Skipjack Fisheries in the Western Atlantic

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Available information on skipjack tuna in the western Atlantic Ocean is reviewed to identify areas where skipjack fisheries might be developed. Areas in the Gulf of Mexico, Caribbean Sea and off southeastern Brazil appear promising areas for development. Utilization of fish aggregating devices and new purse seining techniques are suggested as possible methods for concentrating schools and for catching them more efficiently.

L'information disponible sur le listao dans l'Atlantique ouest a été examinée pour définir les zones où il serait possible de développer la pêche de cette espèce. Des secteurs du golfe du Mexique, de la mer des Antilles et au large des côtes sud-est du Brésil semblent prometteurs à cet égard. L'emploi de dispositifs de concentration du poisson et de nouvelles modalités de pêche à la senne sont suggérés comme méthodes éventuelles de concentration des bancs et d'une pêche plus efficace de ces derniers.

Se estudia la información disponible sobre el listado del Atlántico Oeste con el fin de identificar aquellas zonas donde pudieran desarrollarse pesquerías de listado. Como más prometedoras parecen zonas en el Golfo de México, Mar Caribe y frente a la costa Sudeste del Brasil. Se sugiere la utilización de materias congregantes y técnicas de cerco como posibles métodos para concentrar los cardúmenes y capturarlos con mayor eficacia.

1. Introduction

A disproportionate amount of the total Atlantic catch of skipjack tuna (*Katsuwonus pelamis*) is taken in the eastern Atlantic. In 1981, 116,000 mt were caught in the eastern Atlantic whereas only 23,000 mt were caught in the western Atlantic. One reason is that fishing is more intense in the east than in the west. By fishing harder in the western Atlantic, can catches approach those from the east and if so, in what specific areas should the fishing effort be applied?

The first part of this question is answerable with a qualified yes: increasing fishing effort would probably increase catch. The second part concerning where this effort should be applied is the subject of this study. Data were drawn primarily from United States sources and from published documents; two unpublished documents (Rinaldo MS; Alverson and Verge MS) were used as secondary reference sources.

2. The Western Atlantic Region

The tropical and subtropical regions west of 30°W longitude are the western range of skipjack tuna in the Atlantic Ocean. The region includes waters off North and South America, the Gulf of Mexico and the Caribbean Sea. Within this region, environmental conditions, mainly the principal oceanic currents, seem to influence where skipjack tuna are concentrated and available for exploitation (see Evans et al. 1981).

For my analysis, I divided the region into four areas, corresponding roughly to the locations of the offshore ocean currents (Figure 1). Area A is north of the Florida Peninsula and west of 70°W longitude. In this area, the dominant ocean currents are the Florida Current and Gulf Stream. Area B includes the Gulf of Mexico, Caribbean Sea and waters east of the Antilles. The dominant ocean currents in this area are the Caribbean and Antilles currents. East of Area B (60°W longitude) is Area C, which extends southward to 5°S latitude. The dominant current in this area is the Equatorial Current. Area D is between 5°S and 40°S latitude and is characterized by the Brazil Current.

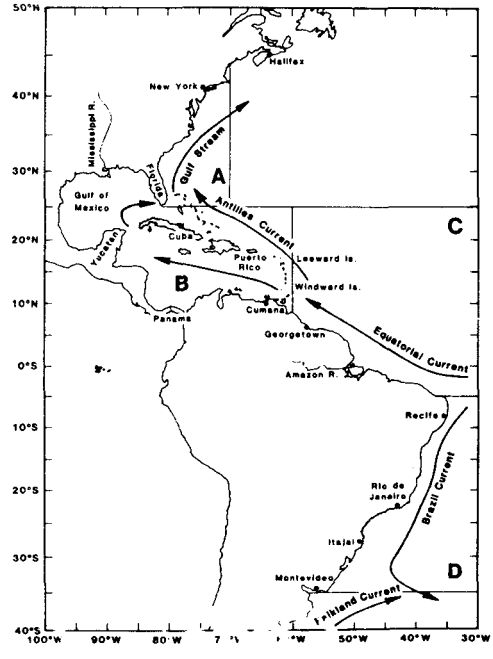

Figure 1. Four geographic areas of the western Atlantic used in the study. Locations of current skipjack tuna fisheries are shaded.

