



# Project GloBAL

Global Bycatch Assessment of Long-Lived Species

## Country Profile

# TRINIDAD AND TOBAGO



**WIDECAST**

*Wider Caribbean Sea Turtle Conservation Network*

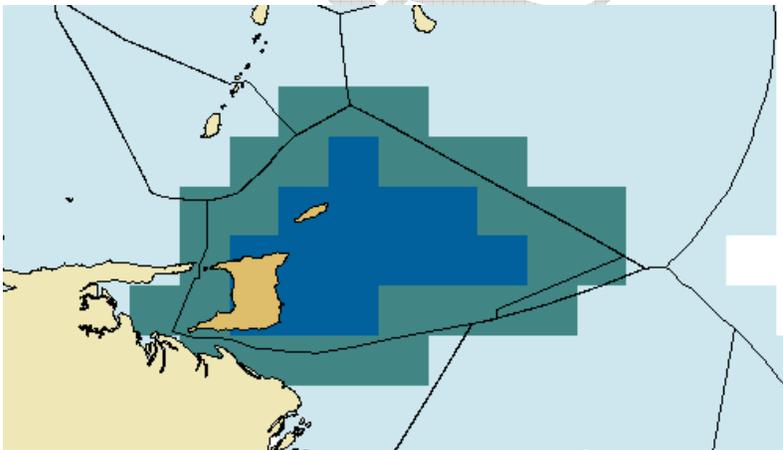
### TRINIDAD and TOBAGO (TT)



**Fig. 1. Flag of Trinidad and Tobago<sup>1</sup>**



**Fig. 2. Map of Trinidad and Tobago<sup>1</sup>**



**Fig 3. Map of Trinidad and Tobago's EEZ<sup>2</sup>**

<sup>1</sup> CIA World Factbook. <<https://www.cia.gov/cia/publications/factbook/geos/td.html>>

<sup>2</sup> Sea Around Us Project <[www.seaaroundus.org](http://www.seaaroundus.org)>

**Geographic Coordinates:** 11 00 N, 61 00 W <sup>1</sup>

**Terrestrial Extent:** 5128 km<sup>2</sup> <sup>1</sup>

**Coastline:** 362 km <sup>1</sup>

**EEZ Extent:** 75,000 km<sup>2</sup>

**Shelf Area:**

**Marine Fisheries Landings (production in tons):** 13.4 thousand live weight (FAO 2000)

**Other countries operating within this EEZ:** Venezuela in Trinidad, Barbados in Tobago

**Government Agency for Marine Fisheries:** Fisheries Division, Ministry of Agriculture, Land and Marine Resources

**Government Agency for the Protection of the Marine Environment:**

**Population:** 1,065,842 (July 2006 est.) <sup>1</sup>

**Description:** The Republic of Trinidad and Tobago is an independent, federated nation consisting of the two islands Trinidad (4828 km<sup>2</sup>) and Tobago (300 km<sup>2</sup>). Trinidad lies 32 km from Tobago at its closest point, but is approximately 13 km from the Venezuelan mainland. English is the official language, but Hindi, French, Spanish and Chinese are also spoken. Trinidad and Tobago is a member of CARICOM, CRFM, FAO, WECAFC.

## The Fisheries of Trinidad and Tobago

### Overview

The fishing industry in Trinidad and Tobago is mostly artisanal, but includes multipurpose vessels, semi-industrial and industrial trawlers and longliners, and is characterized by multi-species and multi-gear fisheries. The FAO estimates that fisheries contribute 0.3% to the total GDP (FAO 2000).

### 1. What fisheries exist in this territory and what are the target species?

The Fisheries Division website gives the following information about the catch composition of fisheries. The **artisanal gillnet fishery** targets predominantly carite (Spanish mackerel) (*Scomberomorus brasiliensis*) and kingfish (king mackerel) (*Scomberomorus cavalla*) off Trinidad, and flyingfish and associated species off Tobago.

The most abundant and commercially important bycatch species in the surface set gillnet fishery, also known as **driftnetting**, include: *Carcharhinus limbatus* (blackfin shark), *Carcharhinus porosus* (puppy shark), *Rhizoprionodon lalandii* (sharpnose shark), *Sphyrna media* (chapo), *Sphyrna tudes* (curry shark), *Sphyrna tiburo* (hammerhead), *Sphyrna lewini* (chapo), *Caranx hippos* (cavalli), *Caranx crysos* (black cavalli), *Selene vomer* (moonshine), *Trachinotus carolinus* (pampano), *Bagre marinus* (catfish), *Pomatomus saltator* (ancho), and *Sphyrna sp.* (bechine).

The most important bycatch species in the **bottom-set (fixed) gillnet fishery** are: *Diapterus rhombeus* (blinch), *Micropogonias furnieri* (croaker), *Cynoscion sp.* (salmon), *Macrodon ancylodon* (german/rock salmon), *Arius spp.* (cacamato/catfish).

One study by Hodgkinson-Clarke in 1990 suggested that monofilament, bottom-set gillnets land a larger percentage and greater variety of bycatch species than the top-set multifilament gillnets because of the demersal deployment and higher hanging ratio (thus, entanglement ability), compared to multifilament nets (Fisheries Division 1999).

The target species in the **flyingfish fishery** off of Tobago are flyingfish (*Hirundichthys affinis*), and dolphinfish (*Coryphaena hippurus*). The most abundant and commercially important bycatch species associated with this fishery are: *Carcharhinus affinis* (sharks), *Thunnus albacares* (yellowfin tuna), *Thunnus atlanticus* (blackfin tuna), *Acanthocyblum solandri* (wahoo), *Makaira nigricans* (oceanguard).

The offshore (drifting) surface and pelagic **longline fishery** targets ocean pelagics including: *Thunnus albacares* (yellowfin tuna), *Thunnus obesus* (bigeye tuna), *Thunnus alalunga* (albacore), *Thunnus atlanticus* (blackfin tuna), *Lutjanus spp.* (redfish), *Carcharhinus spp.* (shark), *Isurus spp.* (mako sharks), *Alopias spp.* (thresher shark), *Caulolatilus intermedius* (gulf bar-eyed tilefish), *Lopholatilus chamaeleonticeps* (golden tilefish). The most abundant and commercially important bycatch species are: *Xiphias gladius* (swordfish), *Makaira nigricans* (oceanguard), *Istiophorus albicans* (atlantic sailfish), *Tetrapterus albidus* (white marlin), *Tetrapterus pfluegeri* (longbill spearfish).

The demersal trawl fishery targets hoppers (*Penaeus brasiliensis*), pink shrimp (*P. notialis*), white/cork shrimp (*P. schmitti*), brown shrimp (*P. subtilis*), honey/jinga shrimp/sea bobs (*Xiphopenaeus kroyeri*).

A significant quantity of finfish (70 species identified from 40 families), crabs (several species of Portunids) and squid are landed as bycatch in the trawl fishery, though the amount varies with trawler type (Fisheries Division 1999). Additionally, several species of groundfish exploited incidentally in the demersal trawl fishery are also targeted by an inshore gillnet fishery. The most commercially important and abundant species are *Micropogonias furnieri* (croaker) and *Cynoscion spp.* (sea trout and weakfishes, also known locally as “salmon”) particularly *C. jamaicensis*.

