

FISHBYTE SECTION

Fishbyte is the Newsletter of the
Network of Tropical Fisheries Scientists

Editorial

This issue of *Fishbyte* includes four contributions. The contribution of Sturm and Manickchand-Heileman gives an overview of the fisheries off Trinidad and Tobago. The paper by King and Faasili provides highlights of a community-based fisheries management and extension program in Samoa. De Souza Braga gives key results of assessment conducted on *Plagioscion squamosissimus* in the Barra Bonita Reservoir, Brazil. Lee and Sadovy give an overview of the status and issues pertaining to the live fish trade in Hong Kong. The issue ends with the usual announcements for NTFS members.

We are currently working on organizing future issues around certain themes (e.g., ecosystem models, stock assessments, fisheries management/overviews). This is to improve complementarity and readability within issues. We shall endeavor to do this as soon as the current publications backlog is out of the way. The implication is that contributors may have to wait a bit longer to see their papers in print, as we wait for sufficient contributions devoted to similar subjects/themes.

Read on and do keep the contributions coming!

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The Marine Fisheries of Trinidad and Tobago

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Abstract

The marine fisheries of Trinidad and Tobago are mainly artisanal and involve about 8 000 fishers. The main fishing gear used are the gillnets, the troll, the shrimp trawl, the fishpot and the industrial longline. Landings total approximately 14 000 t annually with *S. brasiliensis*, shrimps and sharks being most abundant in the landings. Assessment studies indicate overfishing and inferior marketing is an important issue. Underexploited resources include clupeoids, deep shelf and slope resources, and lobsters. The shrimp trawl and longline by-catch are not fully utilized. Fishery legislation is mostly outdated and a Fisheries Policy, including new legislation, is being developed to help solve the problems and effectively manage the fisheries.

Introduction

Trinidad and Tobago, the most southerly of the West Indian chain of islands, is situated off the north-east coast of Venezuela (Fig. 1). The climate is tropical and seasonal, with a wet season from June to De-

cember. The waters around Trinidad are mainly estuarine, being heavily influenced by outflows from the Rio Orinoco and other mainland rivers, whereas the waters off Tobago are more saline. Between the west coast of Trinidad and Venezuela lies a shallow

(< 30 m) semi-enclosed body of water, the Gulf of Paria. The 200 m depth contour is 100 km offshore to the east and north of Trinidad, and skirts the northeastern tip of Tobago (Fig. 1). Bottom type is sand and mud in the Gulf of Paria and off the south coast of Trinidad. Sand

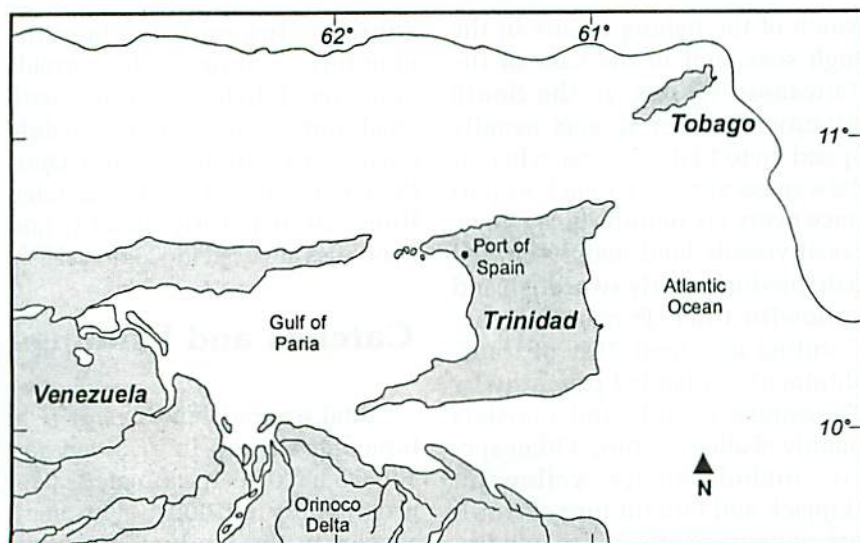


Fig. 1. Map of Trinidad and Tobago.

and rough bottom characterize the east coast of Trinidad and around Tobago (Gines 1972; Strømme and Saetersdal 1989). Coral reefs are found off the north coast of Tobago. These habitats support a high diversity of fishes, with some 476 species listed in Fishbase 96 (Froese 1996). As a result, there are several diverse fisheries which mainly use artisanal methods.

