DAILY ACTIVITY, MOVEMENTS, FEEDING, AND SEASONAL OCCURRENCE IN THE TAUTOG, *TAUTOGA ONITIS*[1]

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ABSTRACT

Observations were made on the activity and movements of adult tautog, *Tautoga onitis*, in their natural habitat using scuba and by monitoring the movements of individual fish by ultrasonic tracking. Results showed tautog to be active during the day and inactive at night. Fish larger than 30 cm moved out from the night resting place (home site) each day to feed, while younger fish (≤25 cm) remained and fed in close proximity to the home site. Examination of digestive tracts from various-sized fish showed the blue mussel, *Mytilus edulis*, to be the principal food for this population. While older fish appeared to move offshore for the winter, the younger fish remained inshore, wintering over in a torpid state. The significance of the tautog's differential responsiveness, food habits, and daily and seasonal movements are discussed.

The tautog, *Tautoga onitis* (L.), an inhabitant of the western Atlantic, ranges from Nova Scotia to South Carolina, being most abundant between Cape Cod and the Delaware Capes (Bigelow and Schroeder, 1953:478-484). Its distribution is limited primarily to inshore regions with individual populations being highly localized (Cooper, 1966). This fish lives in close association with rocky places, wrecks, pilings, jetties, or almost any bottom discontinuity and for part of its range, is a prominent member of inshore benthic communities. Unlike the majority of labrids, this species is valued as a game fish and is an excellent table fish.

Our aim in this work was to observe and describe the behavior of adult tautog in situ and to relate our findings to the animal's life habits and history. Our queries primarily concerned daily activity and movements, feeding, and seasonal occurrence. The study was carried out on a population residing in Great South Bay, N.Y., using scuba and ultrasonic tracking.

MATERIALS AND METHODS

The study area was along the south shore of Great South Bay, Long Island, N.Y., extending east from the Fire Island Inlet Bridge to 2 km east of the Fire Island Light (Figure 1). Water depth in the study area ranged from 2.4 to 8.8 m with the bottom composed primarily of sand, gravel, and shell.

Two methods were employed to observe the activity and movements of the fish: (1) ultrasonic tracking of a single fish and (2) direct underwater observations while using scuba.

Twelve fish were tracked at different times from August through September 1971 and June through October 1972 (Table 1). Fish were captured at night within the Fire Island Coast Guard basin by a scuba diver using a hand-held net, and each fish was held in a floating cage for periods ranging from 10 to 108 h before a transmitter was attached.

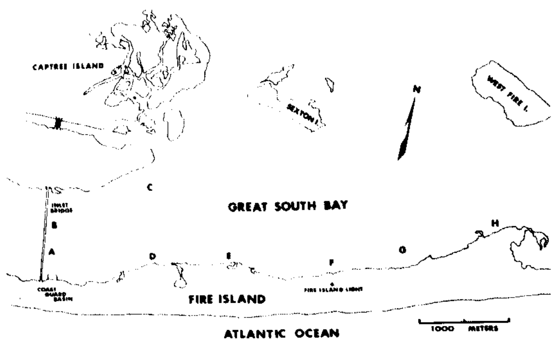

FIGURE 1.—Study area and areas (A-H) of tautog movement as presented in Table 1.

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TABLE 1.—Locations and duration of stay (h) of individual tautog during their daily movements as determined by ultrasonic tracking.

