

**TUESDAY, NOVEMBER 13**

**Chairman—DAVID A. WALLACE**, Director, Oyster Institute of North America, Annapolis, Md.

**Winter Growth of the American Oyster *Crassostrea virginica* in Apalachicola Bay, Florida**

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**\*Abstract**

It has previously been established that the American oyster grows only during the summer months in northern waters, and that growth in general is approximately an inch a year.

In Florida, growth is continuous throughout the year and, in optimum ecological circumstances, is greatly accelerated. For instance, this study revealed an average growth (under favorable circumstances) of 2.7 inches during the period of June 6, 1949 to February 21, 1950. In the period September 9, 1949 to March 3, 1950, largest oysters (average size: 3 inches) grew one inch, or to an average size of four inches.

Because of its rapid and continuous growth, the Florida oyster holds great potential for scientific cultivation and exploitation.

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**Report on the Attempted Introduction of the Virginia Oysters *Crassostrea virginica* into the waters of Puerto Rico**

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IN PUERTO RICO there is found only one species of edible oyster, the small "mangrove oyster," *Crassostrea rhizophorae* (Guilding). These are found attached to the aerial roots of the common mangrove which border the banks of various lagoons and other protected shores where there is little exposure to open waters. Many connoisseurs of sea foods insist that the flavor of the mangrove oyster is superior to that of *C. virginica*, and it is greatly sought after as food. From one lagoon, at Boqueron, it has been estimated that from 25 to 30,000 pounds of these oysters are harvested annually (Mattox, 1949). To augment this production it has been suggested that the "Virginia oyster" *C. virginica* should be brought into Puerto Rico. Attempts have been made to do so.

Through the courtesy of Dr. Philip A. Butler of the U. S. Fish and Wildlife Service three shipments of seed oysters of *C. virginica* were sent from Pensacola, Florida to Mayaguez, Puerto Rico by Air Express. The average length of time in transit from Pensacola to Mayaguez was three days. Upon arrival they

were immediately planted. The oysters were inspected immediately after arrival and all dead animals were removed. The remaining living animals were distributed among several wire baskets and then placed in one of two lagoons. Some were placed in a lagoon at Boqueron where *C. rhizophorae* is very abundant, and others were placed in a lagoon at Joyuda where there are no other oysters. The planted oysters were observed regularly as to mortality and evidences of growth.

The first shipment was planted in the Boqueron lagoon on January 3, 1950. On arrival approximately 50 per cent of the oysters were dead, probably killed by temperature changes suffered during transit. The remaining living oysters, 50 in number, were planted in a series of wire baskets among colonies of *C. rhizophorae* at the average low tide mark. One week after being introduced only 22 of the original 50 oysters were living, a mortality of 56 per cent. From this period there was a gradual drop in number of living animals until after 7 months, July 1950, when all were dead.

The second shipment arrived in better condition with approximately 10 per cent being dead on arrival. These oysters were planted in the Joyuda lagoon on May 11, 1950. After 2 weeks the original number of 135 had dropped to 59, representing a mortality of 57 per cent. These oysters also gradually died until after a period of five months, October 1, 1950, all were dead.

The third group was received and planted on October 13, 1950. They were placed in the Boqueron lagoon. These oysters were larger than those in the other groups, the largest being nearly 70 mm in length. After three weeks there was a drop from the original number of planted oysters of 168 down to 86, a mortality of 49 per cent. Members of this group were all dead after 7½ months on June 1, 1951.

In all three groups the initial drop in numbers during the first few weeks after transplanting was probably due to the shock received during transportation which weakened them to a point beyond which they could not rapidly recover. Only in the third group was there any noticeable growth of the shell and that was very little and at a slow rate. In this group marked oysters increased in shell length only 6.6 mm. in 6½ months. This rate of growth is abnormally slow for *C. virginica* in warm waters. Ingle (1950) indicated that *C. virginica* living in the Apalachicola Bay area of Florida would make approximately this same growth during one month. *C. rhizophorae* living in the Boqueron lagoon would reach a size of approximately 50 mm. during a similar period. There was no indication of the production of spat by any of these oysters.

The environmental factors under which these transplanted oysters were placed were all within the normal range of tolerance of this species. At Boqueron the temperature variation was from 25 to 31°C., approximately the same as the mean temperature during summer months at Apalachicola Bay, of 28°C. The salinity was higher than the mean of 26.3‰ at Apalachicola Bay as it varied here from 26.5 to 38‰. This may possibly be a factor in the high mortality. The pH at Boqueron averaged 7.7.

In the Joyuda lagoon the temperature variation was from 27 to 31°C. The salinity in this lagoon is lower than at Boqueron, it varied from 25 to 29‰ during the period when these oysters were present. The pH was slightly higher, with an average of 8.0.

The question of the cause of the rapid mortality of these *C. virginica* introduced into the waters of Puerto Rico has not been answered. Plans for further introductions and close observations are being made.

## LITERATURE CITED

- INGLE, ROBERT M.—1950—Summer growth of the American Oyster in Florida Waters. *Science* 112 (2908): 338-339.
- MATTOX, N. T.—1949—*Studies on the biology of the edible oyster, Ostrea rhizophorae Guilding, in Puerto Rico.* *Ecol. Monogr.* 19:339-356.

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## A Criticism of Oyster Measurements

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THERE ARE SURPRISINGLY FEW PAPERS among the vast amount of oyster literature which give measurements on oysters. Among those which do give measurements a high proportion report length of oysters in tenths of a millimeter. An article in a Bureau of Fisheries publication, one in the *American Naturalist*, one in a Canadian publication, and two fairly recent articles in *Science*, give the length measurements of oysters in tenths of a millimeter. Further, within the year, two manuscripts have been submitted to the writer for criticism in which comparative growth rates of oysters have been given, with the length measured in tenths of a millimeter. Such measurements are really too "accurate" to be accurate.

Measuring the length of oysters to a tenth of a millimeter should not be attempted because of the very nature of oyster growth, because of the limitations of the instruments used in making the measurements, and because of a time-growth element which should enter into the measurements.

Those familiar with the rapidly growing oysters of the Gulf and South Atlantic coasts realize that, in time of rapid growth, the bill of the oyster may consist of as much as three to five millimeters of extremely thin, brittle, yet pliable chitin-like shell. In gathering specimens for measurements, injury is likely to occur to this thin bill. It is extremely difficult to determine by ordinary observation whether or not small parts of this fast growing oyster bill have been broken off. Assuming that the specimens for measurement can be and have been hand-collected, this very flexibility of a fast growing oyster bill makes it readily subject to distortion if even only a small amount of pressure is applied when the length of the oyster is measured with a vernier caliper. Accuracy of measurement to a tenth of a millimeter seems somewhat dubious under these circumstances.

A measurement or a weight can be only as accurate as the instruments used to weigh or measure. If the measurements of oyster lengths were made by use of an ocular micrometer in a binocular low power microscope, measurements down to one-tenth of a millimeter certainly would be accurate. Undoubtedly, however, the vast majority of oyster length measurements are made with a standard vernier caliper. It is extremely doubtful that any of these have been standardized by the U. S. Bureau of Standards. Although their accuracy is probably relatively good, two such calipers bought from the same company, but at different times, were compared recently at Bears Bluff Laboratories. One of these calipers is inaccurate to one-tenth of a millimeter. While this inaccuracy is small, nonetheless it is sufficient to influence oyster measurements which are given in tenths of a millimeter.

Robert Ingle's publication in *Science* (Vol. 112 No. 2908, pp 338-339) on the "Summer Growth of the American Oyster in Florida Waters" surprised