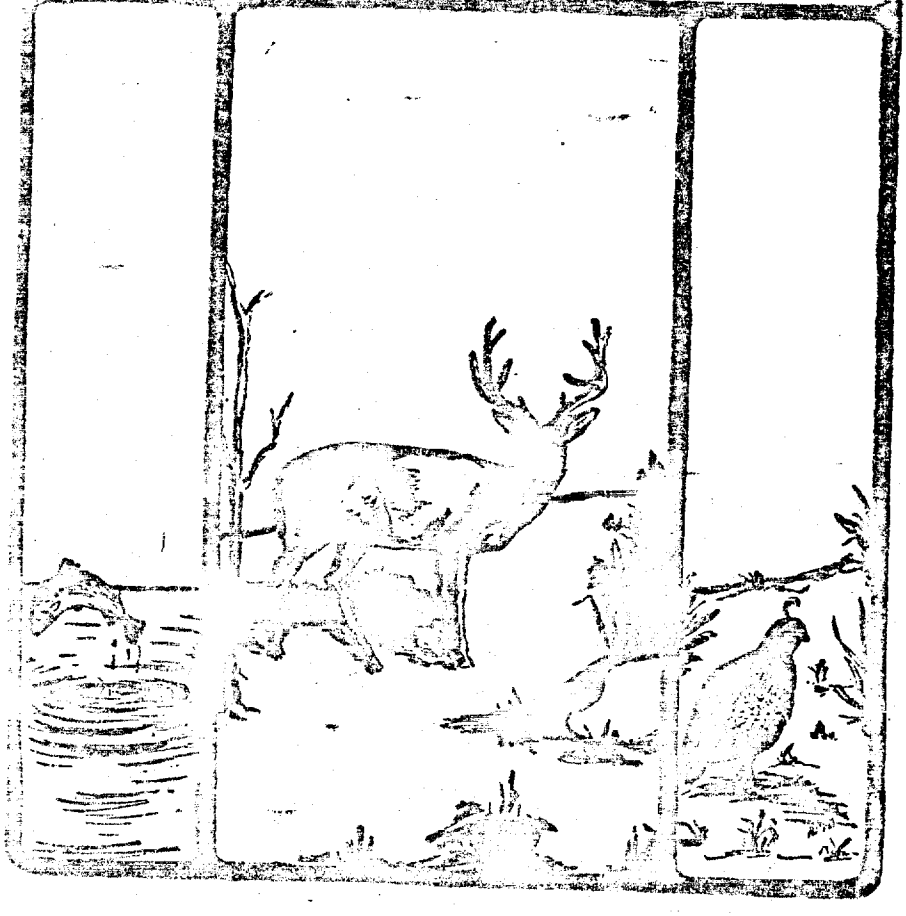
CALIFORNIA FISH AND GAME

"CONSERVATION OF WILD LIFE THROUGH EDUCATION"

Volume 6 Sacramento, April, 1920 Number 2



THE MULLET FISHERIES OF SALTON SEA.

By Will F. Thompson and Harold C. Bryant.

The Salton Sea is, in reality, a portion of the Gulf of California, cut off by the enlargement of the delta of the Colorado River. It has been, consequently, evaporated to relatively high salinity during each of the long periods when the Colorado River emptied its waters into the gulf. Geologists believe, in fact, that the river has periodically emptied its flood in to the Salton Sea, raising its level, and extending its area, just as it did during 1906. At present the Colorado is prevented from doing this by the dikes along its banks, built in order that the Imperial Valley may be safe, and that it may be irrigated, but the irrigating canals carry a certain amount of waste water into the sea. There are, in addition, fresh water springs, notably one called Fish Spring, which pour considerable amounts of fresh water into the sea.

