

SEASONAL GROWTH OF THE NORTHERN QUAHOG, MERCENARIA MER-
CENARIA AND THE SOUTHERN QUAHOG, M. CAMPECHIENSIS,
IN ALLIGATOR HARBOR, FLORIDA

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ABSTRACT

Monthly shell length measurements were made of Mercenaria mercenaria for 3.5 years and of M. campechiensis for 2 years, in Alligator Harbor, Franklin County, Florida. The northern clams were laboratory-reared natives of Long Island Sound. They showed the best growth recorded for any locality, with greatest growth in spring and fall, less in winter, and least in summer. The southern clams, which originated in Alligator Harbor, grew faster than the northern species, with greatest growth in spring and fall, almost as much in summer, and least in winter. M. mercenaria grew from a length of 3 mm to a length of 67 mm in 3.5 years, and from 16.2 mm initial length to 67.0 mm in 3 years. M. campechiensis grew from 16.5 initial length to 74 mm in 2 years.

INTRODUCTION

In March, 1958, several hundred thousand laboratory-reared northern quahogs, Mercenaria mercenaria, mostly under 5 mm in shell length, were obtained from the Biological Laboratory of the U. S. Fish and Wildlife Service at Milford, Connecticut, through the courtesy of Dr. V. L. Loosanoff, Laboratory Director, whom the writer wishes to thank for aid and helpful suggestions in this study. The clams were planted in depths of about one foot at mean low water in Alligator Harbor, Franklin County, Florida, near the site of the marine laboratory of the Oceanographic Institute. The clams were first planted in boxes of sand covered with wire, and a small number of the native southern quahog, M. campechiensis, set in these boxes during the spring of 1959. Monthly shell length measurements were made of the northern species from March, 1958, and of the southern species from August, 1959. The two species of clams were planted under conditions as nearly identical as possible.

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METHODS

The northern clams were planted in various types of cages, mainly for protection against predators (Menzel, 1960). The most satisfactory protective cage for clams under about 10 mm in length was a wooden box four inches deep, filled with sand and covered with asphaltum-treated quarter-inch mesh wire. A small strip of plastic screen wire (#12) was placed around the edges of the box to prevent the small clams from washing out. As the clams became larger the quarter-inch mesh wire was replaced with wire of half-inch mesh. When the clams reached a size of about 25 mm they were planted on the bottom and covered by a frame of half-inch mesh wire pressed over them.

Clams up to about 10 mm in length were planted in concentrations of from 200 to 500 per box in boxes with 2.5 square feet of surface area. Clams from about 10 to 25 mm long were planted in concentrations of 100 to 200 in boxes of this size. Clams over 25 mm were planted in concentrations up to (but usually less than) 50 per square foot.

The southern quahogs collected from the sand-filled M. mercenaria growth boxes were first planted in an 8-inch diameter finger bowl buried in the bottom and covered with a wire frame. These clams were collected during the months of July and August, 1959, and were first measured reliably in August. They were not measured again until December, 1959. By February, 1960, additional southern quahogs had been assembled and growth data from these have been averaged with those of the first group.

Measurements of length to the nearest 0.5 mm were made with vernier calipers near the middle of each month except November, 1960. Because the periods between measurements were not all of the same number of days, the average daily growth was calculated and this figure was multiplied by the number of days in the month. The calculated growth was added to the size of the preceding month.

Surface temperature recordings were made at irregular intervals and at various times of the day. The temperature ranges given are based on from 5 to approximately 30 readings per month. Density measurements were taken occasionally with a hydrometer and converted to salinity by Knudsen's tables. Salinity ranged from 26 o/oo to 35 o/oo.

RESULTS

An initial length of 3.0 mm was selected for M. mercenaria, as this was the closest to the average (2.8 mm) when the clams were secured in March, 1958 (Table 1, Fig. 1). The average length of the 23 M. campechiensis when measured in August 1959 (Table 1, Fig. 1) was 16.5 mm. No examination was made in November, 1960, and the growth in December, 1960, is for the two months (Table 1).

