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## HOW THE U. S. FISH COMMISSION WORKS.

BY FRANKLIN BENNER.

We frequently see in the daily papers notices of the work of the U. S. Fish Commissioners in the various parts of the country; first in regard to the propagation of salmon in the McCloud River, Cal., then in reference to the restocking of some lake, river or its tributaries with trout, shad or black bass, which have long since ceased to frequent them for the purpose of spawning, or been fished out to the last one by the tireless angler or pot hunter. This Commission was appointed in 1871 for the purpose of looking after the interests of our fisheries, and to inquire into the alarming decrease of food fish on our eastern coast, and to find means to resuscitate, if possible, this most valuable industry.

Quietly and steadily has this work been going on, and now, after the elapse of nearly ten years, we are beginning to reap the reward by finding fish more plentiful in our brooks, rivers, bays and lakes. The salmon are re-appearing in their old haunts in the Maine rivers, shad are more abundant in the Hudson, and many brooks and lakes are filled with trout and black bass. Necessary legal protection was at first secured to prevent the catching of fish during the spawning season, and their slaughter at all times; and then the propagation of fish and the distribution of the young fry was taken under careful consideration.

Rugged Norway has always been careful of her fisheries, they being one of the chief means of subsistence of the great part of her inhabitants, and here attention was first directed to the protection and care of the fishing industries.

Prof. G. O. Sars, of the University of Christiania, began his investigation at the Loffoden Islands in 1864, and since then general interest has been awakened all over the world. After the appointment of Prof. S. F. Baird, as the United States Commissioner, the various States successively selected parties to look after their own especial interests, and to cooperate with the head commission located at Washington and having its head-quarters at the Smithsonian Institution. Soon active work was begun on all sides, and special attention was of course directed to the cod and its habits, with the endeavor to discover the cause of its deserting the New England coast where it formerly abounded and where its food is still supposed to exist abundantly. That part of the investigation into its food supply, which necessitated a careful examination of the sea bottom, is one of the most interesting in its details, and brings to its aid some of the most able scientific talent of our colleges.

It was the writer's good fortune to be a member of the party which was stationed at Peake's Island, Portland Harbor, Maine, during the summer of 1873, and through the courtesy of Prof. Baird every facility was offered for the study of marine zoology. The party at this time consisted of Prof. Baird in charge, ably assisted by Profs. Verrill of Yale, Gill of Washington, and others from various colleges both east and west; in all numbering about fifteen. There was placed at the disposal of the Commission, by the Government, the U. S. steam tug BLUE LIGHT, under the command of Com. Lester A. Beardsley, whose inborn tendencies to fishing and natural history investigation, ably assisted the commission in every way. Sail boats, row boats and the numerous fishermen of the coast were also levied upon to bring in whatever they might find that was rare or curious, and in this manner many specimens were obtained, which would otherwise be overlooked. Peake's Island, located within three miles of Portland, forms one of the barriers which separate its splendid harbor from

the ocean, and is one of the largest of three hundred or more islands, forming one of the most picturesque and boldest groups on our Eastern coast. From Portsmouth, N. H., to the shores of Nova Scotia the coast of Maine presents one ragged, sea-torn and turbulent front, throwing spurs of rock far into the sea, which are compensated by long reaches of water running into the shore, making the journey between places which by water are only a few miles distant, an almost interminable way by land. Here among the rocks, in the bay and off in deep water, five or ten miles from land, dredging and trawling was carried on for nearly three months, with untiring zeal.

The headquarters consisted of a small summer hotel, which was almost entirely occupied by the members, and a two-story fish house built out on a dock which was used as an operating room, and for convenience was dubbed the Shark's Parlor. The lower story of the Parlor was devoted to the storage of alcohol, cans and barrels for the preservation of specimens and the various trawls and dredges appertaining to the work. Up stairs the room was surrounded with shelving, and filled with small tables on which were standing microscopes and bowls filled with strange looking animals from the sea depths, looking more like flowers than living members of the lowest orders of the animal kingdom. The shelves in one part of the room would indicate from the number of vials that an apothecary had his wares in preparation; in another, a jar filled with a conglomeration of *Buccinum* shells, pieces of laminaria, a small lobster, and a star fish or two, strongly suggested a housewifely preparation of mixed pickles. On a large table in the centre stood a lot of buckets filled with sea water, and inhabited by some of the most beautiful specimens of holothurians, or sea cucumbers, actinias, or jelly fish, in all their natural symmetry, with tentacles extended and pulsating as when in the ocean proper. From these drawings were made true to life by the artist who ac-