Fishing Activities

There are about 8 000 fishers in a population of 1 250 000 in Trinidad and Tobago (Fisheries Division, unpublished data). Artisanal fisheries are carried out from wooden or fiberglass *pirogues*, which are open boats 7-11 m long powered by one or two outboard engines. In the artisanal trawl fishery, an inboard engine is sometimes used. Vessels of a similar size called 'bumboats' operate in Tobago. These vessels do not stay out for more than a day and remain close to shore. Several semi-industrial and commercial vessels are also found in the fishery. A 1991 census revealed 1 819 and 285 fishing vessels in Trinidad and Tobago, respectively. Several semi-industrial

and commercial vessels are also found in the fishery (La Croix 1984; Fabres and Kuruvilla 1992).

Gillnet Fishing

Gillnets ('filets') are either multifilament (cotton or nylon) or monofilament (nylon) nets, 400-1 500 yards in length, and operated in shallow (8-30 m) inshore waters from *pirogues*. Multifilament nets are used as surface drift nets at night and target *carite* (*Scomberomorus brasiliensis*). Monofilament nets are bottom set during the day or night and target *carite* and sharks. Sharks taken by the gillnet fishery include *Carcharhinus limbatus*, *C. porosus*, *Rhizoprionodon lalandii*, *R. porosus* and four species of hammerhead shark (*Sphyrna*). The king mackerel *Scomberomorus cavalla*, a species of high commercial value, is an important component of the multifilament gillnet by-catch. Other by-catch include *Caranx hippos*, *C. crysos*, *Trachinotus goodei* and *T. carolinus*. In monofilament bottom set nets *Cynoscion jamaicensis*, *Micropogonias furnieri*, and *Lutjanus* spp. are important by-catch (Hodgkinson-Clarke 1990; Henry and Martin 1992a).

Flyingfish Fishery

Flyingfish (*Hirundichthys affinis*) are fished off the north and west coasts of Tobago using multi- or monofilament drift nets about 6-10 m long. Dip nets are also used. Fishing takes place during the spawning season from late November to early July. Chumming and fish aggregating devices made of coconut leaves are used to attract flyingfish which become entangled in the gillnets. Pelagic lines and trolls baited with live flyingfish catch dolphinfish (*Coryphaena hippurus*), albacore and yellowfin tuna, bonito, king mackerel, wahoo, billfish and sharks (*Carcharhinus* and *Rhizoprionodon* spp.). Demersal lines catch snappers and groupers (Jordan 1984; Samlalsingh et al. 1992).

Trolling

Pirogues may troll up to four lines for *carite*, king mackerel, wahoo, dolphinfish, tunas and billfish. A variant of trolling is 'a la viva' fishing, almost invariably using the clupeid *Sardinella aurita* as live bait. This is carried out from an anchored, drifting or slow moving boat mainly on the north coast of Trinidad targeting *carite* and king mackerel (Sturm et al. 1984; Henry and Martin 1992a).

