1943

Steps toward crab conservation in Chesapeake Bay

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VIRGINIA FISHERIES LABORATORY, COLLEGE OF WILLIAM AND MARY
AND COMMISSION OF FISHERIES

CONTRIBUTION NO. 15

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Reprinted from THE COMMONWEALTH,
Vol. X, No. 7, July, 1943 pp. 9-11, 32

Steps toward Crab Conservation

In Chesapeake Bay

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BLUE crabs have increased in abundance in Chesapeake Bay since 1941, but in that year an acute shortage developed which threatened the entire fishery. The serious decline of the fishery, which began in 1940, demonstrated the necessity of finding a way of assuring rapid recovery and preventing a recurrence of similar shortages. One significant step in this direction was taken by the Commission of Fisheries of Virginia in 1941, upon the request of the Hampton Crab Packers Association.

A large sanctuary was established at the mouth of the bay, closed to crab fishing during July and August, to protect egg-bearing or "sponge" crabs. This brood-stock area, containing about 400 square miles, was continued during 1942, and in 1943 the closed season was extended to include April, May, and June.

The possible effectiveness of the sanctuary for increasing and maintaining the crab population became promptly a subject of considerable debate.

BEGINNING IN THE SUMMER OF 1941, the Virginia Fisheries Laboratory has undertaken to accumulate evidence on the value of the sanctuary, and to develop information on additional constructive steps which might be taken to assure the maintenance of the crab fishery.

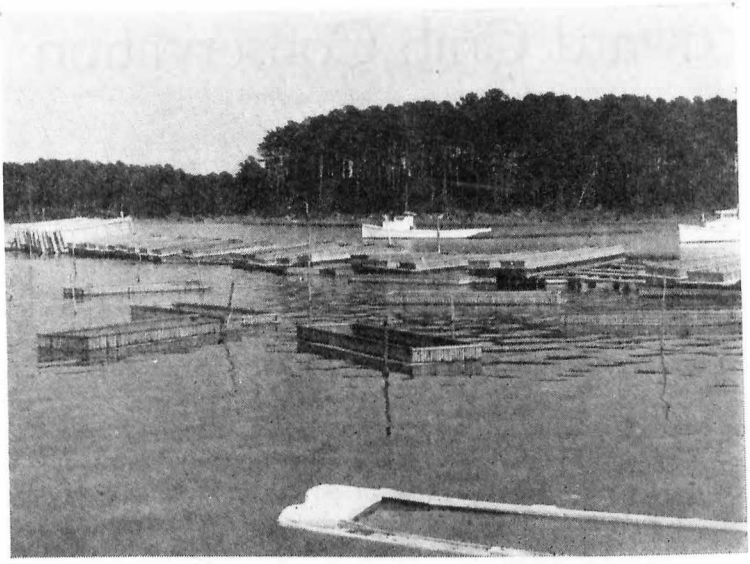
Two lines of investigation were initiated in an effort to determine the value of the sanctuary as a means of assuring rapid recovery of the crab fishery. One involved water sampling in widely scattered parts of the lower bay to discover the areas where blue crab larvae were most abundant. The other was concerned with the determination of the water conditions most suitable for the hatching out of the eggs of the crab and for development and survival of the larvae.

In order to sample the water for blue crab larvae, it was necessary to find a means of positively identifying the blue crab in the early stages of its growth, since the larvae of a dozen or more other kinds of crabs are found in Virginia waters. To accomplish this, Dr. S. H. Hopkins and his associates hatched out eggs of the blue crab under laboratory conditions at Yorktown, and thus provided the first authentic description of the crab in its early stages. Plankton tows, obtained by hauling a fine silk net through the water in order to strain out crab larvae, were taken in different sections of the lower bay.

The results showed that early larval stages predominate in the sanctuary and are conspicuously less abundant in the less saline waters outside the sanctuary.

The second line of investigation required the development of a technique for hatching out and keeping alive large quantities of larval crabs, known as zoeae. This was found to be exceedingly difficult on account of the problem of finding a satisfactory food for the larvae. It was discovered, finally, that the zoeae would feed on a protozoan organism abundant seasonally in the York River.

