

## **Bycatch analysis of tuna gillnet fisheries of Pakistan: An analysis of bycatch data from 2013-2015**

Umair Shahid, Mohammed Moazzam Khan, Rab Nawaz, Shoaib Abdul Razzaq and Saba Ayub

World Wide Fund for Nature, Karachi, Pakistan

### **Abstract**

There are around 700 gillnet vessels engaged in fishing in the continental shelf and offshore waters of Pakistan. These not only operate in the high seas within the exclusive economic zone, but also in the areas beyond national jurisdiction. A large number of sharks, sea turtles, cetaceans have been recorded to be caught in the tuna gillnet fisheries, but the species-wise composition data was not available. The study revealed that the dominating shark species includes *Isurus oxyrinchus*, *Alopias pelagicus* and *Carcharhinus spp.*, whereas among the sea turtles, the olive ridley turtle (*Lepidochelys olivacea*) is the dominating species and constitutes to about 86% of the total sea turtle bycatch, followed by the green turtle (*Chelonia mydas*,) comprising of 14% of the total sea turtle bycatch and Indo-pacific bottlenose dolphin (*Tursiops aduncus*), common bottlenose dolphin (*Tursiops truncatus*) and spinner dolphin (*Stenella longirostris*) have been recorded as dominant cetacean species entangled. WWF-Pakistan has initiated a program of safe release of enmeshed animals and so far 32 whale sharks, 14 mobulids, 1 beaked whale, 1 guitarfish, 2 bottlenose dolphins and thousands of sea turtles have been released safely.

### **Introduction**

The gillnet fisheries of Pakistan relies on pelagic resources which is mainly targeting tuna. These are considered indiscriminate fishing gears due to high bycatch of endangered, threatened and protected species, which includes sharks and rays, sea turtles and cetaceans. The species-wise composition data is largely missing for such species and is considered an issue for making informed decisions. The present study of gillnet vessel is an attempt to collect scientific data. This paper aims to provide a snapshot of the species-wise composition data for bycatch species of tuna gillnet fisheries of Pakistan.

### **Bycatch Analysis**

During the study period from January 2013 to December 2015, bycatch data of the gillnet operations was collected which revealed that sharks are the most dominating bycatch followed by turtles and cetaceans. Marine birds were not generally caught in the pelagic gillnet as only on two occasions brown boobies were found to be entangled in the surface rope of the gillnets. Brown booby are the two rarely caught sea birds recorded. A number of other commercially important species are also caught in gillnets. These include billfishes, narrow-barred Spanish mackerel, dolphinfish, queenfishes, barracuda and unicorn leatherjacket filefish which have been detailed in Moazzam *et al.* (2016)

## Sharks

Sharks in Pakistan are exploited from a wide range, the pelagic fishery forms the component of tuna gillnet fisheries, mostly pelagic in nature, but also occasionally using bottom-set gillnets. There has been a general concern about mortality of sharks and rays in the tuna gillnet fisheries. Among elasmobranchs, shark, pelagic rays, whale shark and mobulids are important bycatch of the tuna gillnet operations.

Dominating shark species are shortfin mako, (*Isurus oxyrinchus*) and pelagic thresher (*Alopias pelagicus*) which contribute about 46 and 24 % respectively in the total shark catches (Fig. 1). Other common species are silky (*Carcharhinus falciformis*) and scalloped hammerhead (*Sphyrna lewini*) contributing 7 and 5 % respectively. Oceanic whitetip (*Carcharhinus longimanus*) are also found enmeshed but on very rare occasions. In addition to these a number of other shark species which are also occasionally caught as bycatch.

Study of the seasonal pattern reveals that sharks are caught throughout the year as bycatch, however, peak seasons for shark catches are November through March with peak catches in February. Shortfin mako dominates the catch in January to March with dominating landings in February (Fig. 2). Pelagic thresher was found to be abundant in January whereas other species are more common in March.

In addition to sharks, some rays species are also caught regularly as bycatch of tuna gillnet operations. These include are spinetail mobula (*Mobula japonica*) and pelagic stingray (*Pteroplatytrygon violacea*). In addition to these, a number of other species of rays are also occasionally caught. Since rays are considered to be of low commercial values, therefore, these are usually dumped in the sea.

