FISHERIES DATA COLLECTION AND STATISTICS IN PAKISTAN

By

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ABSTRACT

Pakistan has multi-species and multi-gear artisanal fisheries Data for its fisheries is reported as only a few species or in certain cases at family level. Fisheries statistics includes information about number of fishers, fishing fleet, fish production and export of fish and fishery products. Data about landed species consists of those reported from two maritime provinces (Sindh and Balochistan) as well as those of foreign fishing vessels permitted to operate in the Exclusive Economic Zone of Pakistan. Species are mainly group according to the FAO International Standard Statistical Classification of Aquatic Animal and Plants (ISSCAAP). Data of different freshwater fishes is not separately available. The data is not collected on catch per unit effort (CPUE), therefore, these statistics cannot be used for stock assessment. Attempts are being made to establish a comprehensive data collection system so that data may be recorded by each fishing gear with species level breakdown. In this regard a web-based soft ware has been prepared under Fisheries Resource Appraisal project by FAO and Marine Fisheries Department (MFD). Data from the fish processing industry is planned to be collected for comparison. For the establishment of such a system, provincial and federal fisheries departments are required to be a part of this exercise.

Presently fisheries statistical data is based on information regarding number of fishers, fishing boats, fish landing and export of fish and fishery products, which is provided either by the provincial fisheries departments or compiled by information provided by Pakistan Bureau of Statistics. These data is published in form of an annual publication "Handbook of Fisheries Statistics of Pakistan" by MFD. Large pelagic species including tuna, billfishes, dolphinfish, narrow-barred Spanish mackerels, pelagic sharks and barracuda are caught by of the about 700 tuna gillnetters.

INTRODUCTION

Fishery plays an important role in the national economy. Marine Fisheries sector is the main component of the fisheries economy contributing about 70 % in terms of landing and more than 90 % in export. Fishery is the most important economic activity in the villages and towns along the coast of Maritime Provinces of Sindh and Balochistan.

Fisheries in Pakistan is multi-species, i.e. fishing fleet exploits several stocks and several types of fleets compete for exploiting the same stock, similar to that of any other tropical country. The major fishing gears used are trawl net, gillnet, seine net, long-line, beach seine, cast net etc.

Marine Fisheries Department (MFD), Government of Pakistan publishing a "Handbook of Fisheries Statistics of Pakistan", based on the fisheries statistics provided by the provincial fisheries departments. These statistics is based on collection of information about number of fishers, fishing boats, fish landing and export of fish and fishery products by major International Standard Statistical Classification of Aquatic Animal and Plant (ISSCAAP) groups as defined by FAO. However, no information about Catch per Unit Effort (CPUE) is available.

For data collection of large pelagic fish species, a stratified sampling programme was launched in 1986 at Karachi fish harbour with the assistance of Indo-Pacific Tuna Programme (IPTP). The information regarding tuna landing was recorded by interviewing the skippers/ tindals of incoming pelagic gillnetters unloading their catches at the harbour. But no biomass estimates was made under that programme (Ahmad, 1989; Anonymous, 1991; Imad, 1988). Details of this fishery including specifications of fishing vessels & gears, area of fishing and fishing operations are describe in details in Hayat (2010), Moazzam (2010; 2012 a-c; 2014) and Moazzam and Nawaz (2014). The fishing fleet engaged in large pelagic species are mainly based mainly in four coastal cities i.e. Karachi, Gwadar, Pasni and Jiwani, although there are more than 60 coastal towns and settlements along the coast of Pakistan. It is estimated that large pelagic contribute more than 20 % in the total landings of fishes from marine origin. A major of catch of large pelagic is transported to neighbouring country mainly through boats based in Gwadar area and to a lesser extent through land route. Small quantities are large pelagic (mainly Spanish mackerels) are consumed locally whereas smaller tuna species (kawakawa, frigate and bullet tuna) are also exported in salted dried form to Sri Lanka.

For the management of offshore fishing, the EEZ from the coastline has been divided in three zones (Figure 1):
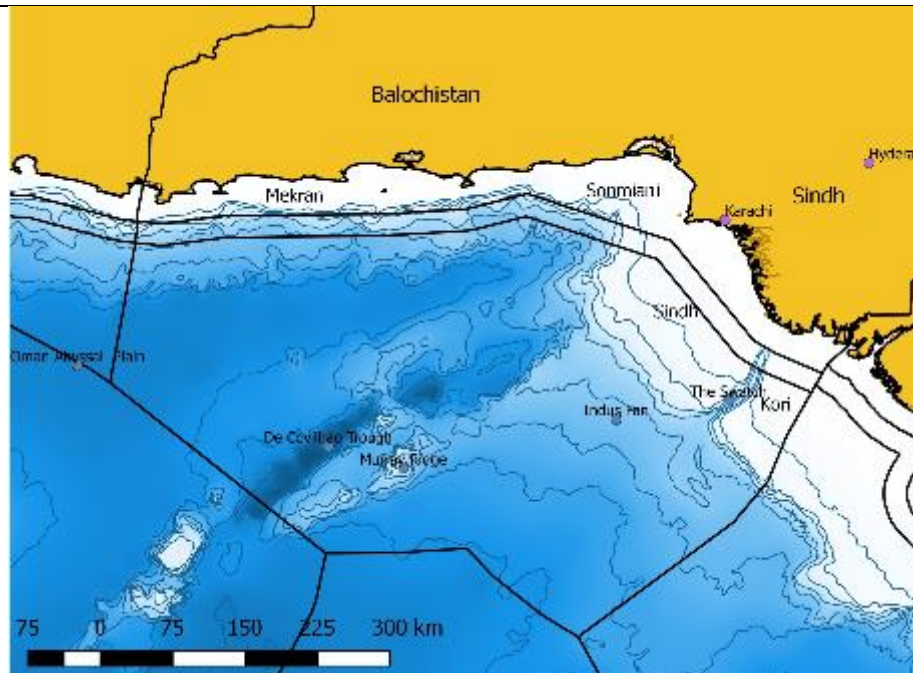
Figure 1Exclusive Economic Zone of Pakistan