Little is known about the fisheries of the Salton Sea before the last break in the jetties of the Colorado River. In 1905 the water of the Colorado River poured down what are now known as the New and Alamo rivers in a great flood which carried 160,000,000 cubic feet of water into the sea daily. The result was a great enlargement of the sea and the extensive freshening of its waters. The extension of the sea buried the Southern Pacific lines along its shores, covered the adjacent territory which at that time was beginning to be placed under cultivation, and threatened great financial loss to the Southern Pacific Company, which owned alternate sections of land throughout the territory. In 1906 the break was closed by the Southern Pacific Company, after a spectacular struggle. It was through this break that the fishes now, or recently, present, entered the Salton Sea.

During the earlier portion of the period since 1906, considerable numbers of "carp," if the indentification of others than scientists be trusted, were to be found in the sea, and some eight years ago a promoter started a company with the idea of using these carp, and other fresh water fish, for oil and fertilizer. Having built the proper buildings, installed machinery and launched boats in the sea, the company was unable to operate because it was unable to find sufficient fish. At this time, Captain Chas. Davis, who came originally from New England and was familiar with fisheries of all sorts from an extensive experience on all our coasts, went to Salton Sea to investigate the likelihood of extensive fisheries being built up. His report was adverse. The company for some time endeavored vainly to dispose of the equipment, but was unable to until they accepted Davis' offer of $500. The latter then scrapped all the machinery, turned the buildings into a pleasure resort for the people of the valley, and took up land in the vicinity when the sea had subsided sufficiently. The buildings are now more than a mile from the sea.

However, five years ago, in 1915, mullet (*Mugil cephalus*) began to appear in the sea, and Davis placed weirs of wire netting along the shallow shores of the sea to impound them. He was able to obtain a

large amount of fish at times, but could not develop a market for them at the time, even in Los Angeles and San Francisco. Attempts to sell the fish in the Imperial Valley were fruitless, the fish being named "cow-carp" and regarded as very poor. These attempts, however, laid the foundation for a later very good demand. The approach to Captain Davis' land being cut off by the overflow from irrigation ditches, he was prevented from pursuing the fishery until the last year, but certain Japanese and Greeks did catch considerable quantities, using much of the mullet for oil, and shipping some to market. The Greeks still operate. In the last year Captain Davis has again begun shipping mullet, catching them by means of halibut trammel nets. The catches during the winter months by two men using eight trammel nets of thirty fathoms length each, comprise but 250 or 300 pounds daily, taken in the vicinity of the mouths of the rivers, in shallow water. These fish are landed and shipped from Niland to Los Angeles or San Francisco. Captain Davis receives 15 cents per pound for the fish at the station.

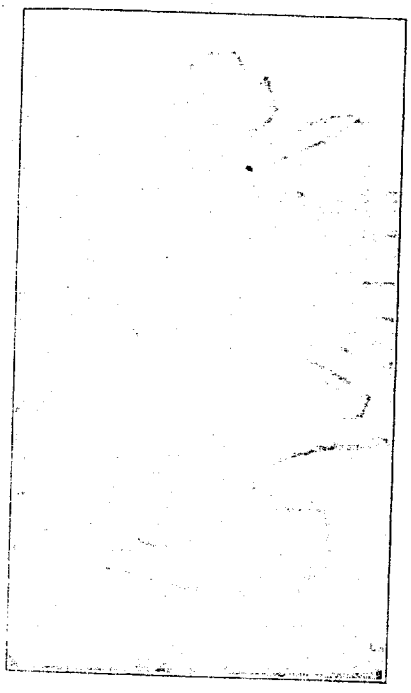
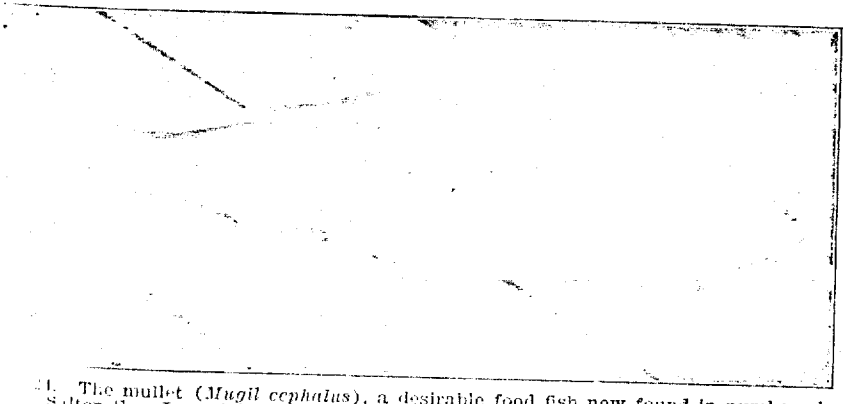


