

Portrait of the Fishery of *Sparisoma viride* and *Sparisoma chrysopterum* in Puerto Rico During 1988 - 2001

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ABSTRACT

The Puerto Rico Department of Natural and Environmental Resources (PRDNER) has the mission to wisely manage and conserve the fishery resources of its territory. The PRDNER Fisheries Research Laboratory has a 32 years old program entitled "Commercial Fisheries Statistics Program" (CFSP). The objective of this program is to collect and analyze data from commercial fishing activity. This data collection is based on fishery dependent data for landings in pounds (by species, by municipality, by gear, CPUE, etc.) and biostatistics data (sampling fork length at species level, CPUE, etc). Puerto Rico's marine commercial fishery is artisanal, multispecies and multigear.

Parrotfishes (Scaridae) probably have been fished in Puerto Rico before the arrival of Christopher Columbus, by the Taínos that used nets and arrows. However, the 1970s data showed that most of the parrotfishes were considered trash fish and the cost per pound was very low. During the 1980s the parrotfishes were considered third class. During this period Puerto Rico's fisheries started to show overfishing symptoms. During the 1990s the parrotfishes were considered second class quality, and it was observed by CFSP that in San Juan's metropolitan area parrotfishes were sold as first class quality. Probably because of the decrease in snappers (Lutjanidae) and groupers (Serranidae), the demand for parrotfishes increased. During the last fifteen years, the most important catch in pounds and numbers for trammel net fishers have been the parrotfishes. The most common species of parrotfishes caught are *Sparisoma viride* and *Sparisoma chrysopterum*.

This report will discuss the *S. viride* and *S. chrysopterum* landings and biostatistics collected by CFSP from 1988-2001. Length frequency distribution (LFD) of this species by years, by fish traps, gill nets and trammel nets will be compared.

KEY WORDS: Commercial Fishery, Fish traps, Puerto Rico, Scaridae, Trammel nets.

Descripción de la Pesca de *Sparisoma viride* y *Sparisoma chrysopterum* en Puerto Rico Durante 1988 - 2001

El Departamento de Recursos Naturales y Ambientales de Puerto Rico (DRNAPR) tiene la misión de administrar y conservar el recurso pesquero en su territorio. El Laboratorio de Investigaciones Pesqueras del DRNAPR cuenta con un programa de 32 años de existencia llamado el "Programa de Estadísticas Pesqueras" (PEP). El objetivo de este programa es recolectar y analizar datos sobre la actividad de la pesca comercial. Esta recopilación de información está basada en datos dependientes de los desembarcos en libras (por especie, por municipios, por artes de pesca, CPUE, etc.) y de bioestadísticas (largo de horquilla por especie, CPUE, etc.). La pesca comercial en Puerto Rico es artesanal, es multiespecie y multiarte.

Los loros (Scaridae) han sido capturados en Puerto Rico probablemente desde antes de la llegada de Cristóbal Colón, por los Taínos quienes utilizaban redes y flechas. Sin embargo, los datos reportados para la década de 1970, reflejan que para entonces los loros eran considerados broza y por ende su costo por libra era muy bajo. Durante la década de los 1980, los loros fueron considerados una calidad de tercera clase. En este periodo la pesca en Puerto Rico comenzó a mostrar síntomas de sobrepesca. Durante la década de los años 1990, los loros pasaron a calidad de segunda clase y el PEP observó que en el área metropolitana de San Juan los loros eran vendidos como calidad de primera clase. Probablemente por causa de la disminución de los pargos (*Lutjanidae*) y de los meros (*Serranidae*), la demanda de los loros aumentó. Durante los últimos quince años la captura más significativa en libras y en cantidad para pescadores de mallorquín fueron los loros. Las especies más comunes en la captura de loros son *Sparisoma viride* y *Sparisoma chrysopterum*.