a) Zone-1 (i.e. from coast line up to 12 nautical miles) reserved for Small-scale Fishing;

b) Zone-II (i.e. beyond 20 nautical miles to 35 nautical miles) reserved for fishing through medium sized vessels. Area between 12 and 20 n. miles is left as buffer between local and industrial fishing area.

c) Zone-III (i.e. beyond 35 nautical miles to 200 nautical miles) for Industrial Fishing.

Marine Fisheries Department (MFD) is main fishery agency of the federal government, with primary responsibilities for ensuring management and development of fishery resources in the Exclusive Economic Zone (EEZ) of Pakistan. Fisheries management is also advice is also provided to the provincial governments for licensing, indicating exploitable stocks and species, use and type of fishing gear and methods, and by suggesting restrictions for closed season, closed areas, etc.

FLEET STRUCTURE

Pakistan used to have sail driven fishing fleet. Mechanization of boats by inboard marine diesel engines was started in 1956 under the auspices of Marine Fisheries Department. There are four basic types of fishing boats. They are I) mechanized ii) mechanized-cum-sail boats iii) sail boats and iv) Doonda boats (Fiberglas life saving boat of scrapped ships) . Physical features and fish hold capacity of fishing crafts is given in Table 1.

Table 1.   Physical Features and Fish hold Capacity of Fishing crafts

Type of boat	Tonnage	Length (LOA)	Gear	No. of Crew	Fishing area (m)	Engine(HP)	Trip duration	Fish hold capacity
Trawler	25-30	13-20 m	Trawl net	10-12	10-30	66-125	5-10	10-15
Gill-netter	15-50	13-25 m	Gillnet (Surface, bottom)	12-14	10-55	120-250	15-30	10-15
Doonda boats	4-7	25-35 ft	Gillnet	6	Upto 20	22-33	5 -10	2 - 3
Hora (Katra)	20-35	12-15	Surroun ding net	18-24	< 20 m	16 (2-3 no.)	2	15 - 30

Mechanized fishing boats: It includes trawlers and gillnetters. The growth of mechanized fishing fleet is shown in Figures 2-5, whereas statistics for the period 2012 to 2016 is given Table 2. In 2016, the overall contribution of mechanized fishing fleet is 34.3% whereas that of mechanized-cum-sail was 65.7%. In 2012, the number of mechanized boats in actual operation was 15,937, this includes 2,112 trawlers and 3,324 gillnetters. The trawler increased from 2,112 to 2,640 and gillnetters from 3,324 to 3,935 during the same period respectively.
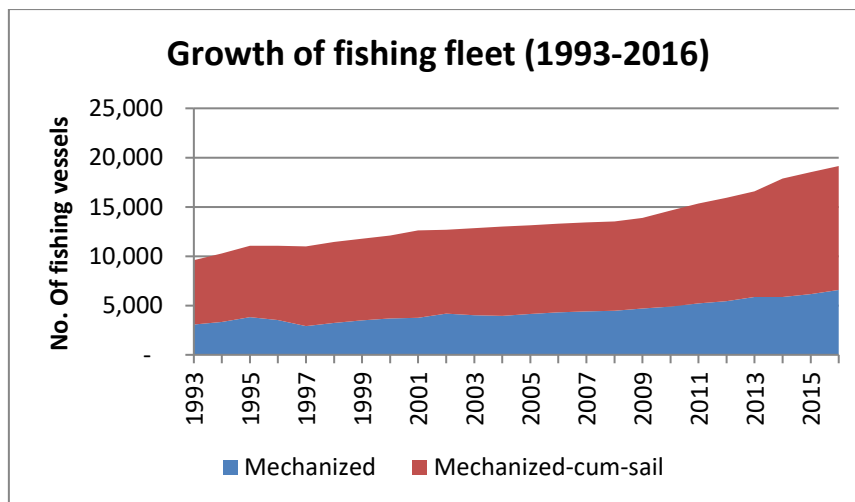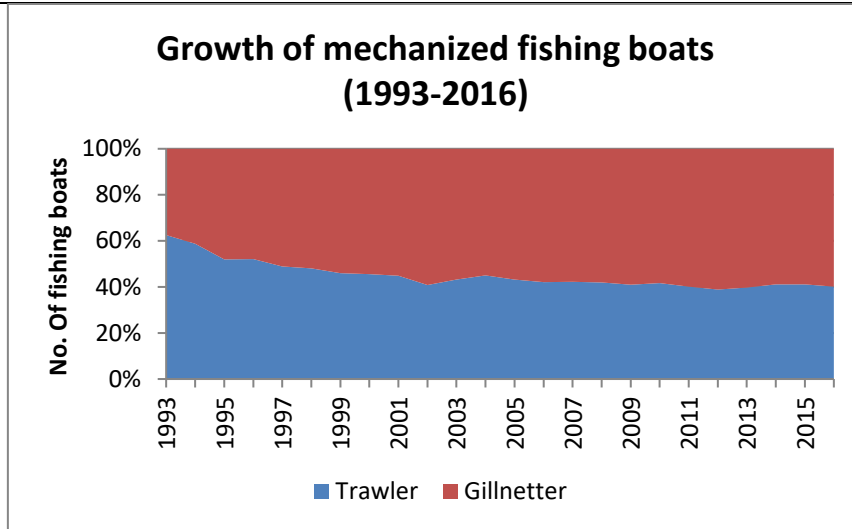

