

F. G. WALTON SMITH, *Director, Marine Laboratory, University of Miami;*
Fisheries Advisor to the Bahamas Government

THE SUCCESSFUL CONTROL and sound exploitation of a fishery necessitates careful appraisals based upon a knowledge of the population parameters, growth rates, breeding seasons, size at maturity and similar biological statistics.

This desirable information is rarely available in anything like the amount of detail which the fishery biologist would like to have. Thinly scattered fisheries of the Caribbean are of insufficient monetary value to allow financial provision for any but the most cursory survey, so that our knowledge of the biological data required for optimum exploitation is even poorer here than elsewhere. Nevertheless, although insignificant in comparison to the large fisheries of temperate latitudes, fisheries of the West Indies are of the greatest actual and potential importance to this protein-starved area. It is therefore fortunate that circumstances have made it possible to obtain, with a minimum expenditure of time and money, detailed statistics of certain aspects of the Bahamas and British Honduras spiny lobster fisheries.

The operation of a canning station at West End, Grand Bahama, has provided an unusual opportunity of studying the Bahamas spiny lobster population, since the lobsters caught at different localities were all brought to the central plant for weighing and processing. During 1945, advantage of this opportunity was taken to visit the plant and to instruct foremen in methods of sampling and measurement. The cooperation of Mr. Hugh Griffiths of General Seafoods was of great value in making these arrangements possible.

General Seafoods ceased operation during 1946. Subsequently it was possible to continue the collection of summary records only. These were made possible by the system of government weighing stations. Most of the spiny lobsters caught on the Grand Bahama banks are sold for export and the government requires that they be weighed or counted and recorded by an inspector before being loaded. These records are kept by the Agriculture and Marine Products Board in behalf of which the investigations were carried out.

The number of lobsters and the average weight of them reported at the various weighing stations are shown in Tables I and II. The value of these statistics is evident from the summary given in Table III. From this it is clear that a decline not only in numbers, but also in average weight has occurred at the stations listed in Table III. At the same time the area served by stations at Hog Cay, Curley Cays and Bullocks Harbor show no decline in average size. On the basis of this information it was recommended in 1950 that the Little Bahamas stations of Table III be closed to fishing.

That a drop in average size as well as in total catch indicates heavy fishing in proportion to the optimum catch was suggested in 1945. At this time a comparison was made between the catch landed at West End from the heavily worked grounds and an experimental catch made at Powell's Point, then almost unfished (see Figure I). It will be noticed that the bulk of the catch landed at West End was already below the legal size limit, which was not actually enforced. The conclusion is that few lobsters escaped to enter into the larger size groups. At Powell's Point, however, the trap catches of lobsters have an average cape (i.e. cephalothorax) length of at least one inch greater and the largest lobsters have a cape length of 5 inches.

*Contribution No. 55 from Marine Laboratory, University of Miami.

