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A Study of the Behavior of Some Tagged South Florida Coral Reef Fishes[1]

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ABSTRACT: Several of the larger species of fishes found on the unique patch reefs of south Florida were trapped and tagged over a one-year period. Many of these were recaptured, some as many as 10 to 41 times, and almost invariably on their home reefs (point of initial capture). In repeated recaptures of the same individual we suspect trap conditioning, but even so we conclude that the species was restricted to its home reef. Transplants of small numbers of white grunts indicated a tendency to home. Tenacity of home reef occupation was also indicated by lack of displacement of tagged fishes by a severe hurricane which occurred during the study.

There are indications that entrance of fishes into the traps was seasonally affected, with the most activity occurring in the warm months. We do not know if decreased numbers of fishes or a change in behavior, or both, accounted for this seasonality, but in at least one instance (gray angelfish) the species appeared to be relatively abundant during all seasons, while in another (white grunt) there appeared to be a decrease in numbers (as determined from another study conducted contemporaneously).

INTRODUCTION

The purpose of this study was to obtain information on the permanency of specific reef residency of various Florida fishes. Data are presented on the movements and activity of a relatively small number of species and interpretations of these data are given with some allusion to seasonality. The only similar study published to date is that of Bardach (1958) on certain Bermuda reef fishes. Our report covers several species not included in his study and affords commentary both in support of and in contrast to his findings. We have published (1961) a separate study on the movements of the great barracuda, *Sphyraena barracuda*, a species associated with the same reefs discussed below.

Acknowledgments.—A number of ideas for our study evolved from conversations with Dr. John E. Randall, University of Puerto Rico, for which we wish to thank him. Considerable assistance in matters of equipment, maintenance and provision was generously supplied by Mr. Dennis Mayo, Mayo's Fish Camp, Key Largo, Florida. We are indebted to him for ameliorating many of the difficulties concomitant with marine field work. Dr. Daniel M. Cohen read the manuscript critically and offered suggestions for its improvement.

GENERAL HABITAT DESCRIPTION

Agassiz (1880) cursorily discussed Florida coral reefs. Since then only scattered systematic accounts of the various coral species in Florida have appeared.

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We arbitrarily divide the coral reefs of southeast Florida into offshore and inshore categories. The offshore reefs are on the edge of the Gulf Stream. The inshore reefs, where our studies were conducted, are on the shallow shelf between the mainland (Keys) and the offshore reefs. In the vicinity of Key Largo the offshore reefs are about six miles offshore; the inshore reefs are three miles offshore.

The physical make-up and environmental conditions of these two reef types are quite different. The offshore reefs are extensive and continue in some instances for over a mile with no break. The inshore reefs are comprised of groups of individual (frequently widely separated) patch reefs, few of which extend for much more than 200 yards, with most extending much less. One group of patch reefs may be separated from another by over a mile (Basin Hill Shoals and Mosquito Bank).

The water over the outer reefs is clear even during periods of rough weather while the inshore reefs may be obscured in waters of visibility of less than three feet for days at a time during periods of mild breezes. The water temperatures over the inshore reefs are more extreme than those offshore. The surface temperatures at inshore Mosquito Bank were 19.5 and 21.9 C on December 7, 1960, and January 14, 1961, respectively, while at the offshore Molasses Reef they were 25.0 and 24.6 C for the same date. The warmer winter temperatures encountered on the offshore reefs are evidence of the effect of the proximity of the Gulf Stream.