Other important by-catch species are: *Arius spp.* (cacamato, catfish), *Cyclopsetta spp.*, *Caranx spp.* (cavalli), *Chloroscombrus chrysurus* (plato), *Selene spixii* (lookdown, moonshine), *Selene vomer* (moonshine), *Trachinotus carolinus* (pampano), shark, *Centropomus ensiferus* (snook/brochet), *Harengula clupeiola* (hardback sardine), *Opisthonema oglinum* (thread herring), *Symphurus spp.* (tonguefish), *Anchoa spp.* (sardine), *Cetengraulis edentulus* (sardine), *Chaetodipterus faber* (paoua), *Diapterus rhombeus* (blinch), *Eucinostomus argenteus* (blinch), *Haemulon spp.* (grunt), *Lutjanus spp.* (redfish), *Polydactylus virginicus* (barbe), *Pomatomus saltator* (ancho), *Callinectes spp.* (cirri crab), *Macrodon ancylodon* (german/rock salmon), *Ophioscion spp.*, *Scomberomorus brasiliensis* (carite), *Trichiurus lepturus* (cutlassfish), *Prionotus punctatus* (fowlfish).

The fishpot fishery targets demersal snapper and grouper species, such as Plumhead (*Rhomboplites aurorubens*), Red fish or red snapper (*Lutjanus purpureus*), grunt

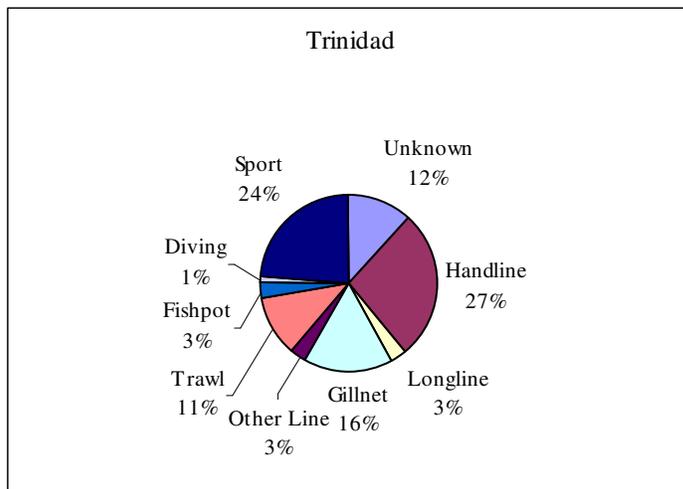
(*Haemulon melanurum*), yellowedge grouper (*Epinephelus flavolimbatus*), sweetlip grouper (*Mycteroperca interstitialis*), and pargue. Fish pots are not very selective gear, and there is high bycatch of finfish, especially sea catfish.

There are multiple types of hand line fishing, including a-la-vive (live-bait) and trolling for pelagics, and bottom line fishing (banking) for demersals. Trolling and a-la-vive fishing targets and catches carite, kingfish, and sierra mackerel. Banking targets benthics such as sharks and red snapper.

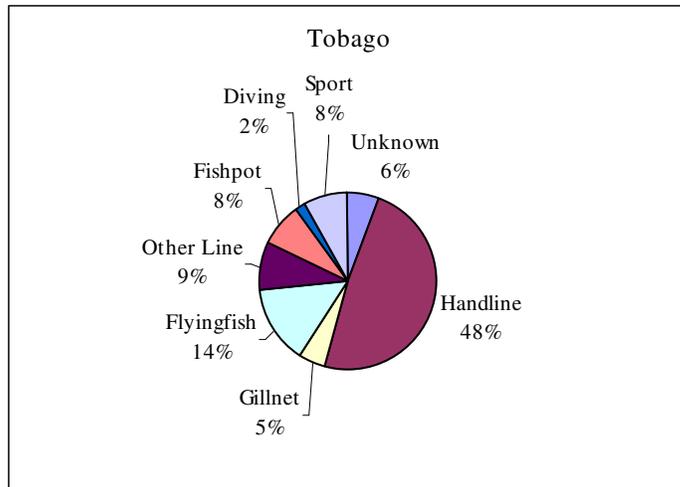
Please see Appendix 1 for a summary table of fisheries and target species.

## 2. What are the specific vessel and gear types used in each fishery?

A 1991 census by the Fisheries Division recorded 2,104 vessels, consisting mostly of artisanal vessels. Figures 4a. and 4b. represent the percentage composition of vessels in the fleet of Trinidad and Tobago in terms of the primary gear they use (charts reproduced from the Fisheries Division, Unknown). Nagassar (2000) reports only 1246 vessels based on summary statistics for landing sites.



**Figure 4a: Percent of vessels by primary gear used in Trinidad.**



**Figure 4b: Percent of vessels by primary gear used in Tobago.**

Lalla reported eight longliners in the national fleet in 2001. These vessels are 14-23 m in length with diesel engines of 180-350 HP. Vessels are equipped with echo sounders, fish finders, GPS, communication equipment and hydraulic equipment for setting and retrieving gear. Main lines are 24-88 km long with 300-1000 hooks, and are set about 30-50m below the water surface. The Fisheries Division (1999) reports that of the pirogues that target groundfish, there are 58 in Trinidad and 1 in Tobago that use demersal longlines as their primary gear type. However, no additional gear information is given.

The gillnet fishery, which targets groundfish, is predominantly a coastal, artisanal fishery that operates out of pirogues – small wooden, fiberglass, or fiberglass-coated wood, open boats 6-10 meters in length, with 1-2 outboard engines between 45-75 HP (Fisheries Division 1999). Most vessels are owned by individuals. Current fishery regulations require a minimum diagonal mesh size of 4 inches (Gass 2006) and this is the preferred mesh size for multifilament nets for most fishers (Nagassar 2000). Fishers operate two types of gillnets. The top-set net is deployed just below the surface of the water, and is typically made of multifilament nylon, cotton, or other synthetic twines, and is a heavier net than the bottom-set nets. These nets are fished at night, except during bright moonlight, and may be free drifting or attached to the boat at one end. The bottom-set (demersal) gillnet that is anchored to the seafloor is composed of transparent, monofilament nylon – this method is also known locally as “transpearing”, “monoflemming”, or “white net”(Fisheries Division 1999). Monofilament nets are fished day and night. About 60% of gillnets island-wide are monofilament, bottom-set nets (Nagassar 2000).

Nagassar’s frame survey estimates that Trinidadian fishermen operate approximately 666 gillnets – 389 monofilament and 277 multifilament nets. There are 23 gillnets operating in Tobago – 11 monofilament and 12 multifilament. Gillnets are typically measured in weight, rather than length. Table 1 is reproduced from Nagassar’s frame survey that tells the total estimated weight of gillnets for Trinidad and Tobago.

