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Blue Shark (*Prionace* glauca) Fishery in Baja California, Mexico: An example of Artisanal and Middle Scale Fisheries Interaction

(Elasmobranch Symposium – Oral)

by

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Abstract

With the development of a new market, since the beginning of the 1990s, blue shark (*Prionace glauca*) is the main target species of the artisanal pelagic longline fishery (25-feet long boats) along the western coast of the Baja California Peninsula. Also this species is targeted or caught incidentally by the middle scale (35-feet long vessels) swordfish fishery. Although the fisheries do not interact in their fishing grounds, they fish on different age classes. We analyzed blue sharks carcasses at the main shark processing plant in Baja California during July 1999 to May 2000, and found that the mean size in total length from the artisanal fishery was 119.0 cm, while from the middle scale fishery was 177.2. We describe the age composition for both fisheries, and the sex composition for some of the samples. Historical trends of catches (between 1990 and 1999) showed a fairly constant level of around 1 350 tons. The organization structures of both fisheries were similar, based on a shark fishing permit system. However, in the artisanal fishery a permit could mean one or more boats, making this system unmanageable.

Introduction

Subsistence shark fishery along the Pacific coast of Mexico has always been an important resource to rural communities. During the World War II, a shark fishing industry developed in the Gulf of California, which provided shark liver oil to the US as source of vitamin A (McGoodwin, 1976). That fishery became an important multi-species and multi-gear fishery with important social and economic value throughout the Gulf of California and the west coast of Baja California. By the 1980s commercial shark fishing in the Pacific had expanded into a major industry supplying 60% of the total shark production in Mexico (Bonfil, 1994).

In this paper we present the general tendency of shark fishing in the state of Baja California that represents around 12.5% of the national catch or 19.5% of the Mexican Pacific catch. The objective of this paper was to describe the shark fisheries that catch blue shark (*Prionace glauca*) in the western coast of the Mexican state of Baja California (north of the Baja California Peninsula). We present the tendency of the catch for the last 10 years, percentage by fishery, and some biological characteristics of the catch and the fishery structure by fishery. This is a preliminary version of the final paper to be submitted to the NAFO Journal with the rest of the papers of the Symposium.

Materials and Methods

Fisheries Data

Landings

Shark landings statistics in weight, 1976-1999, were obtained from the Mexican Fisheries Ministry office in Baja California. Because these statistics were not reported by shark species, the general trend in time of the pooled catches was analyzed.

Fisheries description

Blue shark fishing in Baja California is carried out by two main fisheries: artisanal (small size vessels) along the west coast of the state (Fig.1), and the commercial swordfish drift net fishery based in Ensenada Port (or middle size vessels). Vessels, gear, and fishing strategy were described based on direct observations and semi-structured interviews at different landings sites. The proportion of landings by each of the main artisanal fishery landing sites was calculated. Also for recent years, 1990-1999, the proportion of the landings for each fishery (small and middle size) was determined.

Length Frequencies

In order to understand the shark length frequency distribution per fishery, we sampled blue sharks at the main shark processing plant (Pesquera Cortez) in Ensenada during July 1999 through May 2000 on a monthly basis. Sharks were dressed at sea (headed and eviscerated), therefore lengths of these specimens were alternate lengths (AL). Alternate length was measured to the nearest millimeter (mm) from the origin of the first dorsal fin to the origin of the second dorsal fin. Alternate length in centimeters (cm) was converted to total length (TL) in cm by using the regression equation (Holts, pers. comm.)[1]:

$$TL = 12.716 + 3.379(AL) \qquad [n= 6{,}700\ r^2= 0.98]$$

Using the processing plant records we found the origin of each of the sampled sharks. The majority of samples (80%) were sharks caught by the commercial swordfish drift net fishery, while the balance came from the artisanal fisheries. Because of the dressing method of the commercial fishery, the sex of the sharks could not be determined, only the sex composition in the artisanal fishery samples was recorded.