Tautog no.			Day 1	Day 2	Day 3	Day 4	Night 1	Night 2	Night 3
1	TL (cm)	45	A3[1](5.0)[2]	A1(2.2)	A4(9.8)	A4(2.6)	A1(11.4)	A1(10.0)	A1(14.1)
	Age[3]/sex	12/♀		A3(10.2)					
	Release (date/time)	7-25-72/1310		A4(1.9)					
	Track duration (h)	67.5							
	Mean temperature	19.2°C							
2	TL (cm)	42	A1(0.8)	A4(11.5)	A3(3.1)	A4(0.5)	A1(9.6)	A1(9.8)	A1(9.6)
	Age/sex	10/♀	A4(0.4)	A5(2.3)	A4(9.2)				
	Release (date/time)	8-1-72/0940	C (8.4)		A5(1.8)				
	Track duration (h)	68.3							
	Mean temperature	21.2°C							
3	TL (cm)	42	A1(3.0)	A4(0.9)	A5(6.2)	A5(0.3)	A1(11.3)	A1(11.6)	A1(10.8)
	Age/sex	10/♀	A4(3.0)	A9(10.3)	A9(7.0)				
	Release (date/time)	8-8-72/1215							
	Track duration (h)	66.5							
	Mean temperature	20.4°C							
4	TL (cm)	43	A1(1.0)	A3(2.5)	A4(0.5)		A1(12.8)	A1(15.6)	
	Age/sex	9/♂	A4(5.7)	A5(0.8)					
	Release (date/time)	9-15-71/0830	A6(0.6)	A6(4.5)					
	Track duration (h)	47.5	A7(2.3)	A7(0.8)					
	Mean temperature	22.0°C							
5	TL (cm)	38	A1(0.3)	A5(2.7)	A5(1.0)		A1(16.6)	A1(15.1)	
	Age/sex	7/♀	A4(0.2)	A6(1.4)					
	Release (date/time)	9-27-71/1400		A7(4.0)					
	Track duration (h)	41.5		A8(0.1)					
	Mean temperature	18.1°C							
6	TL (cm)	47	A1(1.4)	A2(10.9)	F (4.1)		A1(10.3)	G (12.2)	
	Age/sex	11/♂	A5(0.3)						
	Release (date/time)	8-16-71/1830							
	Track duration (h)	41.5							
	Mean temperature	21.7°C							
7	TL (cm)	20	A1(9.4)	A1(12.5)			A1(11.5)	A1(0.6)	
	Age/sex	3/♀							
	Release (date/time)	10-4-72/0930							
	Track duration (h)	34.0							
	Mean temperature	16.8°C							

The transmitter emitted pulsed signals at 70 kHz (kilohertz). Those used for small fish (20-25 cm) measured 30 × 9 mm (manufactured by Chipman Instruments[3]). Larger transmitters, 65 × 14 mm (SR-69B, Smith-Root Inc.) were used for the remaining fish (38-50 cm).

The pharyngeal mill apparatus of the fish precluded internal insertion of the transmitter. This necessitated external attachment through the dorsal musculature, with nylon monofilament line just below the midpoint of the dorsal fin. On each side of the body, rubber disks (25-mm diameter) were used to prevent the flesh from tearing. Tags were made neutrally buoyant by the addition of a styrofoam collar coated with silicone sealant. Following attachment of the transmitter, fish were held in a 50-liter tank for 15 to 30 min to insure that the fish were responsive and that the transmitter was operating normally.

Fish were released within the basin and tracked from a 5.2-m skiff. The signal was monitored with hydrophone and sonic receiver (Model SR-70-H and TA-60 respectively, Smith-Root Inc.) in a manner similar to that described by McCleave and Horrall (1970).

The location of each fish was recorded in relation to local landmarks. We considered a fish active whenever a change in transmitter signal was detected. Direct underwater observations confirmed that we were able to detect abrupt changes in the fish's orientation and straight line movement over 1 m. The data were subsequently condensed to indicate the presence of a fish for a period of time at a specific location (Table 1).

For each track, we recorded current velocity,

[3] Reference to trade names in this publication does not imply endorsement of commercial products by the National Marine Fisheries Service.

TABLE 1.—Locations and duration of stay (h) of individual tautog during their daily movements as determined by ultrasonic tracking, continued.