2.1 Area A — North of the Florida Peninsula

Area A is not a productive skipjack tuna area for development of a major fishery. Exploration of the area for tunas was carried out in the 1940's and 1950's with baitboats, purse seiners, and longliners (Squire 1962; Wilson 1965). It was not until the late 1950's that a purse seine fishery for bluefin tuna (*Thunnus thynnus*) was established in Cape Cod Bay, U.S.A. and not until 1962 that this fishery expanded southward and began to also catch skipjack tuna. Catches of skipjack tuna have been small (<5,000 mt/yr) and variable from one year to the next (Sakagawa 1975). The catch is taken in the summer from a small area off New York and west of the Gulf Stream (Figure 1). The highest skipjack catch recorded for the fishery was 5,000 mt in 1964. In recent years, although the number of boats in the bluefin tuna fishery has remained steady (ICCAT 1982), and the bluefin catch reduced with quotas, the catch of skipjack tuna has not increased as the boats searched for alternative tuna species to fill their holds. The catch was 2,100 mt in 1981 and 200 mt in 1982.

Between the Florida Peninsula and New York (Figure 1), there is a large recreational fishery which takes skipjack tuna along with other species. The catch of skipjack tuna by this fishery is believed to be only a few tons annually (Deuel 1973). American tuna purse seiners have explored this region in the past, while traveling between the bluefin tuna fishing area and Puerto Rico. They have had little success in locating or catching skipjack tuna in this region.

2.2 Area B — Gulf of Mexico and Caribbean Sea

Besides scattered artisanal fisheries, Area B currently has two significant skipjack fisheries: one is a relatively small baitboat fishery along the northwestern and southwestern coast of Cuba (Suarez-Caabro y Duarte-Bello 1961; Carles and Hirtenfeld 1978), and the other is a baitboat and purse seine fishery off the northern and northeastern coast of Venezuela (Figure 1).

The year-round Cuban fishery has existed since the 1940's and currently produces an average of 2,000 mt/yr of mostly skipjack tuna together with a few tons of blackfin tuna (*T. atlanticus*). The skipjack tuna catch in 1982 was an estimated 1,300 mt.

The year-round Venezuelan fishery is a more recent development (Ramos y Gerardo-Guerra 1976). Established in about 1974 with baitboats only, it has expanded recently to include purse seiners. Information on this fishery is sketchy, but an estimated 4,900 mt of skipjack tuna were caught in 1981, and 14,000 mt in 1982 (ICCAT 1982a). The fishery catches both skipjack and yellowfin tunas.

Besides these two significant fishing areas, other sites in Area B have been explored for availability of tunas to capture with conventional tuna fishing gears. The best published accounts are by Wagner (1974) and Wagner and Wolf (1974). These authors describe results of exploratory fishing cruises conducted during 1967–70 between 10°N and 20°N latitude. Except in the Gulf of Honduras (15°–20°N latitude, 85°–88°W longitude), pelagic fish schools were seen in all areas surveyed, with the highest sighting rates around Puerto Rico (0.23 schools/hour) and in the Windward Islands (0.21 schools/hour). Small skipjack tuna schools (0.5–5 mt) were the most frequently encountered tuna schools. Pole-and-line catch rates were highest (32.8 kg of skipjack/hour) in the Windward Islands area. Troll catch rates were highest over the submerged banks of the northern Leeward Islands.

American tuna purse seiners that fish in the eastern tropical Atlantic survey Areas B and C for tuna schools while in transit between fishing areas and fishing ports. A typical route used by a purse seiner is from the eastern tropical Pacific fishing area through the Panama Canal and along the coast of South America to Puerto Rico for unloading or taking on fuel; then through the Windward Islands and along the coast of Trinidad, Guyana and Surinam, before heading eastward across the Atlantic to the fishing area off Africa. This same route is used on the return trip.