The offshore reefs (i.e., Carysfort) are composed to a large extent of branching corals (*Acropora*) and extend many feet deep on their outer slope. The inshore reefs (Mosquito Bank, Basin Hill Shoal) are composed almost exclusively of massive brain corals (*Montastraea, Diploria*) up to at least six feet in diameter. Most of the inshore reefs are at depths of much less than 20 feet (from the peripheral base of the reef to the water's surface). Octocorals are especially abundant on the inshore reefs and there are some forests of these covering as much as an acre. The following, collected from our Reef 1, were kindly identified by F. M. Bayer, U.S. National Museum: *Briaereum asbestinum* (Pallas), *Plexaura homomalla* (Esper), *P. flexuosa* Lamouroux, *Pseudoplexaura porosa* (Houttuyn), *Eunicea* sp., *Pterogorgia anceps* (Pallas), *Pseudopterogorgia americana* (Gmelin), *Gorgonia ventalina* Linnaeus. The stinging coral, *Millepora,* was also abundant. During spring low tides the ends of the gorgonians and sometimes the stony corals extended several inches above the water.

The areas separating patch reefs are covered with marine grasses, *Thalassia.*

STUDY REEFS

Three patch reefs about one-third of a mile north-northeast of Mosquito Beacon on Mosquito Bank, three miles east of Key Largo, were selected for our study. The smallest of these (Reef 1) was 154 feet in circumference. The other two (Reef 2, Reef 3) were about equal in size and were estimated to cover approximately four to six

times the area of Reef 1. Reef 2 was estimated to be about 125 feet west of Reef 1, and Reef 3 was about 600 feet south of Reefs 1 and 2. The only other reefs in the vicinity of these was a line of patch reefs which began about 175 feet east of Reef 1.

One aspect of the particular reef area chosen for study was the low degree of sport fishing in the area. Although numerous small fishing craft were observed on week ends, these were relatively few considering the area of reefs available. We know of only one sport fishing catch of a fish tagged on a study reef (tags offered rewards). Commercial spiny lobster fishermen were quite active in the reef area during the open season, March 31 to May 1, but their traps were placed on the bottom between reefs. Only one tagged fish, a gray angelfish, is known to have been taken in a lobster trap, and that after Hurricane Donna.

EFFECTS OF HURRICANE DONNA

Underwater visual surveys were made on the study reefs each month to record noticeable population changes and disposition of tagged fishes. After we had been diving on the coral reefs for several months we were able to recognize and place individual coral heads, barren sand spots and general topography. During September, 1960, a hurricane occurred, the eye of which passed about 20 miles south of our reef area. When we returned to the reefs in October, we were impressed by the tremendous destruction which had occurred. Many, but not all, of the large coral heads had been broken from their bases and either moved or fragmented. We were unable to recognize much of what we had remembered.

Within another month or two it would have been difficult, if not impossible, for an uninformed observer to tell that any extraordinary destruction had recently occurred, although, of course, the reefs had not returned to their pre-hurricane outline. Many tagged individuals which were recaptured prior to the hurricane were not captured after it. At the same time we were amazed that any of our tagged fish should have been recaptured on their home reefs; we did take 8 gray angelfish, 1 green moray, 2 black groupers, and 1 grunt. We do not know if any of these fishes were displaced by hurricane action and subsequently homed.

In addition to the fishes mentioned one schoolmaster snapper was seen on Reef 1 after the hurricane, but it was impossible to tell if this was its home reef; also one grunt caught on Reef 3 and transplanted to Reef 1 before the hurricane was recaptured on Reef 2 after the hurricane.

These results seem to indicate that even in a violent storm when visibility is highly limited and turbulence great, fishes are able to take refuge on a coral reef in shallow water and maintain their position without danger of being injured. The alternative, which we think less likely, would be for the fishes to leave the reefs for open water and return after the storm has passed.

METHODS

Fishes were caught with traps which were triangular in shape, approximately 21 inches on a side and four feet long, constructed of three-quarter inch mesh galvanized hardware cloth. The trap had an inset downward directed funnel, about four to six inches in diameter, which served as an entrance at each end. One trap had a vertical slit at each end with baffles blocking the entrances; no significant differences were noted in the effectiveness of either type trap, but the funnel type was used almost exclusively. The traps were bridled at the apices with a single rope, used for hauling, tied to a numbered cork. Fishes were removed through a door in the trap side.

