Description of the Tiger Grouper (*Mycteroperca tigris*) Fishery of Vieques Puerto Rico, During 1995

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ABSTRACT

Several western Atlantic grouper species are known to aggregate for spawning at specific times. The tiger grouper (*Mycteroperca tigris*) has been reported to aggregate in the waters between Vieques Island (belonging to Puerto Rico) and the U.S. Virgin Islands. It also has been noted to aggregate off Honduras. Due to the large size of *M. tigris*, the species is not marketed in the U.S. Virgin Islands, where people prefer fish of small sizes to diminish the chances of ciguatera. This is not the case in Puerto Rico, where this species is marketable despite it's size. The aggregations of this species initiate 2 days after the full moons of February, March and April of each year. The duration of each aggregation is approximately seven days. The aggregation period is close to the religious tradition of Easter when fish is heavily consumed. This may be one of the reasons for the high demand of exploitation of this species during it's aggregation, with a good market for sale in Puerto Rico.

Two days before the full moon and seven days after the full moon, for the months of February, March and April of 1995, personnel of the Fisheries Research Laboratory visited Vieques Island. They collected data of the landings and biostatistics of the *M. tigris* fishery.

During February, approximately 840 individuals were caught and weighed 3,412 pounds. A total of 249 individuals (47 females, 189 males and 13 unknown) were measured and weighed for biostatistical analysis. In March, approximately 1,660 individuals were caught, and weighed 7,554 pounds. A total of 739 individuals (86 females, 739 males and 5 unknown) were measured and weighed for biostatistical analysis. Most individuals were caught using hand lines. During April no aggregations were reported.

Landings data and length frequency analysis are discussed.

Keywords: *Mycteroperca tigris*; Reproduction; Aggregation; Fishery; Management; Grouper.

INTRODUCTION

Groupers (Serranidae) are of considerable commercial and recreational significance throughout the Caribbean, Gulf of Mexico, Southeastern USA and Bermuda (Sadovy, in prep.). Grouper species share a number of life-history characteristics believed to render them particularly vulnerable to human exploitation (Manooch, 1987; Ralston, 1987). Bannerot (*et al.* 1987) mentioned that many species exhibit a sexual pattern incorporating adult sex change (female

to male sex change, known as protogyny) making them more sensitive to fishing pressure than gonochore (non sex changing) species. Sadovy (in prep.) mentioned that some species spawn in large numbers at well- defined times and locations each year. Many of these spawning aggregations are thus easily located in both time and space and have been heavily fished.

Puerto Rico landings show that during the decades of the 60's and 70's, the Nassau grouper (*Epinephelus striatus*) was the most fished grouper species. This species was highly exploited during the aggregation periods. Presently, *Epinephelus striatus* is not an important commercial fishery species because only few are landed, and those landed are mostly juveniles. On the other hand, the red hind (*Epinephelus guttatus*) has a attained greater commercial importance, being heavily fished during it's annual aggregations. It has become the most caught grouper species. Sadovy *et al.* (1994) mentioned that heavy fishing pressure on the *Epinephelus guttatus* aggregations could diminish the reproductive success, probably causing poor recruitment into the population. These examples clearly suggest that while aggregations and associated stocks can withstand light levels of fishing for extended periods, as soon as effort intensify aggregations suffer and local stocks decline (Sadovy, 1993).

In 1984 a Vieques local diver discovered the tiger grouper (*Mycteroperca tigris*) aggregation. In 1988, Vieques commercial fishermen reported the aggregation to government officials. The aggregation period occurs near to the religious tradition of Easter, when fish is heavily consumed. This may be one of the reasons for the high demand of exploitation of this species during it's aggregation, with a good market for sale in Puerto Rico. In 1992, Sadovy *et al.* (1992), described the biological aspects of the aggregation. During 1993 and 1994, personnel of the Department of Natural and Environmental Resources (DNER) tried to monitory the aggregations, but obtained limited information. Finally in 1995, monitoring of the aggregation was undertaken obtaining significant data. The purpose of this paper is to describe the Vieques's fishery of the *M. tigris* during the aggregation.