Este reporte discute los datos de desembarcos y las bioestadísticas para *S. viride* y *S. chrysopterum* recopilados por PEP durante 1988 - 2001. Se compara la distribución de frecuencia de tallas (LFD por sus siglas en inglés) de estas especies por años, nasas, trasmallos y mallorquines.

PALABRAS CLAVES: Pesca Comercial, Nasas, Puerto Rico, Scaridae, Mallorquín

INTRODUCTION

The Puerto Rico Department of Natural and Environmental Resources (DNER) is responsible to conserve and manage all the Island's natural resources, including the fishery resources. The DNER's Commercial Fisheries Statistics Program (CFSP) collects and analyzes the dependent fisheries data. The CFSP has been collecting data since 1971. Matos-Caraballo (in press a and b) mentioned that during the 1980s, it was observed that the Puerto Rico's commercial fishery resources had shown overfishing symptoms (e.g. decrease in landings pounds, change in catch composition, decrease in the size of some important species). Species considered in the market as trash during the 1970s,

today have been considered a second class market species (Matos-Caraballo, in press "a" and "b"). One of the best examples of this event is the parrotfishes (Scaridae). The two most important Scaridae species in number of pounds landed and number of individuals caught by Puerto Rico's commercial fishers are the stoplight parrotfish, *Sparisoma viride*, and the redtail parrotfish, *S. chrysopteron*.

Puerto Rico's commercial fishers sell all the parrotfishes by their market price. They do not have common names for the different species of parrotfishes. Thus, all the landings reports to CFSP were by parrotfishes category. However, the CFSP's port samplers collected biostatistical data that shown that *S. viride* and *S. chrysopteron* composed over 90 % of the total parrotfishes reported. The family Scaridae occurs principally at tropical waters. They are supposed to be abundant at shallow coral reefs and adjacent areas (Reeson 1983). Parrotfishes feed throughout the day the in the coral reefs but seldom stray far from their accustomed area. Sea grass is also a favorite food, and the bare area around reefs is often the result of the overgrazing by parrotfishes (Randall 1983). *S. viride* and *S. chrysopteron* are caught mainly by fish traps, gill nets, and trammel nets. Other gear, such as beach seine, SCUBA, and skin divers, also catch parrotfishes. Commercial fishers put the trammel nets and gill nets in areas close to coral reefs before the dawn. Three hours after dawn, fishers are able to catch 200 pounds of Scaridae. On the other hand, *S. viride* and *S. chrysopteron* composed most of the fish traps catch in shallow waters. It is important to describe and understand the commercial fishery of the mentioned species.

The objective of this study was to describe the fishery of *S. viride* and *S. chrysopteron* thru the data collected by the CFSP (landings and biostatistics data) during 1988 - 2001. Length frequency distributions (LFD) of these species by years, fish traps, trammel nets, and gill nets were compared.

METHODS

This report will discuss the *S. viride* and *S. chrysopteron* fishery using two types of dependent data collected by CFSP from 1988 - 2001. First, the landings data were collected by CFSP's port samplers. The commercial fishers and/or fish houses reported their catch in a ticket. Unfortunately, the puertorrican commercial fishers sell all the Scaridae species as parrotfishes. They did not use common names to recognize Scaridae by species.

The second type of data used in this study was biostatistics. This data were also collected by CFSP's port samplers. They visited the fishing centers and randomly selected commercial landings. Then they identified by species all the catch to obtain data about composition. Then port samplers measured the fork length (FL) of each fish in millimeters. If it is possible the whole catch was individually measured and sex is also registered. CFSP's port samplers collect catch per unit effort data (CPUE) in situ when they do the biostatistics sampling. The total landings by trip and by gear, number of traps hauled, and net length in fathoms were recorded.

Port samplers delivered the landings and biostatistics data to CFSP and statistical clerks edited and entered in computers using Microsoft FoxPro and

NMFS Trip Interview Program (TIP). The data were analyzed using length frequency distribution (LFD) of this species by years, fish traps, gill nets, and trammel nets. LFD for both species by years and by gears were analyzed. Kolmogorov-Smirnov Two Sample Test, $p \leq 0.05$ (Sokal and Rohlf 1981) was used to know if there is any significant difference among the comparisons.

