

STUDIES OF RECREATIONALLY IMPORTANT  
REEF FISH

JOB PROGRESS REPORT  
RESEARCH PROGRESS SEGMENT

STATE: Territory of Guam

PROJECT NO.: FW-2R-19

SUB-PROJECT NO.: F

STUDY NO.: F-I

JOB NO.: 8

JOB TITLE: Studies of Recreationally Important Reef Fish

PERIOD COVERED: October 1, 1981 to September 30, 1982

SUMMARY

Beginning in January of 1982, populations of recreationally important reef fish species were monitored monthly at three sites on Luminao Barrier Reef. The most striking feature of the fish populations at these sites is their temporal variability, throughout all size classes (excluding recruits). At all three sites large individuals ( $> 25$  cm FL) were greatly outnumbered by smaller sized individuals. Although variability makes interpretation of results difficult, numbers of large size class individuals appeared to increase during the year at one of the sites.

A literature search for information on Siganus spinus, Mulloidies flavolineatus, Caranx melampygus and Selar crumenophthalmus was begun at the Hamilton Library, University of Hawaii at Manoa. Within the last 10 years less than 20 citations have been listed in Aquatic Sciences and Fisheries Abstracts (ASFA) and Biological Abstracts (BIOSIS). Growth data on these species was compiled in the field from fishermen's catches on Guam. Past creel census data were reviewed for information on catch rates by location, seasonality and length/weight relationships. Due to limited personnel and conflicts in job priorities, work on this part of Job-8 was curtailed during the latter part of FY 82, but will be continued as soon as possible. Therefore, this report will summarize progress made primarily in the monitoring of populations of recreationally

important fish species on Luminao Barrier Reef. Data collected on selected species of reef fish will be presented in our next annual report or whenever problems with personnel limitations and job priorities are alleviated so that a proper analysis may be accomplished.

#### BACKGROUND

In addition to reliable data on fishing participation, effort and catch, proper management of a fishery requires pertinent biological knowledge of the species involved. Such information may be used as a basis for sound management decisions in maintaining or improving the quality of sport fishing on Guam while providing requisite data to support government policy and laws related to fish and fishing.

On October 24, 1981, Public Law 16-39 went into effect, closing the Luminao Barrier Reef along the north (ocean) side of Apra Harbor's Glass Breakwater to all forms of net fishing. At this time the Division of Aquatic and Wildlife Resources (DAWR) assumed the responsibility of monitoring populations of recreationally important reef fishes. On December 3, 1982, Public Law 16-114 went into effect, closing the Luminao Barrier Reef to all fishing or taking of any marine life, by any means, for a trial period to end no sooner than October 1, 1983.

During the latter part of 1980, a study of the fish communities of the Luminao-Piti reef complex was conducted (Myers, 1982). The sampling method (primarily the use of 50m transects) was designed to roughly enumerate the populations of all resident reef fish species. This study did not concentrate specifically on the more recreationally important species, such as the larger resident and transient species and seasonal juveniles. Many of these occurred in low numbers, or seasonally and may have been overlooked. For these reasons, and in response to the closure of Luminao Barrier Reef to the taking of marine life, an independent study, utilizing a different methodology was initiated by DAWR.

A second part of this study involves obtaining more specific information on the biology and life history of selected reef fish species. Among the more recreationally important inshore species traditionally targeted by fishermen on Guam are Siganus spinus (Signaidae), Mulloides flavolineatus (Mullidae), Caranx melampygus and Selar crumenophthalmus (Carangidae). Since these species are highly desired both as juveniles and adults their stocks must sustain considerable levels of fishing pressure. As the island of Guam develops, and as fishing continues to be an increasingly important recreational activity for residents and tourists alike, these and other species must be conserved and protected from overexploitation and misuse.

#### OBJECTIVES

- I. To monitor population trends of recreationally important reef fishes on the Luminao Barrier Reef, shoreward of the reef margin.
- II. To assess the impact of fishing on populations of recreationally important reef fishes on Luminao Barrier Reef.
- III. To obtain sufficient information on the biology and life history of selected recreationally important reef fish species (such as Siganus spinus, Selar crumenophthalmus, Caranx melampygus and Mulloides flavolineatus) in order to permit evaluation of the need for fishing regulations and population management.

