



Status of Cartilaginous Fishes in Pakistan

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Abstract: Pakistani fishermen are involved in shark fishing activity and caught cartilaginous fishes as by catch by using gillnet despite their population is decline. In this study we recorded small and large size sharks were found at the two major fish landing sites i.e. Karachi fish harbor and Korangi fish harbor ranging from (29-188cm), rays (DL: 21-104cm and DW: 26-230), guitarfishes (51-116cm) and torpedo (17-34cm) in which large size species are *Carcharhinus sorrah*, *Alopias pelagicus*, *Mobula eregoodootenkee*, *Mobulara pacifica* and small size *Narcines* (17-20cm). In Pakistan annual shark landing was recorded 51,170 tons in 2000 and gradually decrease about 4,660 tons in 2011 whereas Sindh and Balochistan province captured 2,170-2,490 tons of sharks in 2011. Top ranking Shark fishing countries with % of global catch i.e. Indonesia 13.25% (First highest catcher), India 9.8% (Second), Spain 7.3% (Third), Taiwan 5.8%, Argentina 4.3%, Mexico 4.1%, Pakistan 3.92%, United states (U.S) 3.7%, Japan 3.0%, Malaysia 2.9%, Thailand 2.8%, France 2.6%, Brazil 2.4%, Srilanka 2.4%, New Zealand 2.2%, Portugal 1.9%, Nigeria 1.7%, Iran 1.7%, United Kingdom (U.K) 1.6% and South Korea 1.4% whereas shark finning countries are Taiwan (First largest), Hong Kong (Second) and Singapore (Third). Elasmobranchs are caught for global demand, earned money, for delicacy and status symbol but their products would highly beneficial and valuable for medicinal and cosmetic industries.

Keywords: Sharks, Cartilaginous, by catch, Fish Harbor.

1. INTRODUCTION

Worldwide fishing and finning activity causes a high mortality and declining of shark's population (Bonfil, 1994, Castro, Woodley and Brudek 1999, Fowler *et al.*, 2005). Countries are involved in this activity such as Indonesia, India, U.S, Pakistan, Mexico, Taiwan, Japan, Argentina, Srilanka, Brazil, Malaysia, France, UK, Korea, Thailand, Spain, New Zealand and Maldives (FAO, 1998). Some others are Australia, Canada, Oman, Malta, Namibia, Honduras, Philippines, Israel, South America and now emerging South America (Jessica, 2001; Dawn, 3/2016).

Sharks are caught for both fins and meat (Rose, 1996, Mills, 1997). According to FAO extracted oil from the shark liver is used in making cosmetics products and medicines (Shepherd, 2016, Dawn, 9/2014), extracted chondroitin from cartilage used as skin replacement, in pills and energy drinks (Clarke *et al.*, 2007), skin and jaws of sharks and rays used in making luxury and jewelry items (Shepherd, 2016). Rays and their spines are used as a food and making daggers, spear tips and whips. It is the most highly priced fish in Australia, Europe and parts of Asia while Australian, Malaysians, Tribes in South, Central America, West Africa and Indo-Pacific (Last and Stevens, 1994) while gill plates of Manta and Devil rays are used in China (Annexes to CITES, 2nd revised version, 2014, Shepherd, 2016). Fortunately, Pakistan is not involved in exporting of Mobulid gill plates except their meat

(WWF, 10/2015) but some unaware communities in Jiwan used the snout of saw sharks to make the boundary wall of their homes. However, Shark meat consume locally and their dried skin and internal organs used in poultry feeding (The Express Tribune, 9/2014, Shahid *et al.*, 2015) but no medicinal uses yet (Personal observation).

Worldwide estimated 26 to 73 million sharks per year are traded for fins (Clarke *et al.*, 2006b) and killed sandbar shark, bull shark, hammerhead shark, blacktip shark, porbeagle, mako shark, thresher shark, blue sharks and white sharks according to their preferences. Between 1986 to 1997 Hong Kong, India, Pakistan Japan, and Yemen exported dried and salted shark fins to Singapore and now Pakistan, UAE, Spain, Singapore, Taiwan and Indonesia export shark fins to Philippines, Thailand and Taiwan (Dawn, 3/2016, The National, 2012) whereas in 2000 Pakistan exported 83% of salted and dried shark meat to Colombo, Peru and Sri Lanka but has no export data to estimate total trade or even sharks population (FAO, 2002, Lack and Sant, 2011) and now due to the gradual decrease of shark population there is no export of shark as dried salted form (Shahid *et al.*, 2015).