RESULTS

Landings data show that a total of 1,136,962 pounds of parrotfishes were reported to the CFSP during 1988 - 2001. The mentioned number of pounds represented a 2.7 % from the total catch reported during the mentioned period. However, it is known by the CFSP' personnel that higher percentage of the pounds reported as second class were also parrotfishes. For this paper only the parrotfishes data were used. Figure 1 shows landings of parrotfishes reported by year during 1988 - 2001. Since 1988 - 1994, parrotfishes reported represented 3.3 % of the total pounds reported of fish and shellfish. Since 1995 - 2001, parrotfishes reported represented a total of 2.6% of the total pounds reported of fish and shellfish. During 1988 - 2001, parrotfishes reported represented a 3.3 % of fishes. For this period the parrotfishes were in the first 10 categories of fish and shellfish landings reported.

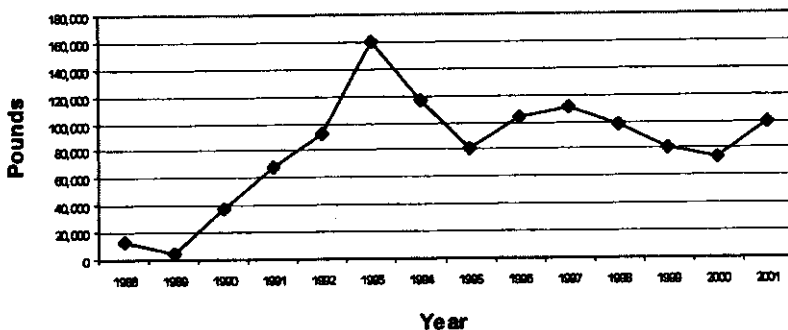


Figure 1. Landings reported of Parrotfishes in Puerto Rico during 1988-2001

Figure 2 shows the trend of landings reported by fish traps, gill net and trammel net during 1988 - 2001. Landings reported by the mentioned gears show that fish traps caught 19.6 % of the 1,136,962 pounds of parrotfishes reported during 1988 - 2001. For the same time period gill nets caught 26.0 % and trammel nets caught 39.6 % of the total landed pounds of parrotfishes reported. On the other hand, fish traps caught 76,898 pounds of parrotfishes during 1988 - 1994, increasing to 146,956 pounds during 1995 - 2001.

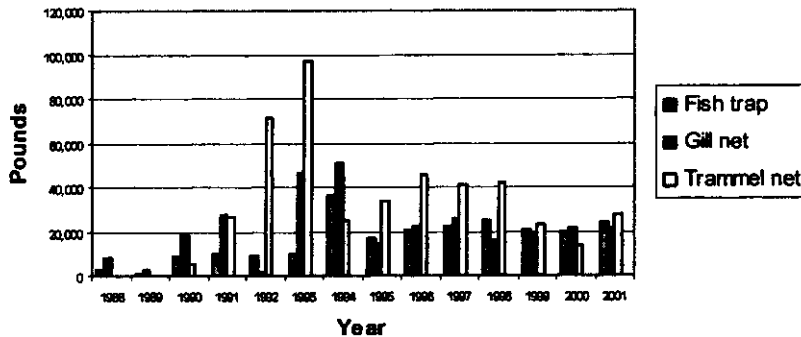


Figure 2. Landings reported of Parrotfishes by fish trap, gill net, and trammel net in Puerto Rico during 1988-2001

Biostatistical data show that from 1988 - 2001, a total of 7,642 individuals of *S. viride* were measured by CFSP port samplers (Figure 3). During the same time period 7,538 individuals of *S. chrysopterus* were measured (Figure 4). The mean FL during 1988 - 1994 for *S. viride* was 275mm and during 1995 - 2001 was 273mm. Kolmogorov-Smirnov Test shows a significant difference in the LFD among both periods of time ($D_{max} = 0.0311$). The mean FL during 1988 - 1994 for *S. chrysopterus* was 259 mm and during 1995 - 2001 was 269 mm. Kolmogorov-Smirnov Test shows a significant difference in the LFD among both periods of time ($D_{max} = 0.1369$).