Tautog no.			Day 1	Day 2	Day 3	Day 4	Night 1	Night 2	Night 3
8	TL (cm)	25	A1(7.7)	A1(12.5)	A1(12.5)	A1(0.6)	A1(11.4)	A1(11.5)	A1(11.5)
	Age/sex	4/♀							
	Release (date/time)	10-3-72/1115							
	Track duration (h)	67.7							
	Mean temperature	16.8°C							
9	TL (cm)	50	D (0.5)	D (10.1)	D (4.9)		G (8.0)	D (7.9)	
	Age/sex	14/♂	E (10.9)	E (3.0)					
	Release (date/time)	6-14-72/0855		F (0.6)					
	Track duration (h)	48.8							
	Mean temperature	14.1°C							
	Renewed track		D (3.9)	D (16.8)	D (10.2)		D (7.9)	D (7.9)	
	Date/time	6-19-72/1750			E (3.1)				
	Track duration (h)	49.9							
	Mean temperature	15.5°C							
10	TL (cm)	43	A5(8.6)	A5(9.8)			A5(10.2)	A5(8.3)	
	Age/sex	9/♂		A6(5.6)					
	Release (date/time)	6-27-72/1025							
	Track duration (h)	42.5							
	Mean temperature	17.3°C							
11	TL (cm)	44	A1(1.1)						
	Age/sex	11/♀	A2(1.8)						
	Release (date/time)	6-5-72/1345	B (0.6)						
	Track duration (h)	3.5							
	Mean temperature	13.4°C							
12	TL (cm)	45	A1(0.3)						
	Age/sex	12/♀	A5(3.2)						
	Release (date/time)	6-12-72/1145	A6(2.7)						
	Track duration (h)	8.3	A8(0.3)						
	Mean temperature	13.8°C	B (1.1)						
			C (0.7)						

[1] Location as presented in Figures 1 and 2.
[2] Hours given in parentheses.
[3] Age estimated from calculated total lengths by Cooper (1967).

stage of tide, cloud cover, water temperature, and water transparency. Current velocity was measured either with a Beauvert midget current meter or by the float method. The current velocity ranged from 0.65 to 1.75 m/s. Temperature was measured with a thermistor and transparency with a secchi disk. Cloud cover was visually estimated.

In conjunction with our tracking, we directly observed tautog in the study area with scuba for a total of 135 h (90 h daytime and 45 h nighttime).

To identify periods of feeding as well as the types and amounts of food ingested, we examined the digestive tracts of fish collected at different times of the day and night. We measured the relative digestive tract fullness of each volumetrically with the fullness index being the quotient of displacement volume of empty tract/displacement volume of tract with contents.

Determination of the maximum size of mussel that the tautog could ingest and of the maximum size it could crush was made by inserting different size mussels into the mouth and into the anterior opening of the pharyngeal mill. The maximum ingestable size was defined as the largest mussel that could be completely enclosed in the mouth. The maximum crushable size was the largest mussel that could be partially grasped by the pharyngeal teeth.

To aid in describing the method of feeding on mussels, at infrequent intervals over a 16-mo period, we directly observed and used cine analysis of three individuals 25 to 38 cm, held in a 2,200-liter aquarium.

RESULTS

Activity and Movements

The fish which we tracked were active during the day and inactive at night. There was some degree of variation in the precise time that activity began or ceased relative to morning and evening civil twilight (Table 2). Activity began from 10 min before to 69 min after the start of morning twilight. Cessation of activity, however, was more variable, ranging from 222 min before to 69 min after the end of evening twilight. Although we were unable to arrive at the cause for this variation, there were indications that cloud cover and water transparency, both affecting light penetration, might play a role. Our direct scuba observations (135 h of observation) on untagged tautog showed that the fish were active during the day and inactive at night. Activity as well as responsiveness at night were at such a low level that we were able to touch individual fish or catch them easily with a hand-held net.

Five fish (No. 1-5, Table 1), tracked at different times from July through September 1971 and 1972, exhibited similar patterns in their daily movements. Each morning at the onset of activity or soon after, the fish moved out and usually remained within 500 m of the basin. They spent most of each day at locations in which there were large concentrations of blue mussel (*Mytilus edulis*) (areas A2-A9, Figure 2; Table 1). Towards late afternoon or early evening, the fish returned to the basin and within 1 to 198 min ($\bar{x} = 55.7$), settled in one location and remained throughout the night in an inactive state.

Another fish (No. 6, Table 1) tracked during this period returned to the basin the first night after being released, following the same pattern as fishes 1 to 5. However, after spending most of the second day in close proximity to the basin, it did not return but rather, at 172 min prior to the end of evening twilight, swam 6.2 km in a direct easterly course to an artificial reef (consisting of sunken barges and tires) where it spent the night (area G, Figure 1).