Repeated experiments showed that there is a wide range of toleration with respect to salinity and temperature in the development and hatching of the eggs. The eggs were found to hatch out at salinities as low as 10 parts per thousand (slightly



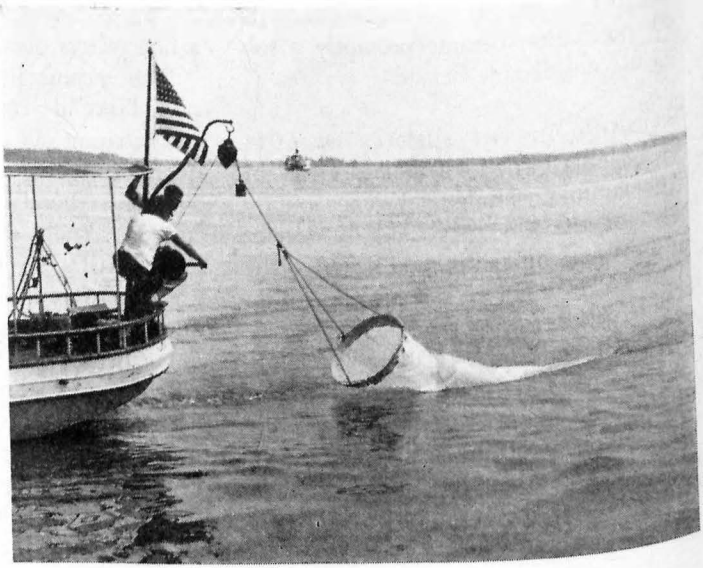
Crab floats laid up in the summer of 1941 as a result of the short age of "peeler" crabs

Coker

less than one-third the concentration of ocean water), but the larvae were abnormal in the low salinities. The abnormal larvae retain the embryonic covering, have undeveloped bodies, and are relatively inactive. The optimum salinity range was found to be from about 23 to 30 parts per thousand. Eggs failed to hatch outside the temperature range of 66°-84°F. The salinity and temperature conditions of the waters within the sanctuary were found to be well within the optimum ranges for the crab eggs and larvae during the period from June until September.

The results of the two lines of investigation described show that the sanctuary, if properly protected, may be expected to provide a haven for "sponge" crabs to develop their eggs and provide larvae for increasing the crab population of the bay.

Towing a plankton net of silk bolting cloth to strain crab larvae from the water



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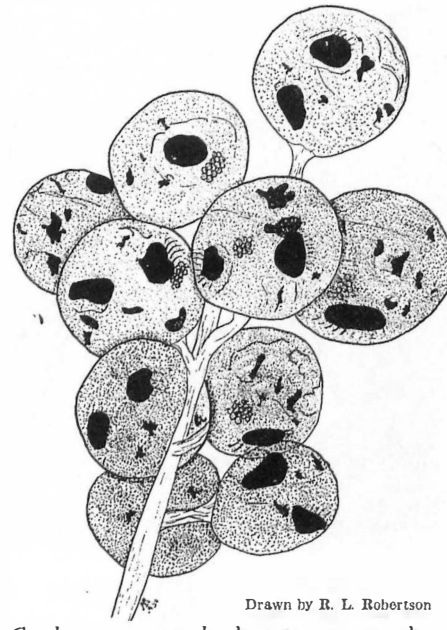
The studies have shown that while eggs may develop in the less saline waters of, for example, the Mobjack area, successful hatching and survival of larvae are favored in the higher salinity waters of the sanctuary. In this connection, limited field observations seem to indicate that with approach to the sanctuary more dark-colored (ripe) "sponge" crabs occur and fewer yellow (younger) "sponges," thus suggesting a southern migration of "sponge" crabs to the region of the Capes for hatching out.

The true test of the value of the sanctuary lies in the volume of catch per unit of gear. But present fishery statistics are so inadequate, unfortunately, that little information can be gained from them on the volume of catch in terms of fishing effort. Current reports from widely separated parts of the bay all agree, however, in the belief that the crab population of the bay has increased greatly since 1941.

A SANCTUARY TO PROTECT THE BROOD stock in Virginia, notwithstanding its evident effectiveness, is only one of the measures which might be taken to restore and maintain the crab fishery.



Drawn by R. L. Robertson

Crab eggs attached to an appendage of the "apron" (abdomen) of the crab, five hours before hatching (magnified about 100 times)

Annual Catches of Hard and Soft Crabs in Chesapeake Bay

1929-1941

(Expressed in thousands of pounds)