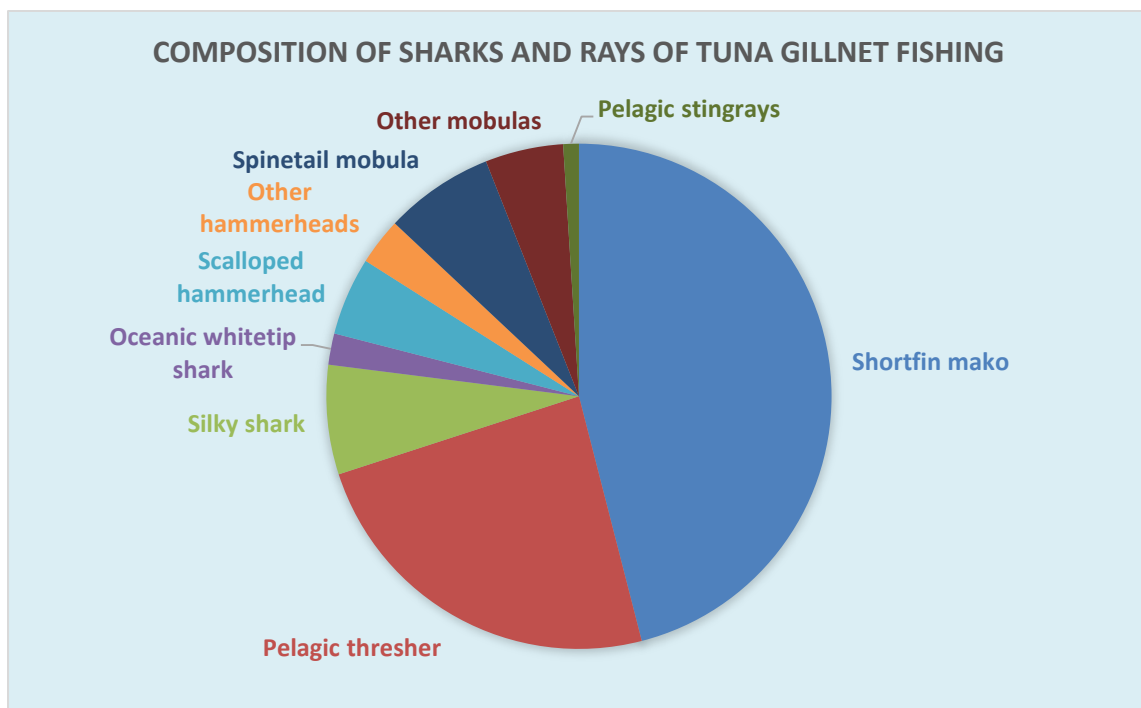


Fig. 2. Average composition of shark and rays caught in tuna gillnet operation in Pakistan (average data of 2013-15)