Underwater observations made during July through mid-October showed that the number of fish, measuring about 30 to 50 cm, in close proximity to the basin increased just prior to and immediately after the beginning of evening twilight in comparison to the number that were present during the day. Comparing these obser-

TABLE 2.—Onset and end of the daily activity of individual tautog relative to morning and evening civil twilight (MCT and ECT[1]).

Tautog no.	Mean time and range (min) to: Onset of activity		End of activity	
	Prior to MCT	Following MCT	Prior to ECT	Following ECT
1		27.0 (21.0 to 35.0)	122.0 (43.0 to 222.0)	
2		20.0 (10.0 to 30.0)	14.7 (8.0 to 26.0)	
3		26.0 (12.0 to 43.0)	71.0 (39.0 to 116.0)	
4	7.0 (4.0 to 10.0)		78.5 (72.0 to 85.0)	
5		23.0 (18.0 to 28.0)	47.5 (12.0 to 83.0)	
6		54.5 (52.0 to 57.0)	28.0 (4.0 to 52.0)	
7		35.0	68.0 (54.0 to 82.0)	
8		27.0 (13.0 to 45.0)	75.3 (51.0 to 88.0)	
9		62.0 (49.0 to 69.0)	131.0 (26.0 to 158.0)	69.0
10		14.0	51.0 (28.0 to 74.0)	

[1] MCT: start of morning civil twilight.
ECT: end of evening civil twilight.

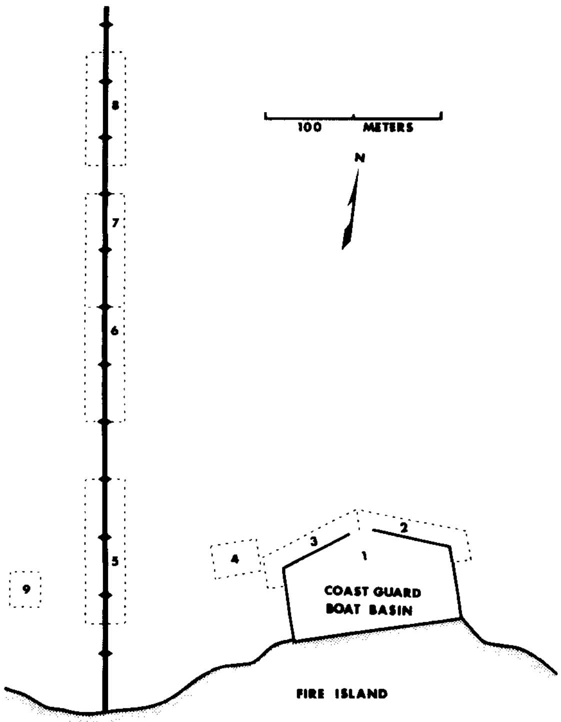

FIGURE 2.—Areas demarcating the locations of tautog during their daily movements as presented in Table 1 (an enlargement of area A, Figure 1).

vations with our tracks of similar-sized fish, we were led to conclude that this increase was the result of the normal nightly return to the basin. However the number of smaller fish (≤25 cm) appeared to remain the same throughout the day and during evening twilight, i.e., there was no discernible increase at evening twilight. To affirm whether the smaller, younger fish did in fact remain closer to the basin during the day than the larger, older ones, we tagged two fish 20 and 25 cm (No. 7 and 8, Table 1), tracking one for 34 and the other for 66.8 h. These fish exhibited the typical habit of the larger fish of being active during the day and inactive at night (Table 2). However, in contrast to the larger fish, these smaller fish remained within the basin and never ventured farther than 2 m from the walls. Examination of the digestive tract of one of these smaller fish, recaptured after tracking had been terminated, showed the presence of mussels throughout the tract, indicating that this fish had been feeding on mussels attached to the basin walls or other substrate within the basin.

These data indicate that tautog occur as an essentially localized population at least from July through mid-October. The basin acts as a focal point for the population, providing a suitable night habitat for all fish and a forage area for smaller fish.