METHODS

Sadovy *et al.* (1992) mentioned that the *M. tigris* aggregation in Vieques (Fig 1), occurs during the months of February, March and sometimes in April. Each month the aggregation starts 2 days after the full moon, continuing for the next 4-5 days. Personnel of the Fisheries Research Laboratory (FRL) of the DNER visited Vieques Island 2 days before the full moon, and stayed up to 7 days after the full moon. The first trip to monitor the aggregation occurred during February 16-24, 1995. The second trip to monitor the aggregation occurred from March 16-24. The final trip was from April 17-21, but no aggregation was reported in April by FRL personnel or commercial fishermen.

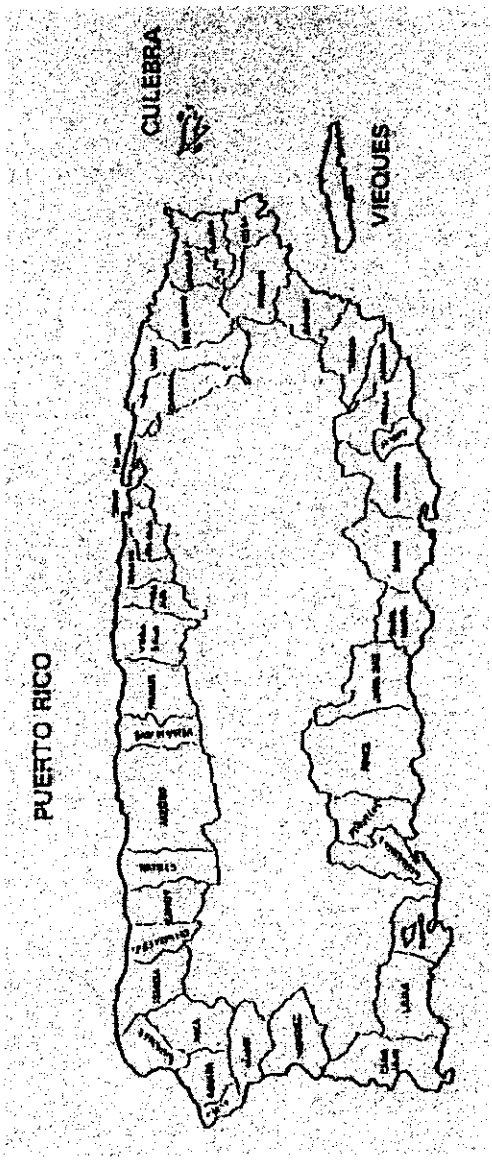

Figure 1. Map of Puerto Rico, Vieques and Culebra.

Monitoring took place each day from 6:00 AM - 3:00 PM, with FRL personnel visiting the most frequently commercial fishing landing areas of Vieques. These are located at Barrio Isabel II and Barrio La Esperanza. Monitoring consisted in the collection of:

1.Landings data - the number of pounds and estimate the number of individuals caught. Data was determined from observations of landings at dockside and interviews with commercial fishermen and fish buyers everyday.

2. Biostatistics data - measured total length (TL) in millimeters (mm) and weighed (gr) individuals caught by commercial fishermen. Also, FRL personnel tried to macroscopically sex every individual sampled.

3. Catch per unit effort data.

4. Gonads - reproductive biology studies.

5. Otholiths - age and growth studies.

For this paper gonads and otholiths analysis will not be discussed.

RESULTS

Landings

Fishing sites for aggregations of *M. tigris* during February and March 1995 occurred at a deep reef known locally as "El Seco", with coordinates 18 07" N, 650 11' 40"W. The depths at which fishing occurred was between 18 - 24 fathoms. Fishermen used boats from 18-25 feet long and motors with 25 -70 horsepower. Most of the fishermen reported that they traveled 1 hour to arrive to "El Seco". Fishermen used hook and line, with either parrotfishes, triggerfishes, doctorfish or squirrelfishes as bait. SCUBA divers caught fishes by harpoon.

During the *M. tigris* aggregation of February 1995, a total of 3,412 pounds were landed. A total of 840 individuals were caught. Full moon occurred on February 15. The day with the most landings of *M. tigris* reported, was February 17, when 885 pounds were reported (Figure 2). Average landings of the *M. tigris* fishery by trip was 67 pounds. Hook and line was the only gear used during this aggregation. FRL personnel obtained reports from fishermen that claimed that strong winds and strong currents affected their activities. Divers claimed that weather conditions stopped them from fishing the *M. tigris* aggregation during February.

