Studies on the Condition Factor of the Sierra Leone Mangrove Oyster Crassastrea tulipa

By

Chodaessessie Wellesley-Cole & Abu B. Kamara

I. INTRODUCTION

Mangrove oysters are found attached to the roots of mangroves that grow in swamps along the estuaries, rivers and creeks in Sierra Leone. The swamps are unevenly distributed throughout the country. Mangrove oysters are generally absent along sandy beaches and in water of less than 5 ppt in the dry season. Oysters found in sandy beach areas are usually attached to rocks and are known as rock oysters. The taxonamic difference between the two types of oysters has not yet been established.

The oyster moves actively during its larval phases which last for less than two weeks. Once the larva is attached to a suitable solid object, it remains sessile for the rest of its life.

Quayle (1969) has suggested that Pacific oysters develop gonads by conversion of the winter store of glycogen when water temperatures begin to rise in March. Under normal weather conditions full ripeness is attained in most British Columbian waters by the end of June. As Sierra Leone is a tropical country water temperatures are high (greater than 24^{o}C) throughout the year. Consequently the local oysters tend to spawn the year round with one or

two spawning peaks. The condition of such tropical oysters may not be as high as those oysters in temperate countries since the stored glycogen is regularly utilised to form gonads. A high condition factor value indicates that the oysters have accumulated glycogen and/or gonads, whereas a low condition factor value indicates that the oysters have spawned and are in the process of accumulating glycogen, which may later be utilized for gonad development. In oyster culture, condition factor studies may be supported by plankton and oyster spat settlement studies in the culture area. These studies give an indication of when oyster larvae and spat settlement are at their peak values. In Sierra Leone studies of the plankton and spat settlement are undertaken every week, throughout the year.

II. METHOD FOR DETERMINATION OF CONDITION FACTOR

In the oyster industry the word 'condition' describes the state of an oyster during its seasonal cycle of change from glycogen storage to spawning. Because the size of meat, either by weight or volume between two oysters of equal shell dimensions may be very different, a more precise measure of condition in oysters known as 'condition factor' is needed. The condition factor is obtained from the ratio:-

$$\frac{\text{weight of dry (oyster) meat X 1000}}{\text{internal volume}}$$

The internal volume or shell cavity volume is the difference between the volume of a whole closed, intact oyster and the volume of the oyster meat after it has been removed from its shell. Volumes are determined as displacement volumes. The oyster meat is dried to a constant weight at 65°C to obtain the dry meat weight. The volume of an

oyster can be used to obtain the condition factor, but the water content of oysters is extremely variable. There may be rapid changes in the volume after the oyster has been shucked and this gives rise to unreliable results. To avoid these problems and obtain more reliable results, the dry weight measurement is used. Therefore the greater the dry weight of the meat relative to the size of its shell cavity, the larger the numerical ratio and the better the condition of the oyster.

Sample sizes of fifty wild and fifty cultured oysters per station per month were used to determine the condition factor. The following factors could be sources of error in obtaining the condition factor:

(a) Oysters, whether wild or cultured, must be clean. That is, no other spat or fouling organisms should have set on them. If any of these organisms have set on the oysters, they should be carefully removed with as little damage to the oysters as possible. If this exercise is not carried out, the displacement volume recorded will be greater than the true value.

(b) If the shells are accidentally damaged during shucking care must be taken to ensure that all the pieces of the shell are used when measuring the shell volume. If this is not done, the displacement volume recorded will be less than the true value.

(c) The oyster meat must be dried to a constant weight. If this is not done, an unusually high condition factor will be obtained.