Figure 2 Growth of fishing fleet

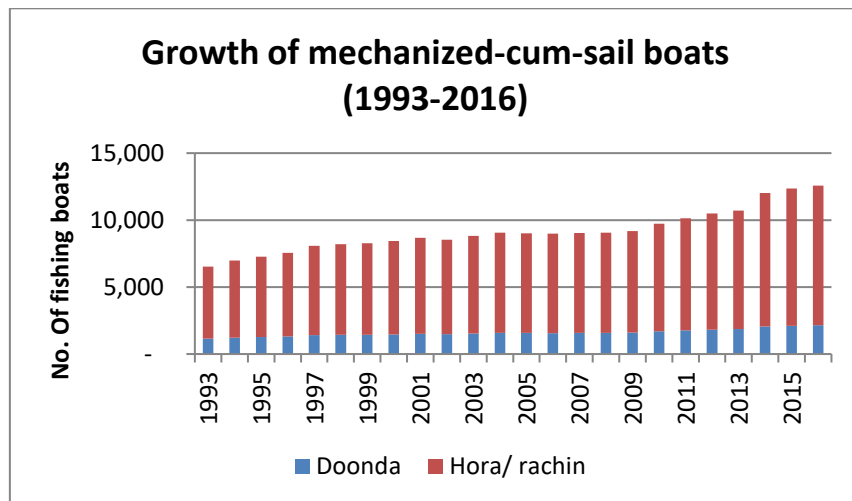**Figure 3 Growth of mechanized fishing fleet**

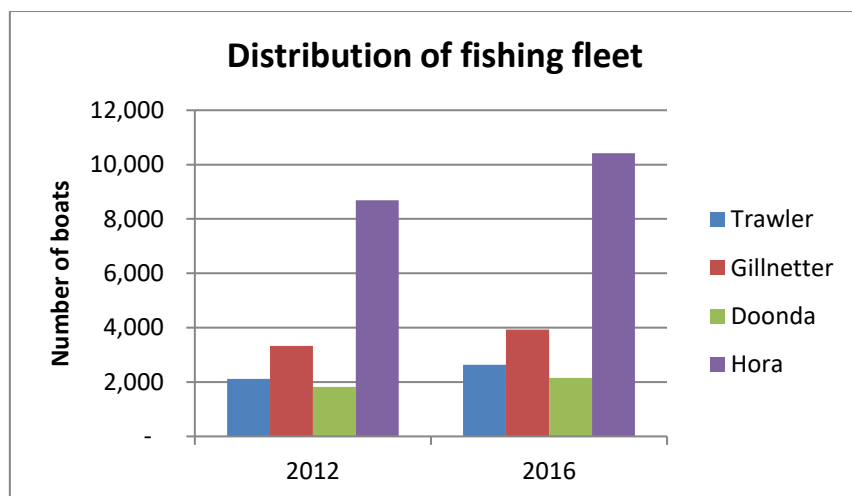**Figure 4 Growth of mechanized-cum-sail boats**

Figure 5 Percentage composition of different fleet

Table 2.   Number of fishing vessel in actual operation (2012 - 2016)

Type of fishing vessel	2012	2013	2014	2015	2016
Mechanized	15,937	16,578	17,889	18,519	19,148
Trawler	2,112	2,336	2,412	2,536	2,640
Gillnetter	3,324	3,538	3,459	3,624	3,935
Mechanized-cum-sail boat	10,501	10,704	12,018	12,359	12,573
Hora/ Rachin boats	8,683	8,850	9,965	10,245	10,421
Doonda boat	1,818	1,854	2,053	2,115	2,152
Sail boats (inland sector)	1,940	2,118	3,140	3,168	3,271
Tuna fishing gillnet	618	638	667	683	709
Tuna fishing longliner	0	0	0	0	0

Mechanized-cum-sail boats: These are also made of wood, they are generally smaller in size as compared to gillnetters. They are fitted with out-board engine, the number of engines ranges from 2-3 depending upon the nature of fishing. They are locally known as "hora" in Sindh and "Rachin" in Balochistan. These boats increased from 8,683 in 2012 to 10,421 in 2016, the overall increase was 20% during the reporting period.

Doonda boats: These are the fiberglass life saving boats of scraped ships having overall length from 25-35 ft, and converted into fishing boat. These are new fishing boats in Pakistan, which started early 1980s. These boats mainly based at Karachi harbour, Ibrahim Hydri and Chashma Goth in Sindh and Gadani, Pasni, Gwader in Balochistan. These boats are fitted with 22-33 HP engine. These boats can operate upto 20 m depth. These boats carry 6 crew onboard and average trips duration is 8-14 days. These boats are also increased from 1,818 in 2012 to 2,152 in 2016 with an overall increase of 18.4% during the reporting period.