accompanied the expedition; in fact, that is the only way of getting representations of any of these delicate forms of marine life, for when once in alcohol, the tentacles, or cilia, are retracted and the bodies are shrunk out of all semblance to natural shape. It may here be stated that in the preservation of mollusks efforts were made to kill them instantly, so that the usual contraction might be prevented, and extensive experiments were made in this view by Prof. W. North Rice, of Wesleyan University, Middletown, Conn. Such poisons as are most fatal to man, seemed to have no effect upon them at all. Sulphate of morphia, chloroform, woorara, sulphocyanide of potassium and others were tried. The last named sulpho-cyanide of potassium, which is the most powerful upon the muscular tissues to render them inert, was, though fatal, not quick enough. Some specimens of shells were left in diluted hydrocyanic acid from Friday until Tuesday, and then they showed signs of life. Stale sea water seemed to be the best, as they were apt to die with their bodies protruding.

In the mornings when the Blue Light's whistle sounded, those proposing to devote the day upon the water, started down to the boat with their pails filled with vials and jars ready to receive whatever the dredge or trawl might bring up, each one eager to make a new discovery himself. The Blue Light, an ordinary high pressure tug of about seventy-five tons burden, was especially fitted up forward with a room for the storage of appurtenances and the davits were so arranged to draw the dredge and trawl to best advantage. The search was carried on in all kinds of bottom and at various depths up to fifty or seventy fathoms. The dredge proved the most useful of all the instruments used. It is composed of a rectangular frame of iron, having the two edges of the larger sides sharpened so as to detach whatever they came in contact with from the rocks below. To this frame was attached a net, some three feet long, surrounded on the outside by a heavy canvas bag to prevent it from being torn, but open at the lower end to

allow the free passage of the water. One side of the dredge was attached to the main rope with a light line, so that in case of being caught on a rock it would part and allow the dredge to be drawn free of the obstruction. Whenever a place was reached where it was thought advisable to examine the bottom, the lead and self-registering thermometer were thrown over to ascertain the depth, its character and temperature. These facts having been carefully noted and recorded, the dredge was let down while the steamer slowly backed, if the tide and wind were at rest; otherwise the natural drifting was enough to keep this instrument in motion. Speed was not advisable, as the things searched for being too rudely detached would be destroyed. After a half hour or less of anticipation and conjecture, the dredge was drawn up and its contents emptied upon a table, where, in a short time, every particle of sea weed, sand, or at times soft ooze, was picked over and everything of value consigned to alcohol or the bucket of sea water, before alluded to, where the delicate specimens were kept alive for the purpose of drawing them. These buckets had oftentimes to be kept cool by being surrounded by ice, for the temperature of the surface and the bottom vary so much that many objects would soon die were not this precaution taken.

The ocean's floor is as varied as our own terra firma with rocks, barrens, and meadows of algae; and each place holds its own peculiar denizens, and in order to capture them a different appliance was necessary for each place. On rocky bottoms the dredge and drag were the only things for that rugged surface; for muddy or sandy bottoms the trawl was used. The latter instrument consisted of two heavy runners of iron, connected by a bar of oak to keep them in position and also to fasten the net to. The lower edge of the net was weighted with the usual seine weights and scraped along the bottom. As this instrument was expected to catch any unwary or napping fish that were not quick enough to get out

of its way, it was provided with pockets to prevent their escape when once in. The bottom or end was so arranged as to be opened rapidly and the contents taken out. Apropos of this it may be said that these trawls are extensively used on the coast of Norway, England and Scotland, being made much larger however, the bars separating the runners being from thirty-five to fifty feet long, and the bag of the net a hundred feet deep. They are managed by large sailing vessels and are found most useful in catching such fish as are inclined to skulk along the bottom, the cod and halibut for example. The trawl required a more rapid motion than the dredge, and the steamer was kept slowly backing when it was in use. In spite of all precautions as to the selection of the bottom an unforeseen rock would at times bring trawl and boat to dead halt, and to prevent such an occurrence from doing any damage an accumulator was improvised in the shape of a light rope, called the "check-stop," which was fastened to the main rope a short distance from the back, and for the time held the whole strain of the dredge or trawl, but the slightest disturbance below would cause it to part with a snap, bringing the engineer to his feet in an instant to reverse before the slack was exhausted. The accumulators used in the British Steamer Challenger and also on ships bearing telegraphic cables, are expensively constructed of rubber to counteract the constant tossing of the vessel, but this simple contrivance answered all purposes. The dredging was frequently varied by fishing, and when a favorable spot was found all hands from cabin to forecastle would turn to and try their luck for cod; but of all tiresome and tedious fishing this exceeds everything; for pulling two or three pounds of lead through forty or fifty fathoms of water, with an eight or ten pound cod attached, gets to be very tiresome work and wearing to the cuticle of those who have not been brought up to it. A shoal of dog fish would occasionally strike the boat when all other fish would vanish. They would bite freely and