Shrimp Trawling

Trawling activities are centered around the north and the south coasts and the Gulf of Paria. There are about 200 registered trawlers in operation. Artisanal trawlers fish close inshore in the Gulf of Paria, while semi-industrial and commercial trawlers operate further offshore. Five species of shrimp are exploited of which *Penaeus schmitti* dominates inshore catches and *P. notialis* is more abundant offshore (Maharaj et al. 1993). By-catch comprises mainly sciaenids, lutjanids, serranids, small carangids,

gerreids, ariid catfish, clupeoids and portunid crabs. The amount of by-catch retained varies according to type of trawler, with up to 94% being discarded (Maharaj and Recksiek 1991). During the wet season, shrimp abundance decreases and certain finfish (e.g., *Lutjanus synagris*, *C. jamaicensis*, *M. furnieri* and grunts) are targeted (Manickchand-Heileman and Julien-Flüs 1990). There is some concern about the destruction of the sea bed ecology and juvenile commercial species by trawling activities.

Fish Pot Fishing

This fishery is conducted in the waters off southwest Tobago and in the east and northeast off the coast of Trinidad in depths of 37-128 m. The main gear used are Antillean fish pots constructed of wood or steel rods and hexagonal wire mesh. Longlines and handlines are used to a lesser extent. The shallower areas are fished by *pirogues* while larger (15 m) mechanized vessels fish the deeper areas. The major species caught are snappers, mainly *Rhomboplites aurorubens*, *Lutjanus purpureus*, *L. synagris*, the yellowedge grouper (*Epinephelus flavolimbatus*) and the sweetlip grouper (*Mycteroperca interstitialis*) (Manickchand-Heileman and Phillip 1992). By-catch include lobsters (*Panulirus argus*) and several species of grunts and triggerfish.

Industrial Longline Fishing

In recent years, longlining activities have increased in Trinidad and Tobago. Large migratory pelagics are fished by a foreign fleet comprising large Taiwanese longliners and several small regional vessels, and a local fleet comprising seven small vessels (Chan A Shing 1993). These vessels transship chilled and frozen fish from a fishing port in Trinidad, although the Taiwanese vessels may use other ports in the region.

Much of the fishing occurs in the high seas, and in the case of the Taiwanese vessels, in the South Atlantic. Smaller vessels usually spend up to 14 days at sea, whereas Taiwanese vessels go back to port once every six months on average. Local vessels land mainly chilled fish, predominantly swordfish and yellowfin tuna. Frozen fish, accounting for about 75% of transshipments, is landed primarily by Taiwanese vessels and consists mainly of albacore tuna. Other species include bigeye, yellowfin, skipjack and bluefin tuna. Swordfish and tuna, both chilled and frozen, are generally transshipped, whereas other billfish may be either transshipped or sold to local vendors and processors. Some sharks are transshipped although most are sold locally for processing. Swordfish and larger tuna are the target species. Although the by-catch of dolphinfish and *mako* sharks may be retained, other commercial fish such as other sharks, billfish, *wahoo*, king mackerel and gempylids are usually discarded.

Recreational Fishing

There are 413 recreational fishing boats in Trinidad and 24 in Tobago (Fabres and Kuruvilla 1992). These are *pirogues* and larger vessels with superstructures. Target species include *carite*, king mackerel, *wahoo*, tuna, dolphinfish, billfish, groupers and snappers. Landings are unrecorded but are known to be substantial. In Tobago there is an annual international tournament in which blue marlin and yellowfin tuna are the most sought after species.

Others

Other types of fishing include beach seining, which is mainly off the east coast of Trinidad, where it targets *carite* and *C. hippos* from June to August, and the bluefish *Pomatrix saltator* in November. By-catch comprise mainly of small car-

angids, clupeoids, sciaenids, mugilids, centropomids, gerreids and rays. Offshore seining with small purse seines catches mainly *carite* and thread herring *Opis-thonema oglinum*, demersal longlines catch mainly sharks, and handlines are used for demersal fish.