TUNA FISHING FLEET

Coastal fishery

The Pakistani tuna fleet consists entirely of locally made wooden boats. A study (Moazzam, 2012) carried out in two maritime provinces i.e. Sindh and Balochistan revealed that most of the boats operating from Karachi (Sindh) range from 15 to 25 m LOA, whereas, those operating from Balochistan range from 10 to 15 m. There are about 65 large boats (ranging from 20 to 30 m LOA) engaged in fishing trips of more than two months in comparatively deeper waters and have onboard freezing facilities. Tuna fishing vessels are equipped with a hydraulic net hauling device as well as navigation equipment such as GPS and fish finders. Fish is stored in 6-8 insulated compartments each having a capacity of about 1 to 1.5 tonnes (t). In most tuna fishing vessels, the catch is stored with crushed block ice. The smaller tuna fishing vessels do not carry any communication equipment; however, a few larger vessels may have VHF and shortwave radios. It appears from Figure-6 that tuna fishing gillnet were at their peak in 1992 thereafter it decreased up to 400 boats in 2002, thereafter, it again started to increases gradually and in 2016, the operation tuna boats were 709..

Surface gillnetting using polyamide nets is used for catching tunas in Pakistan. It has stretched mesh size ranging between 13 cm and 17 cm (average: 15 cm) with a hanging ratio of 0.5. The length of gillnet varies between 4.83 km and 11.27 km. The breadth of the net was reported to be 14 m. There are a few larger fishing boats operated from Karachi and Gwadar,

which may have a gillnet of about 20 km length. There are variations in the length and specification between the nets. When targeting small tuna in neritic waters, nets with smaller mesh size are used. In almost all cases, tuna gillnets are set in the evening and hauled in the early morning (Moazzam and Nawaz, 2014).
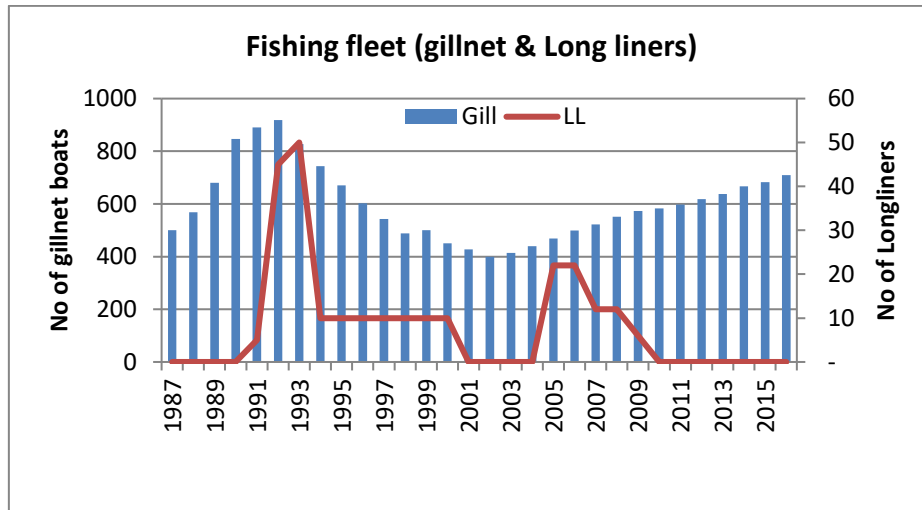

Figure 6 Tuna fishing fleet

Offshore fishery

In 1990, the Government of Pakistan permitted four foreign companies to operate in the EEZ for an experimental resource survey of tuna and tuna-like species (Majid 1995). These survey vessels operated until 1993, but in that same year, 12 Taiwanese longliners were licensed to fish under the Pakistani flag, paying fixed royalties and annual license fees (Anon 1995; Majid 1995; Khan 2006). These joint-ventures drastically depleted the tuna resources in the area, specifically yellowfin tuna, with catches reaching a peak of 30,817 t in 1993 and then dropping to 4,604 t in 1994. The stock of yellowfin was thought to have recovered 12 years later, when in 2005 and 2006, another 25 Taiwanese tuna longliners obtained licenses to fish in Pakistan's EEZ. During this period, a total of 7,870 t of yellowfin tuna was caught by these vessels, which again depleted the stocks.

CATCH AND EFFORT (By Species, Area and Gear)