FIG. 23. Captain Charles Davis, a mullet fisherman of the Salton Sea, Imperial County, California. Photograph by H. C. Bryant.

The recession of the sea has made considerable trouble so far as landing the catch is concerned. As the fall is only about four feet per mile, there are great flats covered with water only six or eight inches deep, in which a boat can not easily be moved. Captain Davis has in



24. The mullet (*Mugil cephalus*), a desirable food fish now found in numbers in Salton Sea, Imperial County, California. Photographed by H. C. Bryant.

a measure overcome the difficulty by making a shallow canal, up which his boat can be pulled part way by means of a picket line and the remainder of the way can be pulled with a tow line.

According to Captain Davis mullet are found in different locations in the sea at different seasons. During part of the year they are found in great numbers on the west shore of the sea in grass which grows profusely there and upon which they feed, being vegetarians. On a visit to Bird Islands, on the west shore of the sea, on December 18, 1919, there was no evidence of mullet, and yet at times large numbers are said to be caught in this vicinity.

The fish are at present of very large size indeed, being between two and two and one-half feet in length. The flesh is oily in the extreme, yielding fully a quart of clear oil to the ten pounds of fish. This oil, of a delicate flavor, renders the canned mullet a delicacy, and samples put up by a Los Angeles firm were found to be very palatable. The fact that the fish is delicious should have been expected because of the very high esteem in which it has been held from ancient times, domesticated mullet being known in Europe since the times of the Romans. The species is found all along our coasts, from Monterey southward, and occasional schools are taken in every sheltered lagoon or bay, as well as occasionally up the rivers in what is really entirely fresh water. Its occurrence in the Colorado River is not highly remarkable, and its transference to the Salton Sea would have been expected by anyone familiar with its habits.

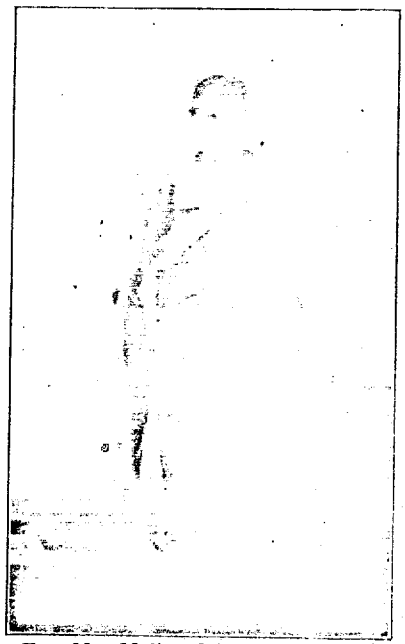


FIG. 25. Mullet fisherman with part of his catch. Photograph by H. C. Bryant, December 19, 1919.

There is also present in the Salton Sea a species of top-minnow *Cyprinodon macularius,* which is found in the streams and springs of the desert throughout Southern California and parts of Mexico. They are said to be abundant in the sea at times, and specimens were obtained for us from there and from Fish Spring by Captain Davis.

