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Growth and Reproduction of the Rock Oyster *Saccostrea cucullata* (Born) in Ashtamudi Lake, Kerala.

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Abstract

The rock oyster, *Saccostrea cucullata* is an important oyster resource inhabiting almost all the estuaries of Kerala. In the Ashtamudi Lake, *Saccostrea cucullata* is found to inhabit the intertidal - subtidal area from the barmouth to the middle of the estuary. The age, growth and various morphometric relations of this oyster is presented. Results of the experiments conducted to study the variation in growth rates of this oyster when grown in the intertidal and subtidal regions of the marine and estuarine parts of Ashtamudi Lake is given in the text. The age at first maturity, and the spawning season of the oyster are also given. The variation in the condition index of the oyster is related with the reproductive phase and the environmental changes.

Introduction

Saccostrea cucullata (Born) has a wide distribution along the Indian coast, occurring along with *Crassostrea madrasensis* (Preston). Some aspects of the reproductive biology (Sukumar and Joseph, 1988; Mane and Nagabhushanam, 1988) and embryonic development (Kalyanasundaram and Ramamurthi 1986) have been studied. In the present paper data on the growth and reproduction of *S. cucullata* inhabiting Ashtamudi Lake in Kerala where it forms extensive beds are presented.

Materials and Methods

Growth: Spat of *S. cucullata* collected from the natural bed were grown in cages (30 x 30 x 6 cm) lined with nylon net and kept in these four sites viz. (I) barmouth-intertidal, (II) barmouth subtidal, (III) estuarine-intertidal, and (IV) estuarine-subtidal. Site I and II were located near the Neendakara barmouth and had marine conditions whereas site III and IV were about 8 km away from the first site and had estuarine environment. The oysters were grown for a period of 12 months.

Morphometric relationships: Fortnightly samples (n = 50 to 100) were collected from the natural bed in Ashtamudi Lake. Length, breadth, thickness and weight of the oysters were measured.

Reproductive biology: Oysters from the natural bed were collected at fortnightly intervals and by examining the gonad smears of the oysters, sex ratio and spawning season were inferred.

Results and Discussion

Hydrography: The salinity of the water above the oyster beds was high during March to April and low during July to September. The freshwater influx caused by the southwest monsoon lowered the salinity. Surface salinity ranged between

10.4 and 34.1‰ the barmouth region while in the estuarine region it ranged between 7.2 and 27.2‰. The bottom water salinity values were slightly higher and ranged between 12.3 and 34.6‰ in the barmouth region and 7.8 and 29.3‰ in the estuarine region.

Growth: The initial length of the spat at the time of stocking ranged between 13.5 and 15.3mm. Throughout the study period, the average length of the oyster was more in the estuarine subtidal area (Table 1). At the end of 12th month the average length of oysters in the subtidal region in barmouth and estuarine area were 48.3 mm and 50.9 mm respectively. While in the intertidal zone of the barmouth and estuarine area, length attained were 46.4 and 45.2 mm respectively. The average whole weight of the oysters ranged between 0.6 and 0.9 g at the start of the experiment. As noticed in the growth in length, the whole weight gained was also high in the subtidal zone of the barmouth and estuarine areas (Table 1). The average total weight of the oyster at the end of 12th month in these sites were 28.1 and 28.6 g respectively. In the intertidal zone the weight gained was low reaching about 23.6 and 21.2 g after 12 months in the barmouth and estuarine zones. The meat weight increased from an average of 0.2 g to 3.49 and 3.68 g in the subtidal region of barmouth and estuarine area whereas in the respective intertidal zones, the average meat weight per oyster was only 1.8 and 1.6 g at the termination of the culture experiment. Considering the growth increment, it was noted that the average monthly growth rate was highest, 8.3mm in the first month in the estuarine subtidal and barmouth intertidal zone. The minimum values ranging from 0.1 to 1mm were observed in the 12th month in all the culture sites. The regression equation describing the length and other linear measurements is given in Table 1. The growth of *S. cucullata* was more in the estuarine area and in the subtidal region.