#### PROCEDURES

1. Three sites, each representing somewhat different major habitats, were selected (Figure 1). The first is situated on the eastern end of the reef, approximately 10 meters from the Glass Breakwater and opposite the ammunition wharf. The remaining two are situated near the western end, and widest point, of the reef. One is located within 20 m of the Glass Breakwater, the other in an area of rich coral growth within 70 m of the reef margin. At each site, two

stakes were driven into the substrate to designate endpoints of permanent 100 m transects running parallel to the Glass Breakwater. Beginning in January, 1982, a series of monthly counts were conducted along each transect. All fishes that were considered important, and observed within 3 m of an imaginary transect line, were tallied. Nocturnal species which often occur in holes and under ledges by day were not considered, nor were a few species incidentally utilized by fishermen. All species were separated into size intervals of 7 to 12.5 cm, 12.5-25 cm, and > 25 cm FL, respectively. Newly recruited juveniles of certain species were also tallied. All monthly counts were taken within a 1 to 2 day period. In an effort to minimize variability due to temporal and tidal factors, all counts were conducted between the hours of 1300 and 1700, and during tidal levels of approximately 1.5 ft. above mean low water. A brief summary of the results of twelve months of counts during calendar year 1982 is presented below and shown graphically in Figures 2-4.

2. Review scientific literature pertaining to selected reef fish.
3. Conduct species specific analyses of past Division of Aquatic and Wildlife Resources' creel census data, identifying trends in catch abundance by location; seasonality; and length/weight relationships.
4. Conduct reef studies using visual surveys and specimen collections to obtain estimates on various parameters including standing crop, population, reproductive potential, survivorship, seasonality and feeding and habitat requirements.
5. Analyse and interpret accumulated data on an annual basis.

## RESULTS

The most obvious, general characteristic of the fish populations was their

variability. This holds true for all size classes (except seasonal recruits and sites, making it difficult to detect and interpret trends. A number of factors may have contributed to this variability, including: (1) the transience of many species within the transect area, (2) variability between counts in the area surveyed, due to difficulty at some sites, in swimming a straight line, (3) omissions and duplications in counts due to the rapid and simultaneous movement of many different individuals and species, (4) inaccuracy in visually separating size classes within and between counts, and (5) variability in sheltering behavior both within and between species. It is widely known that sampling by means of visual transect provides only a crude estimate of fish populations. It is, however, the best non-destructive method available, and the only practical one in the present situation. Despite its flaws, this method should eventually allow detection of long-term trends.

It should be noted that only potentially exploitable, diurnally active, foodfishes are represented in the Figure 2. These include parrotfishes, most species of surgeonfishes, a few of the larger wrasses, snappers, emperors, groupers, scorpionfishes, rabbitfishes and sharks (Table 1). Juvenile (Ee) and adult Bluefin Trevally (Carangidae: Caranx melampygus) .... were not encountered on the transects, but were observed in the area. At all three sites, large fishes ( $> 25$  cm FL) were greatly outnumbered by smaller size-class fishes of both the same, and different species. Approximately equal numbers of small and medium size-class individuals were surveyed throughout most of the study period, although these numbers fluctuated widely. At site 2 there appeared to be a general increase in the number of large size-class individuals. This observation may indicate that net fishing has been instrumental in removing large-sized individuals from fish populations in the past. The absence of a clear trend in the data supporting this may be partially due to the ineffectiveness of the law. A general lack of public awareness and the inability to maintain strict law enforcement resulted in a certain level of net fishing

being maintained throughout the study period. This probably dampened the effect that a true absence of net fishing would have had. Unfortunately the long-term effect of net fishing alone cannot be assessed since the study site has recently been closed to all forms of fishing for the remainder of FY 83. This, however, should ultimately result in a more noticeable shift toward greater numbers of large and medium-sized individuals as long as the ban on fishing is effective and enough time is provided.

#### RECOMMENDATIONS

This study should be continued to permit evaluation of the long-term effects of reduced fishing pressure on Luminao Reef. Studies of the biology and life history of selected species of reef fish should continue in order to provide a sound basis for proper management decisions.

