



Project GloBAL

Global Bycatch Assessment of Long-Lived Species

Country Profile

SURINAME



Duke University
Center for Marine Conservation



WIDECAST

Wider Caribbean Sea Turtle Conservation Network

SURINAME (SR)



Figure 1 National flag of Suriname.



Figure 2: Map of Suriname

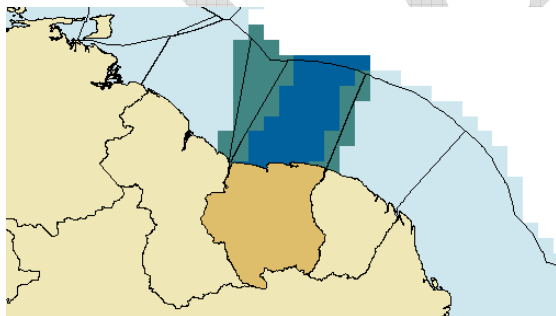


Figure 3: Suriname EEZ

Geographic Coordinates¹: 4 00° N, 56° 00 W

Terrestrial extent¹ (km): 163,270

Coastline:

EEZ area (km²)²: 127,772

Shelf area (km²): ²(53,631)

Fish landings (marine capture, mt) 12,670

Other countries operating in this EEZ:

Venezuela, France (Fr. Guiana)

Government agency for marine fisheries:

Government agency for the protection of marine environment:

Population¹: 470,784

¹ CIA World factbook

² Sea Around Us Project, <http://www.searoundus.org>

Brief Description:

After initial colonization by the British, Suriname became a Dutch colony in 1667. Independent from the Netherlands since 1975, Suriname is the smallest independent nation in South America, with population centers concentrated in coastal areas. The coastal and marine environments are strongly influenced by the Amazon and Orinoco plumes. While Dutch is the official language, English, Sranang Tongo (Surinamese), Hindustani and Javanese are also spoken.

Suriname is affiliated with: Caribbean Community and Common Market (CARICOM), Organisation of Eastern Caribbean States (OECS), Organization of American States (OAS), Food and Agriculture Organization (FAO), Western Central Atlantic Fishery Commission (WECAFC), and Caribbean Regional Fisheries Mechanism (CRFM).

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

Overview statement characterizing the fishery:

Marine capture fisheries in Suriname are directed at attaining shrimp resources, with foreign-owned industrial trawl fisheries responsible for the bulk of biomass removed since the 1960s (FAO 2006). Coastal fishing is artisanal in nature and fisheries deploy drift gillnets and demersal longlines to catch inshore demersal species. Demersal longlines are also set in brackish water off the main estuaries as are drift gillnets. Suriname has no high seas longline operations. Major landing sites for marine capture fisheries are Cevihis, Domdurg, Sluis II, Boomskreek and the Paramaribo Central market (FAO 2000a).

The shrimp fishery targets *Penaeus subtilis* and *P. brasiliensis*. There has been an increase in recent years in the number of vessels targeting seabob, *Xyphopenaeus kroyeri* (Charlier *et al.* 2000). Gillnet fisheries target Sciaenids (*Cynoscion acoupa*, *C. virescens*), Ariidae (*Arius parkeri*, *A. proops*), sharks (*Carcharhinus limbatus*, *Rhizoprionodon porosus*) and tarpon or Cuffum (*Megalops atlanticus*). Weidner *et al.* (1999) reported that fixed gillnets harvest snook (*Centropomus* species), mullet (*Mugil* spp.) and tilapia (*Oreochromis mossambica*). Hook and line (hand line) and trap fisheries target snappers and groupers (Lutjanids and Serranids, respectively). The major target in the hook and line fishery is the red snapper (*Lutjanus purpureus*).