During such passages, fishing (and searching) for tunas are regular activities of the vessels. Data collected from vessel logbooks by National Marine Fisheries Service (NMFS) since 1966 were summarized by fishing effort (including searching effort), catch of skipjack tuna, and 1° square for location of effort (Table 1). Catches in Area B were primarily made off Venezuela, the Windward Islands and off the Mississippi River Delta (Figure 2). The amount of fishing

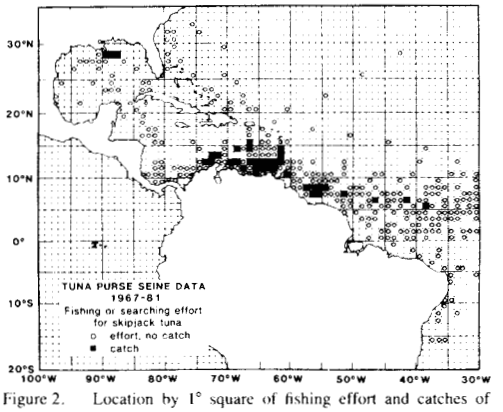

Figure 2. Location by 1° square of fishing effort and catches of skipjack tuna for American tropical tuna purse seiners that fished in the western Atlantic in 1967–81.

effort and catch for the fleet in any particular year was relatively small, but the aggregate total for the 15-year period is 1,493 days of fishing with 2,530 mt of skipjack tuna caught. The annual catch rates range from 0 to 5.31 mt/day's fishing, averaging 1.69 mt/day's fishing for the 15-year period. These yearly rates are almost always lower than those obtained by the American fleet in the eastern Atlantic (2.2–17.0 mt/day's fishing).

Table 1. Summary of catch and effort data for American tuna purse seiners that fished in the western tropical Atlantic Ocean.

Year	Months	Fishing effort (days)	Catch (mt)	Catch rate (mt/day)
1967	Aug, Sep, Oct	13	0	0
1968	Jul, Oct–Dec	43	0	0
1969	Nov	1	0	0
1970	Jul, Aug, Oct	3	0	0
1971	Jun	3	0	0
1972	May–Aug, Nov	79	7	0.09
1973	May–Aug	10	0	0
1974	Jul, Nov	20	0	0
1975	Mar, Jun–Dec	106	52	0.49
1976	Mar–Jun, Aug, Sep, Nov	104	552	5.31
1977	Jan, Apr–Jun, Aug, Sep, Nov	89	24	0.27
1978	Jan–Nov	427	1146	2.68
1979	May, Jun, Aug–Oct	150	299	1.99
1980	Apr, May, Nov, Dec	49	0	0
1981	Jan–Oct	396	450	1.14
Total		1493	2530	1.69

During 1950–69, the Bureau of Commercial Fisheries, predecessor of NMFS, sponsored a number of exploratory finfish and shrimp surveys primarily with research vessels in Area B. Normal survey procedures included trolling of several lines, searching for pelagic fish schools and recording general information on the behavior of the schools. I tabulated all reported sightings that were recorded as skipjack tuna schools, which in reality probably consisted occasionally of other tuna species as well, by 1° square for sighting location. The majority of these schools sighted were reported to be "moving fast" or "subsurface" (swimming deep). The results (Figure 3) show clusters of sightings off the Mississippi River delta, around the Florida Peninsula, off Cuba and in the Leeward and Windward Islands.

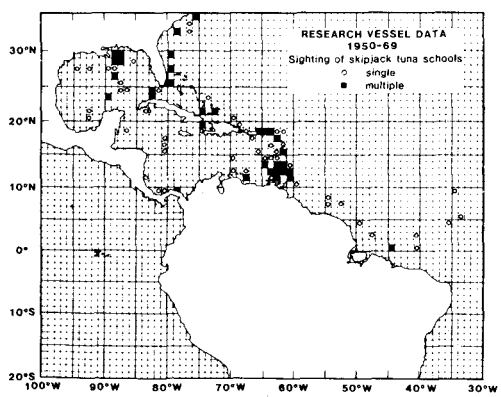

Figure 3. Location by 1° square of sightings of skipjack tuna schools. Data from National Marine Fisheries Service research vessel cruises for the period 1950–69.

In 1980 NMFS executed a special skipjack tagging cruise in the eastern part of Area B with the commercial baitboat, *Rhonda Sue* (Rinaldo et al. 1981). A total of 143 pelagic fish schools were sighted during approximately forty-three days of searching. Skipjack tuna was the primary species in fifty-three of the schools sighted. Assuming a ten-hour searching day, the sighting rates were 0.33 pelagic fish schools/hour and 0.12 skipjack schools/hour. Most sightings were in the Leeward and Windward Islands and to the east and southeast of Trinidad (Figure 4). Most of the schools were reported to be difficult to fish because they were moving at high speed.