During the first month of the study, March, 1960, only five traps were used, two on Reefs 1 and 3 and one on Reef 2. During April and May four traps were placed on Reef 1 and three each on Reefs 2 and 3. From June until the end of the study, February, 1961, two traps were placed on Reef 1 and four each on Reefs 2 and 3.

The traps were baited with cut fish, usually mullet. They were frequently baited twice a day whether old bait was present or not. Traps were checked from one to three times daily, weather and other conditions permitting. During periods of high winds it was sometimes impossible to check the traps for periods of three or four days.

Traps were set from a boat or by positioning them on the substrate after they had been approximately placed from a boat. Most often they were placed on the small sand flats punctuating the reefs, frequently along the edge of a reef or near a large coral head. The positions available were comparatively few and thus used repeatedly. It is possible that this procedure had some conditioning effect on the fishes.

As long as a trap was lying on one of its three long sides there appeared to be little variation in its efficiency. If the traps were set and we were still diving in the area, we were able to observe fishes in the water and to remove a trap when a fish entered in the first few minutes after the set. Ten minutes was the shortest time between setting and the observation of a trapped fish.

Gray angelfish were almost immediately attracted to a baited trap even while a diver was close by. Other species were less audacious with morays, grunts, and finally groupers entering after increasing amounts of time. Many small fishes, pomacentrids, scarids, and pomadasyids, and crabs and spiny lobsters were caught in the traps. These were sometimes removed, sometimes not, with no apparent effect on trap effectiveness.

The life of a trap was approximately eight months. The total number of days in the water amounted to about 45 or 50. Mechanical rather than electrolytic damage terminated use of the trap.

Fishes caught in traps were held in buckets of sea water until after they had been tagged. They were then returned (unless otherwise indicated below) to their home reef (defined for a particular fish as the reef of original capture). Recaptured individuals were released on the reef of recapture even if this was not the home reef.

We never observed predators (barracuda) attacking newly released fishes.

All fishes subjectively considered to be large enough to be tagged were measured for total length (t.l.) and tagged. A minimal size designation of 160 mm t.l. was established for tagging grunts (*Haemulon*) and snappers (*Ocyurus* and *Lutjanus*) after June. All fishes 160 mm t.l. and over were tagged except for several *Haemulon aurolineatum* and perhaps five *H. plumieri* and a similar number of *Gymnothorax moringa*.

Two types of tags, green plastic Petersen discs with nickel pins and yellow nylon barb-type darts (Everhart and Rupp, 1960), were used. Only the Petersen tags offered a reward for return of the tags. Use of dart-tags was discontinued when it became apparent that recaptures were considerably lower than for Petersen tags. We found this true also for barracuda (1961), and J. E. Randall (personal communication) has had the same experience. Comments concerning the efficiency of the tags will be found under discussions of the species.

DISCUSSION OF SPECIES

Gymnothorax moringa — Spotted Moray
Gymnothorax funebris — Green Moray

Thirty-six *G. moringua* (ca. 500-900 mm t.l.) were tagged (14 darts, 22 Petersens) in the muscles of the back just behind the head. Two individuals were recaptured (one dart and one Petersen). Neither had moved from its home reef. The dart-tagged individual had been marked March 10 and was recaptured May 11 dead in the trap. The other individual, tagged November 9, was recaptured twice, December 10 and January 17.

Nine *G. funebris* were tagged (ca. 800-1200 mm t.l.), four with darts, five with discs. Three were recaptured. One, dart-tagged May 13, was represented by only the tag in a trap on Reef 1, February 12. The third individual, disc-tagged on Reef 2 July 15, was recaptured on its home reef February 10. A fourth individual, disc-tagged on Reef 1 January 14, was seen in the same niche on that reef on January 15 and February 12. We cannot be positive that this was the same individual in each instance, but in view of the small number tagged, it seems probable. The January observation is certain as the tag was clean; no algal growth had occurred. The tag of the most recent of the previously tagged fish (December 6) would have been obscured by algal growth by January.