in their efforts to free themselves from the hook would circle around the steamer, getting all the lines in an inextricable confusion. One rather curious incident which shows the peculiar natural traits in the habits of fish is this, that all of these dog fish caught during July and August, with only a few exceptions, were females. As many as twenty-five were caught at a time and all proved to be of this sex. As they belong to the viviparous branch of the selachians, each contained from three to eight young nearly mature, which, on being thus prematurely set free, swam off as lively as possible.

The result of all this dragging and scraping of the ocean's bed would occupy too much space, and an accurate description of one day's work would take up too much time, so a brief insight into the growth and habits of one or two of the well-known kinds must suffice. Take, for instance, the jelly fish, familiar to all who have ever lived upon our sea shore, a soft, gelatinous mass, floating upon the surface of the water, at times moving along quite rapidly, at others merely drifting with the tide. In color varying from a dirty yellowish brown in the largest specimens to that of the water in which they swim, they appear perfectly harmless with their tentacles hanging straight down or trailing out behind, pulsating rapidly in search of food. But let the unwary swimmer or the floating infusoria come in contact with one of them, and a sharp stinging pain which follows makes one wonder from whence comes this unseen harm. This electrical touch to man is only a sting which often lasts some time, but it can readily be imagined fatal to its natural prey which it absorbs into the stomach. The jelly fish belongs to the subkingdom *Cœlenterata*, just below the star fish and crinoids and above the protozoa, all of which radiates having all members symmetrical and supplied from a central cavity. Should any member be injured or destroyed, or should one of them be divided into several parts, each will at once reproduce the others wanting, and thus several new ones are produced. This is one method



of reproduction; in the other the small jelly fish is discharged from the cavity of the parent (it being monogamous) and in some species floats away free, and in a marvelous space of time is reproducing its kind again. In other cases these microscopical young attach themselves to some rock or shell and there remain during the period of their existence, throwing out branches which look almost exactly like vegetable matter, and trench very close to the borderland of the two kingdoms. The top branches of these animals gradually develop until a perfect jelly fish at last floats free to begin again one of the most interesting phenomena of nature. These permanent jelly fish are named hydroids, and some species remain forever in this permanent state, not moving from place to place, except at their very beginning as it were. Star-fishes, echinoderms, actinia and holothurians were found every where and form the staple food of many of our fishes. In the preparations of specimens, alcohol seemed to be the only agent strong enough to preserve these frail animals; but in case of some of the star fish, glycerine was found most useful in preserving their natural colors.

Many new discoveries were made in marine life. One species of star fish (*Ctenodiscus crispatus*), considered very rare and only represented in a few collections, was found to be common in one particular spot and several hundred were preserved. The curious fact of the disappearance of the hard-shell clam (*Venus mercenaria*) from the coast of Maine was also made a subject of study. In the thousands of shell heaps which line the coast and which were left by the Indians, who formerly came down from the country every summer to feast upon the soft-shell clams (*Mya arenaria*), are found many of the former species, but in all the dredging only dead shells would be found, and it was not until nearly the close of the season that a few living ones were dug up in an out of the way bay near Harpswell. In the shell heaps alluded to were

also found bones of the great Auk, which is not found living anywhere within the knowledge of man.

The result of all this work has been embodied in various reports published by the commission, and practical use has been made of it in the distribution of spawn and fry and in a strict supervision of the means of capture. The public are gaining every day from this work in the greater abundance and cheapness of fish as a diet.

During the past summer there has been an international exhibition of the various fishing industries of the world at Berlin, and our methods of work and the results obtained were the subject of interest and approval of the other attending nations.

## THE ANCIENT COPPER MINES OF ISLE ROYALE.

BY N. H. WINCHELL.

[ABSTRACT.]

Two papers were read in 1880, by Prof. Winchell, on the ancient copper mines of Isle Royale. After an account of the exterior phenomena of the mines, and an enumeration of the articles found in them, an inquiry was instituted as to the race that wrought them, and as to their relation to the Mound Builders, and to the Indians. As it has been admitted for several years that the Lake Superior miners were identical with the Mound Builders, the inquiry involved the examination of the relation of the Mound Builder to the present Indian. The characteristics of the Mound Builders were stated, as determined by the highest archæological authorities, and compared with those known to be possessed by the aborigines.

1. Squier and Davis state that there probably existed among the Mound Builders a state of society something like