In recent years Japan and Pakistan having lower production of shark fin whereas Spain, Sri Lanka and Taiwan having higher production to import. Jessica (2001) reported about Taiwan is the first largest shark

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fin trader than Hong Kong and Singapore. However, Hong Kong consumes three million kilograms of sharks per year and responsible for importing sharks fin in 1980s from all over the world (Tanaka, 1994, Vannuccini, 1999, Clarke, 2004a) while Indonesia 100,000 tons per year (Bell, Robertson and Hunter, 2004).

Although 5 out of 11 fins export countries have no shark finning regulations (Oceana, 6/2016). In 2004-2006 shark finning resolutions taken by the International Commission for the Conservation of Atlantic Tunas (ICCAT), the Inter-American Tropical Tuna Commission (IATTC), the Indian Ocean Tuna Commission (IOTC), the Northwest Atlantic Fisheries Organization (NAFO) and the Western and Central Pacific Fisheries Commission (WCPFC) to overcome fin trade in major finning countries (Clarke *et al.*, 2007) and it is prohibited in the USA and state of Hawaii in 2000, European Union in 2004, South Africa, Brazil, Costa Rica, Australia and Canada (Anon, 1999, Fowler *et al.*, 2005, Clarke *et al.*, 2006b, 2007) recorded a sharp drop in importing shark fin to Hong Kong from USA (54%, from 374 to 171t) in 2001, EU (785-550t) 30% in 2003-2004 and 600t in 2005 after implementation whereas US banning shark fin trade by introducing a new bill named "Shark Fin Trade Elimination Act of 2016" in 2016 (Oceana, 6/2016).

The present study gives a global overview to understand the current status of cartilaginous fishes especially in major shark fishing countries and summarize the global and regional information by different sources also collect information and data about size-wise specie distribution and abundance in Pakistan to inform conservationist and management of national and international parties.

2. MATERIAL AND METHOD

Two landing sites, Karachi fish Harbour (Major fish market) and Korangi fish Harbour (Ibrahim hydri) visited per month from August-October, 2015 to March-May, 2016. Recorded small and larger size specimens in which TL (Total length in cm) and BW (Body weight in gm and kg) were measured. All species were identified by the following standard methods and identification keys (Fischer and Bianchi, 1984; Bianchi, 1985; Psomadakis *et al.*, 2015). Sharks identified by taken these parameters: Total length (TL), Fork length (FL), standard length (SL), Dorsal origin to pre-caudal pit (DOPCP), dorsal origin to caudal tip (DOCT), Inter-dorsal space (IDS), Head length (HL), Snout length (SL), Mouth Width (MW), Inter-nasal space (INS), observe labial furrow, body weight (BW) in gm/kg and sex (M/F). In the large size specimens only parameters such as TL, SL, Sex and weight were measured while

Batoid fishes (Rays, guitar fishes and torpedo) by Disc length (DL), Disc width (DW), sex (M/F), tail length, presence of spines on their tail whereas Total length (TL), body weight (BW) Sex (M/F) were measured in guitar fishes and torpedo.

3. RESULT AND DISCUSSION

In this study we observed mature and immature cartilaginous fishes in which dominant sharks *Rhizoprionodonacutus* and *Scoliodonlaticaudus* were found in every size i.e. small (29cm) to large size (88cm) while *Himanturasp* belonging to batoid fishes (rays) are mostly found in small and medium size ranging from 21cm to 56 cm (DL) and 26cm to 63 cm (DW) and 4 species of Guitar fishes are found ranging from (51-116cm). However, large size elasmobranch species are (spot tail shark) *Carcharhinussorrah* (188cm), (Thresher shark) *Alopiaspelagicus* (152.4-182.8cm), (Long horned mobula) *Mobulaeregoodootenkee* (DL: 90 and DW: 222 cm) and (Sickle fin devil ray) *Mobulatarapacana* (DL: 104 and DW: 230 cm) and local fisherman caught Mobula rays by "Rashkajal" while Juvenile size *Narcinespp* (17-20cm) belonging to batoid fishes (torpedo) recorded from Korangi fish harbor (Ibrahim hydri) and remaining elasmobranch species are mentioned in (Table 1). In Pakistan 144 known shark species and 47 species of rays and guitarfishes in which only 14 are found (Moazzam, 2012) and some common rays belonging to the family: Dasyatidae and Gymnuridae (Behzadi, 2007) including Giant manta (*Manta birostris*), Chilean devil ray (*Mobulatarapacana*), Spinetailmobula (*Mobula japonica*), Longhornedmobula (*Mobulaeregoodootenkee*), Smoothtailmobula (*Mobulathurstoni*) and Shortfin devil ray (*Mobulakuhl*) (Pakistan Wildlife and conservation, 5/2006, Moazzam, 2012, WWF, 10/2015, Dawn, 9/2014,3/2016). Currently skates and chimaeras are not found in Pakistan while no data exist (Personal observation).