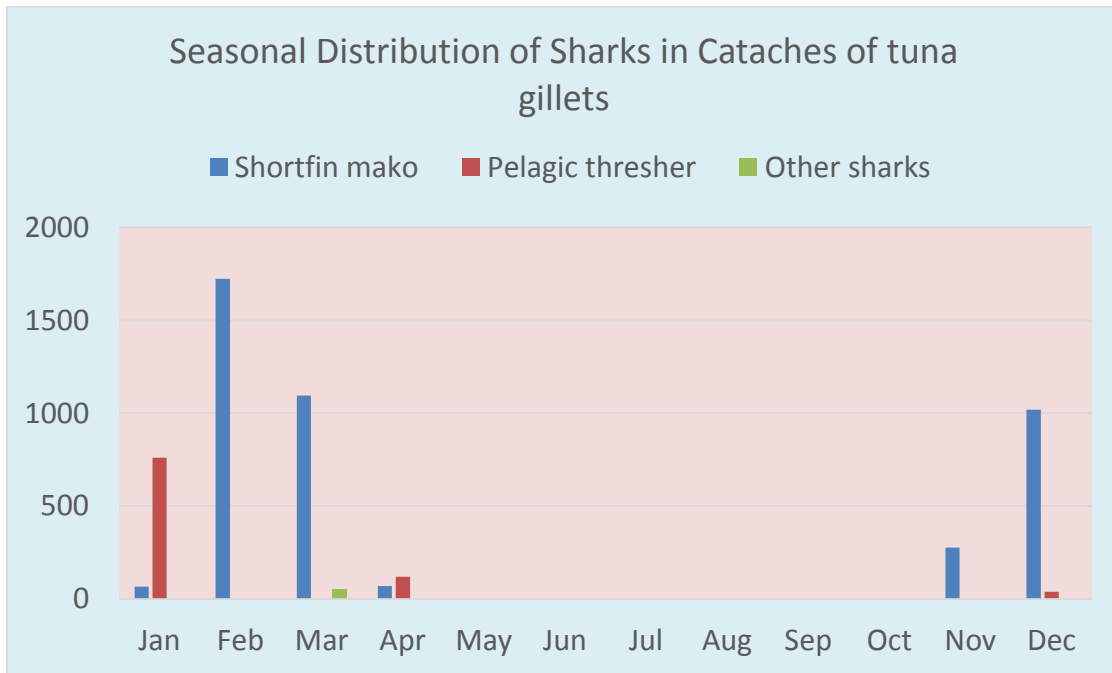


Fig. 2. Seasonal pattern of shark enmeshment in tuna gillnet operations in Pakistan (average data of 2013-15)

### Sea Turtles

A large of marine turtles also get entangled in the tuna gillnet operation (Fig. 3). It was estimated that about 28,000 marine turtles get enmeshed in the tuna gillnet operations in Pakistan (Moazzam and Nawaz, 2015). Insignificant mortality of marine turtles was noticed during the observer programme. A marked seasonality in the turtle enmeshment with a major peak during September to December (maxima in November) and a smaller peak during February to April (peak in April) was observed (Fig. 3).

Among turtles, Olive Ridley turtle (*Lepidochelys olivacea*) seems to be most abundant among the enmeshed species whereas green turtle (*Chelonia mydas*) is also found to be often entangled in tuna gillnets (Fig. 3). On a few occasions hawksbill turtle (*Eretmochelys imbricata*), loggerhead (*Caretta caretta*) and leatherback (*Dermochelys coriacea*) were also observed to be entangled.

Analysis of the data of turtle enmeshment revealed that turtle this phenomenon is not restricted to any particular area along the coastline or offshore waters but it is widely distributed in the area (Fig. 4). However, the enmeshment of turtle is more frequent in offshore waters as compared to inshore and neritic waters. It was also observed that in the offshore waters Olive Ridley turtles were of more common occurrence (85 %) than green turtles (Moazzam and Nawaz, 2015). Seasonal pattern of the two species follows

same pattern except that no green turtle enmeshment was noticed during the month of January (Fig. 5).