The mean FL for *S. viride* caught by fish traps during 1988-2001 was 264 mm (Figure 5). For the same time period *S. viride* caught by nets (gill nets and trammel nets) had a mean FL of 276 mm (Figures 6 and 7). Kolmogorov-Smirnov Test shows a significant difference in the *S. viride* LFD among fish traps and nets during 1988 - 2001 ($D_{max} = 0.1249$).

The mean FL for *S. chrysopterus* caught by fish traps during 1988 - 2001 was 254 mm (Figure 8). For the same time period *S. chrysopterus* caught by nets had a mean FL of 271 mm (Figures 9 and 10). Kolmogorov-Smirnov Test shows a significant difference in the *S. chrysopterus* LFD among fish traps and nets during 1988 - 2001 ($D_{max} = 0.1369$).

A total of 120 biostatistics interviews were randomly selected to obtain CPUE estimates data analysis. All interviews include reports mostly of *S. viride* and *S. chrysopterus* and other reef fishes. However, the mentioned species were significant in the catch composition. CFSP started to collect this kind of data since 1990. CPUE data show that during 1990 - 1994 the fish traps had an average catch of 46 pounds/trip. During this period of time fishing trips had an average of hauling 29 fish traps and the average soak time was 3.68 days. It was estimated that every fish trap catch 0.98 pound/day. On the other hand, for the period of 1995 - 2001, fish traps show a landings increase obtaining an average of 91.2 pounds/trip. During this period reef fishes fishing trips had an average of hauling 52 fish traps and the average soak

time was 4.50 days. It was estimated that every fish trap catch 0.65 pound/days.

Nets (gill nets and trammel nets) interviews showed that over 75 % of their catch composition were *S. viride* and *S. chrysopterum*. During 1990 - 1994, CPUE data shows that nets had an average catch of 45 pounds/trip. During this period of time the nets had a fishing trip average of 344 fathoms and 5.45 hours average soak time. It was estimated that 0.79 pound/fathom/hour. On the other hand, for the period of 1995 - 2001, nets show a parrot-fishes landings increase obtaining an average of 144 pounds/trip. During this period of time reef nets fishing trips had a nets average length of 588 fathoms. Nets/trip had an average 5.00 hours soak time. It was estimated that every net catch 1.58 pound/fathom/hour.

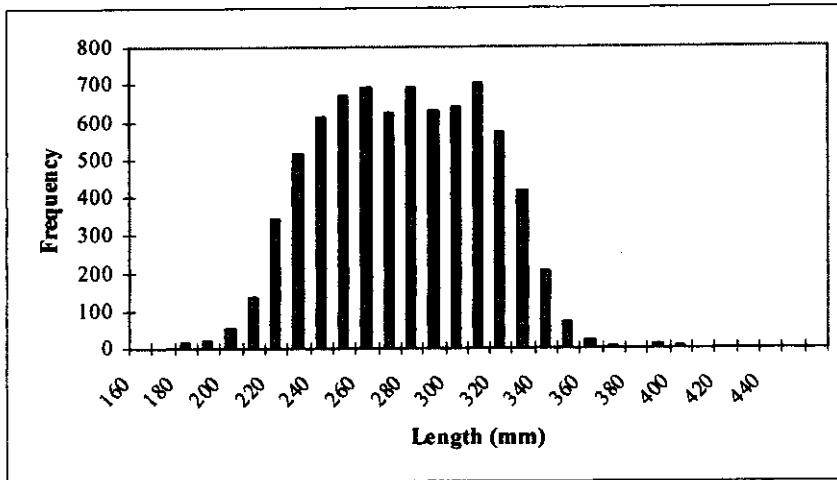


Figure 3. Length-frequency distribution for *Sparisoma viride* caught in Puerto Rico during 1988-2001. (n = 7,642)