During breeding season in Pakistan between April to August some pregnant females i.e., hammerhead shark, grey bamboo shark, blacktip shark, spade nose shark and pelagic thresher shark has been caught (Dawn, 2/2011, Animal rights in Pakistan, 3/2014, Fatima *et al.*, 2016). Shark fishing is common in Baluchistan coast such as in Jiwani, Gwadar, Pasni, Ormara and the towns of Ganz and Pishukan but overexploitation in Baluchistan is less than Sindh coast (Fig. 4). Recently (Fatima *et al.*, 2016) reported about elasmobranch specie-abundance and sex ratio among many important species of sharks and batoid fishes found in Pakistan such as requiem shark belonging to the Family Carcharhinidae are the most exploited species and caught throughout the year while in rays

*Himantura*spp belonging to the family Dasyatidae are caught in early summer season. It is estimated that 1000-15,000 and 50-100 small size blue sharks are caught on a daily basis by pelagic gillnet and estimated that 55-78% of shark catch by using gillnet despite introducing longline fishing gear for sharks, rays and other species (Dawn, 2/2011, Prado and Drew, 1991, Moazzam, 2012, Aranda, 2017) whereas rays are usually discarded due to the low commercial value (Shahid *et al.*, 2016). Aranda (2017) reported about gillnet using countries are Iran, India, Pakistan and Srilanka while longline fishing gear using countries are Japan, Taiwan, China, Indonesia, Spain, Portugal and Korea but only EU using purse seine net for shark fishing.

Pakistan is one of the major shark catcher having 7th rank out of the 20 major shark catching countries and their elasmobranch production rate is 4% with total catch (32,277 tons) followed by Indonesia 13.3% (109,248 tons) is the first major shark catching country, India 9% (74,050 tons), Spain 7.3 % (59,777 tons), Taiwan 5.8% (47,635 tons) (**Fig. 1**) whereas Argentina, Mexico and US having 4% with (35,089 tons, 33,971 tons and 32,277 tons) while Japan(24,960 tons), Malaysia (24,334 tons), Thailand (22,728 tons), and France (21,511 tons) have 3% and others have 2% Portugal (15,819 tons), Nigeria (14,311 tons), U.K (14,001 tons), Iran (13,356 tons) and South Korea (11,887 tons) (FAO, 1998; 2006a; Lack & Sant, 2011). In Pakistan the estimated catch was 32,277t since 1950, it was tripled in 2000 about 51,170t and gradually low about 49,863- 16,335, in 2001-2008 (**Fig. 2**) whereas shark landing was 22,471t in 2002, 18,697t in 2003, 15,533t in 2004 and gradually decrease about 12,250t-4,660t in 2005-2011 (**Fig. 3**) However, landing catch between 15,111t-2,170t and 7,357t-2,490t in 2002-2011 in Sindh and Baluchistan province (**Fig. 4**) but Baluchistan coast captured more sharks than Sindh coast in 2011. It is estimated that the annual catch of rays and skates are 7,500 m.tons in 1970 and increased in 2001 to 22,745 m.tons and during 1978 to 1982 the sharp increase in production was about 41,000 to 53,000 m.tons while recorded shark catch during 1970 to 2001 was about 26,800 to 26,524 m.tons and the high catch was observed in 1973 about 43,800 and 35,357 m.tons in 1998 (Pakistan, 2011).