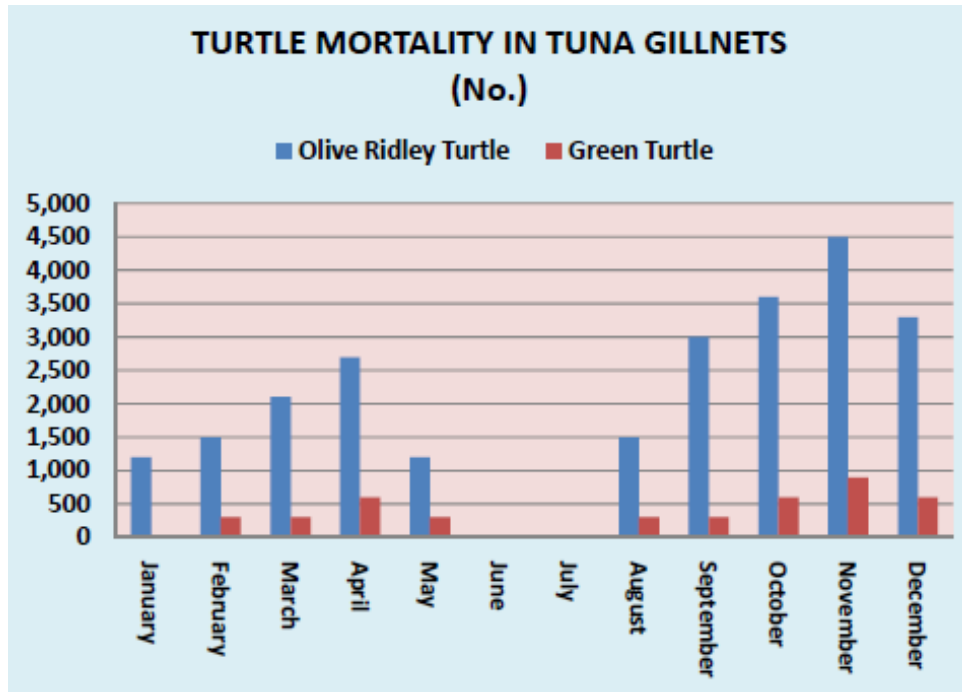


Fig. 3. Seasonal pattern of marine turtle enmeshment in tuna gillnet operations (average data of 2013-15).

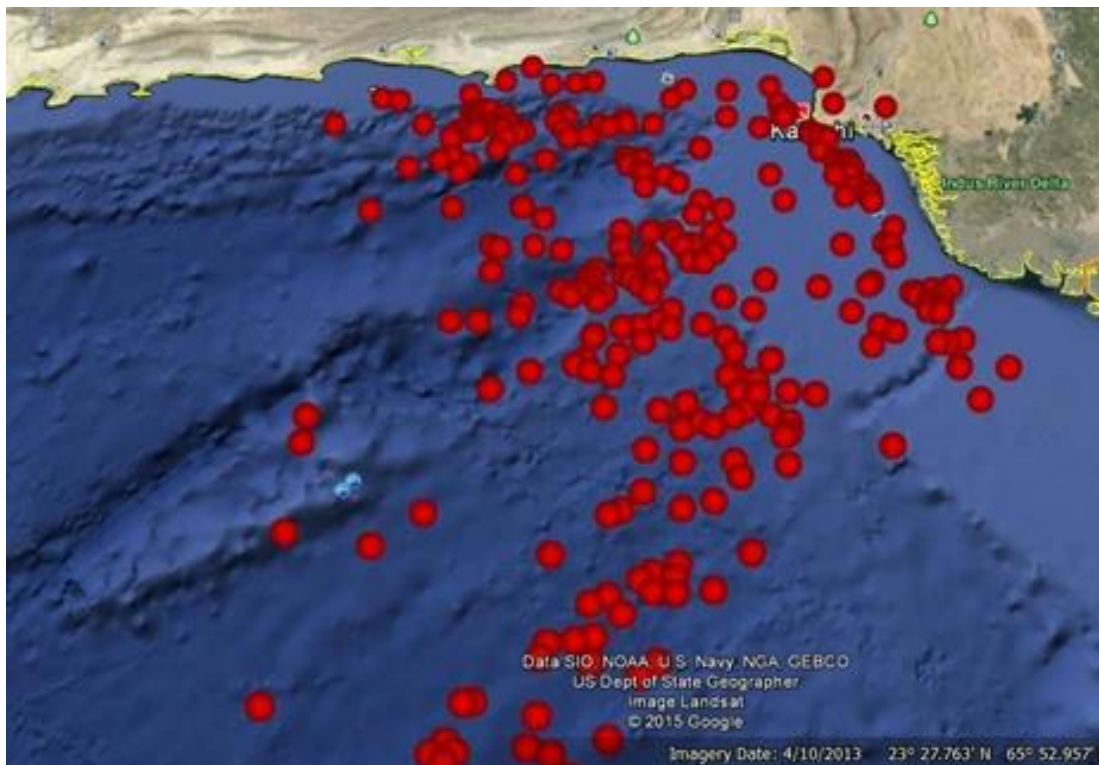


Fig. 4 Google map of Pakistan's EEZ showing major areas where turtle enmeshment was recorded..

### Cetaceans

During the reporting period 208 dolphins and whales have been reported to be caught in bycatch in four gillnet vessels, whereas 10,150 dolphins have been reported to be killed in tuna gillnet operations during 2014 and 17,200 during 2015 along the coast of Pakistan (Nawaz and Moazzam, 2014). During the project period, it was observed that all enmeshed dolphin are killed immediately because they cannot come to surface to breathe.

