it favor the growth of these fungi. A healthy vegetation of green aquatic plants prevents their spreading all over a pond.

Fish which have been attacked by these fungi may be cured, unless very large portions of the body have become affected, by placing them for a short while in a solution of water and 1 per cent of salt, or by rubbing the sore places with a solution of water containing a higher percentage of salt.

As enemies of pond culture we may finally mention various diseases, which are known by a variety of names, but of whose causes and nature we are as yet almost entirely ignorant, and in respect to which we need much accurate and painstaking observation.

KÖNIGSBERG, GERMANY, *July*, 1885.

105.—FISHERY INDUSTRIES OF THE ISLAND OF HOKKAIDO, JAPAN.

By K. ITO.

INTRODUCTORY REMARKS.

The island of Hokkaido, in Japan, formerly known as Yesso, is situated immediately north of Niphon or Hondo, and separated from it by the Strait of Tsugaru. It lies between latitude 41° 21′ and 45° 30′ north, and has an area of 5,109 square ris (1 ri=2.5 miles). This island has remained, for a long time, as a wild territory, roamed over by Ainos, an aboriginal race; and it is not more than twenty years since the Japanese Government took up the effort for its colonization.

The only industry carried on by Japanese in this island previous to that time was fishing; and even in present days this constitutes one of the most important industries of the island. It is, however, to be remarked that the fisheries are confined to in-shore work, and the method pursued in curing fish caught is yet very primitive. Hitherto

no efforts which amount to anything have been made in the direction of propagation. Notwithstanding these circumstances the annual yield of the fisheries is $5,000,000 to $7,000,000; and, with the recent steps taken by the Government to introduce more enlightened and economical methods of carrying on the industries, and the enthusiastic efforts which the recently organized society of fishermen is making, it is to be hoped that the fisheries of the island will yield a much larger return in future.

STATUS OF SOME OF THE PRINCIPAL FISHERIES OF HOKKAIDO.

Herring fisheries.—Herring (*Clupea harengus* Linn.) are caught mostly along the western or Japan Sea coast of Hokkaido during their spawning season, which commences generally in the first part of April and continues until the latter part of June. Two kinds of net are used for their capture, namely, the moored trap-net and the gill-net. The larger part of the herring caught is worked up into scraps and oil, while the remainder is split and dried upon scaffoldings. Bones, gills, and milt left after the split herring is made, are separately dried and sold for manure; while roes are dried or pickled and used as an article of food. All products of the herring fisheries are used in the home market, except the oil, which is exported, when low prices prevail in the island, to a certain extent to the United States.

Fall-salmon or "sake" fisheries.—Fall salmon (*Oncorhynchus haberi* Hilgd.) or "sake," as it is called by the Japanese, ascend several streams in Hokkaido, after the middle of September, for the purpose of spawning. It is caught both in seas and rivers; in the former case traps and gill-nets being used, while in the latter drag-seines are employed. The salmon are mostly cured and sent to southern markets, although they are canned to some extent in the province of Nemuro.

Spring-salmon fisheries.—Spring salmon (*Oncorhynchus perryi* Hilgd.), known in the island as "masu," ascend the rivers in May. They are not so abundant as the fall salmon, but somewhat superior in flavor. The methods of capture and curing are materially the same as those for the fall species.

Cod fisheries.—Cod (*Gadus brandtii* Hilgd.) are caught mostly during winter and early spring with trawls. The fish of early in the season are slightly salted and sent to the southern market for immediate consumption; while those of the later season are split and "thorough cured," boned, and "hard dried." The liver is utilized for the manufacture of codliver oil, and the heads and bones are made into fertilizers.

"Iwashi" fisheries.—"Iwashi" (*Clupea melanosticta* Schleg.) is a small species of herring that approaches the eastern coast in rather small schools during summer for the purpose of seeking food. The school is more or less mixed with "seven-spots" (*Etrumeus micropus* Bleek.) and the young of spring herring (*C. harengus*). It is caught with drag-seines, and worked into oil and scraps.

Trepang fisheries.—Trepangs or sea-cucumbers (*Holothuria*) are collected with dredges upon the sandy bottom of the sea around the island. They are boiled in the decoction of the leaves of "yomogi" (a plant of the genus *Artemisia*) after the abdominal contents have been cleaned out, and are dried in a kind of kiln for exportation principally to the Chinese market.

