寄　稿

# Development of a New Brazilian Skipjack Fishery in the Rio de Janeiro Region

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## 1. Introduction

Brazil has a very long coast line which extends from Cape Orange (4°N) to Chui (34°S) and includes both tropical waters in the northern region and subtropical covergence water in the southern areas. Most of the fishery resources of this vast area are reasonably exploited, but no commercial exploitation of skipjack was carried out until 1979. Recently, the pole-and-line fishery for skipjack was commenced in the Rio de Janeiro region.

This report describes the development of a new skipjack fishery in southern Brazil.

## 2. Historical background

Prior to 1979 the Brazilian tuna fisheries consisted of two locally separated fisheries—one artisanal fishery using trolling along the northeastern coast and a commercial long-line fishery along the southeastern coast. During the last 6 years annual tuna catches by long-line and trolling have been stable ranging between 2.3 and 4.3 thousand metric tons and almost all catch was sold in local markets as fresh fish.

A possibility for a skipjack fishery in Brazil was pointed out by ZAVALA-CAMIN (1977a, b) and MATSUURA (1979), but due to a lack of precise informations on fishery potential of skipjack and a limitation of local markets, no one ventured to explore the stock. Beginning in 1979, a pole-and-line fishery was introduced by a Portuguese fisherman in Rio de Janeiro and with success of this new surface fishery, many Brazilian fishermen have converted their boats to this pole-and-line technique and the total catch and number of bait-boats increased with surprising speed.

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## 3. Current situation

Most Brazilian bait-boats are based in Guanabara Bay, principally in Niteroi City where cold storage and freezing facilities are available. Initially the pole-and-line fishery was started by a modified sardine purse seine boat and at the end of 1981 it counted about 75 bait-boats. Most of the boats are wooden ranging from 10 to 30 m in length, modified from purse seine or hand line fishing boats. The larger bait-boats (15–30 m) normally operate throughout the year, but the smaller bait-boats (10 to 15 m) have no navigation system for open sea thus they operate only temporarily when fish schools are concentrated near the coast. The boats have no brine freezing system and fish are stored in ice. Because the fishing area is relatively close by and the density of fish schools is high, fishing trips last only 2 or 3 days during fishing season, thus there is no storage problem of caught fish.

Before going to sea, fishermen buy their bait fish from specialized bait fishermen ("Iscador") in Guanabara Bay, but handling and keeping of bait fish are not yet efficient, and a high mortality of bait often occurs. Most common bait fish used by fishermen are Brazilian sardine (*Sardinella brasiliensis*), but scaled sardine (*Harengula jaguana*) and Atlantic anchovy (*Centengraulis edentulus*) are also used. Recently Argentine anchovy (*Engraulis anchoita*) showed very good results as bait in the skipjack fishery. From our ichthyoplankton survey and experimental fishing (MATSUURA *et al.*, 1978; 1981), the presence of a spawning stock of Argentine anchovy was confirmed in this region, therefore its use will be expanded by Brazilian fishermen. However for Argentine anchovy, bait fishing techniques must be improved and a bait maintenance system should be developed.

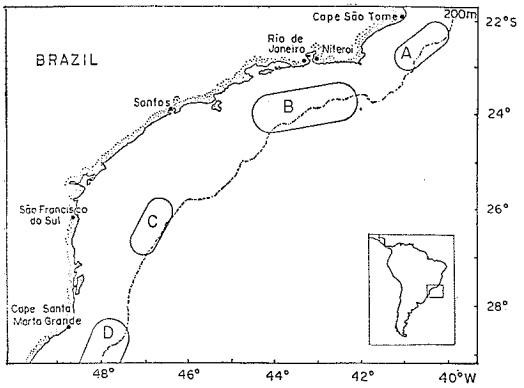


Fig. 1. Fishing areas of the pole-and-line skipjack tuna fishery off the southeastern Brazilian coast. A: northern fishing area, B: southern fishing area a, C: southern fishing area b, D: new southern fishing area.

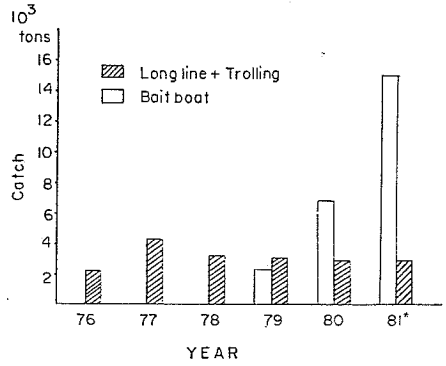


Fig. 2. Fluctuation of the Brazilian tuna catch, 1976-1981, by fishing category (*: preliminary estimate).

The fishing area was started around oil-rig platform off the coast of the State of Rio de Janeiro where concentrations of skipjack schools were commonly observed. Since mid-1980, fishing within a radius of 20 nautical miles of the platforms was prohibited and all bait-boats are now fishing in open sea. Three major fishing areas can be recognized: west of Cape São Tomé, south of Rio de Janeiro and west of São Francisco do Sul, all in the depth zone between 80 m and margin of the continental shelf (Fig. 1). Recently one Japanese bait-boat (284 tons) obtained a license for skipjack fishing under contract with a Brazilian fishing company. After initial trial cruises, they found a new fishing area south of Cape Santa Marta Grande where no Brazilian boat had operated previously.