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

Fishing vessels in Suriname are classified into trawlers, snapper (handliner) boats, Guyana boats (decked or undecked) and canoes. There are 1100+ vessels licensed for fishing in Surinamese waters, with nearly half of these operating in inland and estuary areas (Table 1). The industrial fishing fleet operating with a variety of trawl gear is estimated to have 169 vessels, less than the 196 in 1994 (Madarie 2006). The majority of the industrial vessels are shrimp (68), seabob (50) or snapper handliners (56). Deep water shrimp species (*P. brasiliensis*, *Pleisopenaeus Solenocera*) are harvested by both outrigger and stern trawlers. Handliners are Venezuelan-owned wooden vessels that fish for Lutjanids (*Lutjanus synagris*, *L. purpureus*, *Rhomboplites*). Some of the shrimp trawl vessels are modified to catch primarily finfish including Lutjanids (like *L. synagris*) and Sciaenids (like sea trout *C. virescens*). Madarie (2006) stated that 15 such trawlers currently operate in Surinamese waters. The trawlers for finfish are either Dutch (Kotter) fleet using bottom trawls or the Korean (Osito) fleet using mid-water trawls. The

shrimp and seabob trawl fleet use the Florida outrigger and North Sea stern type vessels (Madarie 2006) also reports the recent addition of four Chinese steel-hulled vessels. The rise in finfish-targeting trawlers has increased the extent of overlap with the shrimp fisheries.

Table 1: Suriname fishing fleet by sector 1994-2005 (from Madarie 2006).

OVERZICHT VAN HET AANTAL UITGEGEVEN VERGUNNINGEN (PERIODE 1994 - 2005)												
Number of registered fishing units 1994 - 2005												
	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Shrimptrawlers	119	101	107	109	109	104	99	85	87	79	77	68
Seabobtrawlers		5	5	18	21	24	24	30	24	26	27	30
Fishingtrawlers	22	21	13	13	12	13	11	18	18	18	19	15
Suappeliners	55	97	73	103	126	134	82	74	62	54	58	56
Total industrial fleet :	196	224	198	243	268	275	216	207	191	177	181	169
Decked boats (inboard engines)	70	75	56	63	54	44	49	45	44	42	58	62
Open boats (outboard engines)	219	189	124	209	231	263	309	240	266	262	328	305
Open boats (Guyanese)										21	21	20
Bangamary (uitsluitend)								3		15	39	40
Total coastal fleet	289	264	180	272	285	307	358	285	310	340	446	427
Chinese seine (BV)	357	351	27	291	248	237	250	253	321	349	289	315
Longline (BV)	89	99	77	68	33	36	38	16	24	30	21	21
Drifting gillnet (BV) :	137	145	107	134	103	113	108	64	72	90	80	100
Guyanese BV										17		
Sport (BV) :	30	32	28	41	39	33	35	42	66	58	75	63
Fixed gillnet (BV) :	50	49	24	30	23	22	14	15	15	11	8	8
Dragnet (BV) :	9	11	7	8	8	4	7	7	7	3	1	2
Riverseine (BV)	19	21	9	12	12	14	7	8	8	7	4	5
Lagoon gillnet (lagoon)	162	148	84	84	50	38	52	85	103	74	42	36
Aquarium					1							
Total inland and estuary fleet (BV)	691	708	613	668	517	497	511	490	616	639	520	550
Total artisanal fleet (coastal, inland and estuary)	1115	1120	793	940	802	804	869	775	926	979	966	977

Source : Fisheries Department

The artisanal fleet operates in near shore environments, including rivers, brackish lagoon and estuaries. A subset operating in coastal waters include ~427 vessels, 367 of which are un-decked vessels of the “Guyana” type, bangamary (“uitsluitend”), and open types. Multifilament polyethylene gillnets (drifting and fixed) are the most widely used net in Guyana and Suriname (Laurent *et al.* 1999). The nets have stretched mesh size of 17.7 cm (7 in) or 20.3 cm (8 in). Madarie (2006) states that most of the fishers use driftnets with 10.16–15.24 cm stretched mesh size. The nets are between 2-4 km in length (Laurent *et al.* 1999, Madarie 2006) and 5-8 m in height (Laurent *et al.* 1999). Fishing is conducted from boats 12-14 m in length (open “Guyana” boats) powered by 40-50 Hp outboard engines (Madarie 2006) or closed Guyana type boats 14-18m long. Guyana-type boats also deploy pin seines (5 cm stretched polyethylene nets with approximate lengths of 2 km) for finfish targets.