Results

Fisheries

Between 1990 and 1999 Mexican shark landings have fluctuated between 36 000 and 25 000 tons (Fig. 2). But the species composition of the catch is unknown. The Pacific coast catch have represented 60% of the national catches. Baja Californian states catches during this period fluctuated around 2 500 tons, which represented almost 12.5% of the national catch and 19.5% of the Pacific catches (Fig. 2). Even this statistics are not reported by species, based in our observations blue sharks catches can be roughly calculated representing less than half of the reported catch, that is to say 1 050 tons per year during 1990 and 1999.

Blue sharks have being caught by the artisanal (or small size) fishery using pelagic longlines (around 1 500 m long with 500 hooks) since the beginning of 1990s when a fairly good local blue shark market was developed. However, since 1993 due to the good market that was developed for the meat of this shark, the swordfish fishery based in Ensenada (Holts *et al*., 1998) started to land blue shark as an alternative species in their fishing trips (Fig. 3). This fishery use drift gill nets of around 2 km long with 18-24 mesh size, and a 26% of shark by-catch has being reported (Sosa-Nishizaki *et al*., 1993) where blue shark represented the 54%.

[1] Dave Holts, National Marine Fisheries Service, Southwest Fisheries Science Center, La Jolla, CA 92038, USA.

Fishery structure

Shark fishery in Mexico has being managed by a shark fishing permit system. Since 1993 there has being a permit moratoria. However the number of small vessel permits for the state of Baja California is unknown. By our interviews we found that two permits were in use for catching sharks by this fishery, but they were issued as multi-species type. One of the permits allowed the use of 15 small size vessels, and the other 38 vessels. The basic organization in this fishery consisted on: fishing permit and vessels owner whom will supply to two fishermen for each boat gasoline, fishing gear and bait. After the fishing trip the owner of the vessel will receive shark carcasses and fins, and depending of the revenues (after taking the coast of the fishing trip) he will pay to the fishermen. We found that in some fishing trips the fishermen did not earn any money.

The medium size fishery was composed by two types of fishing vessel: with shark fishing permit only (n = 22) and swordfish and shark fishing permits (n = 33). In this fishery we found the typical commercial type organization where they use one fishing permit for vessel, and the owner of the boat contracts the crew of the boat that usually is composed by 5 fishermen. The fishermen receive a salary for each fishing day, plus a bonus depending of the total catch for each fishing trip.

Both fisheries supplied a local meat market. Fins were sold to brokers but the final end of them was difficult to evaluate. Due to the high number of Chinese food restaurants in the region a part of the fin production might be consumed locally.

Length Frequencies

Figure 4 shows the length frequencies distributions for each of the fisheries. The catch of the small size vessels had a sex rate (F:M) of 1.05:1, with specimens between 69 to 250 cm of total length, although the mode was in the 100-109 cm bin (Fig. 4). While the catch of the middle size vessels had a sex rate of 1.3:1, with specimens between 87-280 cm of total length with a modes one at 160 cm and other in 210 cm (Fig. 4). In both fisheries the majority of the specimens were considered juveniles based in Nakano (1994).

Discussion

Interactions between fisheries have being described basically in two ways: fisheries that interact when they fish in the same area targeting different species, or fisheries that target the same species stock even they fish in different areas. Here we presented data for the second type of interaction. We are aware that these two fisheries use a blue shark stock that is shared with at least the USA. But when the sharks are in Mexican waters these two fisheries interact by fishing on them.

Most of the shark fished in both fisheries is juveniles, and the effects on the populations can not being assess with this information. Although, the effects of each fishery are expected to be different, especially because most of the small size vessel fishery specimens caught are juveniles, with some of the sharks having a size that could mean that the coastal area is a nursery area.

The permit system for the small size vessels seems to be not working and has permitted an excessive number of fishing vessels to participate in the fishery. We conclude that this system has to change to a vessel permit level, other whiles we will continue to have an uncontrolled level of fishing effort.