Four fish (No. 9-12, Table 1) tracked during June 1972 exhibited quite different patterns of daily movements. Two of these (No. 9 and 10) ranged farther during the day and spent the night at various locations other than the basin. Tracking was discontinued on the other two fish of this group (No. 11 and 12) during the first day due to inclement weather. However, a search the night following tracking termination and on three successive nights failed to detect the presence of either fish in or around the basin. They, too, evidently spent the night at other locations.

The major difference in fish tracked during June from all other fish tracked was that all June fish were in spawning condition, readily extruding sperm or ova during the tagging procedure. Further, if this population bears any similarities to the Narragansett Bay population (Cooper, 1966), we surmise that during June, fish are still arriving inshore from their offshore wintering area and have not yet become localized (at least fish of the size we were tracking).

On 26 September 1972, during the day, we sighted just outside the basin (Area 3, Figure 2) a tautog with a transmitter attached. Although we could not ascertain when this fish was tagged, it had been 49 days since the last tagging. The fish, which appeared normally responsive, had either remained localized within this area for at least 49 days or possibly was one of the four fish tagged during June that had not returned to the basin at that time.

Feeding

There were varying amounts of food throughout the digestive tracts of fish sampled at various times of the day and just after evening twilight (Table 3). The tracts of fish sampled just prior to morning twilight (23-83 min), while still in an inactive night condition, were empty. Thus it appears that the fish feed throughout the day, beginning soon after morning twilight and continuing up to evening twilight. Assuming that the fish sampled just before morning twilight had fed up to the previous evening twilight, passage through the digestive tract while the animals were quiescent took 8 h or less.

Examination of the matter ingested showed that 70% of the fish sampled contained 78.4 to 100% mussels, by volume, in various stages of digestion (Table 3). Next in abundance were remains of various decapod and cirriped crustaceans, followed by an assortment of other invertebrates and debris (vegetable matter, sand, and gravel), with some of the latter probably being ingested incidentally with the mussels. All but two of the fish examined contained over 50% mussels, by volume, indicating that mussels are the principal food for this population.

Observations on the tautog's method of feeding on mussels, in both the field and laboratory, revealed that after approaching a clump of mussels, the fish would grasp one or several at a time with the anterior canine teeth and then tear them from the substrate with an intense lateral or shaking movement of the head. In no case, in either the field or laboratory, did the initial ingestion process involve crushing with the canines. After initial ingestion, muscular contractions in the bucco-pharyngeal area were clearly seen, evidentally resulting from the shells being crushed by the pharyngeal teeth. When a clump of mussels attached by byssal threads was too large to be processed by the pharyngeal teeth, the fish would alternately ingest and egest the clump until it was separated into a smaller crushable size.

The mussels in the digestive tracts consisted primarily of specimens averaging 11.9 mm in length and estimated to be 1 to 2 yr old (Table 3). There was an obvious selection of young, small mussels by all-sized fish.

While factors such as ease of crushing and a greater digestive efficiency may be involved in the tautog's preference for small, young mussels, we found another possible cause related to the limitations imposed by the dimensions of the pharyngeal area where the mussels are crushed. The mouth can accommodate much larger mussels than the crushing apparatus is able to process. For example in the laboratory on 20 occasions, we saw fish that were starved for more than a day attempting to eat mussels

TABLE 3.—Relative fullness and contents of tautog digestive tracts.