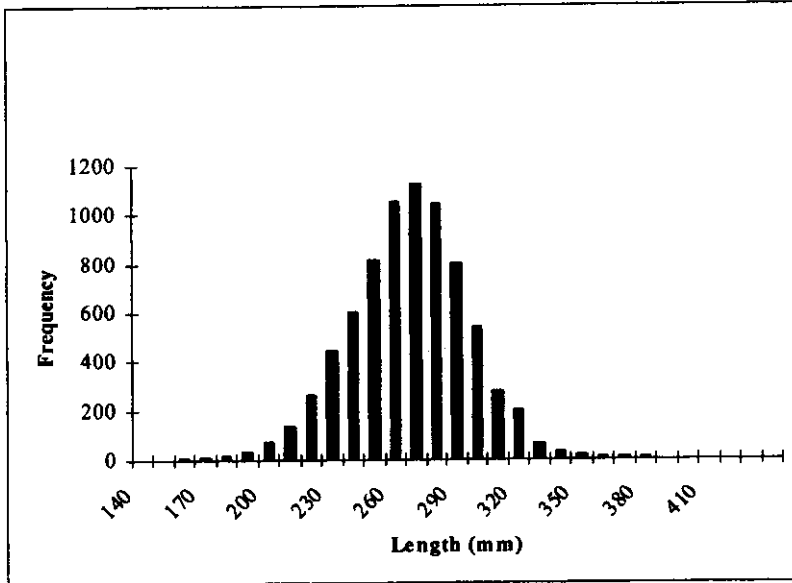


Figure 4. Length frequency distribution for *Sparisoma chrysopterym* caught in Puerto Rico during 1988- 2001(n = 7,538)

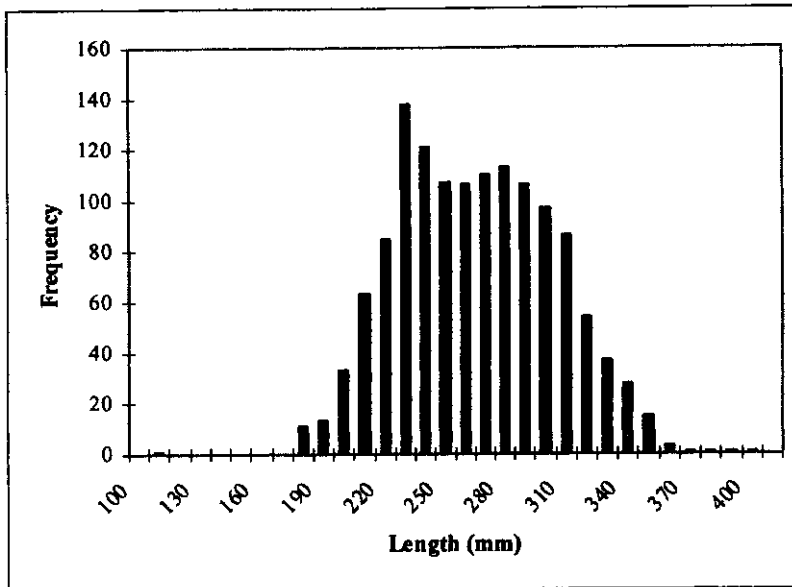


Figure 5. Length frequency distribution for *Sparisoma viride* caught by fish trap in Puerto Rico during 1988-2001. (n = 1,331)