#### REFERENCES

- Myers, R.F. 1982. Fishes. In Assessment of the shoalwater environments in the vicinity of the proposed OTEC development at Cabras Island, Guam.  
R.H. Randall and L.G. Eldredge, eds. Univ. of Guam Marine Lab. Tech. Rep. No. 79, ii, 208 pp.

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Table 1. List of Recreationally Important Fish Species Monitored on Luminao Barrier Reef.

Species

|                                    |                                   |
|------------------------------------|-----------------------------------|
| Carcharhinidae (Sharks)            | <u>Halichoeres hortulanus</u>     |
| + <u>Carcharhinus melanopterus</u> | <u>H. marginatus</u>              |
| Muraenidae (Moray Eels)            | <u>Hemigymnus fasciatus</u>       |
| <u>Echidna nebulosa</u>            | <u>H. melapterus</u>              |
| +Scorpaenidae (Scorpionfishes)     | <u>Macropharyngodon meleagris</u> |
| <u>Scorpaenopsis diabolus</u>      | <u>Novaculichthys taeniourus</u>  |
| Serranidae (Groupers)              | <u>Thalassoma hardwicki</u>       |
| <u>Epinephelus marra</u>           | <u>T. purpureum</u>               |
| Lutjanidae (Emperors)              | Scaridae (Parrotfishes)           |
| <u>Lutjanus fulvus</u>             | <u>Calotomus</u> sp.              |
| Nemipteridae (Monocle Breems)      | <u>Scarus brevifilis</u>          |
| <u>Scolopsis cancellatus</u>       | <u>S. frontalis</u>               |
| Gerreidae (Mojarras)               | + <u>S. oviceps</u>               |
| <u>Gerres</u> sp.                  | <u>S. psittacus</u>               |
| Lethrinidae (Emperors)             | + <u>S. schlegeli</u>             |
| <u>Gnathodentex aureolineatus</u>  | <u>S. sordidus</u>                |
| <u>Lethrinus harak</u>             | + <u>S. rubroviolaceus</u>        |
| <u>L. xanchocheilus</u>            | Acanthuridae (Surgeonfishes)      |
| + <u>Monotaxis grandoculus</u>     | <u>Acanthurus glaucopareus</u>    |
| Mullidae (Goatfishes)              | <u>A. lineatus</u>                |
| <u>Mulloidas flavolineatus</u>     | <u>A. mata</u>                    |
| <u>M. vanicolensis</u>             | + <u>A. nigricaudus</u>           |
| <u>Parupeneus barberinus</u>       | <u>A. nigrofuscus</u>             |
| <u>P. bifasciatus</u>              | <u>A. nigroris</u>                |
| <u>P. cyclostomus</u>              | <u>A. triostegus</u>              |
| <u>P. pleurostigma</u>             | <u>Ctenochaetus striatus</u>      |
| <u>P. trifasciatus</u>             | + <u>Naso annulatus</u>           |
| Pomacentridae (Damsel-fishes)      | <u>N. lituratus</u>               |
| <u>Abudefduf septemfasciatus</u>   | <u>N. unicornis</u>               |
| Labridae (Wrasses)                 | <u>N. vlamingi</u>                |
| <u>Anampses caeruleopunctatus</u>  | <u>Zebrasoma veliferum</u>        |
| <u>Cheilinus chlorurus</u>         | Signaidae (Rabbitfishes)          |
| <u>C. trilobatus</u>               | <u>Siganus spinus</u>             |
| <u>Cheilio inermis</u>             | Monocanthidae (Filefishes)        |
| <u>Coris aygula</u>                | <u>Cantherhines dumerili</u>      |
| <u>C. gaimardi</u>                 | Balistidae (Triggerfishes)        |
| <u>Epibulus insidiator</u>         | <u>Rhinecanthus aculeatus</u>     |
|                                    | <u>R. rectangulus</u>             |

\*Only those individuals over 7 cm FL are considered. Species not listed that may reach 12.5 mm FL were not considered. Holocentrids were not monitored due to their propensity to stay hidden during daylight hours. Elongate species (Belonidae, Hemiramphidae, Aulostomidae, Fistulariidae) were not considered. Juvenile mullids, scarids and acanthurids under 7 mm are currently being monitored, but are not treated in this preliminary report.