During the *M. tigris* aggregation of March 1995, a total of 7,554 pounds were landed. A total of 1,660 individuals were caught. The day with the most landings of *M. tigris* reported was March 21, when 1,822 pounds were reported (Figure 3). Fishermen claimed that favorable weather occurred during the aggregation. Landings by gear analysis showed that 84% of the fishing trips used hook and line, and 16% used SCUBA divers. On March 23, one SCUBA diver was affected by bends while fishing the aggregation. These were the only fishing gears used in the *M. tigris* aggregation fishery. Average landings of the

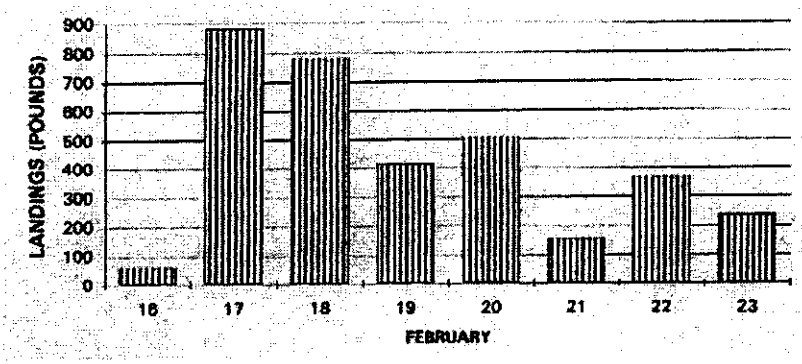

Figure 2. Landings of *Mycteroperca tigris* per day during the aggregation of February 16-24, 1995, at Vieques Puerto Rico. (Full Moon was 2/15/95)

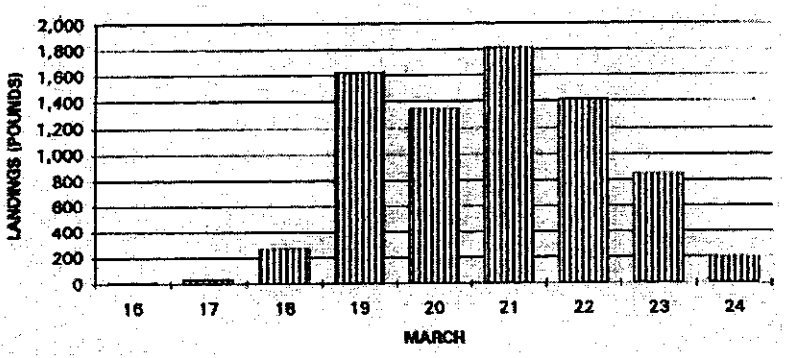

Figure 3. Landings of Mycteroperca tigris per day during the aggregation of March 16-24, 1995, at Vieques Puerto Rico. (Full Moon was 2/15/95)

M. tigris fishery by trip was 147 pounds. The March aggregation occurred 3 weeks from Good Friday. The high demand of this species was observed because 3 fishbuyers from Puerto Rico traveled to Vieques Island and bought most of the landings. Only one local restaurant bought and sold *M. tigris* to the local consumers, specially Vieques tourists.

The price per pound of *M. tigris* from the fishermen to the fish buyer was $1.50. The aggregation of February and March produced approximately $16,449.00 USA Dollars (10,966 pounds x $1.50 = $16,449). A total of twelve boats and approximately 30 fishermen participated in the fishing activity. The average income per fishermen for both aggregations was estimated as $530.00 USA Dollars.

Biostatistics

During the *M. tigris* aggregation of February 1995, biostatistics data was collected from 16 fishing trips. A total of 201 individuals were sampled (Figure 4). One hundred-eighty- eight individuals were macroscopically sexed, with 46 individuals identified as females, and 142 as males (Figure 5). All fishing trips during this aggregation were made using hook and line. Average weight of the individuals caught was 2.46kg (5.4 pounds) and STD = 0.97 . The average total length (TL) was 499mm (19.6in) and STD = 58. Maximum length was 700mm TL (27.6in), minimum length 251mm TL (9.9 in). Catch per unit effort for hook and line was 5.36 pounds/hook/hour.