Because of a constant increase in fishing efforts of the pole-and-line fishery, it is difficult to define a main fishing season, but Brazilian fishermen report their largest catches during autumn months from March to June, although the rest of the year shows occasional good catches. In order to learn detailed migration patterns, behaviour and yearly fluctuations of stock availability, further information is needed both from fishery statistics and from investigation by research vessels.

Skipjack tuna is the most important species caught by the pole-and-line fishery and it comprises 92% of the total catch. Other species caught are yellowfin and blackfin tunas. The size frequency distribution of skipjack was polymodal, ranging from 42 to 74 cm FL and the mean weight of one skipjack based on a sample of 2,984 skipjack landed in Rio de Janeiro was 4.7 kg.

Yearly landings of the Brazilian tuna fishery are shown in Fig. 2. We can observe an exponential growth of bait-boat catch which started with 2,345 metric tons in 1979 and achieved a surprising 15,000 metric tons in 1981. Most fish were exported to the USA, Argentine and Portugal in frozen form and only small part was processed in canneries based at Niteroi City for the Brazilian market.

## 4. Research

Brazil is a member country of the International Commission for the Conservation of Atlantic Tuna (ICCAT) and participates in the International Skipjack Year Program organized by ICCAT. Currently three Brazilian institutions are participating in the program—the Brazilian Fishery Agency (SUDEPE) for coordination and exploratory fishing, the Instituto Oceanográfico da Universidade de São Paulo for larval survey and fishery oceanography, and the Instituto de Pesca de São Paulo for stomach contents and maturity studies. Many sampling cruises have been conducted along the southeastern and northeastern coasts and an analysis of material is underway.

A part of the results were presented at the SCRS meeting of ICCAT in November 1981.

Since 1979, SUDEPE has collected biological and statistical data of the pole-and-line fishery in Rio de Janeiro and a first preliminary analysis of data was presented at the annual meeting of the Tuna Research Group in July 1981 (PDP/SUDEPE, in preparation).*

## 5. Prospects for the Brazilian skipjack fishery

Estimation of a fishery potential for unexploited resources, especially pelagic fish stocks, is a very difficult task and it is necessary to collect much information to obtain reliable estimates. For the formation of a good fishing area, two conditions must be fulfilled, i.e. presence of fish stock (biomass) and concentration of them (vulnerability).

One of the techniques used to determine a spawning stock biomass of tunas is to study quantitatively their larvae in open sea. Presence of large number of larvae means the presence of a spawning stock in that area. For example, distribution and abundance of larvae of tunas and related species were shown by NISHIKAWA *et al.* (1978) using the materials collected from their worldwide survey cruises made during 1956 to 1975. They showed that the density of skipjack larvae in the north and northeastern Brazilian coast was higher than that observed in the Gulf of Guinea where a large commercial skipjack fishery exists. This suggests that the Brazilian coast has a large spawning stock of skipjack.

The next step is to verify if sufficient commercial concentration of skipjack schools occurs in this region. Recently physiological and ecological studies of tunas showed considerable progress and revealed many new facts on behaviour and migration patterns (see SHARP and DIZON, 1978). Based on these new findings and analysing oceanographic data of the Atlantic Ocean, EVANS *et al.* (1981) demonstrated a possible good fishing area in the southeastern Brazilian coast where a constrained environment for habitat layers shallower than 50 m depth rountinely occurs. The current pole-and-line fishery in this region has proven this hypothesis.

At the moment we do not know how long this new fishery will continue to increase, but eventually it will arrive at the point of maximum sustainable yield. To avoid an overfishing problem in the near future, the Tuna Research Group (SUDEPE) recommended a gradual and controled increase of fishing effort at the last meeting in 1981. Previously SUDEPE has not established any management policy on development of pole-and-line fishery.

* PDP/SUDEPE (in preparation): Relatório da Segunda Reunião do Grupo de Trabalho e Treinamento (G.T.T.) sobre avaliação dos estoques. Sér. Doc. Técn., PDP/SUDEPE, Brasilia, 1981.

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# リオデジャネイロ水域におけるブラジルカツオ漁業の最近の発展

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従来ブラジルでは，カツオは沿岸の曳縄と延縄で2～4千トン程度漁獲されているにすぎなかったが，1979年から一本釣が始まり，漁業は急速に発展した。餌はイワシ類を用い，漁場はリオデジャネイロ周辺沖合の水深80～200 m の水域に形成される。1981年の水揚量は1.5万トンに達した。漁獲物の大半はアメリカ等に輸出される。ブラジルはICCATのメンバーで，ブラジル水産庁を中心に，サンパウロ大学海洋研究所等が加わって資源の研究を進めている。北東ブラジル沖では多数のカツオ稚魚が採集され，また海洋学的にも南東ブラジル沖で良好な漁場の形成される可能性が考えられるが，節度ある漁業の発展が望まれている。

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