Spotted morays entered traps during each month of the study, whereas, the less abundant green moray was not caught during June, September, October, and January. On a few occasions morays entered the traps shortly after the traps were placed in the water. It is almost certain that they learned the simple exit as several times they escaped while the traps were being raised, an accomplishment not duplicated by any other species of trapped fish.

Morays were probably responsible for considerable mortality of

trapped fishes and removal of bait. They always regurgitated their stomach contents when they were removed from the water. Bait, and once a living tagged white grunt, were spit up whole.

Plastic dart and disc tags were used on morays. In spite of the greater facility of applying darts we preferred the discs. On the two dart-tagged recaptures which occurred up to 63 days after tagging the legend had been abraded so badly as to be scarcely legible. The morays were anesthetized with MS 222 prior to tagging with Petersen discs.

Haemulon plumieri — White Grunt
(Table I)

This grunt is one of the most abundant species on the patch reefs, both in numbers and mass. Four hundred and five individuals, 160-264 mm t.l., were tagged with discs during the study. An additional 62 individuals were tagged with darts, but lack of returns (only 2, both less than 10 days after tagging) indicated that the dart tag was inefficient. For the purposes of this study dart-tagged individuals are excluded from the discussion (but not from Table I).

Petersen tags, placed anteriorly beneath the spinous dorsal fin, are inefficient on white grunts also. We frequently obtained individuals with the tag almost grown out through the dorsum, and four individuals were recaptured which had Petersen tag scars (these were not counted as recaptures). Petersen tags were reset as many as three times on individual grunts over a period of a few months.

Fifty-three white grunts (excluding transplants, below), 13.1 percent, were recaptured. Thirty-six were recaptured one time; nine were recaptured twice; four, thrice; and one each, four, seven, eleven and twelve times. No fish was recaptured more than 152 days after having been tagged and only four were recaptured 100 days after tagging. Individuals were recaptured as little as three days after tagging.

Of the 53 grunts recaptured only two were taken on other than their home reef. Both were tagged at Reef 2. Each was recaptured at Reef 1 and later at the home reef. One was back on its home reef in at most 28 days after having been taken on Reef 1 and the other was back the day after it had been taken on Reef 1.

Twenty-seven grunts trapped on Reef 3 during June, 1960, were tagged and released on Reef 2. Six of these were subsequently recaptured, all during July. Five had returned to Reef 3 and one was still on Reef 2.

Twenty-eight grunts trapped on Reef 3 during July, 1960, were tagged and released on Reef 1. Two were subsequently recaptured. One, during August, was back on Reef 3; the other, during November, was on Reef 2.

Bardach (1958) tagged eight *Haemulon sciurus* and observed them with the same group of over 300 fish as long as 200 days after tagging. He believed it likely that the individuals remained in the same area for the duration of their lives.

Only one individual of *H. sciurus* was ever taken in our traps even

though the species was relatively abundant and occupied identical cover, freely mixing, with *H. plumieri*. In contrast to Bardach's observations (made on the comparatively deep reefs of Bermuda) we never saw adults of *H. plumieri* or *H. sciurus* schooling on the patch reefs. The two species tended to form small aggregations of usually

TABLE I.—Method of computing catch-per-unit of effort for *Haemulon plumieri* (160 mm and over total length)

	1960											
	Mar.			Apr.			May			Jun.		
Reef	1	2	3	1	2	3	1	2	3	1	2	3
A. No traps	2	1	2	4	3	3	4	3	3	2	4	4
B. No trap runs	14	14	14	9	9	9	10	10	10	17	17	17
C. Recaptures[1]	....	....	....	2	1	1	4	3	....	5	5	4
D. Newly tagged	23	10	6	1	6	10	6	39	13	8	22	63
E. $\frac{C\ D}{A \times B}$	.82	.71	.21	.08	.26	.41	.25	1.40	.43	.38	.40	.98
F. Σ_E = Catch-per-unit of effort			1.74			.75			2.08			1.76

[1] Does not include multiple recaptures.