References

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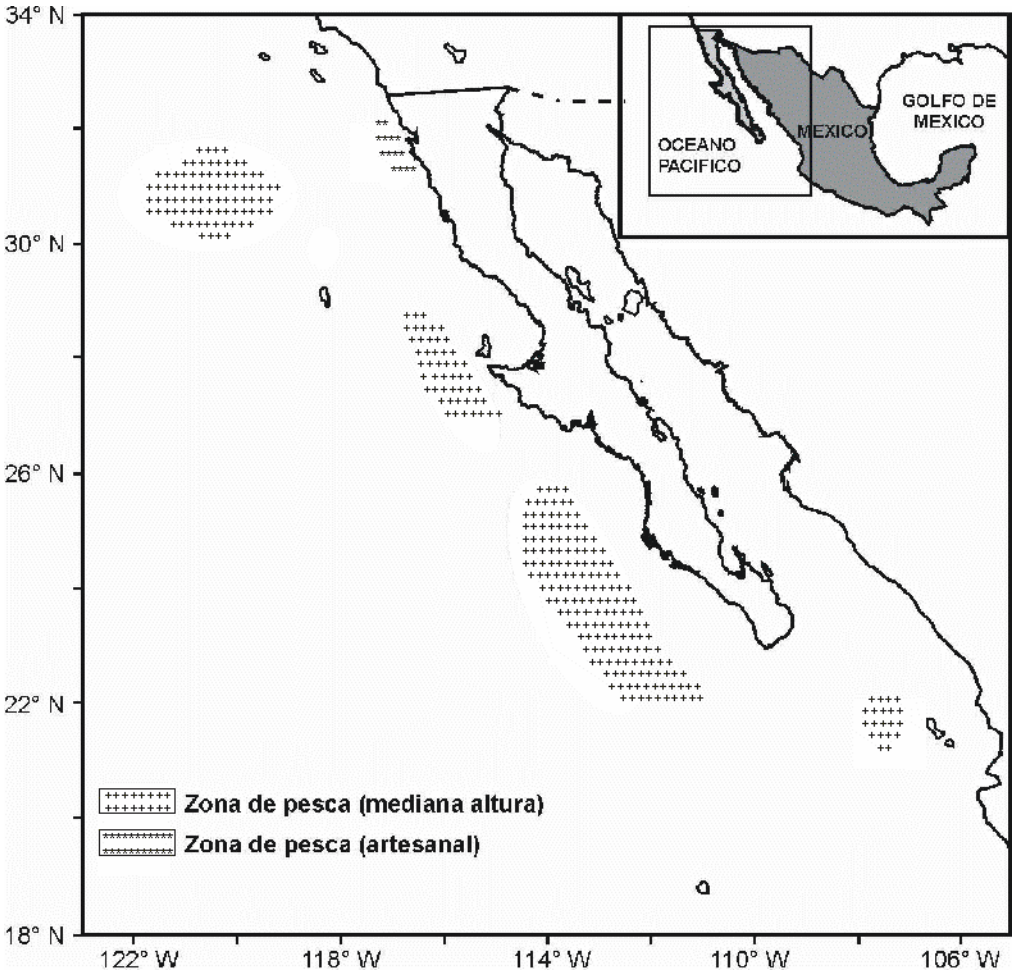

Fig. 1. Fishing areas for small (artisanal) and medium size fisheries (mediana altura) off of Baja California Peninsula.

