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INVESTIGATION OF A HERRING MORTALITY
AT ORCHARD LAKE, OAKLAND COUNTY, MICHIGAN, IN AUGUST, 1934.

Upon receiving notice at noon, August 28, 1934, of large numbers of dead fish being noted on the east shore of Orchard Lake, near Pontiac, in Oakland County, an investigator of the Institute immediately went to this lake, to discover if possible the cause of the death of these fish. The results of this investigation, made by an examination of some of the dead fish, and from information gathered from conversations with the residents about the lake, are as follows:-

History of the Fish Mortality: A most severe wind storm occurred at Orchard Lake on Sunday, August 19, 1934, which caused considerable wave action. On the early morning of August 21 a few dead lake herring, or ciscos, (Leucichthys artedi and probably all of the subspecies clarensis) were found floating near the east shore of the lake. By evening the east shore was said to be covered with the dead and bloated fish. That evening and the following morning one small truck load and one wagon load of the dead fish were hauled away, to be used as fertilizer.

By the next day, August 22, the number of dead herring floating on to the shore had greatly decreased, and by August 23 no more were noted floating in. The concensus of opinion was:

(1) That only herring came floating in.

(2) That all were adult and averaged a foot in length.

(3) That no living, crippled, or dying herring were noted; and

(4) That no external marks of injury on the fish were found, though some of the fish were partly covered with fungi. These fungi may have appeared

only after the death of the fish.

In the investigation made on the afternoon of August 28, the partial remains of some two hundred more or less decomposed herring were noted along a mile stretch of the east shore, the only locality where the dead fish had drifted. As they had been dead one week it was impossible to make a reliable examination or autopsy of them, to discover the probable cause of death.

Conclusions: As stated above, the fish were so decomposed that discovering the cause of their death was impossible. However, from our experiences elsewhere it is safe to state that death was most probably due to one of the following reasons:-

(1) Lake herring are deep water fishes in the lower half of Michigan, normally inhabiting only the colder waters at the bottom or near the thermocline of our deeper inland lakes. Normally the water where these fishes live is cold water, rather constant in temperature, and the fish seldom leave these areas. Occasionally, however, some disturbance occurs in a lake which has the effect:

(A) Of removing the oxygen from the water inhabited by these fish.

(B) Of greatly increasing the water temperature.

(C) Of roiling up the lake bottom to such an extent that the gills of the fishes become covered with organic silt, thereby causing them to die of suffocation.

(D) Or else increasing the bacteriological action to the extent that all oxygen is removed from the water and the fish consequently die of suffocation.

This past July was unseasonably warm, which may have warmed the lake to an unusual degree, and the lake in August had a lower water level than normal, and

this, coupled with the violent wind storm of August 19, may have been sufficient to cause a "turn-over" in the lake. Such a turn-over, if violent enough, would force the warmer water of the surface to near the lake bottom, thereby greatly warming up the lower strata where the ciscos live, roiling up the lake bottom so that it bacame uninhabitable for herrings, or else starting an increase of bacteriological action. Any or all of these three causes may have resulted in the mortality among the herrings.

(2) But few herrings are removed from this lake by man, and as the adults are comparatively free from natural enemies, the bulk of the species would die from other causes. If death occurred in water warm enough to cause a rapid bacteriological action, the gas produced by the bacteria would cause the fish to rise to the surface and then drift shoreward, and as they normally die in comparatively small numbers at any given time, the presence of a few fish along the beach is scarcely noticed. However, if death occurred in water so cold as to prevent a sufficient amount of bacteriological action, consequently failing to bloat the fish sufficiently with gas to raise them to the surface, the fish would tend to sink to the bottom and remain there for a considerable period, without decomposition taking place. In this way a number of dead adult fish would accumulate on the lake bottom during the course of a few months, and when a turn-over did occur, with its warming of the water and stirring of the lake bottom, the fish would become bloated, rise to the surface, especially if aided by a current, and then float to the shore. This, and the killing of the fish as described under Number One, may have acted together in this case.

(3) It appears most unlikely that a disease or epidemic was the cause of the death of these fish. The presence of the dead fish in so short a space of

time, and lack of dying fish being seen, would argue against a disease being the cause.

(4)That a charge of dynamite caused the death of these fish appears but remotely possible. To have killed so many fish, even though they happened to be schooled near the discharge, is highly improbable; also, a charge of dynamite sufficient to kill that many fish would most likely have been heard or seen by many people, especially had it occurred at night. Furthermore, a charge sufficient to kill that many herring would certainly have been strong enough to reach upward and kill some other species of fish thatwere present above the discharge in the upper strata of water.

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