COMPARISON OF SIZE OF CAPTURE OF *SPARISOMA VIRIDE* AND *SPARISOMA CHRYSOPTERUM* IN PUERTO RICO USING TRAPS AND ENTANGLEMENT NETS DURING 1988-92.

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ABSTRACT

Puerto Rico's fishery consists primarily of shallow water reef fishes and shellfish (mainly lobster and conch). The Fisheries Research Laboratory (FRL) of the Puerto Rico Department of Natural Resources is continuously collecting data to evaluate the status of the fisheries resource.

Throughout 1988-92, FRL's port agents randomly selected complete samples of commercial landings around the 42 coastal municipalities to obtain landings data (pounds of fish and shellfish landed) and biostatistical data (identified individuals by species, measured in fork length and weighed).

Parrotfishes (Scaridae) have become an important commercial fish group in Puerto Rico. In 1970, a total of 356,305 pounds of parrotfishes were reported, representing 8% of the total catch reported of fish and shellfish. However, parrotfishes landings have shown a decrease since 1980. In 1992, a total of 92,136 pounds were reported in the landings, representing 5% of the total catch of fish and shellfish.

Parrotfishes are caught mostly by entanglement nets (trammel net and gill net) and traps. From 1988-92, The stoplight parrotffish (Sparisoma viride) and redtail parrotfish (Sparisoma chrysopterum) were the most reported parrotfish species in Puerto Rico. Analysis of the 1988-92 biostatistical data showed that entanglement nets caught S. viride individuals with an average fork length (FL) of 279mm (± 35), and 268mm (± 30) for S. chrysopterum. During the same period, traps caught individuals

with an average FL of 261mm (± 36) for S. *viride* and 249mm (± 29) for S. *chrysopterum*. Analysis of length frequency distribution (LFD), Kolmogorov-Smirnov test for S. *viride* and S. *chrysopterum*, by gear showed that traps caught significantly smaller individuals than entanglement nets for both species ($P \leq 0.05$).

Analysis of LFD (Kolmogorov-Smirnov test), comparing the year of 1988 versus 1992 for all gears for S. *viride* and S. *chrysopterum*, showed that in 1988 commercial fishermen caught significantly larger individuals than in 1992 ($P \leq 0.05$).

Key Words: Commercial Fishery; Scaridae; Entanglement nets; Traps; Biostatistics; Management.

INTRODUCTION

Since 1970, the Fisheries Research Laboratory (FRL) of the Puerto Rico's Department of Natural Resources (DNR) has been collecting data (e.g. landings estimates, biostatistics and fishery census) to evaluate the fishery resources around the 42 coastal municipalities. Fishery data analysis indicates that growth overfishing appears to be a major problem in Puerto Rico's fishery. One indication of overfishing is the large number of small fishes being landed, for example, high percentages of Lutjanus vivanus, Epinephelus guttatus, Ocyurus chrysurus and Panulirus argus are caught before reaching minimum size of sexual maturation (Matos, in press a; in press b; Appeldoorn, et. al. 1992). Another indication of overfishing is the recent decline in total landings, for example, 7.21 millions of pounds in 1979 (Collazo and Calderón, 1987), decreasing to 2.04 million of pounds in 1992 (Matos, 1993). Fishery managers need information that describe how each gear exploits the resource in a different way, producing a different species composition and a different size distribution of individuals. To better evaluate resource status and monitoring resource management, it is necessary to understand the effects of gear type on the catch profile.

Parrotfishes (Scaridae) are tropical shallow water fishes that abound on coral reefs and adjacent areas (Reeson, 1983). During the decade of the 70's, parrotfishes represented approximately 10% of the total landings reported in Puerto Rico (Suárez-Caabro, 1979). In 1979, 382,000 pounds of parrotfishes

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were reported, representing 5% of the total catch (Collazo Y Calderón, 1987). In 1992, only 92,136 pounds of parrotfish were reported, but also represented 5% of the total catch (Matos, 1993). Market price for parrotfishes were low in the past because fish consumers considered that its meat was spiny, however, currently parrotfishes are easily sold at good prices. For example, in 1992 the average price was $1.35/pound (Matos, 1993). It is probable that the increase in market has occurred due to the existing high demand of fresh fishes, and fewer landings than in the past. Biostatistical records showed that Sparisoma viride and Sparisoma chrysopterum are two of the most frequently caught parrotfish in Puerto Rico's fishery (Acosta, 1992; Rosario and Sadovy, 1991; Appeldoorn, et. al., 1992). Traps and entanglement nets (trammel nets and gill nets) are the gears that reported higher catches of parrotfishes in Puerto Rico (Suárez-Caabro, 1979; Matos and Sadovy, 1990; 1991; Matos, 1992; 1993).