The northern quahog had an average increase in shell length from 3 mm to 32.6 mm the first year, to 49.6 mm the second year and to 61.5 mm the third year (Table 1, Fig. 1). The southern species grew from 16.5 mm to 54.3 mm the first year of measurements, and to 74.2 mm the second year (Table 1, Fig. 1). Direct comparison between the two species is difficult because of the different starting dates and initial sizes. In Table 1 the two species are compared, with sizes and monthly growth, although M. campechiensis is one year later than M. mercenaria and conditions of food and temperature would not be the same. In August, 1958, M. mercenaria averaged 13.3 mm and by August, 1959, this species averaged 41.2 mm, an increase of 27.9 mm, whereas M. campechiensis grew from an average of 16.5 mm in August, 1959, to 54.3 mm in August, 1960, an increase of 37.8 mm. Fig. 1 shows that the southern species grew about as much in two years as did the northern species in three.

M. mercenaria had the greatest shell increase during the spring and fall when the temperature was roughly between 15 C and 25 C. Growth was less during the colder months and least during the warmest period (Fig. 2). M. campechiensis grew best during the spring and fall; growth continued fairly rapidly during the warmer period and slowed during the colder period (Fig. 3). Both species showed the greatest increment in shell size when they were younger and smaller (Figs. 2 and 3).

DISCUSSION

Mercenaria mercenaria had a greater annual growth in this area of Florida than in localities recorded by Gustafson (1954) in Maine, Belding (1931), Pratt (1953) and Pratt and Campbell (1956) in Massachusetts, Haskin (1949) in New Jersey, Haven and Andrews (1956) in Virginia, Chestnut (1952) and Chestnut, Fahy and Porter (1956) in North Carolina. The greater annual growth is undoubtedly due to the continued growth in winter, and absence of the hibernation found in the more northern waters.

Table 1. Average monthly size, standard error of mean, millimeter increase and number of clams measured of *Mercenaria mercenaria* and *M. campechensis*. (*M. mercenaria* from March, 1958, through August, 1961; *M. campechensis* from August, 1959, through August, 1961.)

Date	<i>Mercenaria mercenaria</i>				<i>Mercenaria campechensis</i>				
	Number	Size, mm	S. E.	Increase, mm	Date	Number	Size, mm	S. E.	Increase, mm
3/58	181	3.0	0.1	-					
4/58	176	5.4	0.1	2.4					
5/58	158	9.0	0.2	3.6					
6/58	578	11.0	0.1	2.0					
7/58	244	12.3	0.2	1.3					
8/58	317	13.3	0.2	1.0	8/59	23	16.5	0.6	-
9/58	213	16.2	0.3	2.9					
10/58	381	19.8	0.2	3.6					
11/58	238	23.4	0.2	3.6					
12/58	244	28.1	0.2	4.7	12/59	23	33.2	0.7	16.7
1/59	601	29.9	0.2	1.8	1/60	37	35.0	0.7	1.8
2/59	285	30.9	0.2	1.0	2/60	37	35.3	0.7	0.3
3/59	538	32.6	0.4	1.7	3/60	35	37.1	0.7	1.8
4/59	232	35.3	0.4	2.7	4/60	34	39.2	0.7	2.1
5/59	214	38.0	0.4	2.7	5/60	42	43.2	0.7	4.0
6/59	268	39.4	0.4	1.4	6/60	39	47.0	0.7	3.8
7/59	348	41.1	0.3	1.7	7/60	35	50.4	0.7	3.4
8/59	404	41.2	0.3	0.1	8/60	34	54.3	0.6	3.9
9/59	342	41.6	0.4	0.4	9/60	32	58.5	0.7	4.2
10/59	378	42.7	0.3	2.4	10/60	32	60.1	0.7	1.6
11/59	372	45.1	0.3	1.4	12/60	32	65.3	0.6	5.2
12/59	368	46.5	0.3	1.6	1/61	31	66.0	0.6	0.7
1/60	325	48.1	0.3	0.3	2/61	32	66.0	0.7	0.0
2/60	204	48.4	0.4	0.3					
3/60	213	49.6	0.4	1.2	3/61	32	67.3	0.7	1.3
4/60	200	51.6	0.4	2.0	4/61	32	68.4	0.7	1.1
5/60	199	53.0	0.3	1.4	5/61	26	69.5	0.8	1.1
6/60	147	53.7	0.5	0.7	6/61	26	71.3	0.8	1.8
7/60	204	54.9	0.5	1.2	7/61	26	73.7	0.9	2.4
8/60	200	55.2	0.5	0.3	8/61	23	74.2	0.9	0.5
9/60	162	56.2	0.4	1.0					
10/60	136	57.5	0.7	1.3					
11/60	-	-	-	-					
12/60	191	60.1	0.6	2.6					
1/61	167	60.9	0.7	0.8					
2/61	112	61.2	0.7	0.3					
3/61	157	61.5	0.6	0.3					
4/61	156	63.2	0.7	1.7					
5/61	153	65.0	0.7	1.8					
6/61	153	65.9	0.7	0.9					
7/61	148	67.0	0.7	1.1					
8/61	139	67.0	0.7	0.0					