TABLE I

NUMBER OF SPINY LOBSTERS REPORTED IN THE BAHAMAS 1941-1950

STATION	YEAR									
	1941-2	1942-3	1943-4	1944-5	1945-6	1946-7	1947-8	1948-9	1949-50	
Marsh Harbor	.....	52,928	13,074	5,827	.....	.....	.....	.....	.....	1949-50
Green Turtle C.	.....	.....	45,782	49,912	.....	.....	.....	52,850	.....	26,542
Hope Town	.....	11,957	4,589	.....	.....	.....	.....	.....	.....	.....
Carters Cay	124,969	193,736	120,397	171,947	.....	.....	.....	.....	.....	50,539
Red Shank Cay	357,492	345,866	208,902	151,873	.....	.....	.....	183,335	.....	67,402
Grand Cay	22,944	78,139	131,317	152,939	.....	.....	.....	32,329	.....	14,194
Allens Cay	119,528	153,956	123,978	97,135	.....	.....	.....	19,373	.....	22,589
Sandy Point	.....	108,846	145,625	164,293	.....	.....	.....	53,067	.....	36,312
Moore's Island	7,315	.....	61,607	113,119	.....	.....	.....	145,585	.....	83,976
West End	216,149	152,715	106,265	102,579	409,036	444,514	845,337	30,466	.....	8,950
Walkers Cay	.....	.....	.....	.....	.....	.....	33,650	22,600	.....	11,700
TOTAL	843,397	1,098,143	961,536	1,002,624	409,036	444,514	878,987	603,680	322,474	
Alice Town	80,749	195,941	93,302	287,257	516,273	389,272	337,667	153,533	.....	161,255
Bullock Harbor	.....	.....	.....	.....	.....	.....	.....	89,363	.....	42,681
Hog Cay	38,371	76,024	126,854	180,645	.....	.....	.....	141,044	.....	58,515
Curley Cays	.....	.....	66,920	97,432	425	.....	.....	265,645	.....	217,609
Berry Island	17,715	.....	.....	60,406	.....	.....	.....	.....	.....	.....
Jones Cay	.....	92,228	.....	.....	.....	.....	.....	.....	.....	.....
Water Cay	.....	.....	.....	50,292	.....	.....	.....	.....	.....	.....
Mangrove Cay	.....	.....	.....	2,358	.....	.....	.....	.....	.....	.....
Nassau	141,175	124,967	1,610	.....	96,654	130,240	86,505	90,341	.....	125,237
Palm Beach	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
TOTAL	278,010	489,160	288,686	678,390	613,352	519,512	424,172	739,926	784,714	
TOTAL ENTIRE	1,126,407	1,587,203	1,250,222	2,977,293	1,022,188	964,026	1,303,159	1,343,606	1,107,188	

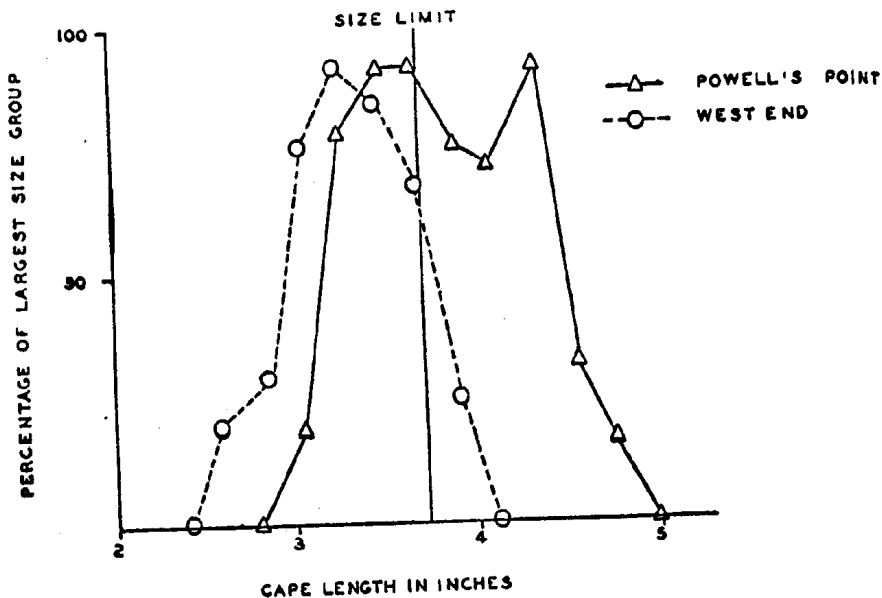


FIGURE 1. Comparison of catches at West End and Powell's Point. June 1945.

The significance of reduced catches and of reduced average size of individuals in the catch must be considered against a background of knowledge of the rate of growth and size at maturity. Fortunately the cooperation of the staff of General Seafoods at the West End canning plant made it possible to acquire much of the necessary information.

Rate of growth.

A careful study was made of the number of lobsters showing signs of moulting during each month of the year. Among monthly samples of approximately 1000 lobsters 8 per cent were moulting on an average throughout the year. While moulting occurred during every month, however, it was most evident from May to July and from December to February. Breeding females in the summer did not moult until their eggs were released. Growth of crawfish held in pens showed that the average rate of growth from the beginning of one month to the beginning of the next was one quarter inch cape length, although there was considerable variation in this.

