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Growth rates of cultivated Sydney rock oysters, *Saccostrea (Crassostrea) commercialis*, in two estuaries in subtropical southern Queensland

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Summary

Oysters *(Saccostrea commercialis)* in subtropical southern Queensland estuaries are affected by seasonal epizootics of QX disease *(Marteilia sydneyi)*, which restrict both the growing season and the types of operations that can be conducted by oyster farmers. Tray cultivation is a technique used in these circumstances.

Growth rates of oysters cultivated in intertidal trays were investigated over a period of 7 months from mid autumn to early summer (May to December inclusive) when QX is not active. Growth of whole oysters and of oyster meats was studied in two estuaries and results indicated that both estuaries have potential for tray cultivation of oysters during this period.

INTRODUCTION

The oyster *(S. commercialis)* industry in southern Queensland employed more than 200 persons at the turn of the century, and was involved in an extensive export trade. Since that time, the oyster industry has declined dramatically, partly due to the presence of QX disease, which has been identified by Perkins and Wolf (1976) as a haplosporidan pathogen, *M. sydneyi*. It was first recognised by Wolf (1972) in diseased oysters from Pumicestone Passage, 50 km north of Brisbane.

The parasite infects oysters primarily during the summer months, particularly in areas where salinity is significantly lowered by heavy rainfall runoff. Oysters in such areas during the period from December to March are at risk from the disease. However, where growth rates between April and November are sufficiently high, tray cultivation has proved a useful technique for oyster growers. Small oysters, obtained from growers in areas where QX disease does not occur, can be stocked in April and harvested as plate oysters by December. Although data on growth rates are available for *S. commercialis* grown in warm temperate conditions in central New South Wales (Wisely, Holliday and Reid 1979a) no data are available for subtropical southern Queensland. Oyster growth rates also depend on factors other than latitude and may vary from one location to another within an estuarine system.

The aim of the present study was to investigate growth rates of oysters cultivated in intertidal trays in selected areas in southern Queensland, and thereby to determine the potential for tray cultivation at those locations during the months of the year when QX is not active.

AREA DESCRIPTION

Pumicestone Passage opens into the northern part of Moreton Bay (Figure 1) and is bounded by Bribie Island on the east and the mainland on the west. With the exception of the most southerly portion, it consists of islands and banks intersected by narrow channels. A number of creeks flow into the Passage. There is an opening to the Pacific Ocean at the northern end.

The Southport Broadwater is geographically similar being bounded by a barrier island, South Stradbroke, on the east and the mainland on the west. Several rivers flow into the

Broadwater. There are two openings to the Pacific Ocean north and south of the experimental area. Maximum tidal amplitudes in both areas are in the range 1.5 to 2 m.