During the *M. tigris* aggregation of March 1995, biostatistics data was collected from 32 fishing trips. A total of 786 individuals were sampled (Figure 6). Seven hundred- eighty-two individuals were macroscopically sexed, with 134 identified as females, and 648 as males (Figure 7). Twenty-seven fishing trips during this aggregation used hook and line (84%) to catch *M. tigris*, and 5 fishing trips used SCUBA divers (16%). Average weight of the individuals caught was 2.20Kg (4.9 pounds) and STD = 0.74 . The average length was 507mm TL (20.0in) and STD = 57. Maximum length was 755mm TL (29.7in), minimum length 280mm TL (11.0in). Catch per unit effort for hook and line was 12.25 pounds/hook/hour. Catch per unit effort for SCUBA divers was 5.53 pounds/diver/hour.

DISCUSSION

Landings

During 1993 and 1994, the Puerto Rico government tried to monitor this fishery (Padilla and Matos, 1993; Lilyestrom, 1994). Unfortunately, the attempts were not successful. Finally in 1995, the monitory effort was successful. To improve the monitoring effort, personnel arrived at Vieques 2 days before the full moon for January, February, March and April, and stayed for the next 7 days.

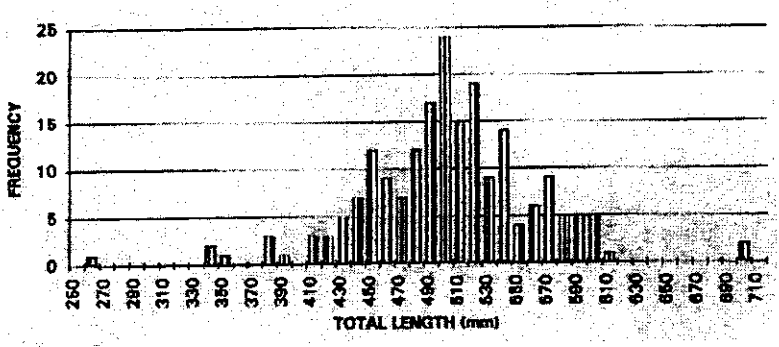

Figure 4. Length Frequency distribution of *Mycteroperca tigris* during the aggregation of February, 1995. (n=201)

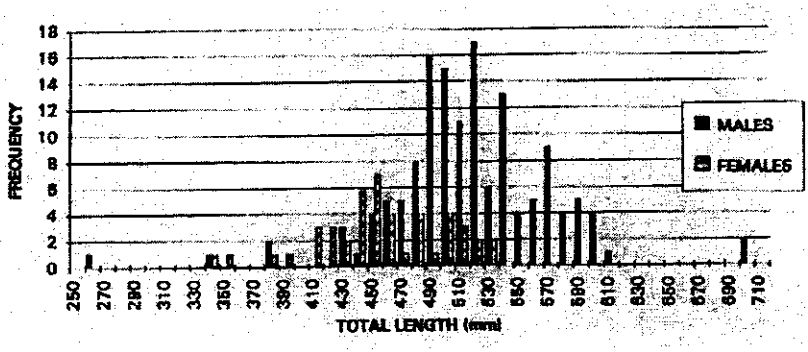

Figure 5. Length frequency distribution of *Mycteroperca tigris* by sex caught during the aggregation at Vieques, Puerto Rico in February 1995. Males n = 142, Females = 46

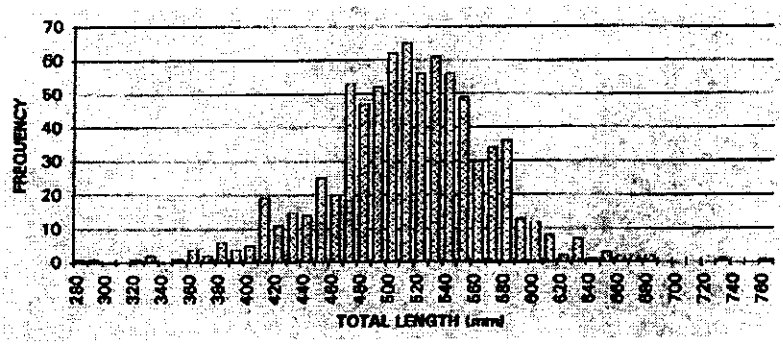

Figure 6. Length Frequency distribution of *Mycteroperca tigris* during the aggregation of March, 1995. (n=786)