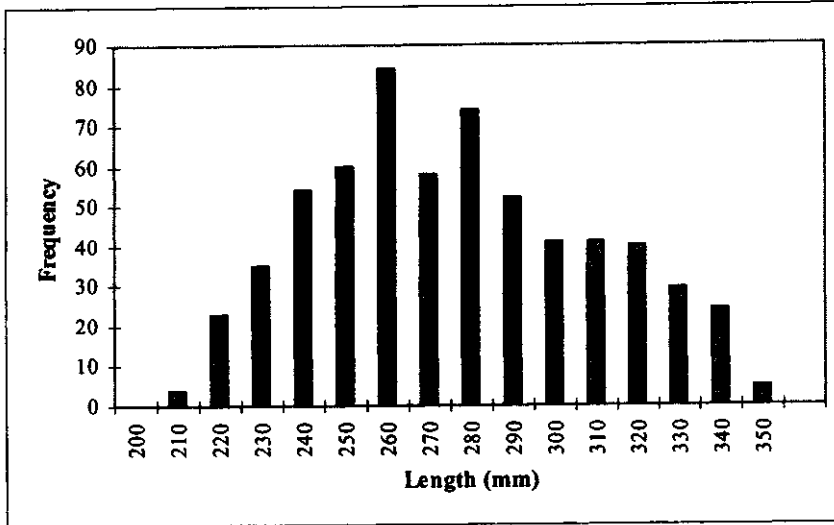


Figure 6. Length frequency distribution for *Sparisoma viride* caught in Puerto Rico by gill net during 1998-2001 (n = 624)

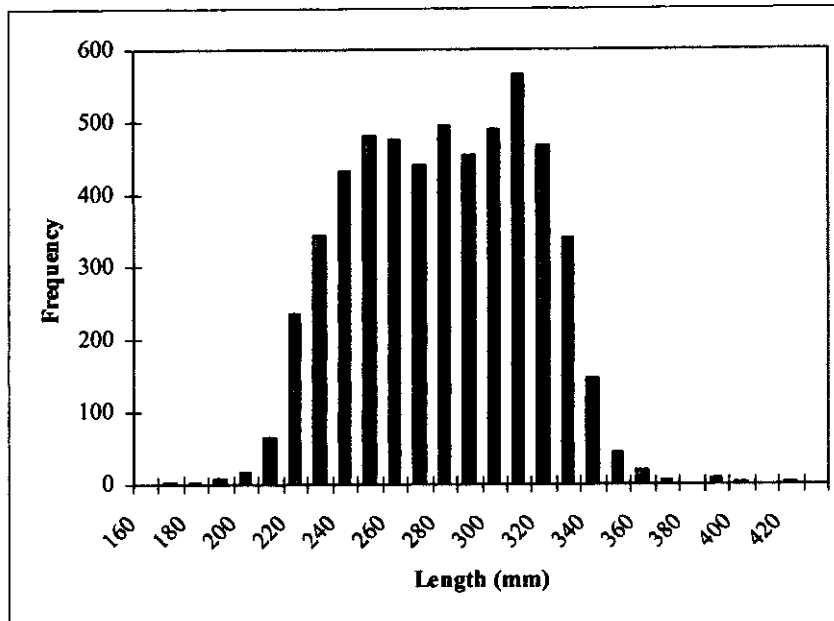


Figure 7. Length frequency distribution for *Sparisoma viride* caught in Puerto Rico by trammel net during 1988-2001 (n = 5,549)