**Table 1: Estimated total weight of monofilament and multifilament nets in Trinidad and Tobago, measured in pounds. (Nagassar 2000)**

<b>Coast</b>	<b>Weight of Nets (Monofilament)</b>	<b>Weight of nets (Multifilament)</b>
East	3725	8490
North	1426	7960
South	14800	13892
West	19424	10550
<b>Total</b>	<b>39375</b>	<b>40892</b>

A 1998 boat census by the Fisheries Division indicated that there are 351 fishing boats in Trinidad that use gillnets as their main fishing gear (Nagassar 2000). Of these, 164 use monofilament nets, 183 use multifilament nets, and 4 use a combination of net types. Nagassar's frame survey (2000) indicates that 342 boats in Trinidad and 12 boats in Tobago operate in the gillnet fishery, with the majority of the activity on the south and west coasts of Trinidad. Of these, 92 vessels reportedly use monofilament, 110 use multifilament, 137 use monofilament and multifilament nets, and 1 vessel uses a combination net. Although the number of vessels recorded from the two studies is similar, Nagassar's study found that more fishermen using a combination of monofilament and multifilament nets or other gear types (138 vessels), rather predominant use of monofilament nets.

The demersal trawl fishery has been described as the country's most valuable fishery in terms of landings, dollar value and foreign exchange earnings (Fisheries Division 1999). Trawlers are divided into four fleet categories according to length, engine horsepower, and degree of mechanization. All local trawlers use four-seamed, flat nets.

A November 1991 census identified 209 active, locally registered trawlers. Although some of the reports upon which this Fisheries Division 1999 report is based are from earlier surveys, such as a 1984 Trawler Gear Survey, authors maintain that the earlier reports are considered to be representative of the current fleet.

There are multiple handline fisheries in Trinidad and Tobago. Trolling involves towing 4-6 lines with approximately 3 baited hooks from bamboo outriggers off of a moving vessel. Banking is semi-stationary (the pirogue from which the lines are set drifts with the current), where multiple weighted lines with multiple baited hooks are set on the seafloor. Switchering involves multiple handlines with baited hooks, deployed from a stationary vessel. Hooks are not bottom-set. Live bait (a-la-vive) fishing uses nylon twine line.

There have been attempts at developing a FAD (floating aggregating device) fishery, around which fishermen could use various hand-line techniques to target pelagics attracted to the FAD (Lalla 2001). However, as of 2001, there were no FAD fisheries,

with the exception of a few coconut branches used in the flyingfish fishery of Tobago. In 1999, three FAD were deployed, but there was little cooperation or communication of results from fishermen, so the effort was not pursued.

Fish pots are baited cages on the seafloor, and are typically the arrow head and “Z” types (Fisheries Division Unknown).

Please see Appendix 2 for a summary table of fleet characteristics and fishing effort.

**3. *Where and when are the specific gear types deployed for each of these fisheries (seasonality, trip duration, etc)?***

The longline fishery operates along the north and east coasts of Trinidad, with larger vessels also venturing into the EEZ. Venezuelan longline vessels also regularly fish within the EEZ of Trinidad and Tobago. Vessels are at sea for periods of 7-15 days, and operate year round with peak activity between November and April. The peak period for targeting swordfish is January to March, when the ICCAT quota of 42 tons of swordfish per year is reached (Lalla 2001). The usual crew size is about 6 people.

There are 65 landing sites in Trinidad where gillnet fishermen land their catch: 8 on the east coast, 9 on the north coast, 9 on the south coast, and 39 on the west coast (Nagassar 2000). The artisanal gillnet fishery is mostly conducted inshore and along the coast at depths between 9-14 meters (Fisheries Division 1999). Most fishers land their catches at the home ports where their vessels are registered. On the southern coast, there is a higher incidence of fishermen operating their boats and landing their catch at ports that are farther away from their homes.

The gillnet fishery operates year-round, with fishers spending on average 15-20 days per month at sea. The majority of gillnet operation occurs on the south (Columbus Channel) and west (Gulf of Paria) coasts of Trinidad (Fisheries Division 1999; Nagassar 2000).

There are four trawler fleets: 2 inshore, artisanal fleets; an offshore, semi-industrial fleet; and an offshore industrial fleet. Major trawling activities centered around the Gulf of Paria in the west, the Columbus Channel in the south and seasonally in areas off the north coast (Fisheries Division 1999). Category I vessels operate in the Orinoco Delta; Category II and III vessels operate exclusively in the Gulf of Paria; Category IV vessels operate in the Gulf of Paria and Columbus Channel year-round, and seasonally from October to January along the North Coast.

A-la-vive fishery is seasonal and depends on the availability of the bait fish, Jashua (note: availability is not usually during leatherback nesting season, so not a viable alternative fishery during this time). The principle line fishing areas are on the west, north and east coasts and around off-shore structures such as oilrigs. Three to five fishers per vessel go out on a daily basis.

Fish pots are deployed off the northwest of Tobago and the north, south and east of Trinidad.

**4. *What species of marine mammals, sea turtles and seabirds occur and may be at risk for capture or interaction with fisheries?***

**Marine Mammals:**

According to a 1994 report by Vidal et al., the only recorded marine mammal interaction with fishing gear in Trinidad and Tobago was the entanglement of a killer whale in a gillnet. The animal died after struggling for more than an hour. The report, which is based on very limited data, also states that bottlenose dolphins and humpback whales are also at risk.

Visual and acoustic surveys for marine mammals were conducted in the spring of 1995, 1996, 2000 and 2006, off the coasts of Dominica, Martinique, Guadeloupe, Grenada, and Trinidad and Tobago (SC/58/SM24 Sm Cet 2006). These surveys encountered 13 species of small cetaceans. The Small Cetaceans report provides a comprehensive look at what species of marine mammals are present in the waters of various Caribbean islands, and identifies threats or potential threats for some of these species. While this is not a direct bycatch mitigation project, it provides a foundation to identify species of concern or areas in need of further research before a proper bycatch mitigation project can be planned and implemented. From these studies, the species found in the waters of Trinidad and Tobago, and information about their populations and threats are as follows:

The Small Cetaceans report indicated that the Fraser's dolphin is found off the central coast of Venezuela, which means that it could also be found in or around Trinidadian waters. This species is exceptionally vulnerable to entanglement in driftnets. Given the gillnet fishery for kingfish, this species could be at risk in Trinidad.

In 1988, an individual killer whale (*Orcinus orca*) from a group of about 15 animals became entangled in a fishing net in the Gulf of Paria.

Most marine mammal exploitation in Trinidad and Tobago occurred from 1826-1865 as part of an intense, shore-based endeavor of local elites who hired slaves to do most of the work (Romero et al. 2002). Exploitation trends in Trinidad and Tobago differ significantly from the marine mammal exploitation of the surrounding countries of Venezuela, Grenada, and St. Vincent and the Grenadines. Whales, mostly humpback whales, were targeted directly and utilized for oil, meat and whalebone (Romero et al. 2002). Direct dolphin fisheries are rare and have mostly been limited to the opportunistic use of incidental catches. As of Romero et al.'s 2002 report, whaling is no longer practiced in Trinidad and Tobago, and ended long ago when local populations declined or went extinct. During the time that whaling did occur, there are records of at least 500 whales being hunted between 1826 and 1865. Although considered endangered, all cetaceans lack legal protection under either the Fisheries Act of 1980 or the Conservation Wildlife Act of 1980.