A study of captive lobsters showed that from the time the first signs of moulting occur until the time the new shell is sufficiently hard to be indistinguishable from non-moulting individuals, an average period of 12 days elapses.

Since the yearly average of lobsters showing signs of moulting is 8 per cent, it follows that the average time spent by each lobster in moulting during each year is 8 per cent of 52 weeks, or 29 days. Since the average period of moult is 12 days, it follows that, on an average, each lobster moults $29/12$ or 2.5 times during the year. Thus the average total growth in cape length per year is $2.5 \times \frac{1}{4}$ inch or somewhat more than $\frac{1}{2}$ inch. It would seem unlikely therefore that a market sized spiny lobster with a cape length of $3\frac{3}{4}$ inches and a weight of $1\frac{1}{2}$ lbs. is less than seven years old.

TABLE II

AVERAGE WEIGHT OF SPINY LOBSTERS REPORTED IN THE BAHAMAS 1944-1950

STATION	1944-5	1945-6	1946-7	1947-8	1948-9	1949-50
Marsh Harbor	2.32	..	..	..	..	..
Green Turtle Cay	1.73	..	..	..	2.0	1.9
Hope Town	..	..	..	..	..	..
Carters Cay	1.57	..	..	..	1.5	1.2
Red Shank Cay	1.6	..	..	..	1.5	1.4
Grand Cay	1.7	..	..	..	1.5	1.9
Allens Cay	1.7	..	..	..	1.7	1.8
Sandy Point	1.7	..	..	..	1.5	1.3
Moore's Island	1.5	..	..	..	1.6	1.4
West End	1.5	1.2	1.5	1.4	1.6	1.2
Walkers Cay	..	..	..	1.5	1.7	1.9
AVERAGE	1.6	1.2	1.5	1.4	1.6	1.5
Alice Town	1.8	1.9	1.7	1.9	1.8	1.8
Bullock Harbor	..	..	..	..	2.3	2.5
Hog Cay	1.9	..	..	..	2.0	2.0
Curley Cays	2.6	2.8	..	..	2.0	2.1
Berry Island	1.8	..	..	..	..	..
Jones Cay	..	..	..	..	..	..
Water Cay	2.3	..	..	..	..	..
Mangrove Cay	2.5	..	..	..	..	..
Nassau	..	2.8	2.4	2.3	2.6	2.5
Palm Beach	..	..	..	..	..	1.4
AVERAGE	2.0	2.1	1.9	2.0	2.0	2.0
AVERAGE ENTIRE COLONY	1.8	1.7	1.7	1.6	1.8	1.8

TABLE III

DECLINE IN AVERAGE WEIGHT AND ANNUAL NUMBERS AT CERTAIN STATIONS, COMPARED WITH 1945 YIELD

STATION	1950 Average Weight lbs.	1949-50 catch in numbers	Percentage decline in average weight since 1945	Percentage decline in numbers since 1945
West End	1.2	8,950	20%	90%
Carters Cay	1.2	50,539	20%	70%
Sandy Point	1.3	36,312	25%	80%
Red Shank Cay	1.4	67,402	15%	55%
Moore's Island	1.4	83,976	7%	25%
Allens Cay	1.8	22,589	0	75%
Grand Cay	1.9	14,194	0	90%
TOTAL		283,962		

Breeding

Reproduction is brought about by means of a mating process in which the male lobster applies a viscous seminal fluid to the under surface of the female, between the bases of the walking legs. This hardens to form a dirty white or grey sperm packet. The eggs are laid several weeks later, at which time the sperm is released, apparently by an enzymatic action, and the eggs are fertilized.