Nominal fish statistics have been studied by several researchers (Garibaldi, 2002; Khan, 2002; Wasim *et al.*, 2003; Hornby *et al.*, 2013; Fanning *et al.*, 2016). The trend during the period 1980-2016 is shown in Figure 7. It appears that total fish production from marine capture was decreasing since 2000, however, there is some improvement since 2011. This increase is attributed due to increase in the tuna landings as shown in Figure 7 and Figure 8.
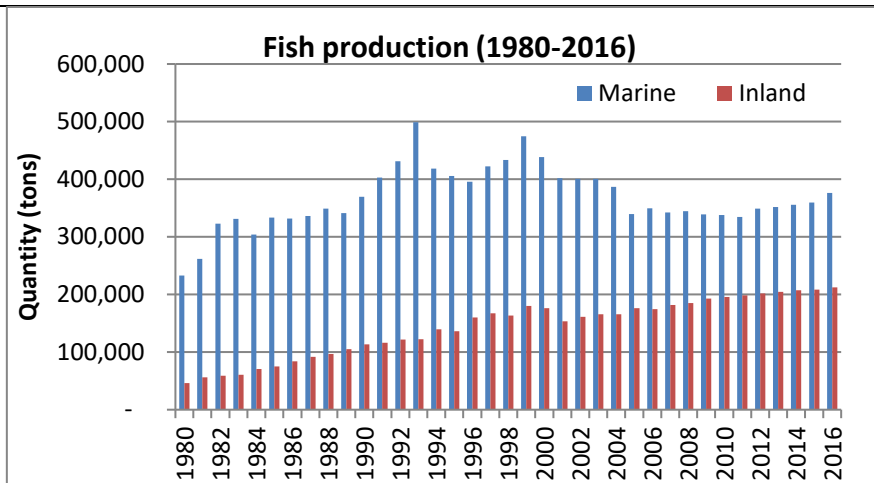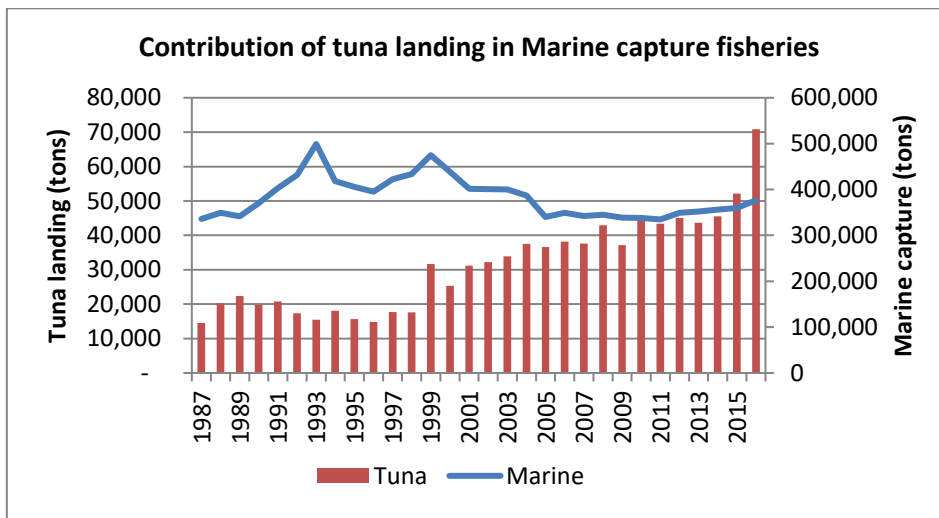
Figure 7 Nominal fish production (1980-2016)

Figure 8 Nominal fish production & tuna landing (1987-2016)

The nominal fish landing during last give years (2012 to 2016) is given in Table 3. It appears that total fish production increase from 550,927 tons to 588,581 tons during the reporting period, the overall increase is 8.63%.The production from marine capture fisheries increased from 349,050 tons to 376,266 tons, with an increase of 7.80% during the same period. The landing of tuna species increased from 45,072 ton to 70,845 tons, with an increase of 57.18% during the same period. The increase is 11.44% per annum. Similarly, the landing of bycatch species in tuna fleet also increased from 19,105 ton to 30,380 ton, with an increase of 59.02% during the same period. This increase is 11.80% per annum. The increase in tuna fish species and bycatch in tuna fleet is due to the fact that more statistics is being recorded due to crew-based observer programme being implemented by WWF-Pakistan under ABNJ project.

Table 3   Nominal fish production (2012-2016)

	2012	2013	2014	2015	2016
Total	550,927	556,552	563,392	568,151	588,581
Marine	349,050	351,747	355,900	359,534	376,266
Inland	201,877	204,805	207,492	208,617	212,315
Tuna total	45,072	43,701	45,569	52,151	70,845
Bycatch	19,105	25,354	27,867	28,379	30,380

Tuna fishing in Pakistan is based on large gillnets used onboard about 500 vessels which are dedicatedly engaged in catching large pelagic fishes (Moazzam, 2012). Information on species composition and mortality of these important fishes is not documented. In this paper an attempt is made to present data on by-catch of tuna gillnetting operations and to suggest measures that can be adopted as alternate fishing methods to minimize mortality of endangered and threatened species.

Nertic tuna is represented by five species in Pakistan including longtail tuna (*Thunnus tonggol*), kawakawa (*Euthynnus affinis*), frigate tuna (*Auxis thazard thazard*), bullet tuna (*Auxis rochei rochei*) and striped bonitos (*Sarda orientalis*). In addition, two oceanic species i.e. yellowfin (*Thunnus albacores*) and skipjack (*Katsuwonus pelamis*) are also important tuna species occurring in Pakistan. Pakistani fishing fleet operating in the Area Beyond National Jurisdiction (ABNJ) and rarely catch of bigeye tuna (*Thunnus obesus*).

Neritic tuna has been covered in the studies carried out on tuna fisheries of Pakistan including Imad (1988), Ahmed (1989), Anonymous (1991), Moazzam (2010; 2012a-c; 2014), Moazzam and Nawaz (2014); Moazzam and Ayub (2015) and Moazzam *et al.*(2016b). Inter-annual variability in the changes in the landings of neritic tuna was noticed in the last past decade which is mainly attributed to Somali piracy which compelled fishermen to restrict their activities to eastern part of the Pakistan coast and operate in the coastal waters (Moazzam, 2012c). Now that the situation has improved, Pakistani fishing tuna vessels have now started operation in comparatively deeper waters within Exclusive Economic Zone (EEZ) of Pakistan and in the Area Beyond National Jurisdiction (ABNJ). In the present paper, an update on the status of neritic tuna fisheries of Pakistan is presented (Moazzam *et al.*, 2016a).