It is, indeed, very questionable whether the mullet will exist for any length of time. The carp, and other fresh-water fish in the sea, died some years ago, according to Captain Davis' recollection, after a heavy blow which mixed the waters, drifting them ashore in great quantities. During the past two years there have been statements made to the effect that the mullet also have been found on certain shores of the lake in great quantity, apparently dead from poisonous waters. It is certain, moreover, that the sea has been steadily falling, at the rate of 4½ feet yearly, and as the sea is everywhere shallow (perhaps 25 or 30 feet

deep) it is plain that it can not last long at such a rate of fall. Analysis of the water at a distance from river mouths shows it to be three or four times the salinity of ocean water. The water, moreover, is not merely saline. If such were the case, it is probable that the mullet, a salt water fish, would survive indefinitely. But as a matter of fact the water is fed from alkaline springs, and has in the past been alkaline in nature, so that the water must become poisonous rather than merely salty. Regarding this, however, there is some question until chemists are able to analyze fair samples taken annually, but the probability is very great that the mullet will be unable to exist.

The area near the center of the mullet fisheries should prove of great interest to the geologist. Mullet Island is a typical volcanic plug. At the edge of the island a number of hot springs boil out, leaving chemical deposits of several colors, similar to those of Yellowstone National Park. Captain Davis, by impounding the waters of these springs, has succeeded in obtaining two different colored "paints," and in a third reservoir a pure deposit of rock salt. Near the island are some mud volcanoes the cones of which are from five to eight feet in height. A spring in this vicinity also is geyserlike in action, boiling out with considerable velocity periodically. Because of these natural phenomena the island is visited by large numbers of people from the Imperial Valley every week.

NOTES FROM THE STATE FISHERIES LABORATORY.*

By WILL F. THOMPSON and ELMER HIGGINS.

A SCIENTIFIC ASSISTANT EMPLOYED.

The Commission has secured the services of Miss Helen M. Edwards as a scientific assistant, commencing January 15. Miss Edwards has had considerable experience as assistant in work of the character now being done by the Commission, having been employed while she was still an undergraduate at Stanford University, by Doctor C. H. Gilbert during his work on the salmon. In addition, she has done scientific drawing, and is a capable stenographer.

W. F. T.

PROGRESS OF THE SARDINE WORK.

Mr. Higgins at San Pedro, and Mr. Sette at Monterey, are engaged under the supervision of Mr. Thompson, in laying the foundation for the future work on the sardine. This preliminary "survey," if such it may be called, consists of a careful and laborious tracing of the character of the sardine "runs" at different times of the year and the ascertaining of the size classes which go to make up the catches. The samples are obtained from the boats as they unload at the canneries, and measurements of length and weight are taken, together with other biological observations on sex and state of maturity. This is expected to give data upon which age may be distinguished, to render it possible to correlate fluctuations in catch with various conditions, to enable the catches of successive years to be compared more accurately from the standpoint of age composition and to indicate the spawning season as nearly as possible. The necessity for such a "survey" and its value in future work have already been amply demonstrated in a number of ways, upon which comment may be expected in the future.

The Commission has been granted the courtesy of accommodations at Hopkins Marine Station, at Pacific Grove, as headquarters for the work being done on the sardine at Monterey, and thanks are due the director, Doctor W. K. Fisher, for his many favors. The work on the sardine is also being carried on at San Pedro, and the Commission is under obligations to the Neilsen and Kittle Canning Company for quarters there. Without their courtesy the Commission would be without adequate facilities for the investigation, as the present laboratory at Long Beach is too distant from the fishery centers.

W. F. T.

OCCURRENCE OF A DEEP SEA FISH AT MONTEREY.

It often happens, especially in deep sea halibut fishing, that cod or halibut trawls are set over water which is too deep, and in such case strange silvery fish are sometimes taken. These fish have snouts projecting in sharp angles beyond the large mouth, their eyes are large, their scales are very rough and silvery, and the body tapers back into a long, thin, pointed tail bordered above and below with fins, but lacking a separate tail fin. These fishes are allied to the cods, and belong to the family Coryphaenoididae. One such specimen was brought into Monterey during January, and preserved by Mr. Oyer, the deputy there. It belongs to the species known as *Nematonurus acrolepis*, one taken in numbers by the United States Bureau of Fisheries' vessel "Albatross" during her work off California, and found along our coasts in depths of 500 and 1500 fathoms as far north as Bering Sea and in Japanese waters. It was entirely unknown to the fishermen, as would be natural considering the depths at which it is usually found.

