SOME FACTORS AFFECTING FLUID LOSS IN SOUTHERN OYSTERS[1/]

By Milton Fingerman* and Laurence D. Fairbanks*

BACKGROUND

The conditions under which fluid loss (bleeding) occurs in the Southern oyster (Crassostrea virginica) have been investigated. The quantity of fluid lost from shucked oysters was first determined. These preliminary experiments led into more complicated experiments in which the changes in the salinities of the body fluids of oysters which were maintained in water with different salt concentrations were determined.

EFFECT OF SHUCKING METHOD ON FLUID LOSS

The fact that commercially-shucked oysters lose a large volume of fluid is common information. Consequently, experiments were designed to determine the amount of fluid lost from oysters after shucking. Oysters which had been removed from their shells in a manner that ruptured the underlying tissues lost 50 percent of their original body weight as fluids in two hours (fig. 1). Most of the weight loss occurred in the first 15 minutes following shucking. Oysters which had been removed from their shells with no damage to the underlying tissues by gently scraping the muscle attachment from each shell lost 25 percent less weight than did the oysters which had been punctured when shucked (fig. 2). The fluids were lost from the oysters shucked with a minimum of injury by bleeding through the ends of the muscle and from fluid spaces in the body proper.

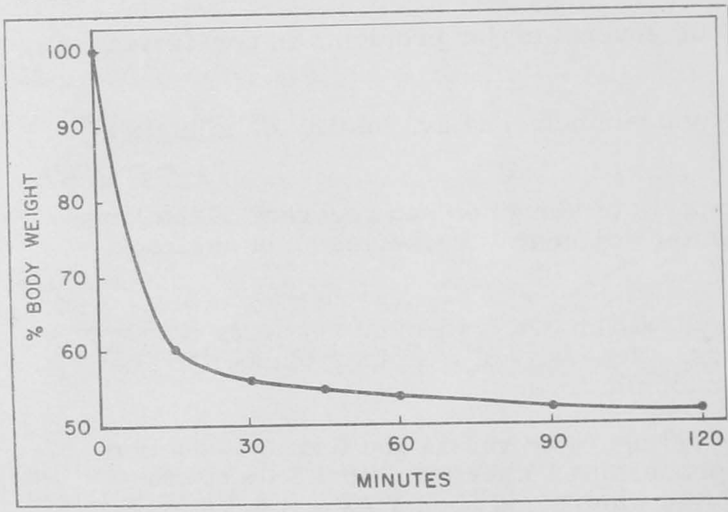

Fig. 1 - The weight changes of the body of oysters after shucking. The mantle and pericardium were intentionally ruptured during the shucking process.

EFFECT OF STRESS FACTORS ON FLUID LOSS OF SHELL OYSTERS

A hypothesis has been set forth that oysters, by virtue of the ability to close their shells freely, are able to "escape" from their environment whenever an unfavorable environmental factor is present. Consequently, oysters have presumably not evolved complicated defense mechanisms because of their ability to shut off the environment under conditions of stress. The fluid content of oysters seems to be extremely labile and subject to rapid changes of quantity in times of stress.

Experiments were, therefore, designed to test this hypothesis and determine some of the conditions under which fluids and consequently weight are lost by oysters. In view of the hypothesis presented above, the most obvious experiment was to prevent the oyster from freely opening and closing its shells and determine the effects of this treatment upon the weight and fluid content of the oyster. Wedges

* Dept. of Zoology, Newcomb College, Tulane University, New Orleans 18, La.

1/This study was conducted by Tulane University under contract with the U. S. Fish and Wildlife Service. It was financed with funds made available under provisions of P.L. 466, 83d Congress, approved July 1, 1954 (commonly called the Saltonstall-Kennedy Act).

were, therefore, placed between the shells to prevent their complete closure. The oysters were weighed at intervals up to 150 minutes and the percentage change of the body weight was determined. Oysters which had been wedged open lost approximately 30 percent of their body weight by secreting fluids from the body into the space between the shells. This loss of weight occurred in wedged oysters kept in sea water and in air. Obviously oysters must be free to open and close their shells if they are to maintain a constant body weight and fluid content.

The next series of experiments was designed to determine some of the conditions under which the loss of fluid in oysters which had been wedged open could be altered. Oysters which had been wedged open were placed in normal, diluted, and concentrated sea water and weighed at several time intervals. The amount of fluid lost varied with the environment. Wedged oysters lost the most weight in concentrated sea water, and the least in diluted sea water. These data could be explained as a simple osmotic phenomenon.

EFFECT OF SALINITY ON COMPOSITION OF SEVERAL BODY FLUIDS

Additional experiments were, therefore, designed to determine how the salinity of the environment influenced the weight and salt content of unwedged oysters. Oysters were, therefore, placed in sea water of several different salinities. At selected intervals the salinities of the several body fluids and the weights of the oysters were determined. The normal oysters in the water of different salinities neither gained nor lost weight yet the salinity of some of the body fluids changed. Obviously free movement of the shells allows the oyster to control its weight. Since no weight changes occurred, the oysters were not gaining or losing water in the different salinities, they must have changed the salinity of some of their body fluids by gaining or losing salt rather than water.

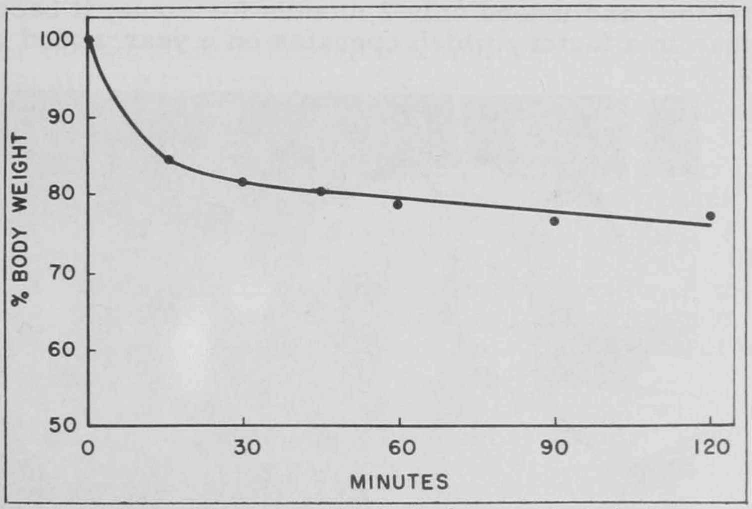

Fig. 2 - The weight changes of the body of oysters shucked without injury to the mantle or underlying parts.

By carefully opening oysters the fluids from several portions of the body could be collected individually. As a result of determination of the salinity of these fluid fractions taken from oysters in several environmental salinities, the observation was made that the deeper in the oyster one obtained the fluid, the less tendency was there for the salinity of the fluid to follow changes in the salinity of the environment, *i.e.* the blood in the heart showed the least change of all the fluids investigated.

The results were compared with data published for the Japanese oyster. The salinity of the blood of the latter oyster readily follows changes of the salinity of its environment which is not true of the Southern oyster. Evidently the Southern oyster is better adapted to life in an environment with changing salinity than is the Japanese oyster.

The oysters used in the experiments described herein were first and second year oysters. From the weight of the shell alone, one can determine with reasonable accuracy the age class to which the oyster belongs.

The data will be published in detail in a forthcoming issue of *Tulane Studies in Zoology*.