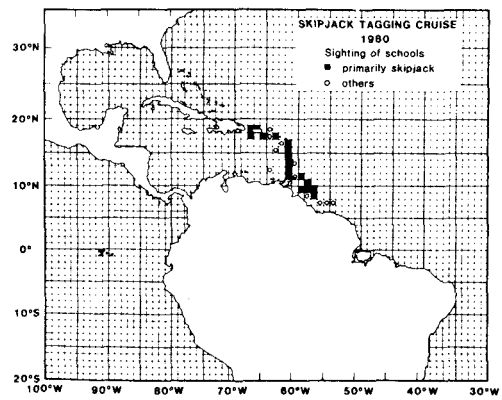

Figure 4. Location by 1° square of sightings of pelagic fish schools made during a National Marine Fisheries Service skipjack tagging cruise with a commercial baitboat in 1980.

These results indicate that Area B still has potential sites for development of skipjack fisheries. Off the Mississippi River Delta and off the west coast of the Leeward and Windward Islands are likely sites, although the density of schools appears at first glance to be too low to sustain purse seining operations. For example, in the Leeward and Windward Islands the sighting rates are about two to three schools per day of searching, assuming ten hours of searching in a day. A purse seiner is capable of setting on two to five schools per day, but when searching time is taken into account, this rate is lower. For the American purse seine fleet, the rate has been 0.6–1.7 sets/day's fishing in the eastern tropical Atlantic during 1966–80. Thus, the sighting rate of two to three schools per day of searching appears capable of sustaining purse seining operations.

The schools in Area B are generally described as being "wild", difficult to fish with pole-and-line or purse seiners, and relatively small in size. This school characteristic might have discouraged development of large-scale skipjack fisheries in Area B so far. The introduction of new fishing techniques such as the use of fish aggregating devices (Matsumoto et al. 1981; Kihara 1981) and lighter and larger purse seine nets, which have been successfully used in the western Pacific Ocean (Anon. 1976), might be the solution. Aggregating devices are particularly appropriate because they are easy to construct and deploy in locations within reach of local fishermen.

2.3 Area C — Off Venezuela to Brazil

Area C (Figure 1) currently has a developing baitboat and purse seine fishery. Information on this fishery is limited, but it is believed that the area of operation is from southeast of Trinidad to off Georgetown, Guyana. According to Calderón de Vizcaino and Salazar (1984), Venezuelan baitboats are involved in this fishery and in 1981, the Venezuelan baitboats landed approximately 48,500 skipjack tuna and 10 yellowfin tuna (*T. albacares*).

Exploratory fishing data (Wagner 1974; Rinaldo et al. 1981) for this area indicate that school density is low, and the schools generally move at high speed. It seems, therefore, that sustained high production by this fishery will depend on the adoption of new fishing techniques.

South of Georgetown, there has been little searching effort for skipjack tuna. Data from logbooks of American purse seiners indicate a low success rate in catching skipjack tuna (Figure 2). All of the catches were in a band between 5°N and 10°N latitude, or in the Inter-tropical Convergence Zone (Evans et al. 1981). This area receives strong northeasterly trade-winds especially during October through March. Fishermen claim that these winds prevent effective searching and fishing for tunas and this alone makes it unlikely, barring technological innovation, that a major fishery will develop.

2.4 Area D — Off Brazil

The potential skipjack fishing zone in Area D is bounded by the Brazilian coast and the Brazil Current (Evans et al. 1981). So far only the southern region of this zone, from Rio de Janeiro to about Itajai, has been developed (Figure 1). The year-round baitboat fishery, started in 1979, produced 13,900 mt in 1981 and an estimated 17,000 mt in 1982 (Negreiros and Meneses de Lima 1980; ICCAT 1982a). The fishery is limited to a narrow band along the coast where current studies indicate skipjack are most readily available to surface gears (Evans et al. 1981; Maluf et al. 1984).

