

*Deep-water Fauna of Lake Michigan.* By P. R. HOY, M.D.

At a distance of sixteen to twenty miles off Racine the water in Lake Michigan is from fifty to seventy fathoms deep. The bottom, at these depths, is composed of an impalpable dark-coloured mud, interspersed with depressions containing quantities of partially decayed leaves intermingled with the muddy deposits. It is on these "mud flats" that the fishermen capture, in gill-nets, the largest and finest whitefish and trout.

The food of the whitefish had never been ascertained. In order to solve this problem, I secured large quantities of the stomachs of fish caught in various depths; by diluting the ingesta, I was enabled to determine on what the fish subsisted. During these investigations I became deeply interested in the new forms of animal life that swarmed in the deep water—fish that never visit the shore, crustaceans that live only in the profound depths of the lake. I discovered three species of fish, four species of small crustaceans, and one mollusk, all new to science. The fish I sent to the Smithsonian Institution at Washington: they were placed in the hands of that accomplished naturalist, Prof. Theodore Gill, who described and named them.

When I sent the fish to Prof. Baird, I asked him to whom I should send the crustaceans? who was the best authority on that branch of natural history? His answer was, we had in the West the very man, the best authority in America on the Crustacea, Dr. William Stimpson, Secretary of the Chicago Academy of Science. I record here this fact in justice to Prof. Stimpson and the West.

Two of the fish belong to the genus *Argyrosomus*, a genus proposed by Agassiz to include that section of whitefish having a projecting under jaw.

The *Argyrosomus Hoyi*, Gill, is the smallest of the whitefish so far found in any of the great lakes, it being only about 8 inches in length, and weighing one fourth of a pound. The "Mooneye," as it is called by the fishermen, is an excellent pan-fish; but its small size renders it unsuitable for market. Trout devour large numbers of these little beauties, as they constitute a large share of their food. The Mooneye is only found in water over forty fathoms.

The Black-fin, *Argyrosomus nigripinnis*, Gill, is a large and beautiful fish, having black fins. It has never been caught in less than sixty, and does not occur abundantly in less than seventy fathoms. During the summer of 1871 there was not a single Black-fin taken off Racine, as the fishermen did not go so far into the lake as they did the previous season.

The third species of fish was taken from the stomach of a trout, caught in the deepest water. It belongs to the *Cottus* family, and is closely allied to *Trigloopsis Thompsonii*, Girard, if not identical. *Trigloopsis Thompsonii* was taken (by Prof. Baird) from the stomach of a *Lota maculosa* caught in Lake Ontario in 1850, since which time not a specimen has been taken, I am informed by the Professor, unless this be the same fish taken now from the trout, as before mentioned. Prof. Gill thinks it is probably an undescribed species,



near *T. Thompsonii*. If this prove so on further investigation, it will be named *Trigloopsis Stimpsonii*. What is peculiarly interesting about this small fish is, that it is a salt-water rather than a fresh-water form. Judging from the quantity of fragments belonging to this species obtained from the stomachs of trout caught in the deep water, it must be by no means rare.

I submitted the minute crustaceans to Dr. Stimpson, who detected three species of freshwater shrimps belonging to the genus *Gammarus*, and one species of *Mysis*, a marine genus, many species of which are found in the North Atlantic and Arctic oceans. The small shell found with the crustaceans, in the stomachs of the whitefish, proved to be an undescribed species of *Pisidium*.

These discoveries were considered of sufficient importance to justify the undertaking of a dredging-expedition. Professors Stimpson and Andrews, with Mr. Blatchford, of Chicago, represented the Chicago Academy of Science, while Drs. Lapham and Hoy represented the Wisconsin Academy of Arts and Letters.

On the 24th of June, 1870, we steamed into the lake, out of sight of land, and spent the entire day in *dredging* in a most enjoyable and, to science, profitable manner. We procured living specimens of those crustaceans which I had previously obtained from the stomachs of whitefish. But, with every exertion, we were not able to keep them alive above a few hours. Fitted, as they are, to sustain the great pressure of from fifty to seventy fathoms of water, when this was taken off, death was the inevitable result.

I here subjoin a catalogue of all the animals thus far known to inhabit the deep water off Racine:—

*Salmo amethystus*, *Mitchel*.  
*Coregonus sapidissimus*, *Agassiz*.  
 — *latior*, *Agassiz*.  
*Argyrosomus* Hoyi, *Gill*.  
 — *nigripinnis*, *Gill*.  
*Trigloopsis Thompsonii*, *Girard*.

*Gammarus* Hoyi, *Stimpson*.  
 — *brevistilus*, *Stimpson*.  
 — *filicornis*, *Stimpson*.  
*Mysis diluvianus*, *Stimpson*.  
*Pisidium abyssorum*, *Stimpson*.

Also one species of parasitic leech, found fastened to whitefish, and a small white *Planaria*.

In conclusion, the occurrence of *marine* forms (*Mysis* and *Trigloopsis*) goes far to prove that Lake Michigan was once salt—had direct communication with the ocean. As it gradually became elevated above the sea, it would naturally take many years to expel the salt water, especially as its greater specific gravity would cause it to sink and remain long in the lake—time sufficient for the animals to become acclimated to the changed condition of things. It is barely possible that salt springs at the bottom of the lake may have materially retarded the change, and that even now there may be brackish water in the greatest depths. This seems the more probable, since the salt-bearing strata occur in Michigan. We made an effort to solve the query; but, owing to the imperfection of the apparatus, I am not certain that the negative was proved.—*Trans. Wisconsin Acad. Sci. &c.* 1870-72, pp. 98-101.



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