Samples of the commercial catch or of experimental catches were examined during all months of the year. It was found that less than one per cent of females carried sperm packets in December, January and February but that at least 5 per cent bore this evidence of mating during the remainder of the year (Figure 2). Mating activity appeared to reach a peak from April to June

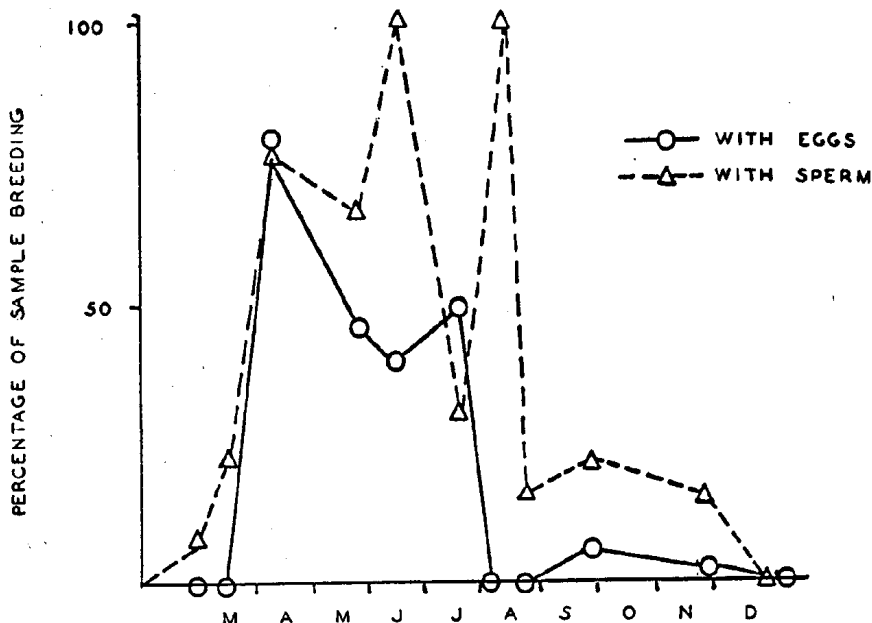


FIGURE 2. Number of breeding lobsters present in monthly samples of catch which show evidence of breeding. Monthly samples of at least 500.

and again in August. After August it rapidly declined. The onset of mating took place first of all in the larger females and occurs earlier in the southern parts of the colony.

Females begin to carry eggs during March and by the end of April the majority have attained this condition. By the end of August the majority have released their eggs, although a small number of egg-carrying females are found even as late as December.

Among the several thousand examined the smallest females carrying eggs were those with a $1\frac{1}{2}$ inch carapace (Figure 3). This corresponds to a body weight of less than $\frac{1}{2}$ pound and a body length of about six inches. Half of the females of this size in the West End catch on June 6, 1945 showed evidence of mating.

It seems clear from the above observations that a considerable breeding potential exists in the lobsters under market size, so that the taking of under-sized lobsters may not seriously affect recruitment of the younger size groups.