TABLE I.—(continued)

	Jul.			Aug.			Sep.			Oct.		
Reef	1	2	3	1	2	3	1	2	3	1	2	3
A. No traps	2	4	4	2	4	4	2	4	4	2	4	4
B. No trap runs	11	11	11	10	10	10	2	2	2	12	12	12
C. Recaptures[1]	3	6	9	....	5	2	....	1	....	....	1	....
D. Newly tagged	2	7	43	2	10	11	....	1	....	10	29	26
E. $\frac{C\ D}{A \times B}$	.23	.30	1.18	.10	.38	.32	....	.25	....	.42	.62	.54
F. Σ_E = Catch-per-unit of effort			1.71			.80			.25			1.58

[1] Does not include multiple recaptures.

TABLE I.—(continued)

							1961					
	Nov.			Dec.			Jan.			Feb.		
Reef	1	2	3	1	2	3	1	2	3	1	2	3
A. No traps	2	4	4	2	4	4	2	4	4	2	4	4
B. No trap runs	9	9	9	9	9	9	7	7	7	11	11	11
C. Recaptures[1]	2	2	4	1	....	1	....	2	....	....	1	....
D. Newly tagged	1	25	12	1	8	1	....	1	2	2	3	1
E. $\frac{C\ D}{A \times B}$	.17	.75	.44	.11	.22	.06	....	.11	.07	.09	.09	.02
F. Σ_E = Catch-per-unit of effort			1.36			.39			.18			.20

[1] Does not include multiple recaptures.

less than 10 individuals, and each individual frequently behaved independently of the group. Young of about 50 mm or less were seen schooling in large numbers.

There is evidence of a seasonal effect on the entrance of grunts into our traps. This is demonstrated when catch per unit effort is calculated (Table I). The lowest catches per unit effort were in December, January and February, the coldest months of the year. September was also low, but this is explainable in terms of low effort and the hurricane which interrupted our work. It is impossible for us to say whether the drop in catches during the winter is the result of decreased individual activity, a decreased population, or both. We (in press) have demonstrated that there is a winter decrease in both numbers and species (including *H. plumieri* and *H. sciurus*) taken at a shore station in the Florida Keys during the same period as encompassed by this study.

Mycteroperca bonaci — Black Grouper (Table II)

The black grouper is the commonest grouper on the inshore reefs.[3] Twenty-six individuals, 222-659 mm t.l., were tagged and 14 (53.8%), were recaptured at least once. Five were recaptured once; three were recaptured twice; one, thrice; two, four times; one, five times; and two, six times. At the time of last recapture tagged fish had been at large 5 to 175 days. All recaptures were from home reefs except for one individual tagged on Reef 2 on June 20. It was recaptured four times on its home reef between August 12 and November 10. On November 12 it was caught on Reef 1, but on December 8, it was recaptured back on Reef 2.

Black grouper tended to enter traps during late spring and early summer, and during October (September hurricane influence?); however, we caught numerous individuals while trolling a line over the reefs during October through December, but not during the earlier months. This seems to indicate a seasonal difference in behavior (Table II).

Petersen disc tags were attached through the dorsum below the

TABLE II.—Seasonal activity of *Mycteroperca bonaci*

	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.[1]	Oct.	Nov.	Dec.	Jan.	Feb.
Cumulative tagged	....	....	3	10	13	12[2]	12	23	23	24	24	25
Recaptures per month	....	....	....	10	4	10	3	3	5	4	....	....
Trap checks	14	9	10	17	11	10	2	12	9	9	7	11

[1] It should be noticed here that a hurricane occurred between the September and October studies.

[2] One individual was known to have been caught by a sport fisherman during August.