The objectives of this investigation were: 1) to compare the length frequency distributions (LFD) of S. viride and S. chrysopterum caught by traps versus those caught by entanglement nets in order to know how both gears exploit each species 2) to compare LFD of S. viride and S. chrysopterum caught by every type of gear in 1988 versus 1992, to know if the resource has been significantly affected.

METHODS

From 1988-92, five port agents of the FRL visited landing areas around the 42 coastal municipalities of Puerto Rico including the municipality islands of Vieques and Culebra. Port agents visited different fishing centers four days per week and randomly selected fishermen landings to collect biostatistical data of fish and lobster. They proceeded to identify individuals caught at the species level, and each individual was measured in fork length (FL) in millimeters and weighed in grams. Only data from S. viride and S. chrysopterum were considered in this report. Port agents delivered the data to FRL statistics clerks, who checked and entered it in IBM PC format using DBASEIII+ (1988-91 data) and Trip Interview Program (1992 data). Data analysis were made using software Lotus 123 and Microsoft Excel. The LFD were compared statistically using Kolmogorov-Smirnov Two Sample Test, $P \leq 0.05$ (Sokal and Rohlf, 1981).

RESULTS

The average FL by gear and by year for S. viride and S. chrysopterum from 1988-92 showed that entanglement nets tended to catch larger individuals than traps (Table 1 and 2).

The LFD for S. viride caught by traps during 1988-92 showed that the higher frequency class was 250mm (Figure 1). The LFD for S. viride caught by entanglement nets during 1988-92 showed that the higher frequency class was 260mm (Figure 2). Kolmogorov-Smirnov test demonstrates significant difference in

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the LFD of S. viride caught by traps versus entanglement nets for years 1988-92 (Dmax = 0.2044). The LFD for S. viride caught by all gears in 1988 showed that the higher frequency class was 280mm (Figure 3). The LFD for S. viride caught by all gears in 1992 showed that the higher frequency class was 260mm (Figure 4). Larger individuals were fewer in 1992. Kolmogorov-Smirnov test demonstrates significant difference in the LFD catch by all gears in 1988 versus caught in 1992 (Dmax = 0.1696).

Figures 5 and 6 showed that a tendency to catch larger individuals of S. chrysopterum by entanglement nets (higher frequency class was 270mm) versus traps for the same period (higher frequency class was 260mm). Kolmogorov-Smirnov test demonstrates significant difference in the LFD of S. chrysopterum caught by traps versus entanglement nets for years 1988-92 (Dmax = 0.3464). The LFD for S. chrysopterum caught by all gears in 1988 caught more individuals in the higher frequencies classes (300mm - 350mm) than in 1992 (Figure 7 and 8). Kolmogorov-Smirnov test demonstrate significant difference in the LFD catch by all gears in 1988 versus caught in 1992 (Dmax = 0.1048).

DISCUSSION

Significantly larger individuals of S. viride and S. chrysopterum were caught by entanglement nets than fish traps (Table 1 and 2; Figures 1,2,5 and 6). Traps were the most used and productive gear in Puerto Rico's fishery from 70's (Collazo y Calderón, 1987) to late 80's (Matos, 1993). In 1982, traps

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reported approximately 71% of the total catch reported (all species of fish and shellfish) in the Island (Collazo and Calderón, 1987), but in 1992, traps reported only 27% (Matos, 1993). Commercial fishermen explained that traps are less efficient today that they were in the past years. Independent data of the FRL reported that in 1991 average pounds per trap (1.25 inch mesh size) per haul was 0.5 (Rosario and Sadovy, 1991). On the other hand, in 1970 the average pounds per trap (1.25 inch mesh size) was 6.0 (Juhl and Suárez-Caabro, 1975). Puerto Rico's fishermen are increasing the use of entanglements nets. In 1982 all nets (beach seine, gill net, trammel net, and cast net) were approximately 12% of the total catch (Collazo and Calderón, 1987) and in 1992 they increased to 24% (Matos, 1993). The trap tends to select smaller individuals than entanglement nets of both studied species. A similar trap tendency was observed for the grouper <u>Epinephelus</u> <u>guttatus</u>, and the snappers <u>Ocyurus</u> <u>chrysurus</u> and <u>Lutjanus</u> <u>vivanus</u> (Matos, in press a).

Individuals of <u>S.</u> <u>viride</u> and <u>S.</u> <u>chrysopterum</u> caught during 1988 were significantly larger than those in 1992 (Figures 3,4,7 and 8). When species reduce their catch size, it is probable that the resource could be overexploited (Bohnsack, 1993). During the last six years, it has been observed that Puerto Rico's fishery has shown signs of overfishing. It is then necessary to consider the probability that these species could be overexploited. However, more data is necessary to reach a more precise conclusion.