Time of capture (EDT)	Fish length (cm)	Fullness index[1]	% of total gut contents			Median length of mussels (mm)	% of mussels less than 30 mm
			Mussels	Decapod and cirriped crustaceans	Other		
0400-0500	23.5	1.0					
	23.5	1.0					
	45.0	1.0					
	37.0	1.0					
	46.0	1.0					
0800-0830	24.0	0.8	85.7	5.8	8.5	14	100.0
	27.5	0.7	100.0			12	100.0
	26.5	0.7	99.5		0.5	14	100.0
	34.0	0.8	62.5		37.5	16	100.0
1200-1300	31.0	0.6	89.6	4.5	5.9	15	100.0
	36.5	0.5	65.3	27.0	7.7	8	100.0
	37.5	0.6	78.5	16.1	5.4	16	100.0
	21.0	0.7	98.6		1.4	11	100.0
	24.5	0.7	100.0			5	100.0
	32.0	0.4	95.2	4.8		15	100.0
	29.0	0.4	54.5	36.4	9.1	10	100.0
1600-1700	40.0	0.7	99.1	0.6	0.3	8	100.0
	32.0	0.4	92.2	6.0	1.8	8	100.0
	32.5	0.6	31.3	68.1	0.6	8	100.0
1930-2000	44.0	0.4	90.4	9.6		14	88.1
	36.0	0.6	45.9	41.3	12.8	12	87.5
	46.0	0.6	65.7	32.9	1.4	10	53.8
	37.0	0.6	92.3	7.7		15	100.0
	42.5	0.4	94.0	6.0		16	72.7
	[2]20.0	0.6	78.4		21.6	11	100.0

[1] Fullness index = volume empty tract/volume of tract with contents.
[2] Fish no. 7 (Table 1) captured at end of track.

larger than could be crushed by the pharyngeal teeth. The fish would ingest the mussel, unsuccessfully attempt to crush it, and then egest it, the process being repeated 20 to 30 times. We also found in a preliminary determination of the maximum crushable size that fish, 34 to 53 cm, could crush mussels that were only 0.47 times the maximum size they could ingest.

Seasonal Movements

Direct observations made during the day with scuba from October 1971 through May 1972 and from October 1972 through January 1973 indicated that there was a difference in the seasonal movement between small fish (≤25 cm, 2-3 yr old) and large fish (>25 cm, >4 yr old). The ages of fish were estimated from calculated total lengths by Cooper (1967). Tautog of varying sizes were observed in close proximity to the basin on 12 October 1971, at an average water temperature of 17.0°C (range: 15.2°-19.5°C). On 1 November with the water temperature averaging 10.0°C (range: 8.9°-10.6°C), no large tautog were sighted, but about 25 small ones were seen swimming within 1 m of the basin walls. Small fish were still active on 18 November (water temperature 10.0°C: 9.7°-10.1°C). On 9 December 1971, and 5 January 1972, with temperatures ranging from 4.0° to 5.5°C, a total of approximately 40 small tautog was sighted within the basin. These fish appeared lethargic and rested against the basin walls. When prodded by a diver, they moved only a few feet before settling to the bottom once again.

Both large and small fish were sighted on 10 May 1972 with an average temperature of 10.0°C (range: 8.5°-11.5°C) and appeared normally active.

Diving observations the following fall and winter substantially supported the fact that small fish wintered inshore. On 2 October 1972, we sighted normally active large and small tautog (water temperature 16.8°C: 16.2°-17.7°C). On 26 October with the temperature averaging 10.0°C (range: 9.6°-10.5°C), we found no large fish but sighted at least 30 small fish which appeared normally active. During dives on 27 November and 29 December 1972, and 9 January 1973, with the temperature ranging 2.0° to 4.8°C, we sighted approximately 35 small fish (≤ 25 cm) lying in a torpid state on the bottom between pilings and the basin walls or in bottom depressions within 10 cm of the wall. Some of these fish were partially covered with silt. Opercular movements were so shallow as to be almost undiscernible. Examination of the digestive tracts of five fish captured during this period showed that the fish had not eaten for some time as indicated by the empty and flaccid condition of the tracts.

We concluded from these observations that fish at least larger than 25 cm moved offshore to winter, agreeing with the conclusions of Cooper (1966) for a population residing in Narragansett Bay, Rhode Island. However, small fish (approximately ≤25 cm) remained inshore throughout the year in close proximity to the home site.

DISCUSSION

The tautog's pattern of being active during the day and inactive at night is a typical labrid trait having been observed in a number of species. For example, field observations in the Pacific by Hobson (1965, 1968, 1972) showed this pattern to be present in five species (*Bodianus diplotaenia*, *Halichoeres nicholsi*, *Labroides phthirophagus*, *Thalassoma duperrey*, and *T. lucasanum*). The pattern was presumed to be present in *Halichoeres dispilus*, *Hemipteronotus mundiceps*, and *H. pavoninus* since the fish were observed in the active state during the day but not sighted at night, having apparently buried under sand or rested in crevices. Field observations in the Atlantic by Starck and Davis (1966) on *Bodianus rufus*, *Clepticus parrai*, *Lachnolaimus maximus*, and *Thalassoma bifasciatum* also show the typical labrid day active/night inactive pattern.