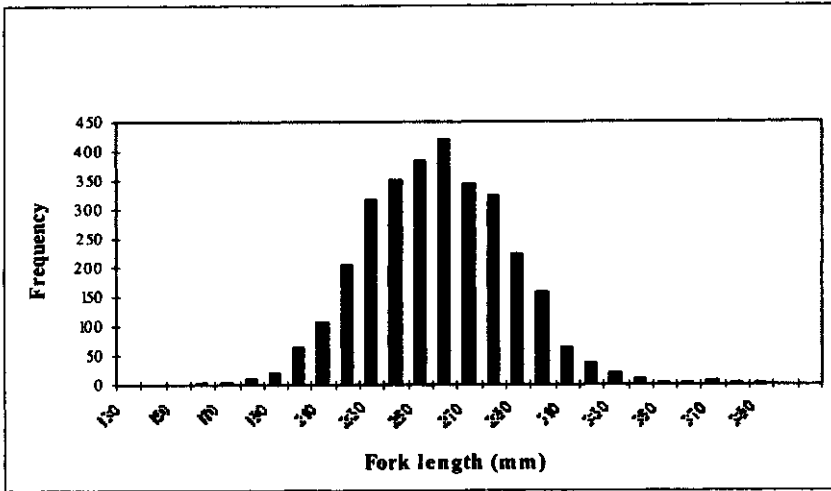


Figure 8. Length-frequency distribution of *Sparisoma chrysopteron* caught by fish traps in Puerto Rico during 1988 - 2001 (n = 3,081; mean FL = 254 mm)

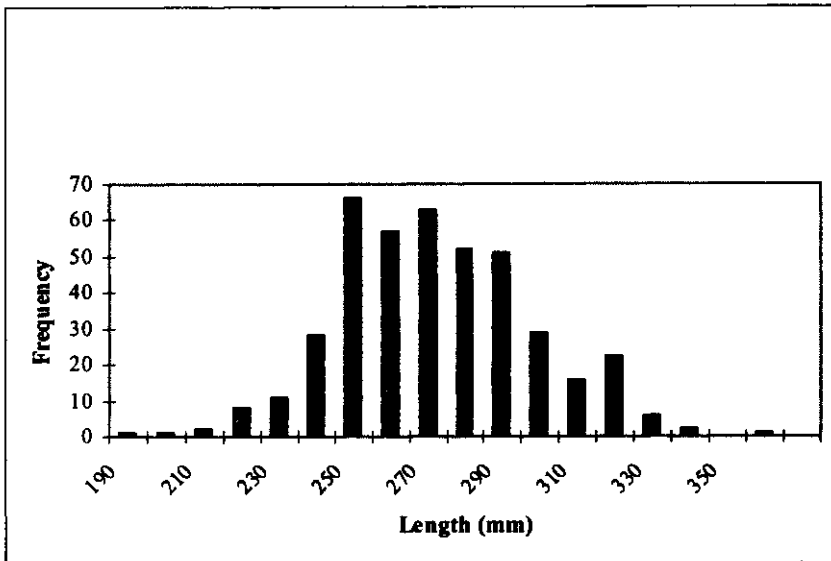


Figure 9. Length-frequency distribution for *Sparisoma chrysopteron* caught in Puerto Rico by gill net during 1988 - 2001 (n = 416)

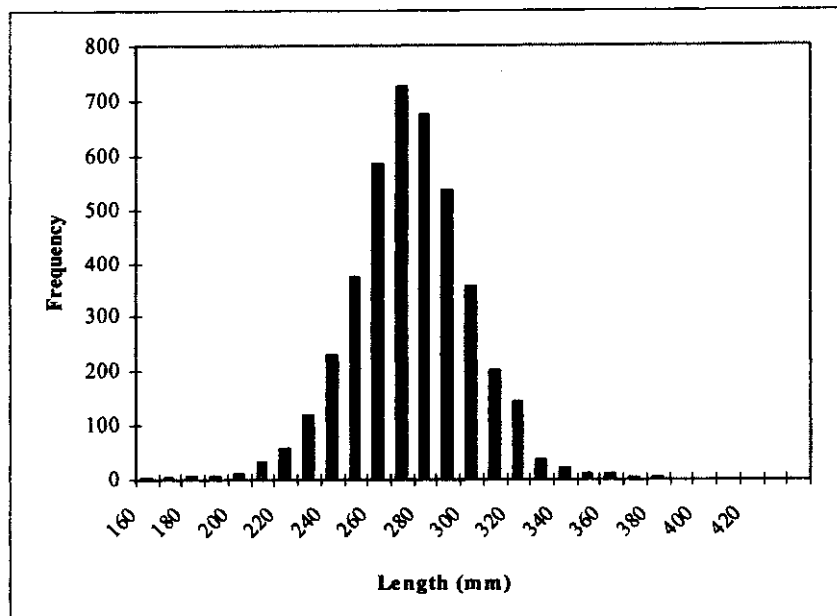


Figure 10. Length frequency distribution for *Sparisoma chrysopterum* caught in Puerto Rico by trammel net during 1998-2001 (n = 4,141; mean FL = 271 mm)