Landings of tuna, specifically yellowfin, peaked between 1991-1994 when the Pakistani government approved an experimental resource survey, allowing more than 50 Taiwanese longliners to fish within Pakistan's EEZ (IPTP 1991; Majid 1995; Khan 2012c). Tuna landings attributed by Taiwanese (and assumed Chinese, Pauly *et al.* 2013) industrial longliners, fishing in the EEZ from 1991-2009, were subtracted from the total tuna catch for all species and reallocated as Taiwanese (and Chinese) catch. The remaining catches were assumed to be domestic catch from inshore and offshore gillnet operations, fishing within the EEZ. Little information is available on catches by the gillnet fishery. However, it is estimated that the inshore gillnet fishery takes 30-40 % of the skipjack catch. Based on information given by the IOTC and FAO (Gillett 2011), it was assumed that 10% of the gillnet catches were made by inshore artisanal fishing operations and the remaining 90% by offshore fleets, which for the purpose of this report, were categorized as industrial catch. Pakistani gillnetters are known to

also fish in the EEZ of Iran, Somalia and the high seas (Moazzam 2012c); however, estimates of catches outside the EEZ were not available.

WWF-Pakistan has initiated a crew based observer programme which has helped in collection of information about neritic tuna fisheries, bycatch in tuna fishery and catch per unit effort of tuna fishing boat as well. In the light of the above, nominal catches as reported in the FAO statistics and IOTC has been revised and reconciled estimates of tuna statistics is being presented in this study (Figure-9,10 & 11).
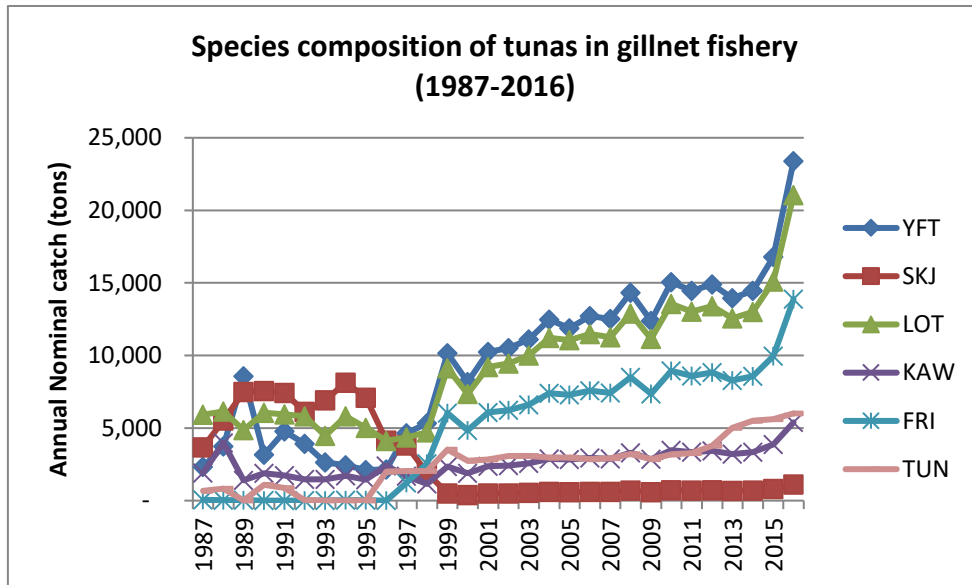

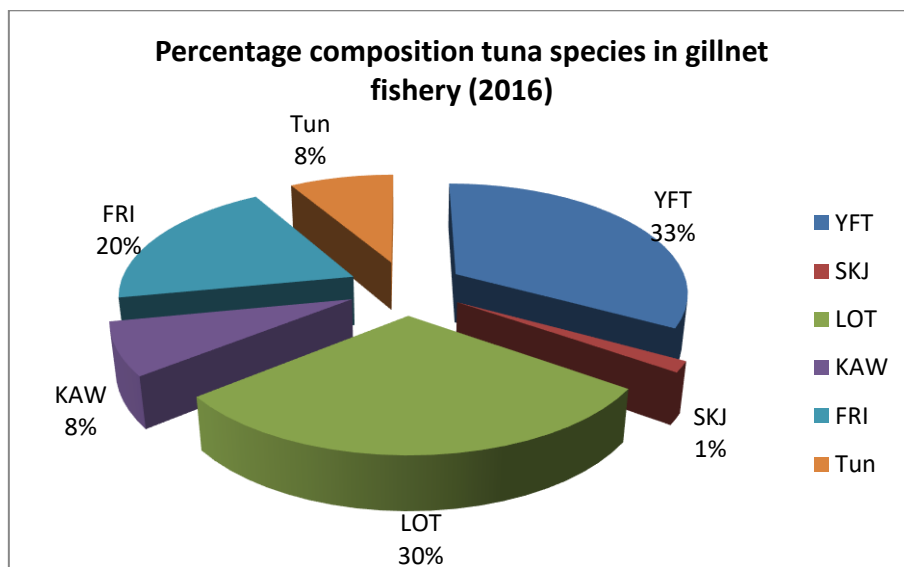**Figure 9 Species composition of tuna in gillnet fishery.**