It was estimated that about 12,000 dolphins are killed in the tuna gillnet operation in Pakistan (Nawaz and Moazzam, 2014). Mortality of dolphin has marked seasonality with a major peak during September and November (maxima in November) and a smaller peak during March and April (Fig.5). It is worth mentioning that almost all dolphin entangled in the gillnet die immediately. During a period of four years since the observer programme was started by WWF-Pakistan only on 3 occasions dolphin entangled in the gillnet was successfully released. Entanglement of whales are very rare and during the past four years only 6 species were whale were found to be entangled in tuna gillnet and only at one occasion an entangled Longman beaked whale (*Indopacetus pacificus*) was successfully released.

Indo-Pacific bottlenose dolphin (*Tursiops aduncus*), common bottlenose dolphin (*Tursiops truncatus*), pan-tropical spotted dolphin (*Stenella attenuata*) and spinner dolphin (*Stenella longirostris*) were observed to be more common as compare to other species of dolphins entangled in tuna gillnet operations

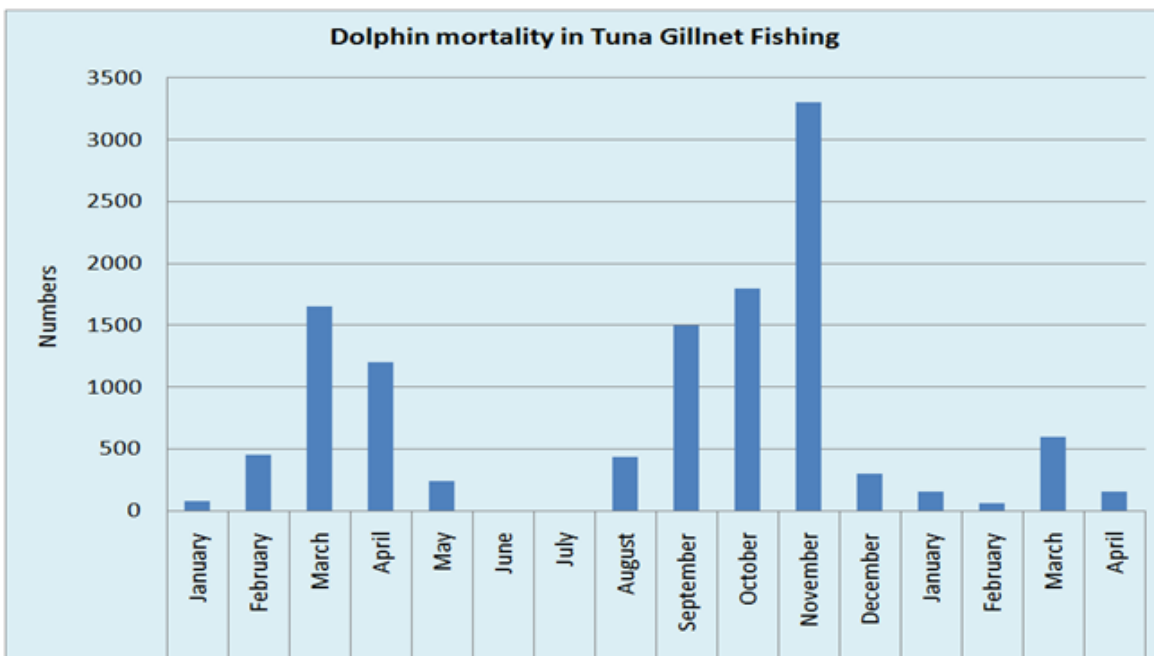


Fig. 5. Seasonal pattern of cetacean enmeshment and mortality in tuna gillnet operations (average data of 2013-15).

## **Discussion**

The tuna gillnet fisheries is one of the important fisheries of Pakistan, however, it is marred with high bycatch and comprises of catches including endangered, threatened and protected species (Fig. 6). High catches of protected species including cetaceans, sharks and marine turtles poses serious threats to sustainability of the oceans. Management measures such as fleet reduction, gear change, use of deterrents (LED light, pingers) putting a cap on soak times, ensuring compliance to international and national regulations are being considered in Pakistan.

