

ing coldness of the water in the pannikins was rendering their movements less active. They glided from one side to the other, and from the surface to the bottom, but in an uneasy manner. Their attitude was that of expectancy. An hour afterwards they were apparently going to sleep, the goldfish on its side, the other in its ordinary position. The fins kept moving in a lazy manner; there was no twitching, no abrupt action. The motion reminded one of the vibration of a wire slowly but surely coming to rest. The eyes were clear, and to all appearances a deep and placid sleep was falling stealthily upon them. Two hours afterwards they were in the same position, but there was no movement. The ice was advancing upon them. Some of the spikes of ice had already reached parts of their bodies, and reflecting the light from the candle produced a beautiful combination of color. The two creatures were sleeping in the light of a gorgeous sunset. After eight hours' exposure to the temperature of the freezing-chamber, and two more to the much lower temperature of the snow-box, I felt sure that the ice was solid. I removed the pannikins to the thawing-tubs and sat down to watch for indications of life, but none appeared. When freed from the ice the salt-water fish floated about for a short time in the same position as that occupied when it was inside the block of ice, and then slowly sank to the bottom. The goldfish on being freed continued to float for upwards of an hour, during which I sat watching it. Next morning it was still floating, not erect like the other, but on its side, with the tail slightly depressed. It was apparently dead. At night it maintained the same position, and I gave it up for dead.

I have made this statement in hope that others who have time and more enlarged facilities for carrying out a series of experiments will proceed with the investigation. (From Transactions and Proceedings of the New Zealand Institute, 1883, vol. xvi, pp. 275-278.)

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#### 181.—THE SCOTCH COD AND LING FISHERIES.\*

The great Scotch cod and ling fisheries last from March till July along the northeastern coast of Scotland and near the Shetland and Orkney Islands. Vessels furnished with a deck are beginning to be employed in these fisheries with great success. At the end of June the larger vessels give up the cod and ling fisheries and engage in the herring fisheries on the east coast of Scotland. The crews of these vessels are composed exclusively of experienced fishermen, and, in a vessel of 30 tons, the crew generally numbers 7 or 8 men. They are not paid in cash, but receive their share of the catch. The fishing is done by lines.

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\* *Det skotske Torske- og Langefiske.* From the *Norsk Fiskeritidende*, Vol. III, Bergen, January, 1884. Translated from the Danish by HERMAN JACOBSON.

As regards the yield of the Shetland fisheries, we will here give an extract from the report of the Norwegian vice-consul at Lerwick: "The cod and ling fisheries near the Shetland Islands commence in the beginning of April, and continue till the first week in June, when the herring fisheries commence. The cod and ling fisheries were formerly continued till the end of August; but at present, when the herring fisheries are more profitable, they cease earlier in the season. These fisheries are carried on with boats having a deck, and a keel measuring 35 to 45 feet. Completely equipped such a boat costs 9,000 to 10,800 crowns [about \$2,250 to \$2,700]. The crew are generally the owners of the vessels. They make up between them from 1,800 to 2,700 crowns [\$450 to \$675], and borrow the rest from some fish-dealers to whom they sell the fish at the market-price. When the fisheries are successful, the entire debt is often paid off in the course of one cod and herring season, which closes at the end of September."

Fishing expeditions are annually made to Iceland and the Faroe Islands from the Shetland Islands and from several English ports. The fish which are caught on these expeditions are salted on board and landed on the Shetland Islands, where they are made into klip-fish. In 1882 the catch of cod and ling amounted to 3,666,596, of which number 121,337 hundredweights of klip-fish were made, and 7,737 tons of salt fish.

To the above we add the following data:

Of the entire quantity of fish, 741,329, which were made into 951,230 kilograms of klip-fish, about 1,000 tons (14 fish to 18 kilograms), were caught by 56 vessels of about 52 tons each and 12 men per vessel. Of these vessels 16 were from the Orkney Islands, and 40 from the Shetland Islands. The remainder of the fish were caught by boat fishermen. The fisheries were most productive near the Shetland Islands, where 1,413,865 fish were made into klip-fish, at the rate of  $9\frac{1}{2}$  fish to 18 kilograms [about 40 pounds].

As regards the fisheries with vessels, on which the fish were prepared at sea, they were carried on in—

Years.	Vessels.	Average yield, fish.
1874.....	154	12,800
1875.....	137	14,800
1876.....	125	10,400
1877.....	130	14,100
1878.....	133	19,300
1879.....	115	13,800
1880.....	92	15,800
1881.....	98	13,400
1882.....	56	13,200

All of these fish were made into klip-fish. From the above figures it appears that these fisheries have declined steadily.