Figure 10 Species composition of bycatch in tuna gillnet fishery

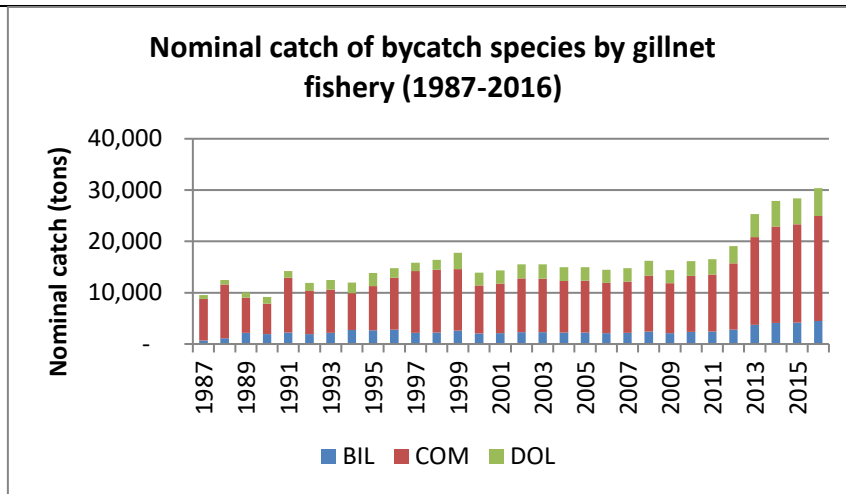**Nominal catch of bycatch species by gillnet fishery (1987-2016)**

Figure 11 Species composition of bycatch species in tuna gillnet fishery (1987-2016)

As already explain above, tuna longliners were licensed on the pretext of stock assessment of large pelagic resources in EEZ of Pakistan 1991, however, they have conducted the commercial fishing and targeted yellowfin tuna. Billfishes and Seerfishes (*Scomberomorus commerson*) were also caught as bycatch. Figure-12 and Figure-13 showing the performance of longline fishery, it is clearly mention that there was no tuna longliner in operation during the period 1987-1990 and 2010-2016
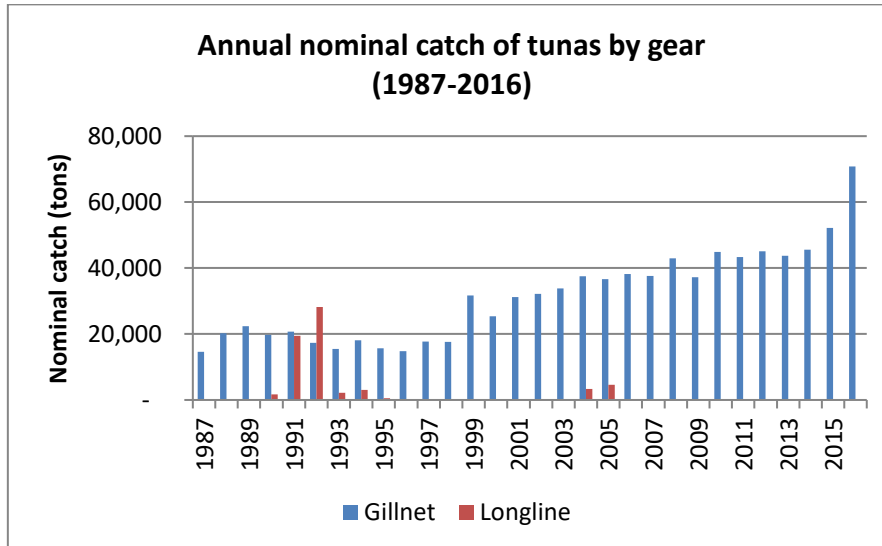
Annual nominal catch of tunas by gear (1987-2016)

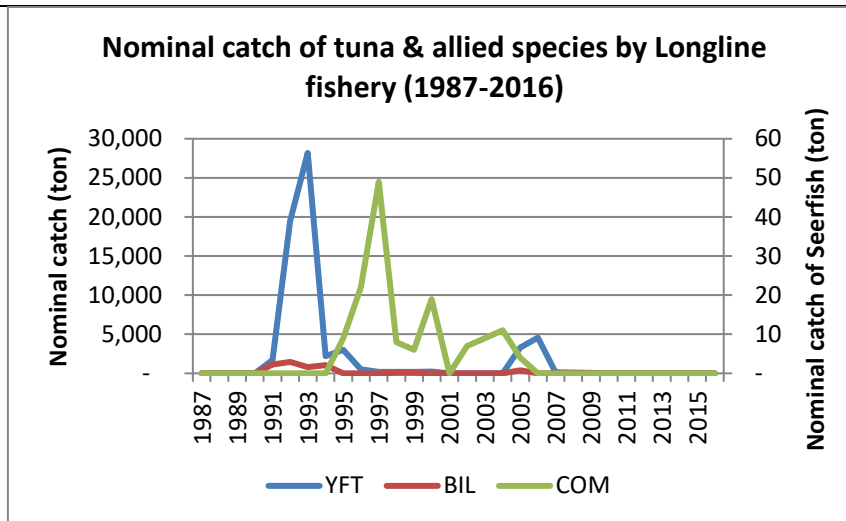**Figure 12 Nominal catch of tunas by gear (1987-2016)**

Figure 13 Nominal catch of tuna & bycatch species by long-line fishery (1987-2016)

NATIONAL DATA COLLECTION AND PROCESSING SYSTEM

1   Logsheet data collection and verification (including date commenced and status of implementation)

Under Clause 13 of Exclusive Fishery Zone (Regulation of Fishing) Rules, 1990 it is mandatory for the licensed fishing vessel to provide furnish to the licensing authority or the Fishery Officer, in the first week of each month on prescribed form regarding the activities of his fishing craft during the previous month. No log sheet is maintained by tuna gillnetters which are permitted by provincial governments. At present, no large longliners are operating, therefore, no log sheet data is available for tuna fisheries of Pakistan.