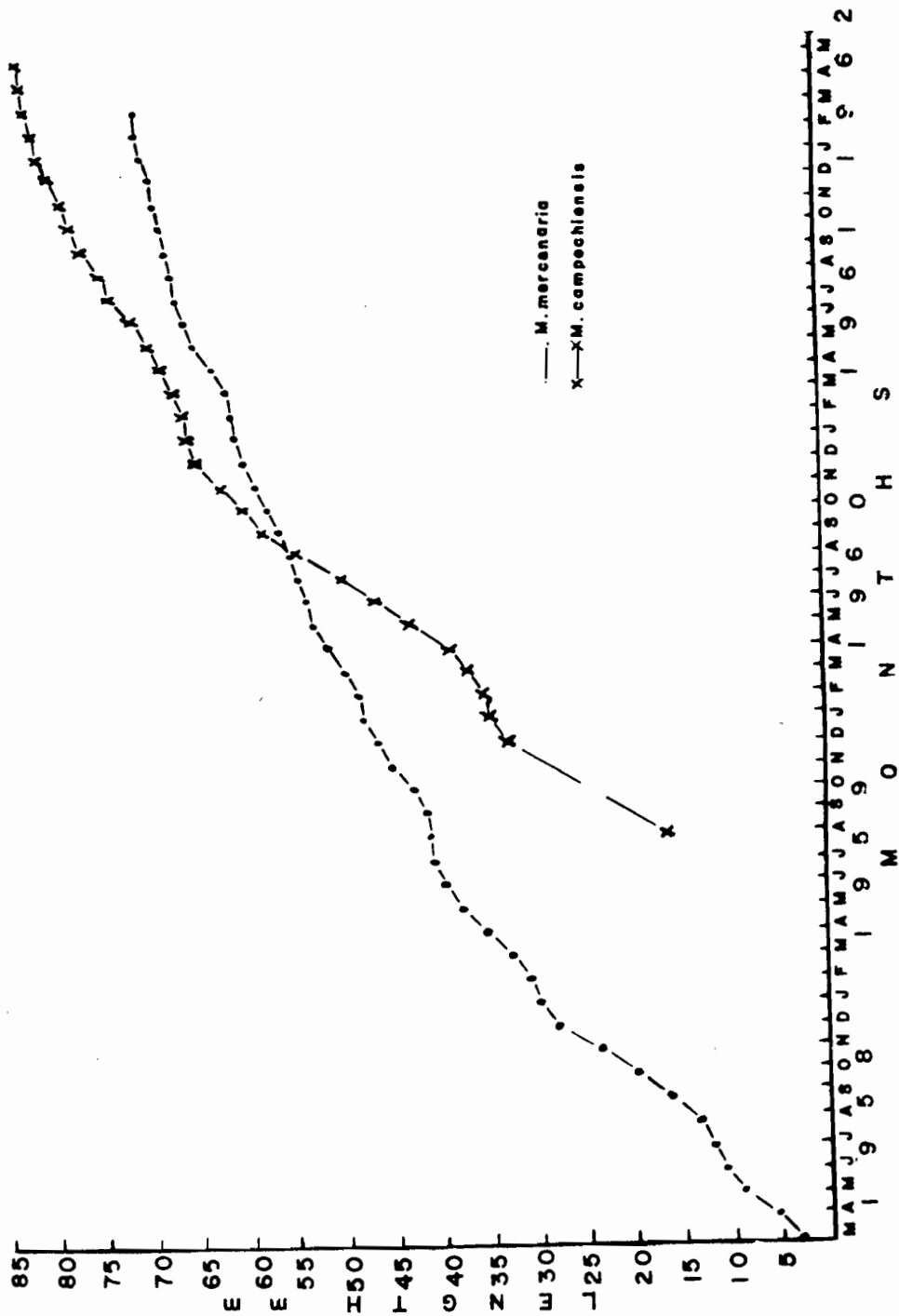


Fig. 1. Monthly size of M. mercenaria and M. campechiensis.