+Not listed in Myers (1982).

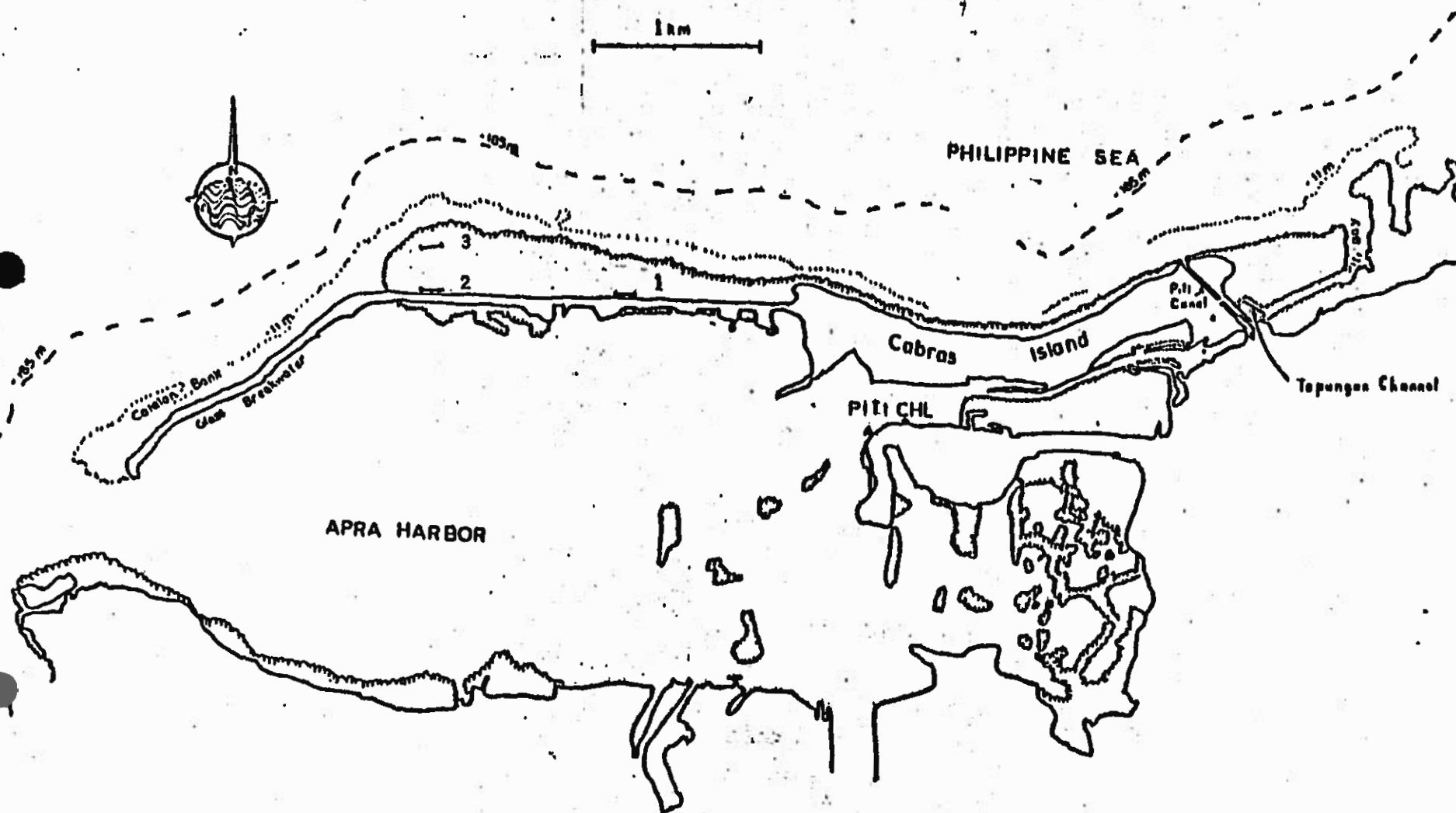


Figure 1. Map of the Luminao-Piti reef system showing locations of fish transects.