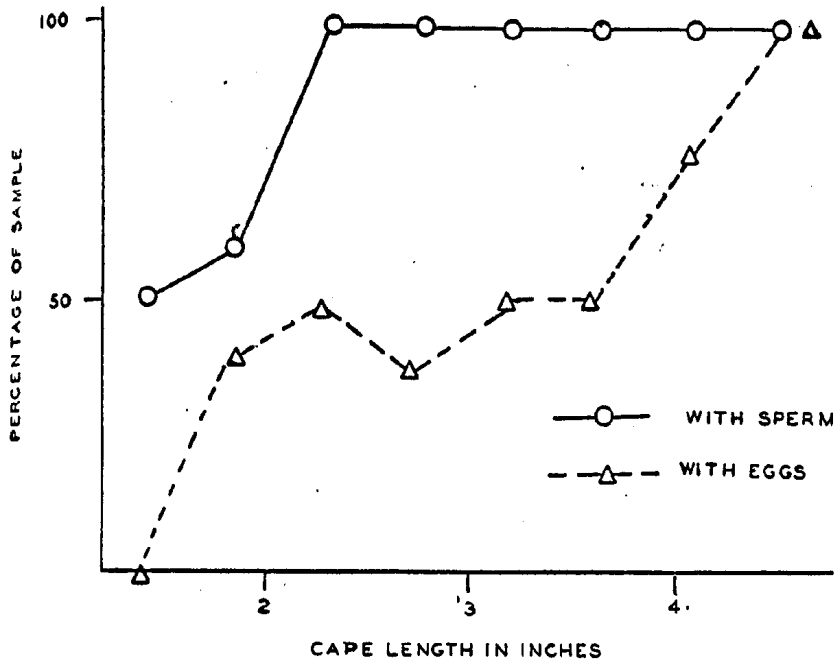


FIGURE 3. Size of lobsters in relation to breeding activity. Sample of 800 taken at West End, June 6, 1945.

On the other hand, the heavy fishing shown by the data of Table I and Figure 1 indicates that a large loss in total catch weight is caused by not allowing individuals to reach the larger size groups.

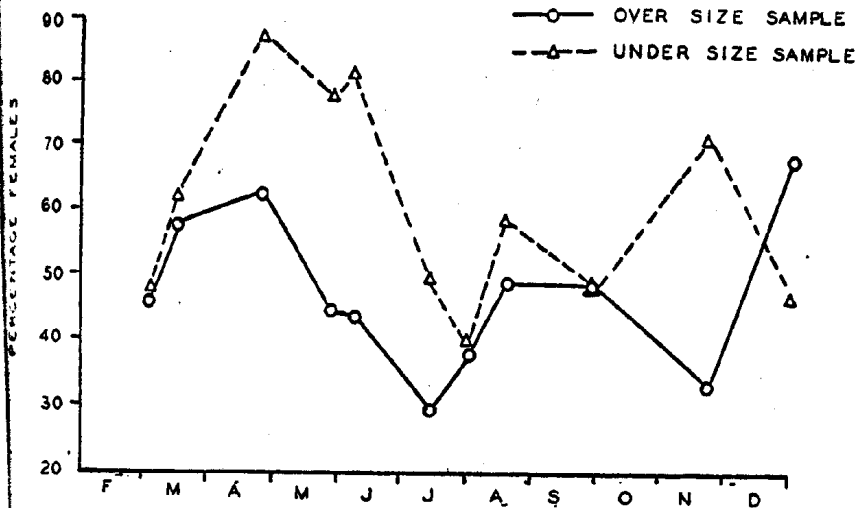


FIGURE 4. Number of females present in samples under size limit compared with number of females present in samples over size limit. Samples of 500 taken monthly at West End.

Migration

General observation shows that large troops of lobsters move en masse at various times of the year, apparently in search of food. Individuals seem to move considerable distances at all times of the year. A more definite pattern of migration appears to exist, however, in the summer migration of females to deeper water, where most of the eggs are released. Figure 4 shows the percentage of females present in samples of lobsters above the legal limit and in samples below the legal limit for each month of the year. These samples were from shallow water catches in the West End area. During May the females begin to disappear from the larger groups. Later, in July, the smaller females also disappear from the shallow water catch. They only appear in quantity again during November and December. It is noticeable that in the winter months the females form more than 50 per cent of the catch.

From the data given above it was possible to make recommendations regarding the control of the fishery. These were based upon a more accurate knowledge of the condition of the lobster population than is usually the case in the fisheries of the West Indies and Bahamas. Of particular importance in this case is the comparatively negligible cost of making the study, due to the fact that during the period in question the catch was almost entirely disposed of to one buyer and also to the system of government weighing stations. It is not unreasonable to suggest that the agents responsible for enforcement could well carry out sampling procedures in such states as Florida and obtain important statistical information at little extra cost.

BIBLIOGRAPHY

- SMITH, F. G. WALTON, 1946. *Final Report of the Bahamas Crawfish Survey*. Typescript Report to the Agriculture and Marine Products Board, Nassau, Bahamas.
- SMITH, F. G. WALTON, 1948. *The Spiny Lobster Industry of the Caribbean and Florida*. Fishery Series No. 3. The Caribbean Commission, Port-of-Spain, Trinidad.