W. F. T.

INVESTIGATION OF THE SALTON SEA.

During the latter part of December, Mr. Crandall of the Scripps Institution, and Doctor H. C. Bryant and Mr. W. F. Thompson of the Fish and Game Commission, visited Salton Sea to investigate the life and the hydrographical conditions of the sea. They were the guests of Captain Davis, who has long been known to the Commission as engaged in shipping mullet from Salton Sea. During the visit, large specimens of mullet were taken by Captain Davis' fishermen, but no other

*California State Fisheries Laboratory, Contribution No. 18.

live fish were observed with the exception of two top minnows taken along the shore. These were of a form usually taken in desert springs and streams, *Cyprinodon macularius*. Later Captain Davis sent to Mr. Thompson samples of small fish taken from the vicinity of Fish Springs at the northwestern end of Salton Sea. These proved to be of the same species.

The existence of the grey mullet in Salton Sea is of considerable interest, as the species must have entered during the inflow of the Colorado River during 1906. If so the mullet must have lived in the Colorado at some distance from its mouth, a fact not strange when the frequent appearance of the mullet in rivers and lagoons bordering our coast is remembered. However, it has taken some time for the species to become abundant in Salton Sea, it having been unrecorded previous to 1915, according to Captain Davis. During the interval it is said that carp appeared in great numbers and then died off. The carp and the mullet are both bottom feeding fish, consuming vegetation, etc., and are not dependent on other smaller fish species. But the mullet is also capable of existing in brackish and salt water—that being its natural habitat in fact—and it is probable that this enabled it to flourish where the carp could not. The ancients used to grow mullet in artificial enclosures, and the flesh was considered a great delicacy.

There are also said to be species fresh water fish found at times near outlets of the New and the Alamo riv but nothing was seen of these. W. F. T.

THE RECUPERATIVE POWER OF THE ABALONE.

During 1911 Mr. W. F. Thomp carried on a survey of the shell fish the northern part of the state, and dur its course came naturally to handle ma specimens of the red abalone, *Halio rufescens*. Among these was a specim remarkable for the evident great recupe tive powers. The viscera of the abalo naturally surround the large centr muscle in a peculiar way, as a bent con and in this case the cone had been cut o by some one attempting to obtain th abalone. The attempt failing, the aba lone had evidently succeeded in coverin the large mass of dead cut-off parts with pearly layers of shell. But that the animal had been seriously injured could not be doubted, the edge of the shell showing a total cessation of growth for some time previous to death. The shell only was found, the abalone having finally died, possibly as a result of the injury. A photograph of it is presented.

Altered shell formation is not at all infrequent, particularly among clams, where growth is often seemingly totally stopped by some injury, and starts again well in from the former edge. But no instance has ever been seen by the

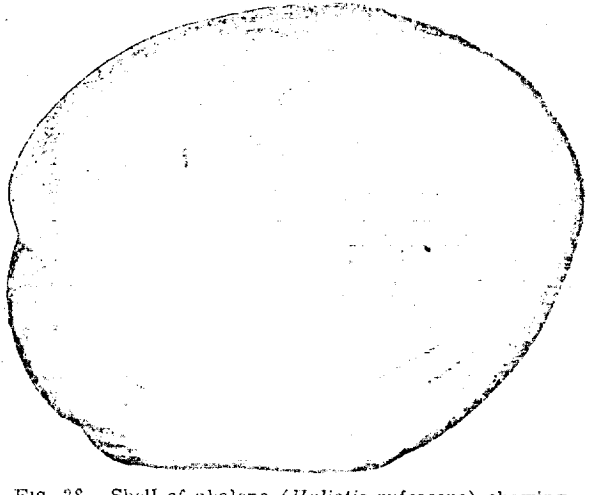


FIG. 28. Shell of abalone (*Haliotis rufescens*) showing part of damaged viscera covered by a pearly layer of shell. Taken near Fort Bragg in 1911.