Dolphins have historically been rare in Trinidad and Tobago's waters, and most reports are related to accidental nettings, although there are occasional reports of harpooning 'porpoises' (Romero et al. 2002). Dolphins caught as bycatch are mostly captured in Italian seines and gillnets. The main species are *Stenella spp.* and *Tursiops truncatus*. Most dolphins are dead when captured, but if they are alive, they are killed. Most are sold in the wholesale market, and occasionally by the side of the road. The orca, *Orcinus orca*, is reportedly the largest animal incidentally captured and kept by a drift gillnet. This occurred in 1987 (Romero et al. 2002). Also in 1987, a pod of 15 adult and 2 calf short-finned pilot whales (*Globicephala macrorhynchus*) stranded on the North Coast at La Filette. All but the two calves and one adult were returned to sea – the others were sold at a fish market.

Manatees have been harpooned for their meat, oil, and hide from Colonial times until relatively recently, as indicated by Trinidadian officials who report illegal hunting of manatees as late as 1980 (Romero et al. 2002). There is a report from 1990 of a manatee accidentally caught in a fishing net and butchered. Unlike cetaceans, the manatee is protected under Chapter 61:01 of the Conservation of Wildlife Act, and cannot be hunted at any time. Its habitat is also protected under the Forest Act Chapter 66:01 (Romero et al. 2002). However, manatees are threatened with extinction, as there is only a small population with approximately 18 individuals (in 1997) living in the Nariva Swamp, and poaching and habitat destruction continue.

A comprehensive list of marine mammals that have ranges which include the waters of Trinidad and Tobago, and which may be found there, can be found in Appendix 3.

#### **Sea Turtles:**

The incidental capture of leatherback turtles in artisanal gillnets has been examined in multiple studies, and Eckert and Lien (1999) found that this may be the largest single source of mortality for leatherbacks in Trinidad and Tobago (Lee Lum 2003). Although a greater number of leatherbacks have been found in the surface-set multifilament gillnets, there is greater mortality of those caught in the bottom-set monofilament nets (Gass 2006). Fishermen often kill sea turtles that are caught in their nets out of frustration from the destroyed nets.

#### **Sea Birds:**

I found no information on the interaction between fisheries and seabirds for Trinidad and Tobago.

#### ***5. What collection methods (observer programs, etc.) exist for gathering fishing effort and bycatch data for each fishery?***

A lot of the fisheries information gathered is still based on a system geared to dealing with artisanal fisheries, but an institutional framework for the monitoring of the industrial fishery, including updating of legislation is now being established. Catch and effort data are collected from a shore-based system that covers about 20% of the 65 landing sites (Lalla 2001). Data is recorded full time by collectors who live close to the landing sites.

For each vessel, they record landed weight and price by species, fishery type, vessel registration number, times departed and returned, number of crew, and gear type used. Data is collected on all landings but not collected on discards at sea (i.e. bycatch).

Another shore-based system which covers about 50% of the landing sites collects data on target species of each fishery, as well as on some important bycatch species. Data collected for these species includes: length, weight, maturity, hard parts for ageing, and morphometric data for species processed at sea.

A logbook program was implemented in November 1991 to collect catch and effort data from the semi-industrial and industrial trawl fleets, but the program was unsuccessful and collapsed in May 1992 (Fisheries Division 1999). According to the Fisheries Division, an observer program for the shrimp trawl fishery, and a formal logbook system for all locally flagged industrial vessels will be attempted in the near future. As of 2001, a system was also being developed for collecting catch and effort data from the semi-industrial/industrial longline fishery with assistance from ICCAT (Lalla 2001).

Other programs exist to record landings, but coverage is sporadic and changes locations over time depending on personnel, funding for observers, and interest in particular landing sites.

The Fisheries Division also has assessed fisheries stocks for several important fisheries. These include the inshore gillnet and line fisheries for carite and associated species, sharks and kingfish; the drifting fishery of Tobago that operates off the northwest coast of Tobago and uses pelagic gillnets and fish attracting devices to catch flyingfish and similar species; and the fish pot and line fishery that operates off the northwest coast of Tobago and the north coast of Trinidad, which targets snappers and groupers, and also captures lobsters.

**6. *Are there databases or datasets (including geospatial databases) on fisheries, fishing effort or bycatch of mammals, birds, or turtles? Please describe.***

Table 3 is based on information from the Fisheries Division Website about the various databases that deal with fisheries. This is the only information specific to databases that I was able to find for Trinidad and Tobago.

**Table 3: Fisheries databases for Trinidad and Tobago.**

Country/Region	Database	Type	Maintained by	Description
Trinidad and Tobago	Pilot GIS for Gulf of Paria	GIS	Fisheries Division, Ministry of Agriculture, Land and Marine Resources, Trinidad and Tobago	A pilot GIS was developed in ARC/INFO for the coastal zone of the Gulf of Paria to reflect these diverse uses and to facilitate the analysis of possible interactions and impacts for integrated fisheries management. ArcView is being used to display and query the geographic data.

Country/Region	Database	Type	Maintained by	Description
Trinidad and Tobago	Agris		Fisheries Division, Ministry of Agriculture, Land and Marine Resources, Trinidad and Tobago	Covers 1900s to present, 4186 Records with regular updates, and uses Mini-Micro CDS/ISIS software. Agris (International Information System for Agricultural Services and Technology) is used by the Fisheries Division library as a database of its entire holdings. Journals, monographs, conference proceedings, theses and articles within these documents are all included. Subject matter covers fisheries, fishery management, oceanography, stock assessment, aquaculture, fishery biology, computers, taxonomy, legislation, biodiversity, and conservation.
Trinidad and Tobago	Cruise		Fisheries Division, Ministry of Agriculture, Land and Marine Resources, Trinidad and Tobago	Covers 1800s to present, with 100 records. This database has irregular updates, and uses Mini-Micro CDS/ISIS software. The database is an inventory of fishery and oceanographic cruises conducted in the Caribbean region. It provides a record of the vessels used, responsible institutions, types of data recorded, fisheries surveyed, geographical area covered and catching methods used. The major objectives and summary of results for each cruise are also included. Most of the data are sourced from cruise reports.
Trinidad and Tobago	Guide		Fisheries Division, Ministry of Agriculture, Land and Marine Resources, Trinidad and Tobago	Database coverage is current with 170 records and irregular updates. It uses Mini-Micro CDS/ISIS software. The database comprises contact information for institutions which have assisted in obtaining material for the Stock, Cruise, and Info databases described above, and others known to have research interests in the region. Records include names, addresses, contact numbers (telephone and fax) and the main areas/focus of research.
Trinidad and Tobago	Gulp		Fisheries Division, Ministry of Agriculture, Land and Marine Resources, Trinidad and Tobago	Database coverage is 1877 to present, with 1217 records and irregular updates, and uses Mini-Micro CDS/ISIS software. The database consolidates all existing information on the Gulf of Paria (Trinidad and Tobago) and the associated coastal zone. It reflects the diversity of uses and users of this area. Journal articles, monographs, conference proceedings, theses and "grey literature" from local (government and non-government), regional and international sources are included. Gulf is also available for on-line searching at the UNECLAC ( <a href="http://searcher.eclacpos.org/">http://searcher.eclacpos.org/</a> ) office, Trinidad and Tobago. Subject matter covers agriculture, conservation, demography, ecology, fisheries, fisheries management, flora and fauna, freshwater ecology, industry, pesticide use and management, planning and development, pollution and wetlands.
Trinidad and Tobago	Info		Fisheries Division, Ministry of Agriculture, Land and Marine Resources, Trinidad and Tobago	Database coverage is 1964 to present, with 2767 records and regular updates, and uses Mini-Micro CDS/ISIS software. Info covers literature dealing with processing and management of fishery, biological and oceanographic data. Journal articles, monographs, conference proceedings, theses and "grey literature" from local, regional and international sources are included. Subject matter covers computer programs, data collection, data handling, data processing and information systems (geographic, coastal, etc.).