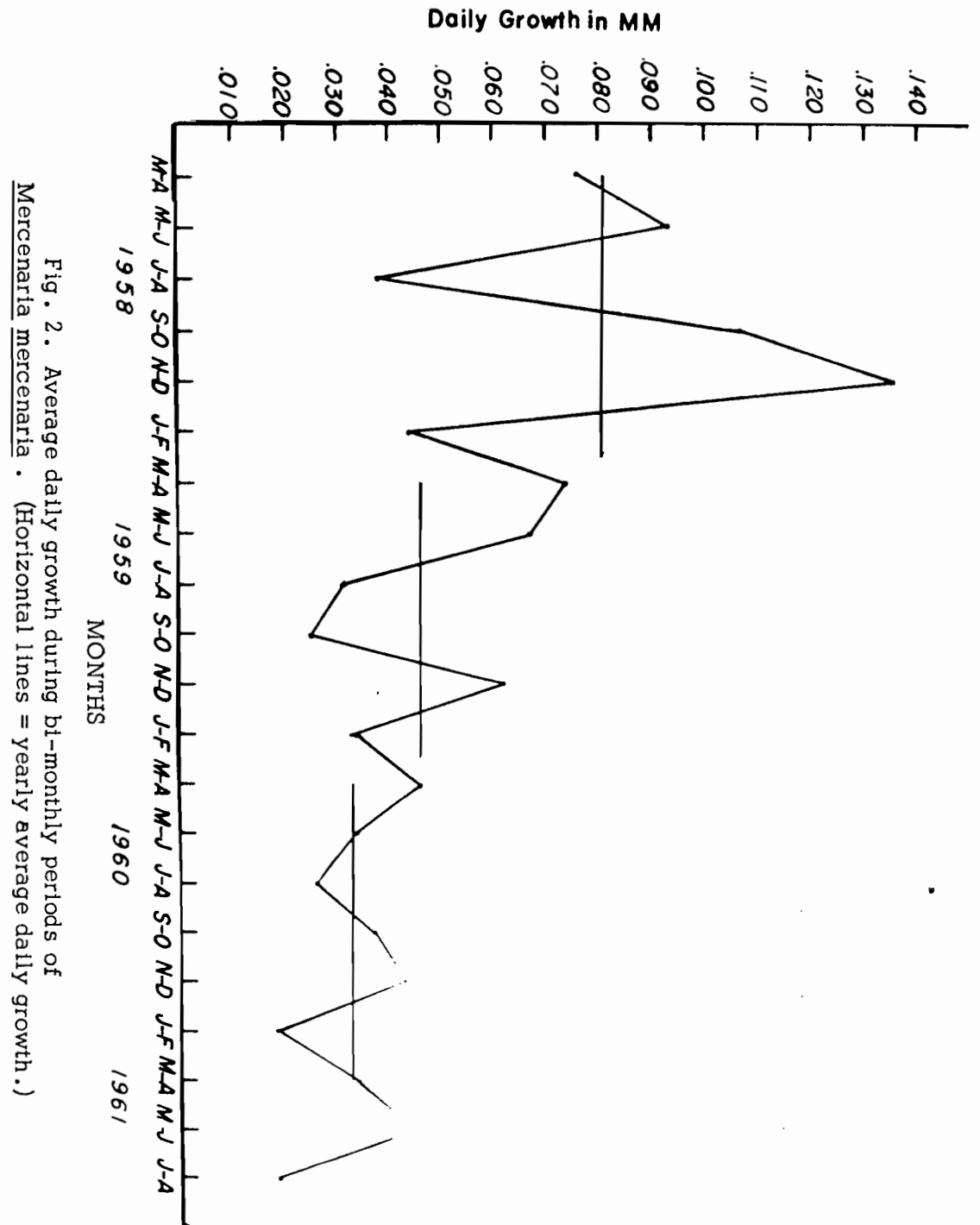


Fig. 2. Average daily growth during bi-monthly periods of Mercenaria mercenaria. (Horizontal lines = yearly average daily growth.)