After alarming decline of sharks in all around the world especially in major shark fishing countries need to conserve shark population. However, CITES, TRAFFIC, FAO, COFI, and RFMOs responsible for shark management and action Plan development. In 1994, International treaties such as CITES (Convention on International Trade in Endangered Species of Wild Fauna and Flora) mandating a review of the status and

trade in sharks, FAO (Food and Agriculture Organization) formed a Technical Working Group (TWG) and regional fisheries management organizations (RFMOs), TRAFFIC has involve in IPOA and NPOA since 1994 to determine shark population and their catch rate (Lack and Sant, 2006, 2008, 2011) and IUCN has formed a Shark Working group (SWG) that prepare global action plan (GAP) for the conservation and management of sharks. According to (Lack and Meere, 2009) regional Plan of Action (RPOA-Sharks) was developed only for Pacific island countries and later on it develop with NPOA-Sharks in Bay of Bengal, India, Srilanka, Bangladesh, Maldives, Central and South America (Sanchez, 2010). However, National Action Plan (NPOA) is less implemented by certain countries and currently 13 of the Top 20 are known to have a NPOA and remaining Indonesia, India, Pakistan, Srilanka, Nigeria, Iran and South Korea are unknown to have NPOA-sharks. During 2000-2007 FAO recorded specie-specific and non-specie specific data from certain countries. They record elasmobranch catch by specie level (**Table 1 and 2**) and this may help to calculate shark catching rate regionally (Lack and Sant, 2009, 2011).

Recently U.S banned shark fining in their territorial water for the conservation of elasmobranchs while Thai government in 2000 removing shark-fin soup from the menu of its national airline but China and Singapore have no shark management and conservation strategy (Jessica, 2001). Australia implement NPOA-Sharks in its northern water and developed a revised plan on illegal, unreported and unregulated shark fishing in 2004. However, Maldives declared shark sanctuary in their coastal waters and Exclusive Economic Zone in 2010 (The Express Tribune, 9/2014, Timms and Williams, 2009, Lack and Sant, 2011) and Palau decided to create world first shark sanctuary in September 2009 whereas temporary banning in Honduras in 2010 (Lack and Sant, 2011). Recently, Pakistan sign a treaty to export shark fins through permit otherwise it would be illegal (Dawn, 9/2014). From 2008-2010 WWF take their part in the assessment, monitoring and focusing on shark landing, catch and trade in Pakistan, India and Indonesia. Recently WWF organized workshops on NPOA-sharks in Pakistan resulting some fisherman release back entangled large size Mobulid rays and whales since last 2 years (Dawn, 3/2016, WWF, 10/2015).

4. CONCLUSION

After highlighting the various aspects with previous and current status of cartilaginous fishes in major shark catchers, now Pakistan are ranking 7th and has 70 above landing sites in Sindh and Baluchistan province. They are involved in shark fishing activity due to this sever

declining of cartilaginous fishes are recorded in Pakistan. Governmental and non-governmental bodies are somehow involve in NPOA-sharks (National Plan of Action) and spread awareness regionally such as WWF, FAO, CITES, TRAFFIC, Ministry of climate change (Government of Pakistan), IUCN, Fisheries department of Sindh and Baluchistan and others. There is urgent need to collect data on the elasmobranchs assessment, update stock, exact status of catch and population, daily basis landing catch rate and specie-specific trade data. Pakistani government should take an immediate action on banning shark fishing activity particularly in breeding areas, exporting, gillnets vessels and trawlers, decrease local demand, release back to entangled species, pollution control that may cause to habitat destruction, implement on conservation strategies especially NPOA-Pakistan until the population of elasmobranchs recover back. Despite using elasmobranchs in poultry and fishmeal production in Pakistan, focused on the production of some value-added products can be used as a dietary supplement as well as for cosmetic use. We may enhance and fill the gap in science by doing research on the elasmobranchs in respective field i.e. Biochemical, blood, tissue and cartilage analysis, anatomy, food and feeding, reproduction, life history and maturity assessment that would help in the conservation of cartilaginous fishes.

Table 1. Recorded Total length (TL) of sharks and Batoid fishes (rays, guitarfishes and torpedo) from two major fish landing sites in Karachi, Pakistan during 2015-2016.

Elasmobranchs in Pakistan	TL (Total length)
SPECIES (Sharks, guitarfishes and torpedo)	Size range (cm)
<i>Rhizoprionodon acutus</i> *	29-88
<i>Scoliodonlaticaudus</i> *	30-54
<i>Carcharhinus macroti</i>	61
<i>Carcharhinus sorrah</i>	188
<i>Carcharhinus amblyrhynchos</i>	135
<i>Carcharhinus obscurus</i>	81
<i>Chiloscyllium arabicum</i>	37-60
<i>Sphyrna lewini</i>	56
<i>Mustelus mosis</i>	59.1
<i>Alopias pelagicus</i>	152.4-182.8
<i>Rhinobatos annandalei</i>	65-71
<i>Rhinobatos punctifer</i>	71
<i>Glaucostegus granulatus</i>	53-116
<i>Glaucostegus halavi</i> *	51-99

