

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

by

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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 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 Tainos that used nets and arrows. However the 1970's data showed that most of the parrotfishes were considered trash fish and the cost per pound was very low. During the 1980's the parrotfishes were considered third class. During this period Puerto Rico's fisheries started to show overfishing symptoms. During the 1990's 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 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.

RESUMEN

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 analyze the dependent fisheries data. The CFSP has been collecting data since 1971. Matos-Caraballo (in press a and b) mentioned that during the 1980's decade, 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 1970's, 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. chrysopterum*.

Puerto Rico's commercial fishers sell all the parrotfishes by their market price. They do not have common name for the parrotfishes different species. 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. chrysopterum* 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. chrysopterum* are caught mainly by fish traps, gill nets and trammel nets. Other gears 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. chrysopterum* composed most of the fish traps catch at shallow waters. It is important to describe and understand the commercial fishery of the mentioned species.

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

METHODS

This report will discuss the *S. viride* and *S. chrysopterum* fishery using two types of dependent data collected by CFSP thru 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 proceed to identify by species all the catch to obtain data about composition. Then port samplers measured fish's fork length (FL) in mm. 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 nets length in fathoms was 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 1988-94, 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 landed reported.

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.

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. chrysopterum* were measured (Figure 4).

The mean FL during 1988-94 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 1988-94 for *S. chrysopterum* was 259mm and during 1995-2001 was 269mm. 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 264mm (Figure 5). For the same time period *S. viride* caught by nets (gill nets and trammel nets) had a mean FL of 276mm (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. chrysopterum* caught by fish traps during 1988-2001 was 254mm (Figure 8). For the same time period *S. chrysopterum* caught by nets had a mean FL of 271mm (figures 9 and 10). Kolmogorov-Smirnov Test shows a significant difference in the *S. chrysopterum* LFD among fish traps and nets during 1988-2001 ($D_{max} = 0.1369$).

A total of one-hundred-twenty biostatistics interviews were randomly selected to obtain CPUE estimates data analysis. All interviews include reports mostly of *S. viride* and *S. chrysopterum* 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 1990-94 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 shows a landings increase obtaining an average of 91.2 pounds/trip. During this period of time 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 show that over 75% of their catch composition were *S. viride* and *S. chrysopterum*. During 1990-94, 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 parrotfishes 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.

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 over the *S. viride* and *S. chrysopterum*. The average nets length increased from 344 fathoms during 1990-94 to 588 fathoms during 1995-2001. 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 traps fishers consider 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 are very active to fish 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. chrysopterum* were significant 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) should happens in this analysis. On the contrary, this study *S. viride* and *S. chrysopterum* 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 concludes the status of this species.

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

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

ACKNOWLEDGEMENT

We want to express our deep gratitude to all that made possible this research. To NOAA/NMFS Cooperative Fisheries Statistics Program and Puerto Rico's Department of Natural and Environmental Resources (DNER) that provided the funds. To Puerto Rico's Commercial Fisheries Statistics port samplers Walter Irizarry, Jesús León, Héctor Y. López, and Luis A. Rivera, whom collected the data. To Albaliz Mercado and Lucía T. Vargas who edited and entered the data in computers. To Miguel Figuerola who edit the paper. Finally, we want to acknowledge all the commercial fishers that participate in the Fisheries Statistics Program (FSP).

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