Catches and Landings

Total annual landings of fish, tuna and shrimp in Trinidad and Tobago have been estimated at approximately 10 000 t. The main species in the landings are *carite* (2 500 t), shrimp (1 780 t) and sharks (950 t) (Fabres and Kuruvilla 1992; Henry and Martin 1992b). In Tobago, flyingfish is the most important species, averaging 276 t annually and comprising 75% of the total pelagic catch (Samlalsingh et al. 1992). In addition, annual landings of oceanic pelagics from the longline fleet approximate 1 690 t (Chan A Shing 1993). The data collection system is in need of improvement and is presently being upgraded under a joint initiative of the Government of the Republic of Trinidad and Tobago (GORTT), FAO/UNDP and the CARICOM Fishery Resources Assessment and Management Program (CFRAMP). More recent estimates give total annual fish and shrimp production of around 14 000 t valued at US\$22 million (0.30% of GDP). Fishery exports were about 2 980 t valued at US\$6.8 million and imports about 2 200 t valued at US\$4.9 million (Fishery Division, unpublished data).

Fish are landed at some 15 major beach landings, five markets and one fishing port. Few artisanal boats carry ice, and there are little or no icing facilities at the beaches or markets, except at the Port-of-Spain fish market. There is also a lack of icing facilities at roadside retail outlets. Fish are sold with guts and gills and this inferior handling is a serious issue. The development

of export markets for shrimp and, more recently, snappers and flyingfish together with the increase in the number of larger vessels, has led to improved handling and preservation methods.

Assessments

There have been a number of fishery surveys in Trinidad and Tobago since 1944, mainly conducting gear trials and exploratory fishing (Whiteleather and Brown 1945; Richards 1955; Sal'nikov 1969; Gines et al. 1971; Wolf and Rathjen 1974). In 1988, the *R.V. Dr. Fridtjof Nansen*, under the auspices of NORAD/FAO, completed four cruises from Suriname to Colombia, including Trinidad and Tobago, with the major objective of assessing fishery resource potentials. The results indicate moderate productivity of pelagic and demersal fish and low to moderate levels of exploitation, with the possible exception of *carite* (Strømme and Saetersdal 1989).

Recently, GORTT/ UNDP/FAO carried out assessments of various fisheries resources. These include assessment of fish pot fishing in Tobago (Manickchand-Heileman and Phillip 1992, 1996), flyingfish (Samlalsingh and Pandohee 1992), *carite* (Henry and Martin 1992b) and shrimp (Lum Kong et al. 1992). These studies show the resources to be optimally fished or overexploited. Studies on the white-mouth croaker *M. furnieri* show the stock to be in danger of overexploitation (Manickchand-Heileman and Kenny 1990; Manickchand-Heileman and Ehrhardt 1996), whereas those on the lane snapper *L. synagris* indicate the species is underfished (Manickchand-Dass 1987; Maingot and Manickchand-Heileman 1987).

Available studies indicate a number of underexploited resources. These include clupeoids and associated resources, deep shelf and slope resources, and lob-

sters. Moreover, underutilized resources stemming from by-catch of existing fisheries deserve attention to improve utilization of harvests.

The *R.V. Dr. Fridtjof Nansen* surveys reported dense coastal schools comprising mainly clupeoids (principally *Chirocentrodon bleekermanus* and *Pellona harroweri*), engraulids (mainly *Anchoa* spp. and *Anchoviella* spp.) and small carangids (mainly *Selene* spp. and *Chloroscombrus chrysurus*) with an annual harvestable biomass of about 20 000 t. These are low valued species and, apart from being landed as by-catch in the trawl and beach seine fisheries, they are harvested only for bait and limited human consumption. Full utilization of these species would require substantial capital investments which may not be economically viable. The surveys also indicate a potential of 1 000-2 000 t of cutlass fish (*Trichiurus lepturus*) and the barracudas (*Sphyracna guachancho* and *S. picudilla*).

Recently, there has been some interest by multi-purpose vessels in snappers, groupers and tilefish (*Caulolatilus* spp.) on the deep shelf and slope off the east coast of Trinidad. The *R.V. Dr. Fridtjof Nansen* trawled to depths of 800 m on the slope for deep sea shrimp. The most important species sampled were the royal red shrimp *Pleoticus robustus* and the scarlet shrimp *Plesiopenacus edwardsianus*. It was concluded that these resources could not sustain a trawl fishery.