Country/Region	Database	Type	Maintained by	Description
Trinidad and Tobago	Stock		Fisheries Division, Ministry of Agriculture, Land and Marine Resources, Trinidad and Tobago	Database coverage is 1804 to present, with 12,391 records and regular updates, and uses Mini-Micro CDS/ISIS software. Stock database is a comprehensive database on the commercial marine species, fisheries and oceanography of Trinidad and Tobago and the adjacent region. Journal articles, monographs, conference proceedings, theses and "gray literature" from local, regional and international sources are included. Subject matter covers fisheries biology, fisheries management, marine ecology, oceanography and stock assessment.

**7. *What bycatch studies or bycatch mitigation projects exist for marine mammals, sea turtles, and sea birds?***

**Marine Mammals:**

Based on Romero et al's 2002 study on the historical utilization of marine mammals, it does not appear that marine mammal bycatch is a large problem for Trinidad and Tobago. It appears that most whale populations are locally extinct and that direct harvest is a threat to these cetaceans. Dolphins are relatively rare in the waters of Trinidad and Tobago, although they would be the mammal of concern for bycatch in gillnets. Perhaps the WIDECAST efforts to transition from gillnets to other gear types for the protection of leatherbacks will also have positive implications for dolphin populations.

**Sea Turtles:**

Eckert and Eckert (2005) discusses a national consultation that addresses leatherback bycatch in gillnets. In February 2005, a National Consultation was hosted by the Wider Caribbean Sea Turtle Conservation Network (WIDECAST) and the Fisheries Division (Ministry of Agriculture, Land and Marine Resources) to address the issue of leatherback bycatch in gillnet fisheries in Trinidad and Tobago. Participants included fishers, local and national NGOs, the primary governmental natural resource management agencies, the Ministry of Foreign Affairs, and a small number of international fishing and conservation efforts.

The objectives of this meeting were that fishers must be made better off economically as a result of bycatch mitigation proposals, and that the incidental catch and mortality of leatherbacks in coastal fisheries must cease. Multiple bycatch reduction methods were proposed, including: new bait types (artificial, dead and non-traditional baits) to enhance hook-and-line fishing as a replacement for gillnets; new technologies, techniques, or gear modifications (power take-up reels, alternate net materials, FADs; net-fishing at different depths); and creative approaches to net avoidance (sonic 'pingers', shark silhouettes).

In addition, new regulations were proposed, particularly regarding time and area closures. The recommended regulation was a ban of gillnets from March 1 go May 31 within the area extending from the south end of Fishing Pond Beach to the west end of

Paria Beach, and extending 8 km offshore, where and when the majority of leatherback nesting occurs.

In addition to these efforts at reaching solutions with fishermen, the United Nations Development Program (UNDP)/Global Environmental Facility (GEF) Small Grants Programme provided a grant in the late 1990s to the Grande Riviere Environmental Action Trust (GREAT) to reimburse fishers for the cost of net repairs when the damage was caused by a sea turtle that was captured and released alive. This provides fishermen the incentive to release turtles alive, rather than killing them, which is or was common. This program is currently being evaluated, pending potential renewal.

### **Sea Birds:**

I found no information about seabird bycatch or bycatch mitigation studies in Trinidad and Tobago.

### ***8. Are there bycatch research and mitigation projects for other taxa, such as non-target fish or shark species?***

The Fisheries Division of Trinidad and Tobago gathers data for commercially important bycatch species (such as finfish, sharks, and others) in select fisheries. This data is gathered in conjunction with other landings data programs. The information is gathered in part to assist with the development of fisheries management plans, which may or may not have bycatch mitigation components. See Fisheries Division 1999.

### ***9. What policy/regulatory framework exists to guide fisheries or bycatch management?***

**Table 4: Treaties and conventions to which Trinidad and Tobago is a member that pertain to marine conservation issues.**

Short Title	Long Title
CARICOM	<a href="#">Caribbean Community</a>
Cartagena de Indias	<a href="#">Convention for the Protection and Development of the Marine Environment of the Wider Caribbean Region</a>
CBD	<a href="#">Convention on Biological Diversity</a>
Living Res. of the High Seas Cnvt.	<a href="#">Convention on Fishing and Conservation of the Living Resources of the High Seas</a>
CITES	<a href="#">Convention on International Trade in Endangered Species of Wild Fauna and Flora</a>
---	<a href="#">Convention on Nature Protection and Wildlife Preservation in the Western Hemisphere</a>
Continental Shelf Convention	<a href="#">Convention on the Continental Shelf</a>
Basel Convention	<a href="#">Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal</a>
High Seas Convention	<a href="#">Convention on the High Seas</a>
IMO Convention	<a href="#">Convention on the International Maritime Organization</a>
Territorial Sea Convention	<a href="#">Convention on the Territorial Sea and the Contiguous Zone</a>

Short Title	Long Title
Ramsar Convention	<a href="#">Convention on Wetlands of International Importance especially as Waterfowl Habitat</a>
Lome IV	<a href="#">Fourth ACP - EEC Convention</a>
ICCAT	<a href="#">International Commission for the Conservation of Atlantic Tunas</a>
IPPC	<a href="#">International Plant Protection Convention</a>
MP	<a href="#">Montreal Protocol for the Protection of the Ozone Layer</a>
---	<a href="#">Treaty Banning Nuclear Weapon Tests in the Atmosphere, in Outer Space and under Water</a>
UNCLOS	<a href="#">United Nations Convention on the Law of the Sea</a>
UNFCCC	<a href="#">United Nations Framework Convention on Climate Change</a>
WECAFC	<a href="#">Western Central Atlantic Fishery Commission</a>

**10. Have research and management needs, priorities or constraints been identified or recommended? (include gear/technological developments or prohibitions that might impact fisheries)**

Nagassar (2000) discusses a ban on the importation of monofilament gillnets in March 1998, and a ban on its use effective March 2000, as a result of the nonselectivity of the gear type and the deleterious impacts on coastal marine fisheries. This was based on recommendations by the Monitoring and Advisory Committee (MAC) on the Fisheries of Trinidad and Tobago, a stakeholder/participatory management group established in 1997 by the Minister of Agriculture, Land and Marine Resources. The frame survey (Nagassar 2000) found that multifilament nets were a good alternative to monofilament nets, but there was heavy protest of the regulations by fishermen, particularly those on the South coast where monofilament nets were most heavily used. Those who supported the ban also thought that monofilament nets had deleterious impacts on the seabed. The frame survey, which was conducted in response to the protest of the ban to learn more about the use of gillnets and their impacts on fisheries, recommended that further studies be done to determine the impact of the gear and the impact that such a ban would have on fishery-dependent communities that do not have alternate means of livelihood.