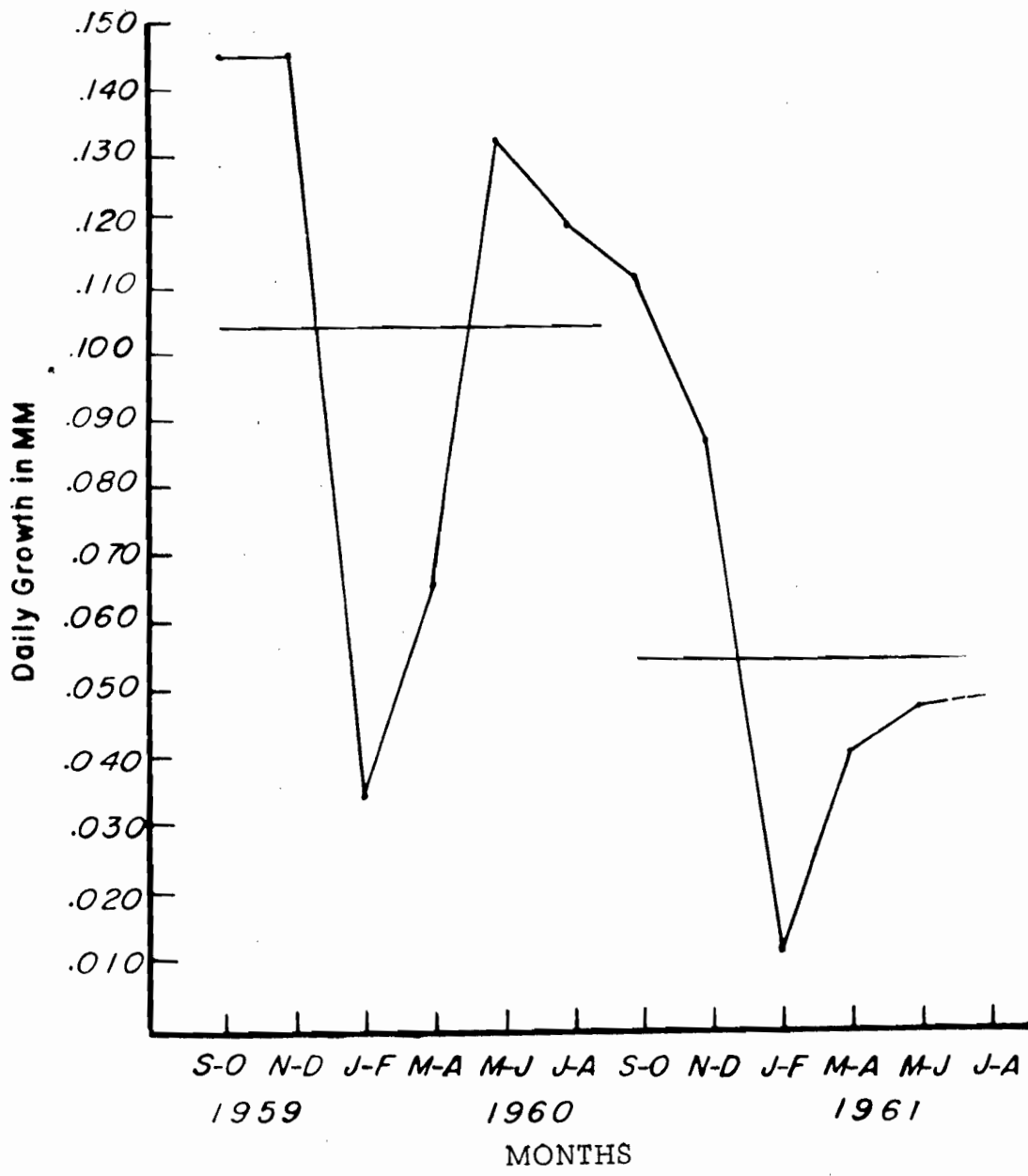


Fig. 3. Average daily growth during bi-monthly periods of Mercenaria mercenaria. (Horizontal lines = yearly average daily growth.)

Table 2. Monthly surface temperature ranges (C°) at Alligator Harbor, Franklin County, Florida

	Months	C°	
1958	March	15.0 - 19.0	
	April	17.0 - 26.0	
	May	22.0 - 27.0	
	June	25.0 - 29.0	
	July	28.0 - 32.0	
	August	28.0 - 33.0	
	September	27.0 - 31.0	
	October	17.0 - 30.0	
	November	16.0 - 24.0	
	December	9.0 - 18.0	
	1959	January	6.0 - 13.0
		February	9.0 - 14.0
March		12.0 - 16.0	
April		15.0 - 23.0	
May		21.0 - 28.0	
June		23.0 - 29.0	
July		25.0 - 35.0	
August		29.0 - 33.0	
September		27.0 - 31.0	
October		18.0 - 28.0	
November		16.0 - 21.0	
December		11.0 - 18.0	
1960	January	7.0 - 13.0	
	February	9.0 - 15.0	
	March	7.0 - 19.0	
	April	18.0 - 26.0	
	May	20.0 - 28.0	
	June	25.0 - 30.0	
	July	27.0 - 31.0	
	August	27.0 - 32.0	
	September	26.0 - 30.0	
	October	18.0 - 27.0	
	November	15.0 - 25.0	
	December	9.0 - 17.0	
1961	January	8.0 - 16.0	
	February	11.0 - 18.0	
	March	12.0 - 20.0	
	April	14.0 - 21.0	
	May	18.0 - 26.0	
	June	23.0 - 30.0	
	July	26.0 - 30.0	
	August	27.0 - 31.0	

The southern species has a faster annual growth rate than the northern species when both are grown in Alligator Harbor. Haven and Andrews (1956) found that the southern quahog grew faster than the northern species in Virginia waters. It may be that the southern quahog is a more vigorous species with a faster "natural" growth rate.

The greatest shell increase in both species, but especially in M. mercenaria, was in the spring and fall. Grice (1956) found that copepods, which are indicators of phytoplankton abundance, were most abundant in August. Marshall (1955) found the highest values for chlorophyll in