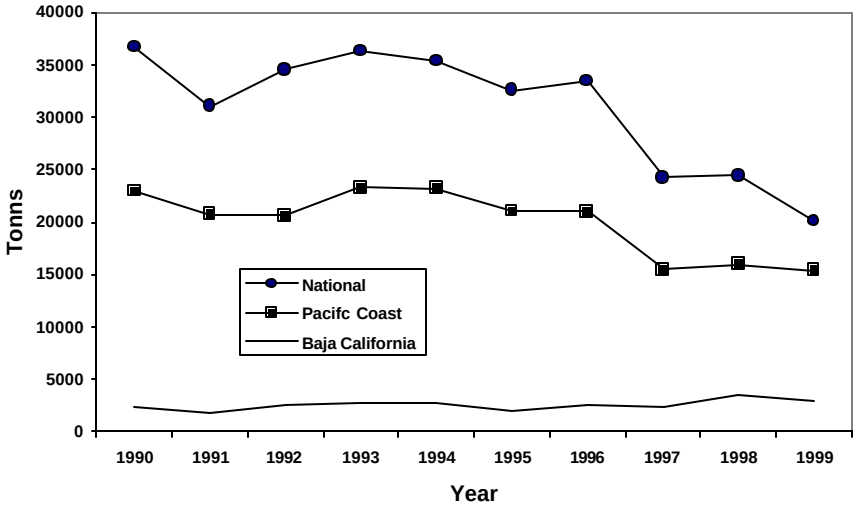

Fig. 2. National, Pacific coast and Baja California state's shark landings time series caught by all fisheries.

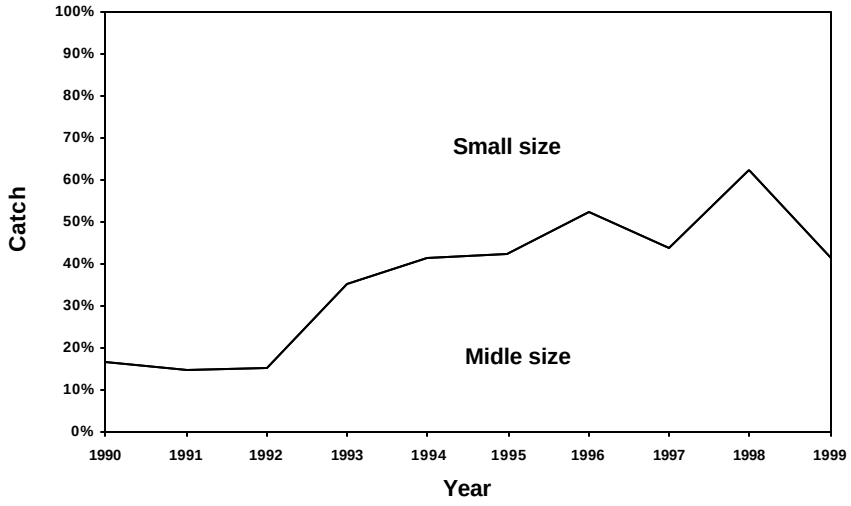

Fig. 3. Origin of the shark catches in percentage by fishery.

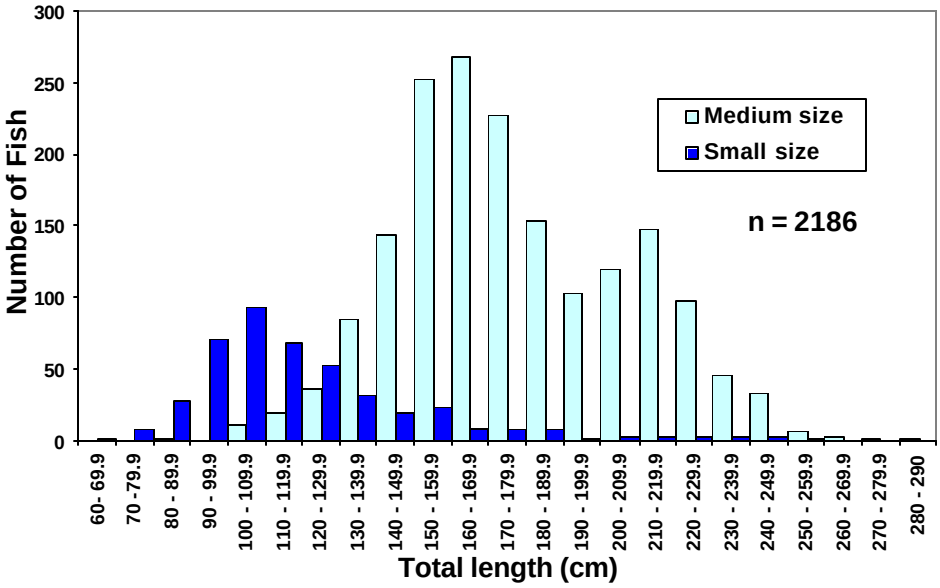

Fig. 4. Blue shark total length frequencies distributions by fishery.