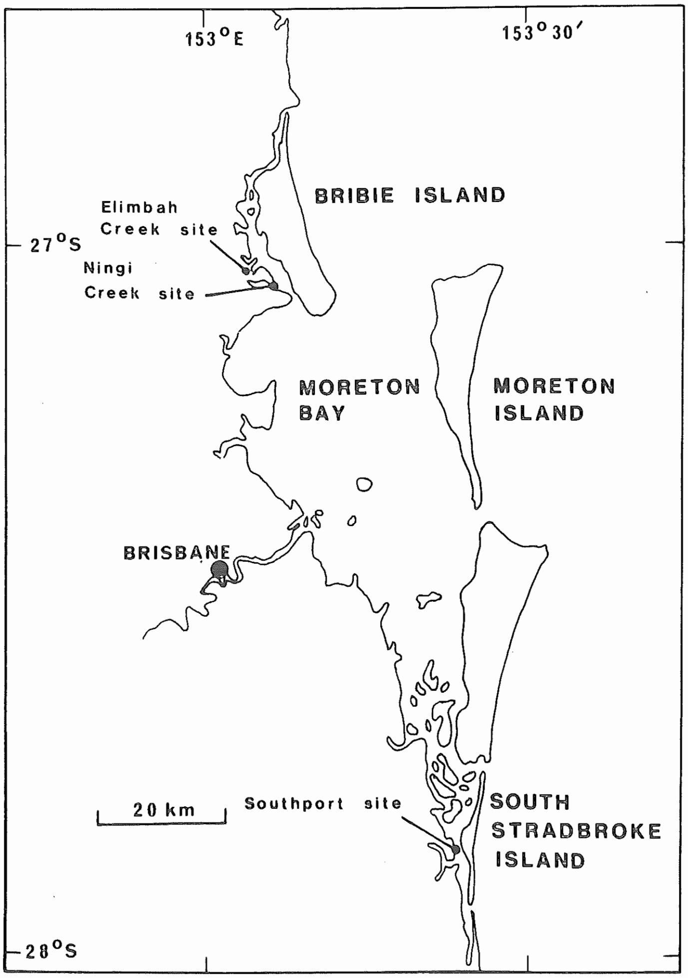

Figure 1. Map of Moreton Bay and adjacent areas showing the experimental sites.

MATERIALS AND METHODS

Oysters for the experiment were obtained from Moreton Island as this area has a a low incidence of QX disease. They were prepared by a local oyster grower who carefully culled and selected large spat grade oysters so as to ensure a uniform quality and size range.

Two oyster trays (1.8×0.9 m each) were placed at each of the three selected experimental sites: in Ningi Creek and in Elimbah Creek off Pumicestone Passage and in the Southport Broadwater near Wasp Creek (see Figure 1). Wire mesh covers were fixed to the tops of the trays to prevent loss of oysters through wave action or by predation from mud crabs *(Scylla serrata)*.

An initial (zero time) sample ($n>1000$) was taken from the experimental oysters on 17 May 1979, and the trays at the experimental sites were stocked the same day at a density of 550 to 600 oysters per tray.

Sampled oysters were scraped and scrubbed to remove fouling organisms and allowed to dry in air for 2 h. Each sample was then divided into equal groups of about 40 oysters which were weighed and the mean oyster weight determined. After being weighed each group of oysters was opened. Oyster meats were commonly damaged during opening and these were discarded. Thirty intact meats from the remaining oysters in the group were randomly selected, washed in seawater and then drained in a plastic sieve for 4 min. The volume of the 30 oyster meats was then measured by displacement in a graduated measuring cylinder, and the mean meat volume determined.

Three field samples of about 200 oysters were collected from each site during the course of the experiment. Pumicestone Passage sites were sampled on 3 August, 15 October and 11 December and the Southport site on 2 August, 11 October and 10 December.

RESULTS

Oysters at all three experimental sites grew considerably over the period of the experiment. The greatest increase in whole oyster weight occurred at the Ningi Creek site (Figure 2). Whole oyster weights at Southport Broadwater were less than those at Ningi Creek, but better than those at the Elimbah Creek site.

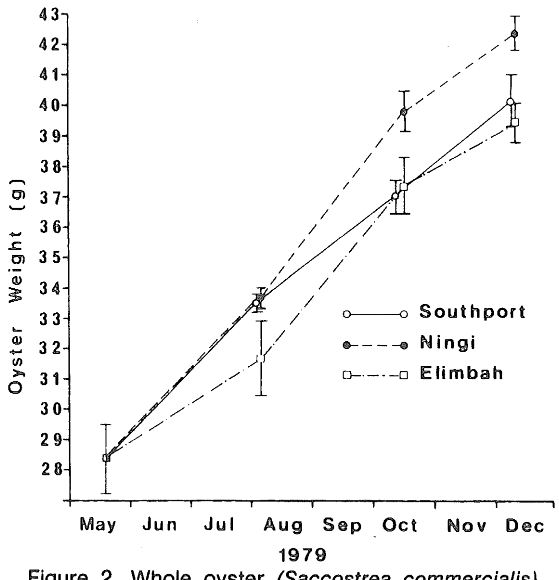

Figure 2. Whole oyster *(Saccostrea commercialis)* weight at the three experimental sites from May to December 1979. Means +1 standard deviation are given.