Previously such management actions could not be taken as there were no legislative cover for protection of important species was available. In May 18, 2016, Government of Sindh (one of two maritime provinces) and now on September 8, 2016, Government of Balochistan has enacted law for protection of species of cetaceans, marine turtles, whale sharks, silky shark, oceanic whitetip shark, thresher sharks, and hammerhead sharks. Similarly, mobulids rays, guitarfishes and sawfishes, which are at the verge of extinction in Pakistan, have also been covered under this legislation.

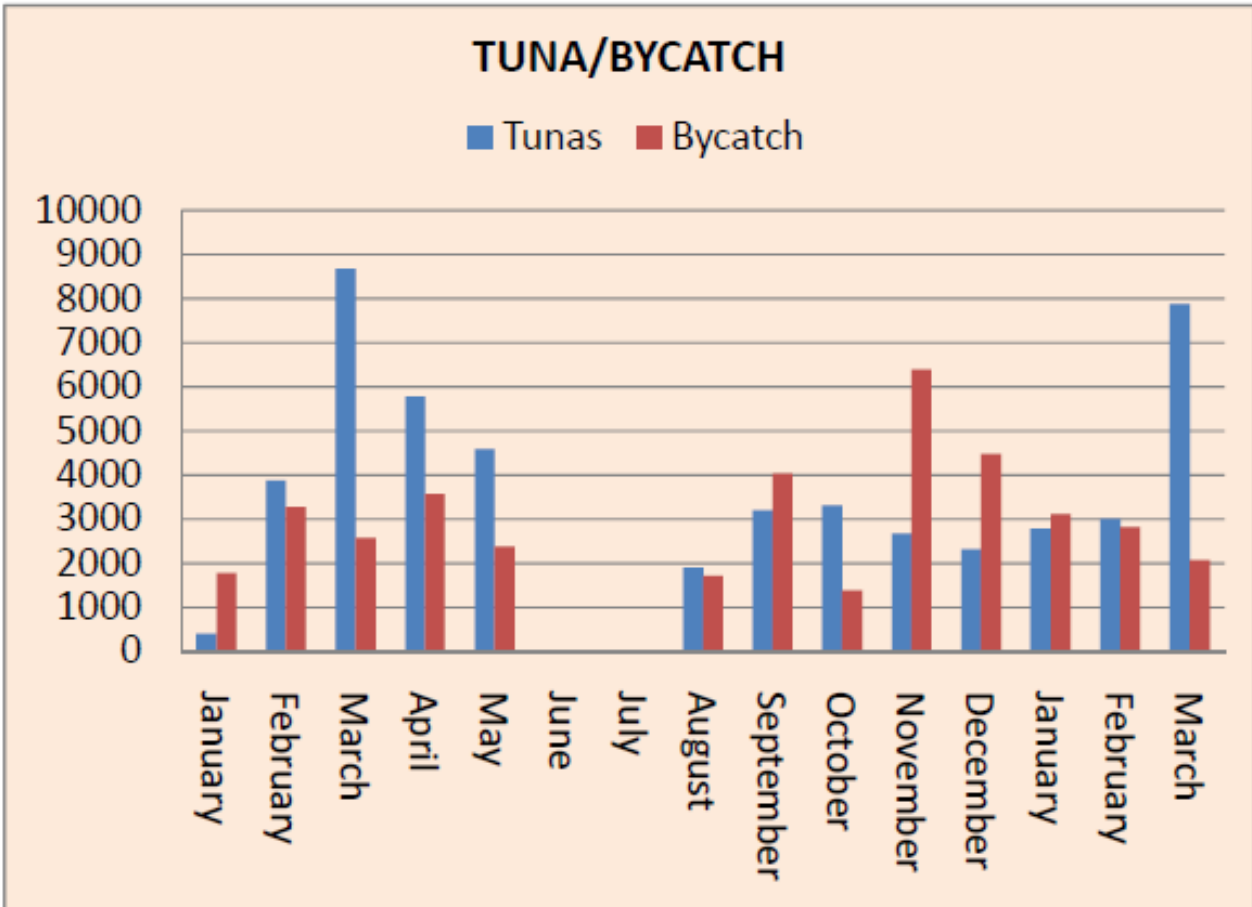


Fig. 6 Seasonal change in tuna catches and bycatch (including commercially important species, marine turtles, sharks and cetaceans)

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