Lobsters (*P. argus*) are taken mainly by hand and as by-catch in fish pots. There has recently been some targeting of the resource by multi-purpose vessels using fish pots. Wise (1976) estimated an annual sustainable yield of 500 t for Trinidad and Tobago, suggesting that a regulated expansion of the fishery is possible.

Underutilization of resources occurs mainly as a result of the unregulated discarding of the by-catch in longline and shrimp trawl

fishing. In shrimp trawling, a substantial proportion of the landed by-catch comprises small-sized species and juveniles of commercial species with limited potential as food fish. Possible utilization includes production of fish meal. Portunid crabs, which seasonally comprise a large proportion of the by-catch, are marketed only in small quantities although they are a prized food item in some other countries (Maharaj and Reckseik 1991; Sturm 1991; Maharaj et al. 1993). Other underutilized species include rays, mullets (*Mugil* spp.), cutlass fish and ariid catfish.

Research and Management

There are two GORTT-funded institutions involved in fisheries research: (1) the Fisheries Division of the Ministry of Agriculture, Land and Marine Resources, which also has responsibilities for fisheries administration and management; and (2) the Institute of Marine Affairs (IMA). The University of the West Indies offers academic training and supports post-graduate fisheries research. CFRAMP established a Resource Assessment Unit in Trinidad which implements the assessment of shrimp and groundfish stocks on the Guyana/Trinidad shelf. CFRAMP also assisted in the establishment of a regional age and growth laboratory at IMA which is involved in the ageing of selected commercial fish species from the region using hard parts, including *carite*, king mackerel, *C. hippos* and the sharks *C. porosus*, *C. limbatus* and *R. lalandii* from Trinidad. GORTT/UNDP/FAO is also carrying out a project on integrated coastal fisheries management in the Gulf of Paria.

The GORTT-funded Caribbean Fisheries Training and Development Institute (CFTDI) offers training to the fishing industry on

a regional basis. Modules offered include navigation, seamanship, safety at sea, fishing methods, gear technology, engine repair and maintenance, and fish processing.

Trinidad and Tobago has been involved in several fisheries joint ventures. Agreements with Venezuela from 1979 to 1995 provided for a limited number of Trinidad *pirogues* to trawl exclusively for shrimp in a special restricted area in the western part of the Orinoco Delta on the Venezuelan coast. In exchange, Venezuelan artisanal vessels were allowed to fish in Trinidad and Tobago's exclusive economic zone. Also, an unlimited number of trawlers from both countries were allowed to operate in the area south of Trinidad and north of Venezuela. Despite several attempts this agreement has not been renewed. A joint venture allowing Trinidad industrial trawlers to fish in Brazil coastal waters in exchange for marketing the catches in Brazil lasted for three years (1982-1985). Another joint venture permitted Barbados boats to exploit flyingfish off Tobago in exchange for marketing facilities in Barbados for flyingfish and by-catch caught by the Tobago boats. This agreement lasted only for one year (1991). Reasons for the failure of Trinidad and Tobago to successfully establish fisheries joint ventures are given by Goodridge (1995).

Fisheries legislation exists but is mostly outdated. The only fishery that is regulated is the trawl fishery, with restrictions on areas fished and mesh sizes as well as limited entry for commercial trawlers. The major difficulty is the enforcement of regulations. As a result of stock assessment studies, new fisheries legislation is being formulated as part of the development of a Fisheries Policy. This should assist the Fisheries Division in solving the problems facing the industry and in effectively managing the fishery.

Acknowledgments

Thanks are due to Dr. Avril Siung-Chang for useful comments and to Ms. Hillary Baptiste for assistance in the preparation of Fig. 1.

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