<i>Narcinebrunnea</i>	17-20	
<i>Narcinesp</i>	18-19	
<i>Torpedo sinuspersici</i>	34	
SPECIES (rays)	Size range (cm)	
	DL	DW
<i>Himanturableekeri</i> *	21-54	26-56
<i>Himanturandalli</i>	51-56	57-63
<i>Pastinacusephen</i>	22-50	28-55
<i>Himanturauarnak</i>	Not measure	
<i>Gymnurapoecilura</i>	15-35	27-64
<i>Aetobatusocellatus</i>	40-45	67-74
<i>Rhinopterajayakari</i>	Not measure	
<i>Rhinopterajavanica</i>	19	41
<i>Mobulaeregoodootenkee</i>	90	222
<i>Mobulatarapacana</i>	104	230

(*Major species in catch throughout the year.
(DL) disc length; (DW) disc width.

Table 2. Global landing of sharks during 2000-2007 (Source: Lack and Sant, 2009).

NON-SPECIE SPECIFIC DATA		
Countries	Categories	Description
India	Not specific	Sharks, rays, skates etc. (nei)
Pakistan	3 categories	Guitar fishes etc. (nei) Rays, stingrays, mantas (nei) and Requiem sharks (nei).
Japan	2 categories	Sharks, rays and skates etc (nei) and Whip stingray <i>Dasyatis akajei</i> . [In 2007 all recorded sharks, rays, skates etc (nei)].
Malaysia, Taiwan and Thailand	2 categories	Sharks, rays and skates (nei) and Rays, stingrays, mantas (nei)
Srilanka	2 categories	Sharks, rays, skates etc. (nei) Silky shark
SPECIE- SPECIFIC DATA		
Countries	Description	
Argentina	Rays, stingrays, mantas (nei)	
France	Dogfish shark (nei) and spiny Dogfish	
Portugal	Blue shark, Leafscale Gulper shark, Portugal Dogfish, short fin Mako <i>Isurus paucus</i>	
Spain	Blue sharks and short fin Mako and "Raja rays (nei)"	
U. K	Spiny Dogfish, Dogfishes and hounds(nei), "Raja rays (nei)", Leafscale Gulper shark	
USA	Dogsharks (nei), spiny Dogfish. "Raja rays (nei)" and "Rays, Stingrays, mantas (nei)"	

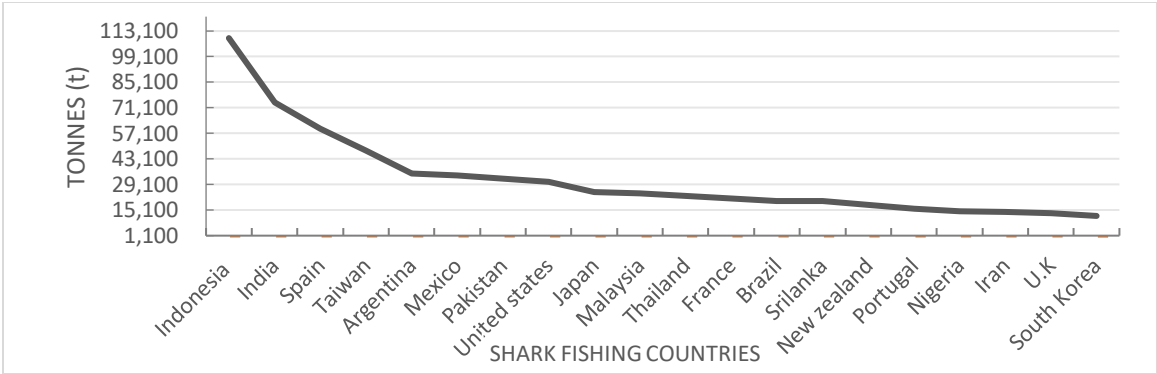


Fig. 1. Annual catch rate (tons) in major shark fishing countries (FAO, 2010)