Other fishing gear and methods deployed by Suriname’s artisanal fisheries include longlines, pin seines, dragnets and beach seines. Longlines and pin seines are deployed from the “open” Guyana boats at water depths 2-10 m; pin seine operations occur at the 0-5 m. Industrial fisheries for penaeid shrimp operate on the continental shelf at depths between 18 and 90 m (Table 2). Deepwater species (*P. brasiliensis*) are fished at >50 m, generally at between

190-25 m. Seabob fisheries tend to operate in shallower waters 10-20 m (Laurent *et al.* 1999). FAOa, 2000 <http://www.fao.org/fi/fcp/en/SUR/profile.tm> accessed 7/20/2006) gives a similar depth range (13-24 m) for seabob fisheries. Large finfish are caught at depths ranging between 20-50 m, while small finfish are caught at depth ranging from 10-30 m (FAOa 2000 <http://www.fao.org/fi/fcp/en/SUR/BODY.HTM> accessed 7/18/2007).

3. Where and when are the specific gear types deployed in these fisheries (seasonality, trip duration)?

Trawlers targeting shrimp are at sea for 50-100 days (FAO 2000a, Madarie 2006). Seabob fisheries undertake trips lasting 4-10 days (FAO 2000a, Madarie 2006). Average catch per day in the shrimp fisheries has declined from 100 kg tail weight to 50 kg tail weight (Charlier *et al.* 2000). Shrimp trawlers employ two fishing strategies - either two nighttime hauls of about 5-6 hours or a daytime haul of 4 hours, (FAO 2000b). Drift gillnets fisheries from the open Guyana boats have soak times of 5-6 hours. Fishing effort is lowest between November and April/May (Madarie 2006).

Table 2. Fishing grounds by gear in Suriname (from FAO 2000b):

TYPE OF BOAT	FISHING GROUNDS	TYPE OF GEAR	DEPTH ZONE
Trawler	Sea	Shrimp	20-80 m
		Deep sea shrimp	190-250 m
		Sea bob	13-20 m
		Small finfish	10-30 m
		Cotters	20-85 m
		Large finfish	20-50 m
Decked guyana	Sea	Drifting gillnets	5-20 m
Open guyana	Sea	Drifting gillnets	5-10 m
		Pin seine	0-5 m
		Longline	2-10 m
		Chinese seine	2-5 m
Korjaal	Estuaries	Bottom longline	2-5 m
		Drifting gillnet	2-5 m
		0-1 m	Korjaal or no boat
River	Haritete (river seine)		
River and inland	Other		

4. What species of marine mammals, sea turtles, and sea birds occur and maybe at risk for capture or interaction with fisheries?

Marine Mammals

Appendix III lists the 28 species of marine mammals have been sighted or are believed to be in Surinamese waters (Sea Around Us Project).

The only reports of cetacean bycatch found in the literature pertained to the incidental capture of tucuxi (*Sotalia fluvialis*) by Vidal and Waerebeek (1994) and Van Waerebeek (1990), as cited in Bolanos-Jimenez and Rojas-Bracho (2005). Vidal and Waerebeek (1994) reported 3 tucuxi were caught between May 1964-November 1972) at the mouth of the Coppename River and 4 tucuxi (3 at Pomona and 1 at Braamspunt) were caught in shrimp trawls at the mouth of the Suriname river between February and May 1971. The authors noted that fishers characterized their

incidental capture of dolphins as “occasional.” The authors also regard dolphins and humpback whales as being potentially at risk of bycatch in coastal gillnets.

Sea turtles

Suriname provides nesting habitat for leatherback or Aitkanti (*Dermochelys coriacea*), green or Krape (*Chelonia mydas*), hawksbill (*Eretmochelys imbricata*) and olive ridley (*Lepidochelys olivacea*) sea turtles, and in-water observations include loggerheads (*Caretta caretta*). Suriname once hosted the largest regional nesting populations for *L. olivacea*; the collective Guiana shield nesting aggregation of leatherbacks is the largest in the world (Spotila *et al.* 1996, Ferraroli *et al.* 2004). Leatherback nesting in the Guianas is concentrated on both sides of the Marowijne (Maroni) estuary, at Ya:lima:po-Awa (French Guiana) and Galibi (Suriname). Matapica, 100 km to the west of Galibi, is an important beach for all four nesting species and Eilanti is the major olive ridley rookery in the western Atlantic. Several reports document the research on leatherback nesting populations in the Guianas including Suriname and French Guianas (Ferraroli *et al.* 2004). Nesting season for leatherbacks in the Guianas is December–January termed as the “small season” and the “normal” season is March–August. Chevalier *et al.* (1999) and Reichart *et al.* (2003) cite February–August as the leatherback nesting period, with concentration between April and July. Green sea turtle nesting occurs mainly between February and June, while nesting season for olive ridleys is reported to be between May to August (Reichart *et al.* 2003). The hawksbill is deemed a sporadic nester in Suriname with no pronounced peak (Reichart *et al.* 2003).