Ear-shell fisheries.—The ear-shell or sea-ear (*Haliotis*) is a large gasteropod occurring only on the western coast. It is speared with a sort of trident from a dory in water from 2 to 4½ fathoms deep, the fishermen being enabled to discern the mollusk in these depths by the aid of an open box with a glass bottom, used on the same principle as a sponge-fisherman's water-glass. Suits of diving apparatus were formerly much used for this fishing; but this use was recently prohibited by legislation, on account of their devastating influence upon the fisheries. After the fresh product is separated from the shell, it is cooked, dried, and slightly smoked, for sending over to China.

Squid fisheries.—Squid is caught with hook and line, during the fall. It is split and dried, both for home consumption and for exportation to China.

"Kombu" fisheries.—"Kombu" is a species of algæ belonging to the genus *Laminaria*, growing upon submerged rocks in salt water. The best kind is collected mostly on the northeastern coast during the fall months. It is dried by spreading it upon a sandy beach, and afterward cut up into lengths of 4 feet, and bound into bundles weighing about 66 pounds each. It is inspected and branded before exporting to the markets of China.

Sea-otter fisheries.—The sea-otter is found about the Kurile Islands, where it is captured by means of guns and small bomb-lances, for its exceedingly rich furs. It is to be much regretted that this valuable fur-bearing mammal is rapidly diminishing in number, on account of the indiscriminate destruction of both young and old by those who come from different countries to hunt it.

Oyster fisheries.—The oyster occurs in the shape of small islands in some lagoons on the northeastern coast. It is cooked and dried with steam, and sent to China.

STATISTICS.

Number of persons, boats, seines, and nets engaged in the fisheries of Hokkaido in 1884.

	Hakodate district.	Sapporo district.	Nemuro district.	Total.
Fisheries proprietors	3,218	3,324	1,338	7,880
Employed hands	17,440	33,630	14,703	65,773
Boats	15,100	16,800	3,473	35,373
Seines	496	267	326	1,089
Trap-nets	935	1,828	335	3,098
Gill-nets	150,820	33,365	65	184,250
Miscellaneous nets	6,406	40	65	6,511

Value of the principal fishery products of Hokkaido in 1884.

Fishery.	Hakodate district.	Sapporo district.	Nemuro district.	Total.
	*Yens.**	*Yens.*	*Yens.*	*Yens.*
Herring	1,412,762	2,023,883	108,003	3,544,648
Fall salmon	31,989	221,993	281,874	535,856
Spring salmon	1,528	5,617	118,675	125,820
Cod	16,390	85,048	712	102,156
Iwashi	116,577	15,434	1,640	133,651
Trepang	5,661	23,210	14,623	43,494
Ear-shell	26,818	95,123	.....	121,941
Squid	35,250	2,817	.....	38,067
Kombu	49,993	189,811	164,440	404,244
Sea-otter	.....	.....	3,150	3,150
Oyster	.....	.....	13,413	13,413
Total	1,696,974	2,662,936	706,530	5,066,440

* One yen equals about 80 cents.

The total value of the yield for the year 1884 was unusually small, on account of a poor catch and low prices.

WASHINGTON, D. C., *December* 20, 1886.

106.—YOUNG SALMON IN NORTHERN NEW JERSEY.

By F. M. WARD.

[From a letter to Mr. Fred Mather.]

About May 20, 1885, nearly 100,000 fry of the Penobscot salmon (*Salmo salar*) were planted under the direction of the U. S. Fish Commission in the Paulinskill, Pequest, and Musconetcong Rivers, they being tributaries of the Delaware in Northern New Jersey. These fry were placed in the streams about 20 miles from where they emptied into the Delaware; and in September, 1885, some of the young fish were found in the Paulinskill, and in the small tributaries or spring runs near where they empty into the main stream.

In May, 1886, I learned that some salmon had been taken by a party while fishing for trout at a point about 5 miles below where they were placed the year before. The party that caught them thought at first that they were rainbow trout, but on examination I learned that they were young salmon from 4½ to 6 inches long. They were taken with common angle-worm bait, and seemed to be quite numerous at this point.

I saw them during the early part of last September in the same stream, and have no doubt that they have done equally well in the other two streams. There were about 40 taken at this point, and nearly all were returned to the water. I am satisfied from this experiment that planting the fry in the headwaters of the tributaries in natural trout water is the best way to stock the Delaware.

NEWTON, N. J., *November* 13, 1886.