Whether a labrid species spends the night buried under sand or lying in cracks or crevices, all appear to be in a state of low responsiveness. Tauber and Weitzman (1969) investigated the level of responsiveness of the slippery dick, *Irideo bivittata*, at night. They found the fish to be in a state that resembled the mammalian sleep phase characterized by decreased responsiveness to altering stimuli, diminished or irregular respiration, and eye movement activity.

The low level of responsiveness present at night in labrids and other species with a similar habit has wide ramifications with regard to susceptibility to environmental stress. The probability that fish would be able to respond and escape potentially lethal environmental perturbations during the inactive night phase would be less than if the same stress were applied during the day. Physiological responses would also differ. Differential susceptibility to stresses as related to the daily rhythm has been clearly established (for discussion and review, see Reinberg, 1967).

During most of the summer and into early fall, fish of the colony we studied had a fairly well defined home range (Gerking, 1959) with the basin acting as a focal point or home site, providing a suitable night habitat for all-sized fish. While larger fish (≥30 cm) moved out each day to feed, the smaller fish (≤25 cm) foraged along or in close proximity to the basin walls. The adaptation of young fish remaining close to the home site may relate to effectively protecting them against predators. On one occasion while diving in early July 1972, we observed three striped bass (*Morone saxatilis*, 80-90 cm) actively pursuing and attempting to capture young tautog (≤25 cm) from a group of 30 to 40. The tautog were within 1 m of the basin wall at the onset of the attack. They escaped from the predators by swimming directly to the wall where they remained in crevices. The older fish, not as susceptible to predation, moves out to feed, resulting in a fuller utilization of the potential energy resources of the area and in the probable reduction of feeding competition among individuals. The reduction in the probability of feeding competition seemed especially critical since all sizes studied preferred, to a large extent, similar-sized mussels. This daily movement of the larger fish out of the basin also seemed to make the home site a nursery for young fish.

Our observations that tautog larger than 30 cm (approximately 5 yr or older) were not present in the vicinity of the basin after the end of October circumstantially agree with the finding of Cooper (1966) that Narragansett Bay fish of similar size wintered offshore. In contrast, our results showed that younger fish remained inshore throughout the year, wintering at the home site in a torpid, nonfeeding state. It is apparent that the younger fish are highly dependent on the home site throughout the year for at least the first 3 to 4 and perhaps 5 yr of their life. The habit of remaining inshore over the winter is not unknown in labrids. Green and Farwell (1971) found various-sized cunner, *Tautogolabrus adspersus*, lying in a torpid state inshore when temperatures fell below 5°C.

Although tautog feed readily on other types of food, the most abundant food available and found most frequently in the digestive tract was mussels. Mussels were predominantly less than 30 mm long, indicating an average age of 1 to 2 yr (Savage, 1956). The next most abundant food found in the digestive tract was various crustaceans, with only negligible amounts of other items. It seemed that, on the basis of our diving observations, the crustacean population, in terms of a potential alternate food source for the tautog in this area, did not approach the abundance of mussels in the 1 to 2 yr class. We surmise that the equilibrium of the population, in terms of food resources, is highly dependent on a single food item, with no alternate potentially serving as a sustaining element.

Environmental perturbations that would directly affect 1- to 2-yr-old mussels or any of the pre-adult stages, would lead to a high probability of stress in the tautog population. This would be especially true for young fish (3 yr or less) since they seem especially dependent upon the home site. This dependence on the home site raises the question of whether or not it is within their capability to move out and seek new feeding areas and if so, how successful would they be.

Another obvious limiting element of the population is a suitable physical structure which all-sized tautog require during their night inactive phase and upon which young tautog seem totally dependent. In areas where food resources are in relative abundance to support a population, the introduction of a suitable physical habitat could lead to the establishment of new discrete colonies.

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