spring and fall but found relatively high values in summer, greater than in winter. August was usually the period of least growth for the northern species, whereas M. campechiensis showed almost as great shell increase during this period as in the faster growing months.

It is not known whether temperature, food or some other factor was critical in the growth of the two species during the various months. M. campechiensis is native to the area and it may be assumed that it is better adapted than M. mercenaria, native to Long Island, where the temperatures never attain the high levels found in this area. The spring and fall temperatures coincide roughly with the summer temperatures of the area where the northern species is native. The northern species thrives on the food found in Alligator Harbor as evidenced by the good growth.

Another factor that may account for the relatively poor growth of the northern species during summer is turbidity which is high in Alligator Harbor during this period. Hoagland (1958) found up to 69 mg/liter of dried weight, retained by a millipore filter, and Grice (1956) found Secchi disk readings of less than 50 cm during summer months in Alligator Harbor. Loosanoff (1961) presented data on the effect of turbidity on clams and oysters. He found that high turbidity (at levels that may occur normally in some southern waters) is highly injurious to clams and oysters native to Long Island Sound. Perhaps the high summer turbidity in Alligator Harbor adversely affects the northern species, whereas the native species is adapted to it. It would be interesting to determine seasonal growth rates of M. mercenaria native to southern waters and hence possibly better adapted to high turbidity.

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