[3] *Mycteroperca microlepis,* sometimes called black grouper in south Florida, is infrequently caught on the inshore reefs. On the middle and northwest coasts of Florida *M. microlepis* is common, but there is no verifiable record of *M. bonaci.*

anterior portion of the spiny dorsal fin. In general this type of tag is not satisfactory for groupers as replacements were frequently necessary. The tag has a tendency to be shed.

Epinephelus striatus — Nassau Grouper (Table III)

Twenty-three Nassau grouper, 186-473 mm t.l., were tagged and 11 (47.8%) were recaptured at least once. Six were recaptured once; two were recaptured twice; two, thrice; and one, seven times. At the time of recapture individuals were at large 2 to 120 days. All recaptures were from home reefs except for one fish tagged on Reef 3, October 16. The tag from this individual was found in a trap on Reef 1 on January 16. No fishes tagged prior to the September hurricane were recaptured after the hurricane. Also, none of the six individuals less than 250 mm t.l. was recaptured.

Entrance into the traps appeared to be seasonal (Table III) with the least number of grouper entering during the coolest months of the year.

Pomacanthus aureus — Gray Angelfish (Tables IV and V)

This is the common *Pomacanthus* of the inshore reefs. It is distinguished from its close relative, the French angelfish, in having nine instead of ten dorsal spines.

Thirty-five specimens, 134-314 mm t.l., were tagged and twenty (57.1%) were recaptured. Four were recaptured only once; four, twice; two, thrice; two, four times; two, five times; one, nine times; three, 13 times; one, 22 times; and one, 41 times. Several of the specimens were caught twice on one day and the last mentioned individual was caught twice a day on five different days and thrice on one day (we believe such behavior to indicate trap addiction). The latter individual was in a trap on 46.6 percent of the 88 trap runs made after it was tagged.

At the time of their last recapture, the angelfishes had been at large for 24 to 276 days, for an average of 139 days. First recapture of one individual occurred the day after it was tagged.

This species shows a strong affinity for its home reef. None of the recaptured individuals was on other than its home reef and seven of the 14 individuals on which recaptures were made prior to the September hurricane were recaptured on their home reefs after the hurricane.

TABLE III.—Monthly captures of *Epinephelus striatus*

	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.[1]	Oct.	Nov.	Dec.	Jan.	Feb.
Newly tagged	....	1	3	6	3	3	....	5	1	1	....	....
Total recaptures	....	....	3	6	3	3	2	1	3	1	1	....
Trap checks	14	9	10	17	11	10	2	12	9	9	7	11

[1] Hurricane occurred between September and October studies.

TABLE IV.—Index of monthly activity of *Pomacanthus aureus*

	1960									1961		
	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.
Cumulative specimens tagged	0	1	3	15	21	27	27	33	34	35	35	35
Recaptures (including multiple recaptures)	0	0	0	13	20	23	8	26	13	15	11	18
Trap runs	14	9	10	17	11	10	2	12	9	9	7	11
Activity index[1]	0	0	0	.25	.12	.11	.15	.08	.04	.05	.04	.05

$$1 = \frac{\text{(Number of recaptures in current month} \div \text{Cumulative tagged fish as of preceding month)}}{\text{Number of trap runs during current month}}$$

One individual which was recaptured prior to the hurricane was caught in a lobster trap after the hurricane at a location which, from its description to us, could have been close to our study reefs. Bardach (1958) has noted the restricted movements of angelfish (*Holacanthus bermudensis*).

There is evidence of a seasonal effect (Table IV) on the entrance of gray angelfish into the traps. The most active months are the warm ones, June through September. The activity index of Table IV could be affected by trap selection tending to eliminate recapture of the large individuals (Table V). However, we believe the selective effect worked about equally during the warm and cool months, especially since we saw several large and small untagged gray angelfish on the study reefs during the latter months of the study and no gray angelfish tagged (caught) after August was larger than 219 mm.