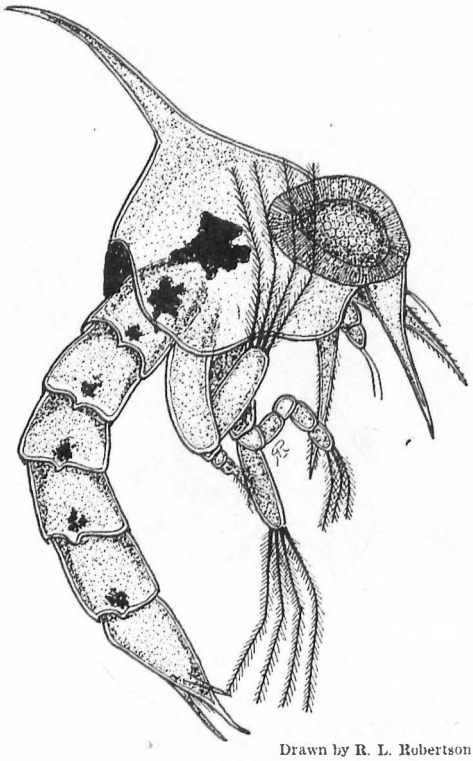
Year	Soft Crabs		Hard Crabs	
	Maryland	Virginia	Maryland	Virginia
1929	2,644	1,700	25,455	30,377
1930	5,313	2,881	31,625	28,939
1931	3,910	1,712	29,930	28,963
1932	3,540	1,549	29,399	27,024
1933	3,449	2,067	26,648	23,911
1934	2,288	1,370	13,620	22,516
1935	2,556	1,449	17,264	19,762
1936	2,268	1,969	13,294	26,137
1937	2,514	2,475	16,198	27,927
1938	2,898	2,782	20,699	28,690
1939	3,233	2,783	24,062	26,967
1940	1,790	1,977	15,031	23,016
1941	836	1,709	11,975	15,716

Source: U. S. Fish and Wildlife Service

In the final analysis, the key objective is to prevent a recurrence of severe declines in production, with consequent losses to the fishermen.

Since the inception of the soft crab fishery in Chesapeake Bay in 1873 and the hard crab fishery in 1878, shortages of crabs have at times assumed serious proportions. In 1920, the total yield of hard and soft crabs in Maryland and Virginia was exceptionally low, amounting to only about 22,000,000 pounds.[1] Conservation measures were enacted thereafter and a peak production of about 68,000,000 pounds was reached in 1930. Among other changes in the management of the crab fishery, failure to protect egg-

[1]Statistics from U. S. Fish and Wildlife Service.



Drawn by R. L. Robertson

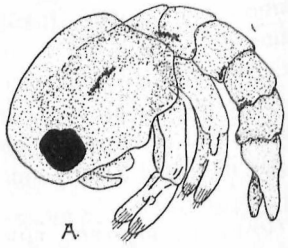
Zoea larva of the blue crab, three days after hatching (magnified about 100 times)

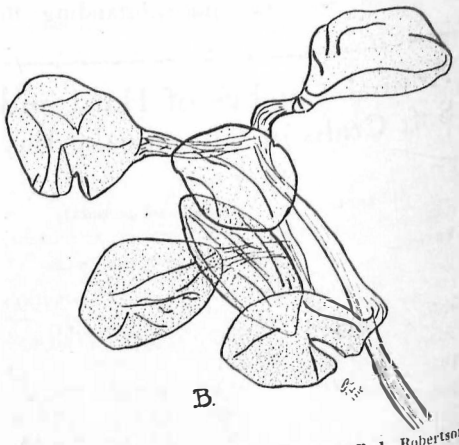
bearing or "sponge" crabs followed, and by 1934 the annual catch dropped to about 39,000,000 pounds. However, by 1939, it had reached 57,000,000 pounds. The decline during 1940 and in 1941 (to about 30,000,000 pounds) and the apparent increase since then are of special interest at this time.

During some years, declines in the crab catch have meant losses in income to Virginia crabbers alone of over a quarter million dollars. The average value of the catch in Virginia during the ten-year period 1930-40 was $608,000. During four years, 1931-34, it fell below this figure an average of $150,000 per year.

The declines of 1920 and 1941 were preceded by extremely severe winters during 1918 and 1939, respectively, and there is a considerable body of opinion emphasizing the significance of natural causes rather than human factors in accounting for such changes. Doubtless both exercise an important influence.

Were adequate records taken of the time, place, and amount of the commercial catches per unit of gear used, it would be possible to tell not only the cause of a decline but possibly to foresee it in time to take measures which would decrease the loss to the industry. Such statistics would likewise provide an invaluable index of the effectiveness of remedial measures.