**Discussion**

The longline fishery's peak activity ends just as leatherback nesting season is beginning. There could be an overlap of the fishery when the turtles are mating, which could pose a threat to the males in the population that are still around at that time. Females are also at risk. Given that the swordfish fishery reaches its quota by March, then perhaps this is also of little concern for turtle bycatch.

While FAD fishing was not developed during the time of writing of the Lalla 2001 report, the report discussed the interest of locals in developing artificial reef systems, and the potential for future development of the FAD fishery. While this could result in more bycatch of other species of sea turtle, depending on the types of fisheries that operate around the FAD, it could be an alternative to gillnetting during the leatherback nesting season, and could relieve some pressure off the leatherbacks. There may be need for compromise between which species are to be "sacrificed" to bycatch. According to Lalla

2001, results from trial FAD were encouraging but fishers were not forthcoming with information. The report indicates they were skeptical about what the information would be used for. This raises questions about potential turtle encounters that they may not have wanted to report (Personal Speculation).

Lalla 2001 also states the hope that development of FAD or artificial reef structures would not create obstacles for shrimp trawlers and impede their ability to trawl in these areas. I'm not sure if this means the FAD will be placed in areas separate from where trawlers normally operate, or if they will be placed in the same areas but somehow the trawlers will continue to operate in the same region. If the latter is the case, then this could present a significant increase in risk for the bycatch of turtles that may congregate under the FAD, and increase their density in surrounding waters where trawlers operate.

Other countries (Grenada) have used the FADs for the flyingfish fishery. Grenadians also use flyingfish as bait fish, which might be a source of live bait, which would allow fishermen to switch to a more selective fishing technique. Fishermen use Jashua as a bait fish for the a-la-vive fishery, but Jashua are not available during the leatherback nesting season. There has been some interest in aquaculture to raise other fish, such as tilapia. However, live bait fishing and trolling will create higher fuel costs for fishermen, and they may be reluctant to switch from gillnetting to live bait fishing if their catches are lower and costs are higher. (Gass, pers. comm.)

According to Gass 2006, leatherback bycatch in gillnets is higher in the top-set multifilament nets, but mortality is higher in the bottom-set monofilament nets. Overall, it appears from the Fisheries Division (1999) report that the monofilament nets land a greater variety and number of bycatch. This is because they of demersal deployment and the higher hanging ratio of monofilament nets, which increases entanglement ability (Hodgkinson-Clarke 1990 in Fisheries Division 1999). This may also be because they fish day and night. One reason for higher bycatch of leatherbacks in the multifilament nets may be because they are set at night, and might be more likely to intercept females making their way to shore to nest.

Another issue with addressing sea turtle bycatch is that they are the target of some fishermen. There is an open season and some fishermen specifically fish for them with nets. Thus, it is important to distinguish between turtle catch and turtle bycatch. Furthermore, it is likely (though not often reported) that turtles incidentally caught in other fisheries are retained, particularly when catch of target species is low.

***11. Fishing Effort Contacts: If there are other individuals in relevant government agencies or non-governmental organizations that may be able to assist us with information on fisheries, please provide their names and contact details below***

Ann Marie Jobity  
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Fisheries Division

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RAU Leader/Biologist  
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*Participants in Regional Workshop on Reducing the Impact of Tropical Shrimp Trawl Fisheries:*

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Trawler Owners Association

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Ragindra Bachan  
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Sita Kuruvilla – National Coordinator  
Fisheries Biologist  
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***12. Bycatch Contacts: If there are other individuals in relevant government agencies or non-governmental organizations that may be able to assist us with information on bycatch of sea turtles, sea birds and marine mammals, please provide their names and contact details below:***

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Senior Lecturer in Zoology  
(Fisheries Management and Aquaculture)  
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University of the West Indies  
St. Augustine, Trinidad and Tobago  
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New Wing Room 219  
<http://www.sta.uwi.edu/fsa/lifesciences/iramnarine.htm>

*WIDECAST contacts*

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**13. Documents: What documents (journal articles, grey literature, agency reports) describe fisheries and bycatch in this area?**

**Literature Cited:**

Eckert, S.A. and Eckert, K.L. 2005. Strategic plan for Eliminating the Incidental Capture and Mortality of Leatherback Turtles in the Coastal Gillnet Fisheries of Trinidad and Tobago: Proceedings of a National Consultation. Port of Spain, 16-18 February 2005. Ministry of Agriculture, Land and Marine Resources, Government of the Republic of Trinidad and Tobago, in collaboration with the Wider Caribbean Sea Turtle Conservation Network (WIDECAST). WIDECAST Technical Report No. 5. Beaufort, N. Carolina. 30 pp. + appendices.

Eckert, S.A. and Lien, J. 1999. Recommendations for Eliminating Incidental Capture and Mortality of Leatherback Turtles, *Dermochelys coriacea*, by Commercial Fisheries in Trinidad and Tobago: A Report to the Wider Caribbean Sea Turtle Conservation

Network (WIDECAST). WIDECAST Information Document 1999-001. January. 7 pp.

FAO. 2000. Fishery Country Profile: The Republic of Trinidad and Tobago. May 2000. <http://www.fao.org/fi/fcp/en/TTO/profile.htm>

Fisheries Division. Unknown. Website:

[http://grid2.cr.usgs.gov/cepnet/trini\\_tbgo/fisheries/index.htm](http://grid2.cr.usgs.gov/cepnet/trini_tbgo/fisheries/index.htm). Last Accessed September 27, 2006.

Fisheries Division. 1999. National Report of Trinidad and Tobago: The shrimp and groundfish fisheries of Trinidad and Tobago. *In*: National reports presented and stock assessment reports prepared at the CFRAMP/FAO/DANIDA Stock assessment workshop on the shrimp and groundfish fisheries on the Guiana-Brazil shelf. FAO/Western Central Atlantic Fishery Commission. Port-of-Spain, Trinidad and Tobago, 7-18 April 1997. FAO Fisheries Report No. 600. Rome, FAO. 1999. 200p. <http://www.fao.org/docrep/006/X3125E/X3125E00.HTM>

Gass, J. 2006. Bycatch Mortality of Leatherback Turtles in Trinidad's Artisanal Gillnet Fishery. Nicholas School of the Environment. Duke University. 27 pp.