Gray angelfish and blue angelfish (see below) adapt ideally to Petersen disc tags. The tags were placed under the first few anterior spines of the dorsal fin. No abrasion of the fish or destruction of the tags was noted.

The gray angelfish (and the blue angelfish) became docile after repeated recaptures and scarcely moved from the time they were removed from the traps to the time they were returned to the ocean. Docility of frequently recaptured individual fishes has also been noticed by Randall (1960).

Holacanthus bermudensis — Blue Angelfish

Eight blue angelfish, 139-268 mm t.l., were tagged using Petersen disc tags. Four were recaptured for 2, 3, 6, and 28 times (the latter

TABLE V.—Trap selection on recaptures of tagged *Pomacanthus aureus*

Total length (mm) class	125	150	175	200	225	250	275	300
Recaptured specimens	2	2	6	6	2	2	..	..
Nonrecaptured specimens	1	..	..	3	2	4	1	4

individual was caught 57.2% of the 49 times the traps were run between the time of its initial capture and its last recapture). All recaptures were from home reefs. At the time of their last recapture, individuals had been at large for 66-113 days.

The species entered the traps only during April, May, June, and August, although untagged individuals were seen on the reefs during each month of the study.

Miscellaneous Tagged Species

Caranx ruber (bar jack).—Four fish, 345-579 mm t.l., were tagged with Petersen discs, two in March and two in October. None was recaptured.

Caranx bartholomaei (yellow jack).—One specimen, 413 mm t.l., was tagged with a Petersen tag during May, but was not recaptured.

Epinephelus morio (red grouper).—Four individuals, 234-455 mm t.l., were tagged with Petersen discs during October through December. Only one was recaptured, three days after tagging, still on its home reef. A second tagged fish was seen on Reef 1 during January, 1961. Since no specimens were tagged on Reef 1 this individual must have crossed over from either Reef 2 or Reef 3.

Epinephelus adscencionis (rock hind).—One individual, 234 mm t.l., was tagged with a Petersen tag during May, but was not recaptured.

Lutjanus apodus (schoolmaster).—Five fishes, 181-272 mm t.l., were tagged with Petersen tags: one on Reef 1, June; one on Reef 2, July; and three on Reef 3, July and August. None was recaptured, but a tagged individual was seen on Reef 1 during February, 1961. The species was not recorded on Reef 1 during visual surveys for the months March, April, September through December.

Lutjanus synagris (lane snapper).—Five individuals, 155-213 mm t.l., were tagged with Petersen tags between April and July. None was recaptured.

Ocyurus chrysurus (yellowtail snapper).—Eighteen fish, 167-482 mm t.l., were tagged (15 with Petersen tags, three with darts) during all seasons. Eleven of these were taken on Reef 1. One individual was recaptured on its home reef four days after tagging.

Haemulon aurolineatum (tomtate).—Nineteen individuals, 156-185 mm t.l., were tagged (16 with Petersen tags, three with darts). None was recaptured. This species is actually one of the most abundant fishes on the reefs, and we trapped thousands, most of which were too small to be tagged. All of the tomtates were caught on Reefs 1 and 3. We never recorded this species during monthly surveys on a reef of similar size to Reef 1, but some distance from our three study reefs.

Haemulon sciurus (bluestriped grunt).—Only one individual, 215 mm t.l., was taken in our traps. It was tagged with a Petersen tag but not recaptured.

Anisotremus virginicus (porkfish).—Two individuals, 113 and 168 mm t.l., were tagged with Petersen tags. The larger fish, tagged on May 14, was recaptured on June 14 and 15 on its home reef.

Abudefduf saxatilis (sergeant major).—Four fish, 117-160 mm t.l., were tagged with Petersen tags. None was recaptured.

Sparisoma viride (stoplight parrotfish).—One individual, 254 mm t.l., was tagged with a Petersen tag on Reef 1 during June. It was seen on Reef 1 during September, but was not recaptured.

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