Since sea turtle occurrence overlaps with fisheries, particularly the driftnet fisheries in near shore zones adjacent to these major Guianas rookeries, fisheries are considered a major source of mortality for leatherbacks. Chevalier *et al.* (1999) and Hilterman and Goverse (2004) reported that in the 2003 nesting season, at least 21.1% (472 individuals) had injuries that may have been fisheries related, up from 17% in 2002. The considerable decline in nesting of olive ridleys on Eilanti, the major nesting beach in Suriname (Reichart and Fretey 1993), has been attributed to incidental capture in shrimp fisheries (Tambiah 1994, Reichart and Fretey 1993, Laurent *et al.*, 1999).

Seabirds

No references specific to incidental capture of seabirds in fisheries were found.

5. What collection methods exist for gathering fishing effort and bycatch data?

Logbooks, landings and observer data exist for all trawl fisheries. All trawlers are required to report their daily position to their base (CRFM 2005).

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

None were found.

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

A survey of fishing crews, industry managers, government officials in Paramaribo and Georgetown (Guyana) provided an estimate of 3,200 turtles per year with a 50% rate of mortality

in trawl fisheries (Tambiah 1994). That assessment indicated a year-round capture of turtles, with a peak in June and October (Tambiah 1994). All size classes were reportedly taken, with olive ridleys as the most common species caught incidentally. Olive ridleys were caught immediately preceding the “arribadas” or large nesting aggregations at Eilanti and other species were caught immediately after peak nesting seasons. Tambiah (1994) also stated that gillnets in Guyana and Suriname were a much larger problem when compared to trawl fisheries, catching 21,600 turtles a year.

In 2006, a survey of sea turtle bycatch in coastal fisheries was undertaken on behalf of the World Wildlife Fund (WWF; Madarie 2006). Madarie (2006) estimated that 70% of artisanal fleet fish in the areas east of the Suriname River were in the vicinity of nesting beaches and thus, the survey focused on 160 km of Suriname’s eastern shores. Data collectors stationed at ports collected information from boat captains on leatherback, green and olive ridley sea turtles captured in fishing gear on a daily basis for 6 months. Although 1,437 boats were monitored and caught 1,160 sea turtles, the actual bycatch rate might be two or three times higher (Madarie 2006). Excluding March, capture rates of operations in closed type boats were three times those in open boats (1.93 turtles/boat and 0.64 turtles/boat respectively; calculated from Madarie 2006). Mortality in the fishing gear range from 7% to 14%; most capture events occurred in the eastern sections of Suriname to its border with French Guiana (Madarie 2006).

Table 3. Sea turtle bycatch reported from monitored vessels in 2006 (from Madarie 2006). The final column of bycatch rates (total number of turtles caught/number of boats monitored) was estimated for this review.

Month	Number of boats monitored		Sea turtle species caught			Total	turtles/boat/month
	open type	closed type	Dc	Cm	Lo		
March*	207*		48	32	22	102	0.49
April	137	40	43	12	16	71	0.4
May	192	48	159	96	40	296	1.23
June	211	41	162	83	28	273	1.3
July	233	38	148	75	44	267	0.99
August	245	45	24	83	45	152	0.52
TOTAL	1225	212	584	381	195	1160	0.82

*in March no distinction was made in data collection between open and closed boats.

8. Are there bycatch and mitigation projects for other taxa?

Suriname participates in the FAO Bycatch Reduction Project **Is this true ???**

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

Turtle excluder devices (TEDs) have been a requirement since 1992. However in neighboring French Guiana there are no TED requirements. Spatio-temporal restrictions on fishing include closures from April 1 to July 31 and are in effect for the area north of Galibi, westwards for 15 km and seawards for 15 km. There are plans to introduce a vessel monitoring system (VMS) for the industrial fleet (Madarie 2006)

The following agreements and instruments are considered relevant to the international framework for managing marine and coastal environments in Suriname (Table 4).