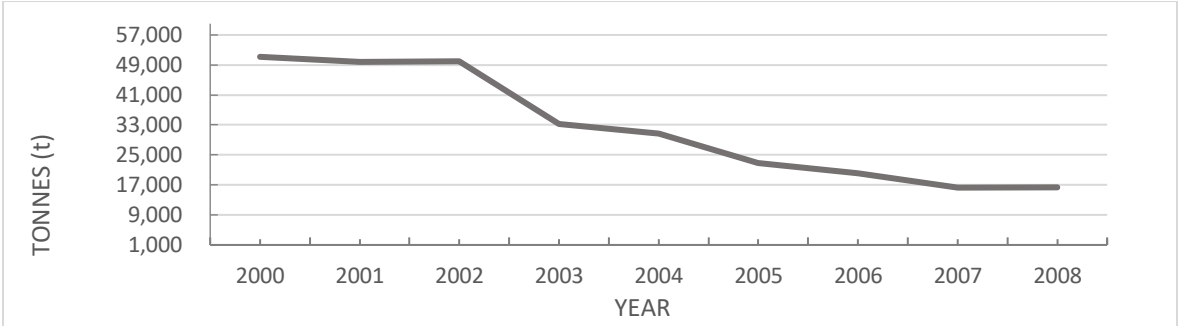


Fig. 2. Reported annual shark catch rate (tons) in Pakistan (FAO, 2010)

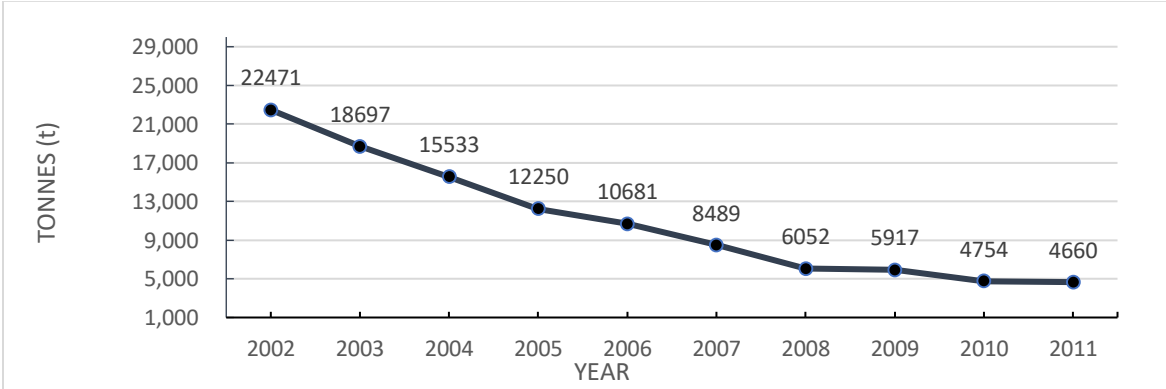


Fig. 3. Severe decline of Shark landing in Pakistan (Moazzam, 2012)

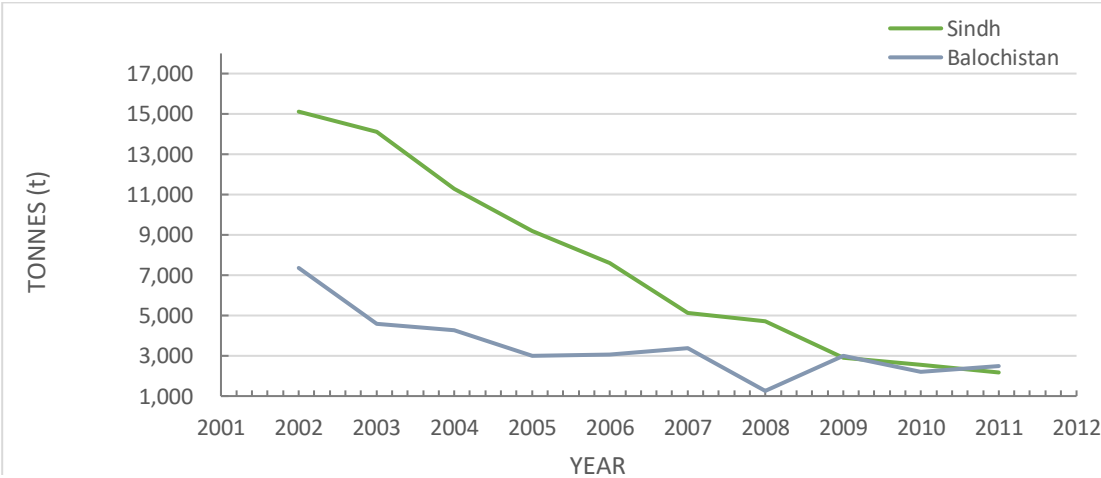


Fig. 4. Annual Shark landing (tons) in the two-main province of Pakistan (Moazzam, 2012)

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