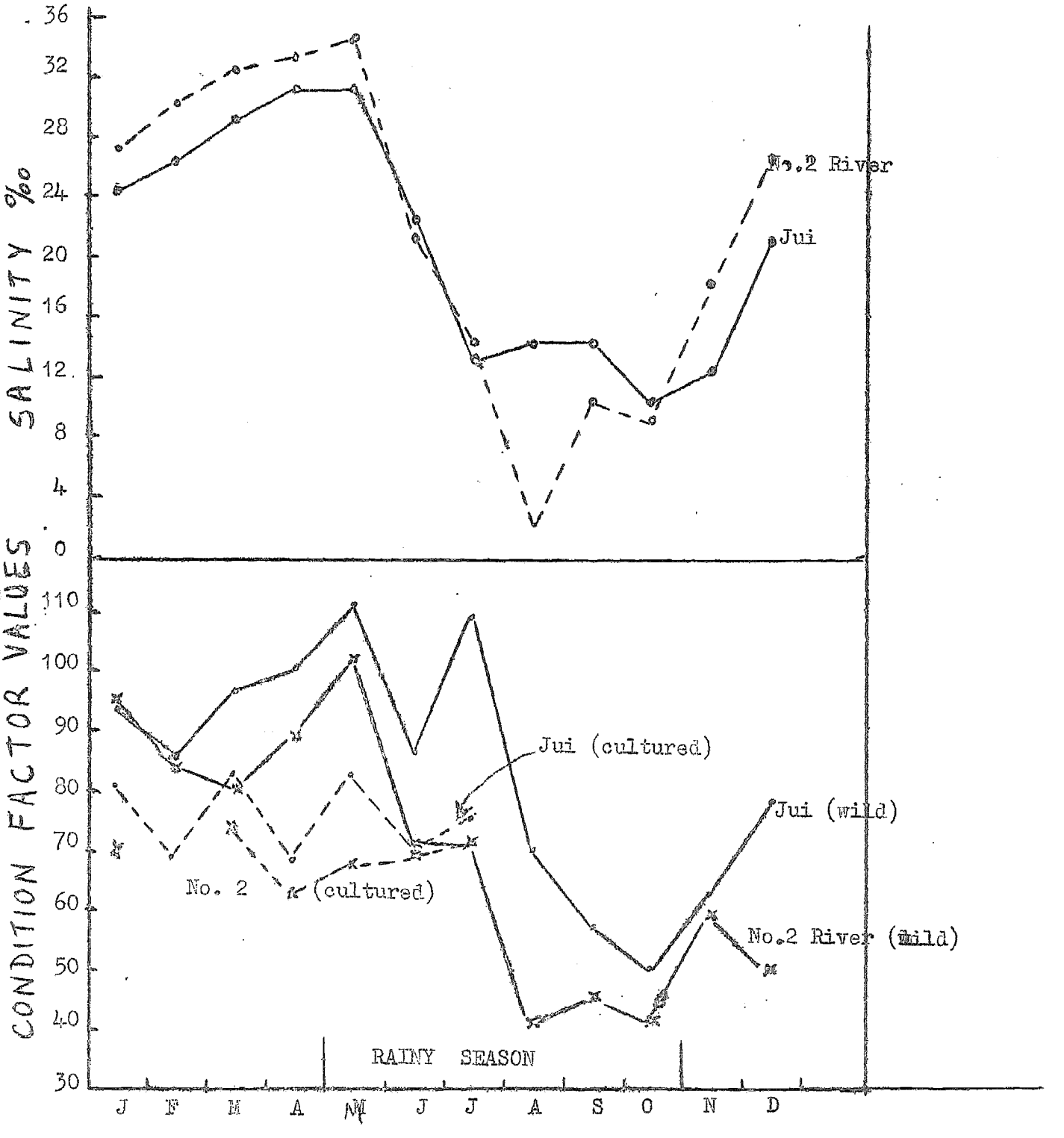
The oyster samples were taken from Jui and No.2 River. Jui is situated on the east coast of the Freetown Peninsula, off Bunce River, a tributary of the Sierra Leone River. Jui is 17.7km from Freetown. No.2 River is a small tidal river on the west coast of the Freetown Peninsula. It is approximately 2.5km long and varies from 40 to 60 metres in width. No.2 River is 35.4km from Freetown.

III. RESULTS

The average monthly condition factor curves for wild and cultured oysters at No.2 River and Jui, over a four year period in relation to salinity changes are shown in Fig. 1. The wild oysters at both sites gave the higher condition factor than the cultured ones during the dry season and the first month of the rainy season. The highest condition factor values were obtained in May when salinity was maximum. The lowest values for the wild oysters were obtained during the last three months of the rainy season. The cultured oysters were usually harvested at the beginning of the rainy season and consequently no condition factor values could be determined for them during the rainy season.

The condition factor of the wild oysters at Jui was usually higher than that of the No.2 River ones. The salinity was usually lower at Jui than at No.2 River except during the rainy season. A large drop in salinity of 32 ppt during the first three months of the year at No.2 River reduced the condition factor of the oysters by 60 units. At Jui the drop in salinity of 18 ppt produced a reduction in condition factor of 40 units.

FIG. 1 Average monthly condition factor of wild and cultured oysters at Jui and No.2 River in relation to salinity changes from 1975 - 1978.



The condition factor of the cultured oysters varied between 70 and 80 units at Jui and between 65 and 75 units at No.2 River. The drop in salinity at both sites during the second month of the rainy season seemed to have had little effect on the condition factor of the cultured oysters.

IV. DISCUSSION

In Sierra Leone under normal circumstances, the rainy season starts in May and ends in October, whilst the dry season starts in November and ends in April.

From plankton and oyster spat settlement studies in these areas it is believed that high condition factor values indicate that the gonads are ripe for spawning in the wild oysters. As soon as this stage has been reached, the oysters spawn with a resulting drop in the condition factor values of the oysters. From Fig.1. it can be seen that the values rise and fall throughout the year but that at No.2 River there is a major spawning peak for the wild oysters in May, whilst at Jui two peaks occur in May and July. The wild oysters at both stations are in their poorest condition in October.

In the case of the cultured oysters it is not yet known whether their condition factor of 80 units indicate that they are ripe for spawning.

Detailed spatfall studies at No.2 River and Jui have shown that the spatfall at No.2 River is very much less than at Jui, so oyster spats are only collected at Jui and a requisite number transported to No.2 River which is used as a growing area. Studies on spatfall and fouling organisms

have shown that the best time to collect spats from Jui is from the end of September to the end of October. The oysters then grow to market size in six to seven months and harvesting can commence in May. These studies also show that oyster spat can be collected from the middle of May to the middle of June. Studies are in progress to see whether the oysters can be collected and grown through the rains to give a second crop of oysters six or seven months later in December or January.

REFERENCES

1. Kamara, A.B. and K. B. McNeill (1976)
Preliminary Oyster Culture
Experiments in Sierra Leone.
Occasional Paper No.1.

2. Quayle, D. B. (1969)
Pacific Oyster Culture in British Columbia.

3. Unpublished Oyster Culture Project Reports (1975-1978).