The ecological and economics importance of Scaridae (Gygi, 1975; Reeson, 1983) demonstrates the need to develop more studies to understand the real status of this resource. It is also necessary know more about the life history (e.g. minimum size of sexual maturation, reproduction strategies, dispersion, growth, etc.) of *S. viride, S. chrysopterum* and other Scaridae species.

ACKNOWLEDGEMENT

LITERATURE CITED

Acosta, A. 1992. A preliminary study of gill net, trammel net, and beach seine catches from southwest Puerto Rico with notes on length-frequency. *Proceedings of the Gulf and Caribbean Fisheries Institute*. 41: 123-149

Appeldoorn, R., J. Beets, J. Bohnsack, S. Bolden, D. Matos, S. Meyers, A. Rosario, Y. Sadovy and W. Tobias. 1992. Shallow water reef fish stock assessment for the U.S. Caribbean. NOAA Technical Memorandum NMFS-SEFSC-304, 70 pp.

Bohnsack, J.A. 1993. Marine reserves: they enhance fisheries, reduce conflicts, and protect resources. *Oceanus* 36 (3): 63-72

Collazo, J. and J. Calderón. 1987. Status of the fisheries in Puerto Rico 1979-82. Technical Report. CODREMAR 1 (2): 1-30.

Gygi, R.A. 1975. _Sparisoma viride_, a major sediment producer in corals reefs of Bermuda. _Ecoalgae Geol. Helv._ 68: 327-359.

Juhl, R. and J. A. Suárez-Caabro. 1975. La pesca en Puerto Rico, 1970. Reporte Técnico. Cont. Agrop. Pesq. 3(1): 1-32.

Matos, D. In press a. Comparison of size of capture using hook and line, fish traps and gill nets of five species of commercial fish in Puerto Rico. _Proceedings of the 44th Gulf and Caribbean Fisheries Institute_.

Matos, D. In press b. Comparison of size of capture using trap and diving of spiny lobster (_Panulirus argus_) in Puerto Rico, 1988-91. _Proceedings of the 45th Gulf and Caribbean Fisheries Institute._

Matos, 1992. Commercial fisheries statistics: Puerto Rico/State Federal Cooperative Statistics Program. Department of Natural Resources Annual Report to the National Marine Fisheries Service. Mayaguez. PR 55 pp. MS.

Matos, 1993. Commercial fisheries statistics: Interjurisdictional Fisheries Program. Department of Natural Resources Annual Report to the National Marine Fisheries Service. Mayaguez. PR 64 pp. MS.

Matos, D. and Y. Sadovy. 1990. Overview of Puerto Rico Small-Scale Fisheries Statistics. Technical Report. CODREMAR 1(4): 1-17.

Matos, D. and Y. Sadovy 1991. Commercial fisheries statistics: Puerto Rico/State Federal Cooperative Statistics Program. Department of Natural Resources Annual Report to the National Marine Fisheries Service. Mayaguez. PR 53 pp. MS.

Reeson, P.H. 1983. The biology, ecology and bionomics of the parrotfishes, Scaridae. Pages 166-177 _in_ J.L. Munro ed. _Caribbean coral reef resources_. ICLARM.

Rosario, A. and Y. Sadovy. 1991. Trap mesh selectivity off the west coast of Puerto Rico. Puerto Rico Department of Natural Resources. Mayaguez. PR 60 pp. MS.

Sokal, R. R. and F. J. Rohlf. 1981. _Biometry_. 2nd ed. W. H. Freeman and Co. San Francisco CA. 859 pp.

Suárez-Caabro, J. A. 1979. _El mar de Puerto Rico._ Primera edición. Editorial Universitaria, San Juan PR. 259 páginas.

TABLE 1. SPARISOMA VIRIDE AVERAGE FORK LENGTH (mm) BY GEAR AND BY YEAR IN PUERTO RICO DURING 1988-92

Year	Traps			Entanglement Nets		
	n	Average	Standard Deviation	n	Average	Standard Deviation
1988	292	281	37	280	280	41
1989	108	259	38	325	274	33
1990	129	255	32	621	281	34
1991	180	252	39	619	281	31
1992	317	256	33	296	280	34
1988-92	1,026	261	36	2,141	279	35

TABLE 2. SPARISOMA CHRYSOPTERUM AVERAGE FORK LENGTH (mm) BY GEAR AND BY YEAR IN PUERTO RICO DURING 1988-92

Year	Traps			Entanglement Nets		
	n	Average	Standard Deviation	n	Average	Standard Deviation
1988	368	250	33	149	267	50
1989	362	250	29	173	265	34
1990	314	245	28	364	272	18
1991	538	249	31	311	269	29
1992	330	249	25	173	267	21
1988-92	1,912	249	29	1,170	268	30

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FORK LENGTH (mm)