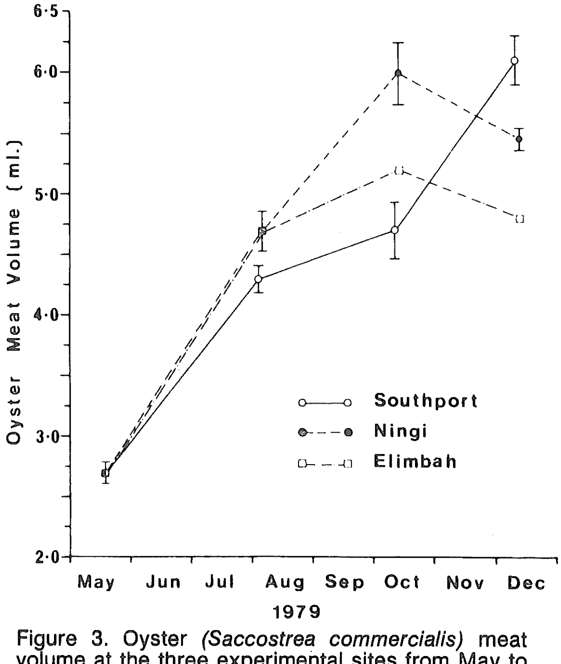

Figure 3. Oyster *(Saccostrea commercialis)* meat volume at the three experimental sites from May to December 1979. Means +1 standard deviation are given.

Meat volumes at all three sites doubled during the course of the experiment. Oysters at the Southport Broadwater site had the largest meat volumes at the end of the experiment (Figure 3). The meat volumes of Ningi and Elimbah Creek oysters dropped after the October sample when Ningi Creek oysters recorded their greatest volume, being similar to the volume of Southport Broadwater oyster meats in December.

DISCUSSION

The qualities that determine the grade of an oyster are the size and the condition of the oyster meat. For an oyster in marketable condition, the grading is directly related to its size, which can be expressed as whole oyster weight. Wisely, Holliday and Reid (1979b) graded whole oysters (*S. commercialis*) on a weight basis into three marketing categories, namely spat (22 to 29 g), seconds (29 to 40 g) and plate oysters (40 to 67 g). The oysters originally stocked in the present experiment can be considered as large spat oysters, and had become plate oysters by December.

Whole oyster growth rates recorded in this paper compared favourably with growth rates given by Wisely *et al.* (1979a) for a commercial tray patch at Port Stephens. During the period from mid May to mid November 1975, experimental tray spat oysters increased in whole weight by 30.0% at Port Stephens. Growth rates in the present study ranged from 38.7 to 48.9% between mid May and mid December 1979. Wisely *et al.* indicate, however, that the tray patch oysters of Port Stephens were raised above the normal growth level to reduce the effects of the phenomenon known as winter mortality. This action would decrease the growth rate and may account partially for differences in growth rates recorded by Wisely *et al.* and the present study.

There are no published data available on drained meat volumes of *S. commercialis* in market condition. Measurements of fresh plate oysters opened at a Brisbane wholesale establishment (using the same methods) gave a range of 7 to 8 mL for mean drained meat volumes.

The drop in meat volumes shown by Pumicestone Passage oysters in December may be due to a partial spawning. Water temperatures in excess of 30°C were recorded at these experimental sites in December whereas October temperatures were less than 24°C. Rising water temperatures are a well known trigger for spawning in many species of oysters. Spawning reduces the meat volume of oysters, and can result in spatfall on the oyster shell. Both of these factors are detrimental to tray cultivation of *S. commercialis.* This suggests that the effective growing season of commercial oyster crops at the locations examined in Pumicestone Passage may be shorter than the effective growing season at Southport.

CONCLUSION

The three sites investigated showed growth and fattening rates that, in the absence of QX disease, would be regarded as acceptable for tray cultivation of *S. commercialis.* However, with the additional seasonal limitations imposed by the presence of QX disease in the estuaries, the Southport Broadwater and Ningi Creek sites appear to have the most potential. Experimental oysters initially stocked as spat grade oysters at these sites were marginal plate oysters after 7 months.

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