Table 4. Suriname's status with respect to key international agreements.

Agreement short form	Agreement long form	Status
CARICOM	Caribbean Community	Member
CBD	Convention on Biological Diversity	Ratified
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora	Ratified
UNCLOS	United Nations Convention on the Law of the Sea	
WECAFC	Western Central Atlantic Fishery Commission	Member
FAO Code of Conduct		
Stradd. /Highly Migr. Fish St. Agr.	Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks	
London Dumping Convention	Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter	
Cartagena Convention	Convention for the Protection and Development of the Marine Environment the Wider Caribbean Region	
IWC	International Whaling Commission	
SPAW Protocol		

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

Since 2001, the no fishing zone / closed season in the area described in Section 4 has been in effect. The Guianas Sea Turtle Recovery Action Plan (Reichert, 2003) calls for the following:

- A harmonized sea turtle research and monitoring program is developed and jointly implemented in the three Guianas.
- Critical marine habitats are defined and adequately managed for the benefit of the target species.
- All key sea turtle nesting sites in the Guianas are granted protection status by the relevant authorities, and comprehensive plans are developed for their management. Harmonized legislative and regulatory frameworks are developed and adopted by the relevant authorities.
- Marine fisheries incidental catches of sea turtles are significantly reduced and eventually eliminated.
- Fishing gear is improved to reduce and eventually eliminate incidental catches of sea turtles, while protecting economic returns.
- Procedures for assisting fishermen whose interests are hurt by measures to conservation measures.

11. *Are there other individuals in relevant government agencies or non-government organizations that may be able to assist us with information on fisheries?*

Rene Lieveld
Department of Fisheries
Paramaribo, Suriname
E-mail: pierre@sr.net

H. M. Madarie
Head of the Artisanal Fisheries
Fisheries Department
Cornelis Jongbawstraat 50
Paramaribo
Tel: (597) 472233/Fax: 424441
E-mail: visserijdienst@sr.net

Dr. Robert Power
Marine Biologist
Suriname Japan Fishery Ltd. (SUJAFI)
60 Willem Anthonielaan, Paramaribo,
Suriname
Tel: 433757
Fax. No: 433757
E-mail: rhpower@cq-link.sr

Mr. Parmanand Sewdien
President
Suriname Seafood Association
Cornelis Jongbaw Straat 48 Paramaribo,
Suriname
Tel: (597) 8888966
Fax: (597) 425985
E-mail: namoona@sr.net

Mr. Mario Yspol
Manager, Suriname Fisheries Department
Cornelis Jongbaw 59 Paramaribo, Suriname
Tel. No: (597) 47674
Fax. No: -
E-mail: visserijdienst@sr.net

12. Are there other individuals in relevant government agencies or non-government organizations that may be able to assist us with information on bycatch?

Johan Chevalier

93 Rue de L' Agriculture
Bezons, Val d'Oise 95870
France
E-mail: johan.chevalier@utt.fr

Marie Louise Felix

Marine Turtle Program Officer
WWF Guianas Programme
Paramaribo, Suriname
E-mail: mlfelix@wwf.sr

Edo Goverse

Dutch Amphibian and Reptile Task Force
RAVONKromme Mijdrechtstraat 5-I
1078 RN
Amsterdam, Noord Holland NL
Country Code: 0031
Area Code: 20
Tel: + 31 (0) 20 525 7332
E-mail: edogoverse@zonnet.nl
Alternate E-mail: goverse@.science.uva.nl
URL: <http://www.ravon.nl/>

Maartje Hilterman

Project Coordinator Suriname
Netherlands Committee for IUCN
Plantage Middenlaan 2K
Amsterdam, Amsterdam 1018DD NL
Country Code: 31
Area Code: 20
Tel: (+31)20 6261732
Fax: (+31)20 6279349
E-mail: maarthilterman@zonnet.nl
URL: <http://www.iucn.nl>

Laurent Kelle

Ocean/Coast Officer
WWF
Lot Katoury
Route de Montabo
Cayenne, Guyane 97300 GF
Country Code: 33
Tel: (594 594) 31 38 28
Fax: (594) 31 38 28
E-mail: lkelle@wwf.fr