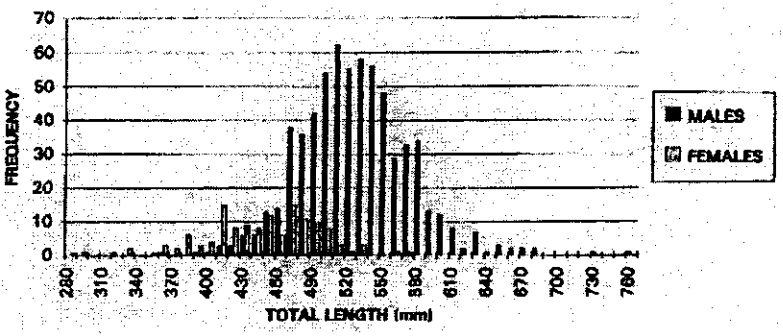

Figure 7. Length frequency distribution of *Mycteroperca tigris* by sex caught duriung the aggregation at Vieques, Puerto Rico in March 1995. Males n = 648; Females = 134

"El Seco", "La Iglesia", and specific areas in waters adjacent to Culebra and Saint Thomas, have been reported by Vieques fishermen as being excellent areas to fish the aggregations of *M. tigris*. However, during this research it was observed that Vieques fishermen preferred to fish at "El Seco". Only 1 landing came from "La Iglesia" (2.2% of the total fishing trips reported in March), and no reports of landings of *M. tigris* from Culebra, or from the other area close to Saint Thomas were received. One port agent from the FRL visited Culebra Island and interviewed fishermen and fish buyers to collect data about the existence of a fishery on the aggregation of *M. tigris* from that Island. Contrary to what the Vieques fishermen mentioned, all the interviewed persons mentioned that they did not know about an *M. tigris* aggregation off waters of Culebra and that they had never before fished the aggregation. Sadovy *et al.*(1992) with the cooperation of the Vieques fishermen, described the aggregation at "El Seco". In the future, it is necessary to continue monitoring this fishery to confirm how many aggregations exist close to Vieques.

The landings of the March aggregation were twice as large as those of February. Probably, the February aggregation was protected by bad weather from fishermen.

The aggregation is economically successful to the fishermen ($530.00 USA Dollar per fishermen). The aggregation period is close to the religious tradition of Easter when fish is heavily consumed, this facilitates the marketing of this species and helps to keep a good price for fishermen and fish buyers. Catch per unit effort by trip showed that this fishery is very sustainable at this time. Future monitoring of the aggregation is necessary to wisely manage the vulnerable *M. tigris* stocks.

Biostatistics

Most individuals caught during the aggregation of February and March were adults. Only 1.8% of the total individuals sampled were immature, for both aggregations. During the February aggregation the male-female rate was 3:1 and during March the rate was 5:1. Böhlke and Chaplin (1993) mentioned that this species has shown indications of sex reversal. Smith (1958; 1959) showed evidence that *M. tigris* is protogynous hermaphrodite. Smith 1959 worked with *M. tigris* in Bermuda and determined that individuals that measured less than 370 mm TL were females and individuals larger than 450mm TL were males. Macroscopic observations during 1995, showed several males measuring less than 370mm TL and several females measuring larger than 450mm TL. Lilyestrom (1994) also reported females larger than 450mm TL. These observations should be confirmed with microscopic observations.

Randall (1983) reported that the largest individual of *M. tigris* was caught off Bermuda and recorded a total length of nearly 40in (1001mm). Sadovy *et al.*(1992), Padilla and Matos (1993) and Lilyestrom (1994) reported their largest

sampled individuals as measuring between 580-650mm TL. This research sampled it's largest individuals measuring between 700-760mm TL.

Commercial fishermen reported in 1988 that the *M. tigris* aggregation was fished mostly by SCUBA divers. This research noted that only 16% of the total fishing trips in March, were caught by SCUBA divers. Catch per unit effort by gear showed that hook and line is a more efficient gear than divers. Presently, fishermen have reported that many SCUBA divers have been affected by bends, and so that fewer of them are fishing the aggregation. The aggregation occurred between 18 fathoms (108 feet) - 24 fathoms (144 feet). These depths are very dangerous to practice commercial SCUBA diving fishing. On the other hand, the possibility exists that during the previous years the aggregation occurred in shallower waters than today,

CONCLUSION

The aggregation of *M. tigris* in 1995 was successfully monitored. No signs of overfishing were detected. The methods used to collect the data to monitor the aggregation of *M. tigris* should be repeated every future year to obtain the necessary information to wisely manage this vulnerable species.

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