2.   Vessel Monitoring System (including date commenced and status of implementation)
   i)   As per Clause 7 (k) of Deep sea Fishing Policy 2009, it is mandatory requirement for the licensed tuna longliner (foreign flag vessel having joint venture with Pakistani company) to have satellite-based VMS on board. Contravention of any provision of the regulation is punishable under Exclusive Fishery Zone (Regulation of Fishing) Act, 1975 (XXXII of 1975) and Exclusive Fishery Zone (Regulation of Fishing) Rules, 1990 notified vide No. S.R.O. DD-60(I)/90 dated 04-02-1991 is punishable.

   ii) On experimental basis VMS has been installed on four fishing vessels (With collaboration with WWF-Pakistan and Pakistan Maritime Security Agency). Another four vessels have been installed with satellite based AIS (with Collaboration with WWF-Pakistan). A plan is being developed with the collaboration of Provincial Governments to make it mandatory to install VMS on all vessels longer than 15 m. New Deep Sea Fishing Policy also make it mandatory to have all vessels operating in EEZ of Pakistan to have VMS.

iii) Government of Balochistan also promulgated regulation Notification No.SO (Coord) Fish/2-1/2013/3148-58 dated 08-09-2016 and Clause 2(b, c, d, e, f, g, and h), it is made mandatory that all fishing vessels larger than 15 meters (in length overall) licensed under Balochistan Sea Fisheries Ordinance, 1971 and engaged in catching tuna and tuna like species by any methods/gear operating drift net/ gillnet in territorial waters of Balochistan shall have a satellite-based vessel monitoring system (VMS) on board. Contravention of any provision of the regulation is punishable which include fine as well as imprisonment.

3.   Observer programme (including date commenced and status; number of observer, include percentage coverage by gear type) (Table-4).

Table 4. Annual observer coverage by operation

Type of gear	No of vessels monitored in 2016	Coverage in (%)		
		2014	2015	2016
Purse seine	No Purse seine was in operation in Pakistan	Not applicable		
Longline	No longliner was in operation in Pakistan during 2016	Not applicable		
Gillnet	There are estimated 700 tuna gillnetters in operation in Pakistan. No Government observer on any gillnetters.	No observers on gillnetters by Government of Pakistan.		
		WWF-Pakistan has placed 4 crew based observers in 2014 (0.6%)	35 boats (5%)	85 boats (12.1)
Bait boat	No bait boat was in operation	Not applicable		
Hand line	No tuna hand line fishing in Pakistan	Not applicable		

SIZE DATA (BY SPECIES AND GEAR)

Tuna landings of gillnet fisheries are being recorded at the port (i.e. Karachi Fish Harbour) on regular basis. The length frequency was recorded for different species as per frequencies given in Table 5 whereas size frequency distribution of each species during the period 2013 to 2016 are given in Table-6 to Table-9.

Table 5. Number of individual measured by species of gillnet fishery

Name of species	2012	2013	2014	2015	2106
Skipjack	54	73	54	90	195
Yellowfin tuna	28	631	473	154	249
KAWAKAWA	49	568	197	102	250
Frigate tuna	30	156	27	19	84
Longtail tuna	10	553	226	115	261
Saurida orientalis	0	26	02	04	28

Table-6. The size ranges and dominant size class of the tuna species during 2013.

2013/ Species	Size Range (in cm)	Dominant Size Class (in cm)
Yellow fin tuna	45-169	55-79
Skip jack	35-72	40-64
Long tail tuna	38-86	50-74
Kawakawa	30-70	35-64
Frigate tuna	27-43	30-41
Sarda Orientalis	41-52	41-50

Table-7. The size ranges and dominant size class of the tuna species during 2014.

2014/ Species	Size Range (in cm)	Dominant Size Class (in cm)
Yellow fin tuna	65-191	50-109
Skip jack	43-74	50-64
Long tail tuna	35-84	50-79
Kawakawa	42-75	50-59
Frigate tuna	32-47	30-44
Sarda orientals	46-50	46-50

Table-8 The size ranges and dominant size class of the tuna species during 2015.

Species	Size Range (in cm)	Dominant Size Class (in cm)
2015		
Yellow fin tuna	56-145	61-112
Skip jack	45-74	46-59
Long tail tuna	46-97	53-77
Kawakawa	44-73	49-65
Frigate tuna	38-46	39-43
Sarda orientals	52-66	52-66

Table-9 The size ranges and dominant size class of the tuna species during 2016.

2015/ Species	Size Range (in cm)	Dominant Size Class (in cm)
Yellow fin tuna	50-174	56-149
Skip jack	38-77	40-75
Long tail tuna	35-93	52-87
Kawakawa	42-75	45-67
Frigate tuna	29-47	30-42
Sarda orientals	40-59	43-56

IMPLEMENTATION OF IOTC RECOMMENDATION RESOLUTION RELEVANT TO THE DATA COLLECTION SYSTEM

Fisheries data collection system is being improving; a soft ware has been developed to record the fisheries statistics at landing places.

Marine Fisheries Department in collaboration with WWF-Pakistan has conducted training course for field samplers in identification of fish species and use of identification cards for billfish, sharks, tunas.

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