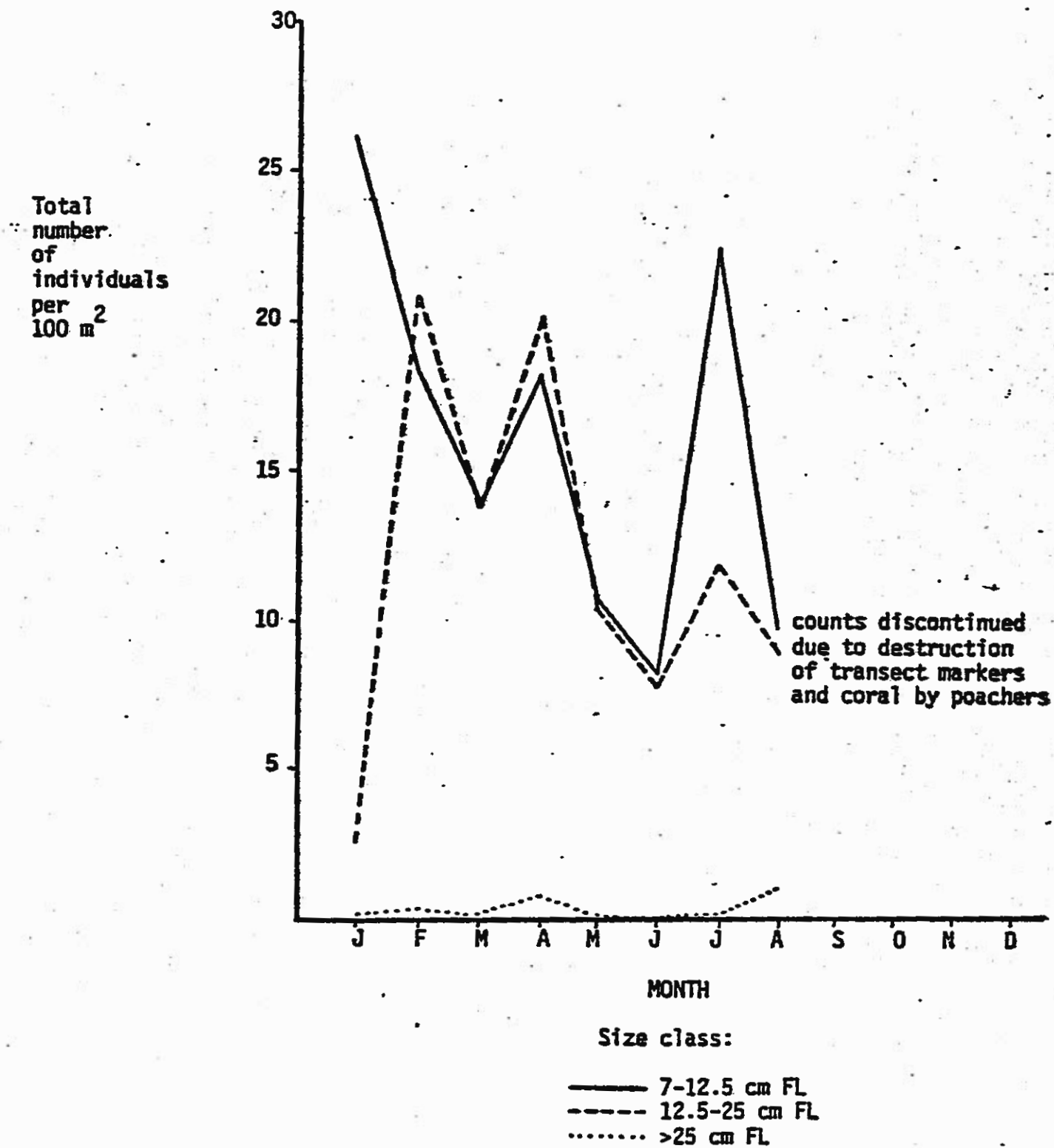


Figure 2. Density of recreationally valuable fishes at site 1 during 1982.