Drawn by R. L. Robertson

(A) An abnormal crab larva, prezoea stage, hatched out under unfavorable conditions of salinity (magnified about 100 times). (B) Empty egg shells after the larvae have hatched out (magnified about 85 times)

In the laboratory at Yorktown where crab eggs are hatched

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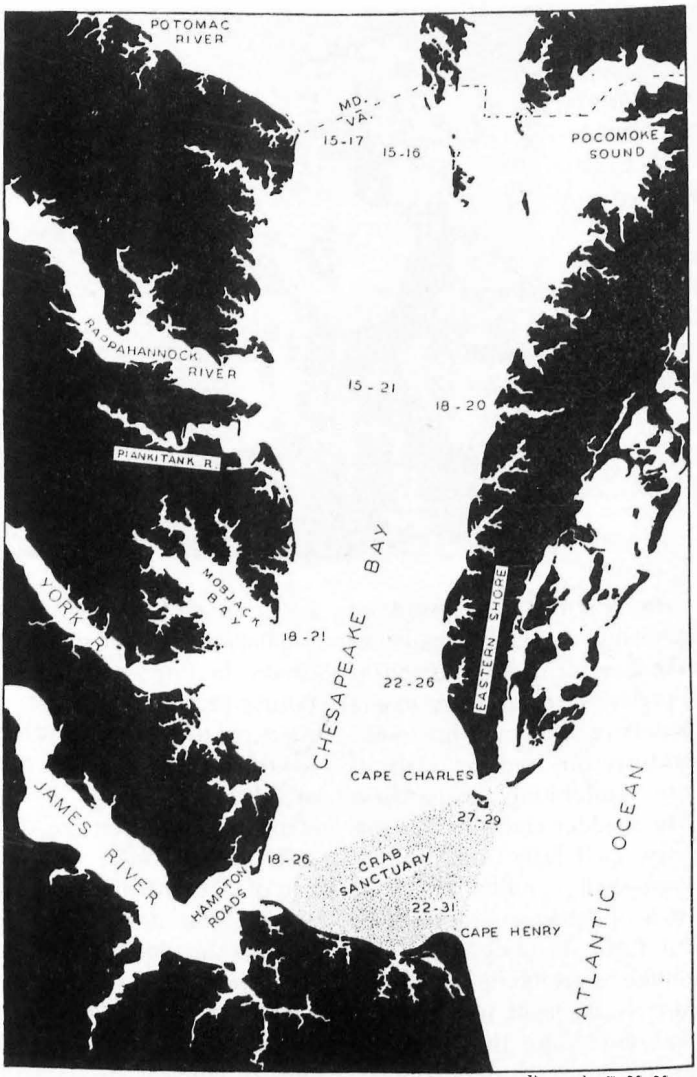
SOME OF THE FREQUENTLY DISCUSSED ways of increasing the crab population of Chesapeake Bay include the establishment of a "peeler" crab sanctuary in the less saline waters of the upper bay, similar to the sanctuary for "sponge" crabs in the lower bay; prohibiting the purchase of "peeler" or shedder crabs that do not have a soft new shell fully formed under the outer hard shell; prohibiting at all times the catch of buckram crabs (those not recovered from shedding and hence in poor condition); prohibiting the holding of green crabs on floats for shedding purposes; and shortening the length of the season of the winter dredge fishery.[2]

All these measures are likely to contribute to the desired end, but to what extent no one knows. This is not because some of these measures have not been tried; rather it is due to a failure to collect statistical data to show the effect of the regulations that have been introduced.

The several remedial measures mentioned represent reasonable possibilities for maintaining higher average levels of production and for effecting a rapid recovery in times of severe shortage. In fairness, remedial measures should not be restricted to a single branch of the fishery, for this would make one particular group of fishermen—such as the crab pot fishermen, the winter dredge crabbers, or the soft crab fishermen—bear alone the burden of restricted fishing. The biology and migratory habits of the crab are such that an equitable distribution can be made of the responsibility for saving crabs to speed up recovery, and this should be done, so that each group will undergo a reasonable curtailment of its type of fishing.

INFORMATION ON THE VOLUME OF catch per man per boat in the various parts of the bay would provide the best if not the only sure means of recognizing unfavorable years in time to apply remedial measures. These facts must be available, too, as a basis for apportioning equitably among the several branches and regions of the fishery the responsibility for assuring a consistently high crab yield in Chesapeake Bay.

[2]The winter dredge fishery for hard crabs takes about one-fifth of the total catch of hard crabs in Virginia. It is limited to the period from December 1 to April 1.



Drawn by G. M. Moore

The Virginia section of Chesapeake Bay, showing the sanctuary established in 1941 for the protection of egg-bearing crabs. The figures indicate the annual average surface and bottom salinity records (after Wells, Bailey, and Henderson, 1929)