Lalla, H. 2001. National Report of Trinidad and Tobago. *In* National reports and technical papers presented at the First Meeting of the WECAFC Ad Hoc Working Group on the Development of Sustainable Moored Fish Aggregating Device Fishing in the Lesser Antilles. FAO Fisheries Report No. 683, Supplement. ISSN 0429-9337. Le Robert, Martinique, 8-11 October 2001.

Lee Lum, L. 2003. An Assessment of Incidental Turtle Catch in the Gillnet Fishery in Trinidad and Tobago, West Indies. Trinidad and Tobago Institute of Marine Affairs. Project # 00-026-005. 22pp.

Nagassar, N. 2000. Frame Survey on Gillnet Fishery of Trinidad and Tobago. Prepared for the National Consultation of the Monitoring and Advisory Committee (MAC) on the Fisheries of Trinidad and Tobago. 16 pp.

Romero, A. et al. 2002. *Environmental History of Marine Mammal Exploitation in Trinidad and Tobago, W.I. and its Ecological Impact*. Environment and History. 8:255-274.

Vidal, O. et al. 1994. Cetaceans and gillnet fisheries in Mexico, Central America and the Caribbean: A Preliminary Review. Rep Int. Whal. Comm006E. Special Issue 15.

#### **Other Relevant Sources of Information:**

A summary of library services and resources pertaining to fisheries is given in Appendix 4.

<http://www.tha.gov.tt/> - Tobago House of Assembly website. Has been under construction at least since May 2006.

[http://grid2.cr.usgs.gov/cepnet/trini\\_tbgo/fisheries/index.htm](http://grid2.cr.usgs.gov/cepnet/trini_tbgo/fisheries/index.htm) Trinidad Fisheries Division website.

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**Appendix 1: Summary table of fisheries by gear type and the species that they target. “I” denotes industrial fisheries, “A” denotes artisanal, and “X” denotes undetermined scale of the fishery.**

Fisheries and associated gear types. “I” denotes industrial, “A” for artisanal fisheries and X undetermined.															
Fishery by Target	Longline		Gillnets /entangling nets		Trawls		Seine nets			Traps		Falling gear	Hook & line		Hand Harvest
	Pelagic	Demersal	Drift	Anchored	Mid-Water	Bottom	Boat / Circle	Beach	Purse	Pots	Fyke nets	Cast nets	Troll	Hand or pole line	(free dive, scuba, or wire loop)
<u>Ocean Pelagics</u>	A/I														
<u>Coastal Pelagics</u>													X		
<u>Demersal / Groundfish / Deep Slope / spp.</u>				A						X				X*	
<u>Shallow-shelf reef fish</u>															
<u>Sharks</u>				A										X*	
<u>Crustacea (shrimp)</u>						A/I									
<u>Crustacea (lobster, crab)</u>															
<u>Cephalopods (squid)</u>															
<u>Sea Turtles</u>				A											
<u>Marine Mammals</u>															

\* banking (bottom line fishing) (used to target demersal species such as snapper and shark)

**Appendix 2: Summary table of fleet characteristics and fishing effort for longlines, gillnets and trawls, the gear types of major concern for bycatch**

	Gear type →	Longline	Gillnet		Trawlers			
			Mono filament	Multi filament	I	II	III	IV
	Artisanal/Industrial/Undetermined	Undetermined	Artisanal		Artisanal inshore	Artisanal inshore	Semi-industrial offshore	Industrial offshore
<b>Fleet Characteristics</b>	Target species		Carite and other groundfish		Orinoco Delta: white/cork shrimp and brown shrimp. Gulf of Paria: pink, brown and white shrimp	White/cork shrimp	Mostly pink shrimp, some white and brown shrimp	Mostly pink and brown shrimp
	Vessel type		Pirogue – wood, fiberglass or fiberglass-coated wood					
	Vessel Classification (country specific)				Type 1	Type II	Type III	Type IV
	Vessel length (m)	14-23	6-10 m		6.7-9.8	7.9-11.6	10.4-12.2	17.1-22.9
	Number of vessels	8	92 <sup>1</sup> 389 nets Trin; 11 nets Tob	110 <sup>1</sup> 277 nets Trin; 12 nets Tob	113	66	9	21
	Engine type	Diesel	1-2 outboard engines		Outboard	Inboard or Inboard/Outboard	Inboard diesel	Inboard diesel
	Avg Horsepower	180-350	45-75		2 x 56	137	176	>365
	Gear Used (materials)				1 stern trawl net, manually operated/retrieved	1 stern trawl net, manually operated/retrieved	1 stern trawl net set and retrieved w/ hydraulic winch	2 nets on outriggers, set and retrieved with hydraulic (double-drum) winch
	How gear deployed (demersal/pelagic, set/drift)	Pelagic (set 30-50 m below surface)	60% (232) set demersally (anchored to seafloor); 40% (157) set midwater or at sea surface	5% (15) set demersally; 95% (262) set at midwater or at sea surface	Demersal	Demersal	Demersal	Demersal
<b>Effort</b>	Crew Size	6						
	Where gear deployed/ area fished	N & E coasts of Trinidad	Groundfish in west (Gulf of Paria) & south (Columbus Channel); minor activity on E & N coasts; inshore at depths between 9-14 m		Orinoco Delta at depths 1.2-3.6 m Area fished 394 km <sup>2</sup>	Gulf of Paria at depths 1.8-18 m Area fished 329 km <sup>2</sup>	Gulf of Paria at depths 9.0-41.4 m Area fished 1793 km <sup>2</sup>	Gulf of Paria at depths 9.0-48.6 m; area fished 1269 km <sup>2</sup> Columbus Channel at depths 18.0-41.4 m; area fished 826 km <sup>2</sup> North Coast at depths 37.8-57.6 m; area fished 235 km <sup>2</sup>
	Fishing seasons (months)	Year-round; peak swordfishing Jan-March	Year round				Vessels fish Gulf of Paria and Columbus Ch. year-round, and the North coast from Oct-Jan.	