DISCUSSION

Puerto Rico's commercial fishery of parrotfishes has shown that marketing and demand have been increased during the last 15 years due to the decrease of first class fishes (snappers and groupers). The data analyzed in this report show that fishery pressure on *S. viride* and *S. chrysopterum* has been increasing since 1988 - 2001. The landings data show trends of increase in parrotfishes landings during 1995 - 2001. The CPUE data also confirms the increase in the fishery pressure for *S. viride* and *S. chrysopterum*. The average nets length increased from 344 fathoms during 1990 - 1994 to 588 fathoms during 1995 - 2001. The same trend was observed in the fish traps CPUE data. During 1990 - 1994, average fish traps haul per trip were 29 and during 1995 - 2001, were 52. The landings pounds per trip also increase for nets and fish traps.

Trammel nets and gill nets are more efficient gears to catch *S. viride* and *S. chrysopterum*. The results show these nets caught more quantities in pounds and also significant larger animals than fish traps. Fish traps also reported more pounds landed during 1995 - 2001. This fact is an evidence of the improvement in the parrotfishes marketing. In the past, many fish trap fishers considered parrotfishes third class and/or trash, selling at \$0.85 per pound in 1988. In 2001, they sold the parrotfishes as a wholesale price of \$1.50 to \$2.00 per pound. Commercial fishers that use gill nets and trammel nets very actively fish for parrotfishes. They fish four to five days per week. On the

contrary, the fish traps fishers are hauling their traps once per week.

Matos-Caraballo (1999) mentioned that individuals of *S. viride* and *S. chrysopterus* were significantly larger in their LFD for 1988 than for 1992. Due to the pressure observed in the parrotfishes fishery it was expected that the trend observed by Matos-Caraballo (1999) would occur in this analysis. On the contrary, this study *S. viride* and *S. chrysopterus* were significantly larger for 1995 - 2001 than for 1988 - 1994. That suggests that the fishery resource it is stable. It is reported by CFSP's port samplers that some fishers keep the nets fishing continuously during three or four days. There is no bycatch data in this activity. Thus, it is necessary to do the bycatch study before concluding the status of this species.

Figuerola et. al. (in press) reported that *S. viride* has a minimum size of sexual maturation (MSSM) of 205 mm FL and *S. chrysopterus* has a MSSM of 235 mm FL. The data analysis shows that only 2.9 % of *S. viride* were caught before reaching the MSSM during 1988 - 2001. On the other hand, 20.7 % of *S. chrysopterus* were caught before reach the MSSM during 1988 - 2001. Biostatistics data shows that 8.2 % of *S. viride* were caught by fish traps before they reached MSSM during 1988 - 2001. In contrast, the nets caught only 1.6 % of *S. chrysopterus* before reaching the MSSM for the same time period. The same data shows that 11.4 % of *S. chrysopterus* were caught by fish traps before they reached MSSM during 1988 - 2001. In contrast, the nets caught only 5.6 % of *S. chrysopterus* before reaching the MSSM for the same time period. This information suggests that this fishery has a relative low reproductive output for both species. However, fish traps have higher rates of mortality than nets for immature individuals of both species. Once more it is necessary to mention the need of bycatch data for nets and fish traps.

Some coral reefs investigators mention that the overfishing of coral reef herbivorous fishes, such as parrotfishes, affect this habitat (Hernández 1992). The absence of parrotfishes allows algae to grow without grazing pressure resulting in a reduction of coral reef space availability. Coral reef reduction affects fishery resources. This subject also needs further study.

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