North of Rio de Janeiro, surveys for tropical tunas sponsored by primarily Brazilian interests have been made, but results of the surveys have not been made public. Judging from information on the oceanography of the region (Zavala-Camin 1978; Evans et al. 1981; Matsuura 1982a), however, this area looks promising for development of a skipjack tuna fishery.

3. Discussion

Skipjack tuna are taken by a range of surface fisheries, from artisanal to large-scale, in the western Atlantic. The current catch from the region is only sixteen percent of the total skipjack tuna catch of the Atlantic Ocean. By increasing fishing effort in selected areas of the region, it is possible to increase the catch.

Available data primarily from United States sources were reviewed to identify promising areas for further skipjack fishery development in the western Atlantic. These data provided the basis for a number of tentative conclusions: (1) the area north of the Florida Peninsula (Area A) does not appear to be capable of supporting a sustained commercial skipjack fishery. Availability of large concentrations of fish is variable from one year to another, probably influenced by environmental conditions such as favorable temperature and oxygen levels, availability of food supply and perhaps the presence of cold-core rings (The Ring Group 1981). (2) The Gulf of Mexico and Caribbean Sea (Area B) appear to have promise for expanding existing or developing new skipjack tuna fisheries. However, progress will depend on the introduction of new fishing techniques for more effective interception of the fast moving schools and for concentrating the relatively small schools. Fish aggregating devices and large, light-weight purse seine nets are new techniques that might aid development. (3) With the exception of an area southeast of Trinidad, the area south of Georgetown, Guyana to about Recife, Brazil does not appear to have much promise for skipjack fishery development. The severe weather seems to be the limiting factor. The area southeast of Trinidad has a developing fishery; growth of this fishery can be improved with introduction of new fishing techniques. (4) The area south of Recife to about Itajai, Brazil (Area D) appears to have promise for further development. However, actual fishing survey information is needed for a part of the area between Recife and Rio de Janeiro before a full evaluation of the area's potential can be made.

Acknowledgement

Grant Beardsley, Atilio Coan and Ronald Rinaldo assisted in identifying and locating data for this study. I also acknowledge the contribution of participants of the International Skipjack Year Program, who shared information on the developing fisheries and helped to sharpen my thinking and conclusions on tuna fisheries potential in the Atlantic Ocean.

Some Recent Changes in the Atlantic Skipjack Tuna Fishery

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ICCAT's International Skipjack Year Program was instrumental in drawing attention to the presence of the underutilized resource of skipjack Tuna (*Katsuwonus pelamis*) in the Atlantic Ocean and in encouraging increased exploration and exploitation of the resource. Comparison of fisheries statistics for the period before 1979 and from 1979 and afterwards, when the four-year program was in effect, demonstrates that the fisheries for skipjack tuna have undergone expansion and changes. The Atlantic catch of skipjack tuna, for example, increased from an average of 91,300 MT in 1975–78 to an average of 118,300 MT in 1979–82.

Le Programme de l'Année internationale du Listao de l'ICCAT a été déterminant pour attirer l'attention sur la présence de ressources sous-exploitées de listao (*Katsuwonus pelamis*) dans l'Atlantique et stimuler une exploration et exploitation plus poussées de ces stocks. La comparaison des statistiques de pêche pour la période antérieure et postérieure à 1979, date à laquelle le programme est entré en vigueur, démontre que les pêcheries de listao ont subi une expansion et des modifications, les prises de listaos dans l'Atlantique, par exemple, ont augumenté, d'une moyenne de 91.300 TM en 1975–78 à une moyenne de 118.300 TM en 1979–82.

El Programa del Año Internacional Listado de ICCAT ha contribuído a llamar la atención sobre la existencia del recurso infrautilizado del listado (*Katsuwonus pelamis* en el Océano Atlántico, y a estimular una mayor exploración y explotación del recurso. La comparación de las estadísticas de pesquerias para el periodo anterior a 1979 y desde 1979 en adelante, cuando el programa de cuatro años de duración estaba en vigor, demuestra que las pesquerias de listado han experimentado expansión y cambios. La captura de listado del Atlántico, por ejemplo, aumentó de un promedio de 91.300 TM en 1975–78 a un promedio de 118.300 TM en 1979–82.