Table 1: Growth of *Saccostrea cucullata* (Born)

Month	Barmouth Intertidal		Estuarine Intertidal		Barmouth Subtidal		Estuarine Subtidal	
	L	W	L	W	L	W	L	W
	December '94	14.9	0.6	13.2	0.6	13.5	0.6	13.5
January '95	23.2	4.3	19.8	3.2	20.2	1.8	21.8	4.8
February	26.8	7.2	24.6	3.8	24.8	10.2	29.2	13.6
March	29.2	9.8	29.1	4.3	28.2	13.4	33.1	17.2
April	32.3	13.6	31.2	8.4	32.8	17.1	34.9	19.6
May	32.8	14.1	33.8	12.6	36.1	20.8	37.6	22.3
June	33.7	15.2	36.1	14.8	39.2	22.4	41.2	24.2
July	39.3	16.4	37.2	16.7	43.2	24.6	44.6	25.3
August	42.3	23.1	40.2	18.2	44.8	26.4	45.3	27.8
September	43.6	23.4	43.1	18.9	45.2	27.3	46.2	28.3
October	45.2	23.4	47.1	18.9	46.2	27.3	50.1	28.3
November	46.0	23.6	48.2	21.2	46.3	28.9	50.9	28.6

Estimates of the parameters for morphometric and length-weight regression equations in *S. cucullata*. Length (X) is taken as the independent variable.

Sl.No.	Dependent Variable	a	b	r
1	Breadth	6.8760	0.5310	0.7421
2	Depth	2.1466	0.4083	0.6387
3	Total Weight*	-7.5144	2.7649	0.8999
4	Meat Weight*	-9.3594	2.5586	0.7877
5	Dry Weight*	-11.1044	2.6002	0.6953

* After logarithmic transformation

L = Length (mm)

W = Whole Weight (g)

Reproductive biology : The length at first maturity was 29mm in males and 33mm in females which is attained after 4 to 5 months after settlement. During December to January about 80 to 91% of the oysters were in the partially spent and spent stage indicating peak spawning activity in these two months (Table 2). In the female oysters release of gametes started in November. Occurrence of 26 to 30% partially spent oysters in the population during May-June indicated another minor spawning peak. From July to September and March to April majority of the oysters were either in the active or ripe stages of maturity suggesting the progress of the main spawning season. However presence of partially spent oysters throughout the year suggested that *S. cucullata* was a continuous breeder. Oysters in the indeterminate stage were more in January and February. The oysters attained maturity at slightly lower size than that observed from the Someshwar coast (Joseph and Joseph 1988). They had indicated a prolonged spawning period commencing in June and extending upto December with two peaks during this period. The lowering of salinity was considered as the factor accounting for spawning. According to Mane and Nagabhushanam (1988), *S. cucullata* in the Shirgaon creek spawns with rise in salinity after monsoon and with moderate temperature during November-

Table 2: Monthly variation in gonadal condition (Percentage occurrence) of *Saccostrea cucullata* in Ashtamudi Lake

Month	Maturing		Mature		Partially		Spent	
	Male	Female	Male	Female	Male	Female	Male	Female
	March 1994	37.5	31.3	47.5	49.0	7.5	9.8	7.5
April	38.7	40.3	45.1	45.1	16.2	14.5	-	-
May	20.0	23.0	50.0	50.0	30.0	26.9	-	-
June	48.2	40.5	20.6	29.7	31.2	29.8	-	-
July	68.8	65.3	25.0	24.4	06.2	10.3	-	-
August	65.7	75.0	28.9	18.7	05.4	6.3	-	-
September	34.8	29.7	60.4	54.8	04.8	5.4	-	-
October	10.4	11.1	79.2	75.1	10.4	13.8	-	-
November	-	-	71.4	54.8	28.6	45.1	-	-
December	-	-	71.4	54.8	28.6	45.1	-	-
January 1995	4.5	9.6	0.9	16.1	61.3	64.5	25.2	9.8
February	30.3	58.6	09.0	16.1	61.3	64.5	25.2	9.8

December, while in the present study the peak was observed in December-January and another minor one in March - April. The condition index of the oysters ranged from 8.8 to 13.6 with an average of 10.8. It increased from 11.5 in July to 13.6 in October and from 9.8 in February to 12.8 in May. The high values in the condition index of the oyster coincided with the ripe gonadal stages of maturity observed during that period. The low values in February-March were noted when the oyster in the spent and indeterminate stage.

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