Luc Laurent

c/o BIOINSIGHT
20, rue Bellecombe 69006 Lyon
04 72 74 03 99
06 79 41 89 08
télécopie : 04 72 74 03 99
SIRET 394 265 193 00034 APE 731Z
urbanisme-et-environnement@bioinsight.fr

Henri Reichart

Program Officer
WIDECAST
348 Hickory Lane
San Rafael, CA 94903 US
Country Code: 1
Area Code: 415
Tel: 472-2939
Fax: 472-2959
E-mail: HARreichart@aol.com

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

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Other relevant documents

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Appendix I. Summary of fisheries by target species (A= artisanal, I=Industrial).

Fishery by Target	Longline		Gillnets/entangling nets		Trawls		Seine nets			Traps		Falling gear	Hook & line		Hand Harvest (free dive, scuba, or wire loop)
	Pelagic	Demersal	Drift	Anchored	Mid-Water	Bottom	Boat/circle	Beach	Purse	Pots	Fyke nets	Cast nets	Troll	Hand or pole line	
Ocean Pelagics															
Coastal Pelagics															
Coastal demersals			A	A	I	I									
Demersal shelf / deep slope spp.		A			I	I								I	
Shallow-shelf reef fish															
Sharks															
Crustacea (shrimp)					I	I		I			A				
Crustacea (lobster, crab)															
Cephalopods (squid)															
Sea Turtles															
Marine Mammals															

Appendix II. Description of fisheries and fishing effort by major gear.

	Gear type	Longline	Drift Gillnets (polyethylene)	Traps ("fish pots")	Trawls	Finfish	Snapper handliners
				Penaeid trawls	Seabob trawls		
Fleet Characteristics	Artisanal / Industrial		Artisanal	Industrial	Industrial	Industrial	Industrial
	Target species	Lutjanids and Serranids (<i>L. synagria</i> , <i>L. purpureus</i> , <i>R. aurorubens</i>)	<i>Cynoscion</i> spp; Snook (<i>Centropomus</i> spp.); sea catfish (<i>Arius</i> spp); sharks (Charcharinids); <i>Macrodon ancylodon</i> (banga mary), (<i>Cynoscion</i>) spp.; butterfish (<i>Nebris microps</i>)	Penaid shrimp (<i>Penaeus</i> species, Parapenaeus, Solenocera, Pleisopenaeus)	<i>X. Kroyeri</i> ,	Lutjanids and Serranids, Arrids, Charcharinids haemulon spp.	
	Vessel type	Industrial Florida type trawlers,		Industrial Florida type trawlers and North Sea stern trawlers	Industrial Florida type trawlers	Industrial Florida type trawlers	
	Vessel Classification/ Category (country specific)						
	Vessel length (m)						
	Number of vessels (2005)	12-14 m	12-14 m (and 14- 18 m	68	30	15	50
	Engine type						
	Avg Horsepower			400 (outriggers); 1000 (stern trawlers)			
	Gear Used (materials)	Hook and line gear		4-5 cm or 8 cm min. stretched mesh on the cod end			
	How gear deployed (including demersal/pelagic, set/drift, mid-water/bottom)	Demersally-set longlines		Mid water and bottom trawls for stern trawlers			
Effort	Crew Size						
	Where gear deployed/ Area fished	At depths 40- 90 m			At depths 25-90 m		
	Fishing seasons (months)	June- October	June- October	June- October	June- October	June- October	June- October

Gear type	Longline	Drift Gillnets (polyethylene)	Traps			Snapper handliners
			Penaeid traps ("fish pots")	Seabob trawls	Finfish	
Avg. trip duration (hours/days)			50-60 days	8-10 days		
Total days fished per month/ year						
Number of fishing trips per year						
Gear/vessel effort (gear & trip information)						
Number of sets/hauls/soaks/tows per day and per trip						
Duration/ Number of hours per set/soak/tow						
= Total effort (list metric(s))						

Appendix III: Marine Mammal species in the EEZ of (Sea Around Us 2006)

Scientific name	Common names
<i>Balaenoptera borealis</i>	Sei whale
<i>Balaenoptera brydei</i>	Brydes whale
<i>Balaenoptera musculus</i>	Blue 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