Avg. trip duration (days)	7-15 days		7-12 hrs	5-8 hrs.	15-18 hrs.	7-21 days	
Total days fished per month/year		Average 15-20 days/month at sea = 180 – 240 days/year	8 days/month/vessel 96 days/year/vessel 10848 days/year/fleet <sup>3</sup>	13 days/month/vessel 156 days/year/vessel 858 days/month/fleet 10296 days/year/fleet <sup>3</sup>	16 days/month/vessel 192 days/year/vessel 144 days/month/fleet 1728 days/year/fleet <sup>3,4</sup>	17 days/month/vessel 204 days/year/vessel 357 days/month/fleet 4284 days/year/fleet <sup>3</sup>	
Number of fishing trips per year <sup>5</sup>			96/year/vessel 10848/year/fleet	156/year/vessel 10296/year/fleet	192/year/vessel 1728/year/fleet	~12/year/vessel ~252 days/year/fleet	
Gear/vessel effort (gear & trip information)	Hook size/type: Number of hooks: 300-1000 Main line length: 24-88 km	<b>Net mesh size:</b> 95mm/3.75 in – 114 mm/4.5 in (avg 4 inches) <b>Twine gauge:</b> 9,10,12,15,18 (10 most used) <b>Weight<sup>2</sup>:</b> 5-8 bales/net; 25 or 50 lb bales) <b>Mesh length:</b> 100mesh/50 lb 50 mesh/25 lb <b>Net length:</b> 450-1098 m	<b>Net mesh size:</b> 95mm/3.75 in – 114 mm/4.5 in (avg 4 inches) <b>Twine gauge:</b> 12, 15 <b>Weight<sup>2</sup>:</b> 3-6 bales/net; 25 or 50 lb bales) <b>Mesh length:</b> 100mesh/50 lb <b>Net length:</b> 732-1190 m	<b>Net mesh size(s):</b> 3.8 cm <b>Foot rope length &amp; diameter:</b> <b>Head rope length (min/max/avg)</b> = 7/14/10.4 m <b>Horizontal opening width (m):</b> <b>Tow (trawl) or haul (seine) speed:</b> 1 knot	<b>Net mesh size(s):</b> 2.45 cm <b>Foot rope length &amp; diameter:</b> <b>Head rope length (min/max/avg)</b> = 9.2/12.5/10.6 m <b>Horizontal opening width (m):</b> <b>Tow (trawl) or haul (seine) speed:</b> 1 knot	<b>Net mesh size(s):</b> 3.5 cm <b>Foot rope length &amp; diameter:</b> <b>Head rope length (min/max/avg)</b> = 10.1/15.2/11.6 m <b>Horizontal opening width (m):</b> <b>Tow (trawl) or haul (seine) speed:</b> 2 knots	<b>Net mesh size(s):</b> 3.5 cm <b>Foot rope length &amp; diameter:</b> <b>Head rope length (min/max/avg)</b> = 13.7/13.7/13.7 m <b>Horizontal opening width (m):</b> <b>Tow (trawl) or haul (seine) speed:</b> 3 knots
Number of sets/hauls/soaks/tows per trip			6/day: ?/trip	5/day: ?/trip	2-4/day: ?/trip	2-4/day: ?/trip	
Number of hours per set/soak/tow			0.5-1	1-1.5	4	2-4	
= Total number of hours towed per trip							

<sup>1</sup>From Nagassar (2000): 92 vessels use monofilament, and 110 use multifilament gillnets. However, there are an additional 137 vessels that use monofilament *and* multifilament nets, and one vessel uses a combination net.

<sup>2</sup> Fishers often measure gillnets based on weight rather than on their overall length.

<sup>3</sup> These values were calculated based on the assumption that vessels fish year-round. This may not be a reasonable assumption, but I was not given seasonal data for Type I, II or IV trawlers.

<sup>4</sup> Unsure what percent of fleet fishes on the North Coast during Oct-Jan. I assume that no vessels are added to the fleet during this time, so the total number of days fished for this fleet should be the same as if they only fished year-round in one spot. I cannot calculate the days fished per month or year for a given fishing ground with the data that I have.

<sup>5</sup> This is based on the assumption that vessels make only one trip per day fished. For Type IV trawlers, the trip durations range from 7-21 days, although the average number of days fished per vessel is 17 days. I then assumed that only one 17-day trip is made per

month because I do not know the inter-trip interval. However, it's likely that more trips are made per month when there are shorter-duration trips.

### Appendix 3: Marine mammal species in Trinidad and Tobago. (from Sea Around Us)

Scientific Name	Common Name
<i>Balaenoptera acutorostrata</i>	Dwarf minke whale
<i>Balaenoptera borealis</i>	Sei whale
<i>Balaenoptera brydei</i>	Brydes whale
<i>Balaenoptera musculus</i>	Blue whale
<i>Balaenoptera physalus</i>	Fin whale
<i>Delphinus delphis</i>	Short beaked common dolphin
<i>Eubalaena glacialis</i>	North Atlantic right whale
<i>Feresa attenuata</i>	Pygmy killer whale
<i>Globicephala macrorhynchus</i>	Short-finned pilot whale
<i>Grampus griseus</i>	Rissos dolphin
<i>Halichoerus grypus</i>	Gray seal
<i>Kogia breviceps</i>	Pygmy sperm whale
<i>Kogia simus</i>	Dwarf sperm whale
<i>Lagenodelphis hosei</i>	Frasers dolphin
<i>Megaptera novaeangliae</i>	Humpback whale
<i>Mesoplodon densirostris</i>	Blainvilles beaked whale
<i>Mesoplodon europaeus</i>	Gervais beaked whale
<i>Mesoplodon mirus</i>	Trues beaked whale
<i>Peponocephala electra</i>	Melon-headed whale
<i>Physeter macrocephalus</i>	Sperm whale
<i>Pseudorca crassidens</i>	False killer whale
<i>Sotalia fluviatilis</i>	Tucuxi
<i>Stenella attenuata</i>	Pantropical spotted dolphin
<i>Stenella clymene</i>	Clymene dolphin
<i>Stenella coeruleoalba</i>	Striped dolphin
<i>Stenella frontalis</i>	Atlantic spotted dolphin
<i>Stenella longirostris</i>	Spinner dolphin
<i>Steno bredanensis</i>	Rough-toothed dolphin
<i>Tursiops truncatus</i>	Bottlenose dolphin
<i>Ziphius cavirostris</i>	Cuiviers beaked whale

### Appendix 4: Library Resources

There are library services available from the Fisheries Division of Trinidad and Tobago. The Fisheries Division Library is one of six (6) special libraries in the Ministry of Agriculture Library Services and contains information only on fisheries and related topics. It contains approximately 4,000 texts, 5,000 reports, serials and other documents in over 12,000 titles.

**Major Topics Covered:**

- Fisheries Assessment & Management
- Fishery Research
- Biodiversity
- Sampling Methods
- Fish Biology
- Spawning
- Fisheries Institutions
- Processing
- Oceanography
- Integrated Fisheries Management
- Habitats
- Fisheries Legislation
- Marine Protected Areas
- Age & Growth
- Catch & Effort
- Fisheries Ecology
- Fish Handling
- Marketing
- Resource Management
- Commercial Fishing
- Conservation

**Other collections of interest include:****Gulp (Gulf of Paria)**

- hard copies of published and gray literature on the (Gulf of Paria)
- over 1,182 reprints cross referenced to the local collection (written approval is required to access some reprints in Gulp)

**Local and Caribbean collection of fisheries and related literature 1800's to current**

- a comprehensive collection of literature on the fisheries of Trinidad and Tobago including theses, historical reports annual reports, internal documents, research and survey papers, cruise reports

**Hard copies of most of the citations in the bibliographic databases**

- stock (50%), info (47%), cruise (60%)