

## BYCATCH OF COMMERCIALY IMPORTANT SPECIES OF THE TUNA GILLNET FISHERIES OF PAKISTAN

Muhammad Moazzam<sup>1</sup>, Muhammad Wasim Khan<sup>2</sup> and Rab Nawaz<sup>1</sup>

<sup>1</sup>WWF-Pakistan, 46-K, PECHS, Block-6, Karachi 75400, Pakistan

<sup>2</sup>Marine Fisheries Department, Government of Pakistan, Fish Harbour, West Wharf, Karachi 75400, Pakistan

### ABSTRACT

Gillnet operations in the offshore waters of Pakistan including Exclusive Economic Zone (EEZ) and the Area Beyond National Jurisdiction (ABNJ) contribute substantially to landings of tuna as well as a variety of non-target species. In addition to ecologically important species such as cetaceans (whales and dolphins), turtles and elasmobranchs (sharks, mobulid rays and whale sharks), a number of commercially important finfish species are also caught. Among these bycatch species billfishes, Spanish mackerels, queenfishes and dolphinfishes are dominating. Among billfishes, Indo-Pacific sailfish (*Istiophorus platypterus*) and black Marlin (*Makaira indica*) are dominating in the bycatch almost throughout the year especially during winter months. Common dolphinfish (*Coryphaena hippurus*) is another species which is caught throughout the year and contributing substantially to total landings of pelagic fisheries of Pakistan. Unprecedented increase in the bycatches of unicorn leatherjacket filefish (*Alutrea monoceros*), rough triggerfish (*Canthidermis maculata*) and largescale triggerfish (*Canthidermis macrolepis*) is of great interest, as these species were not reported in landings of tuna gillnetters during last decades.

### INTRODUCTION

Fishery is an important economic activity along the coast of Pakistan. It is estimated that there are about 1.0 million people engaged directly or indirectly with this industry. The fishing operations involve gillnetting, trawling, seining and longlining in shallow coastal waters, creek systems of the River Indus, lagoons, bays, inshore waters over continental shelf, Exclusive Economic Zone and in the Area Beyond National Jurisdiction (ABNJ). Tuna is caught in Pakistan predominantly with gillnets mainly in the offshore areas of Pakistan 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).

Large pelagic species including tuna, billfishes, dolphinfish, narrow-barred Spanish mackerels and barracuda are dominating in the catches of the tuna gillnetters. The present paper deals with the bycatch of tuna gillnet operation in the offshore waters. This paper, however, does not cover catches of cetaceans, turtles and sharks (including whale sharks and mobulids) which is available at Nawaz and Moazzam (2014), Moazzam and Nawaz (2015), Moazzam *et al.* (2016) respectively.

## MATERIALS AND METHODS

Data collected through WWF-Pakistan's Observer programme (Moazzam *et al.*, 2016a) and annual fisheries statistics of Government of Pakistan were used in quantifying the composition of bycatch species of tuna gillnet fisheries.

## RESULTS

It is estimated that about 79,000 m. tons of large pelagic are caught in Pakistan annually (2015 data) as calculated on the basis of data collected through WWF-Pakistan's Observer Programme. Of this, 46,000 m. tons is contributed by tuna whereas remaining (33,000 m. tons) is contributed by bycatch species. According to Government of Pakistan's statistics, landings of large species during 2015 is 46,639 m. tons. Of this 22,892 m. tons is contributed by tuna species whereas remaining 23,747 m. tons is contributed by bycatch species. Tuna landings is followed by narrow barred Spanish mackerel (kingfish) annually contributing about 12,300 m. tons (18 %) whereas billfishes contribute about 11 % in total large pelagic landings. It is noticeable that the percentage contributing by each group of large group varies during past 16 years but tuna is always found to be dominating followed by narrow barred Spanish mackerel. (Fig. 1).

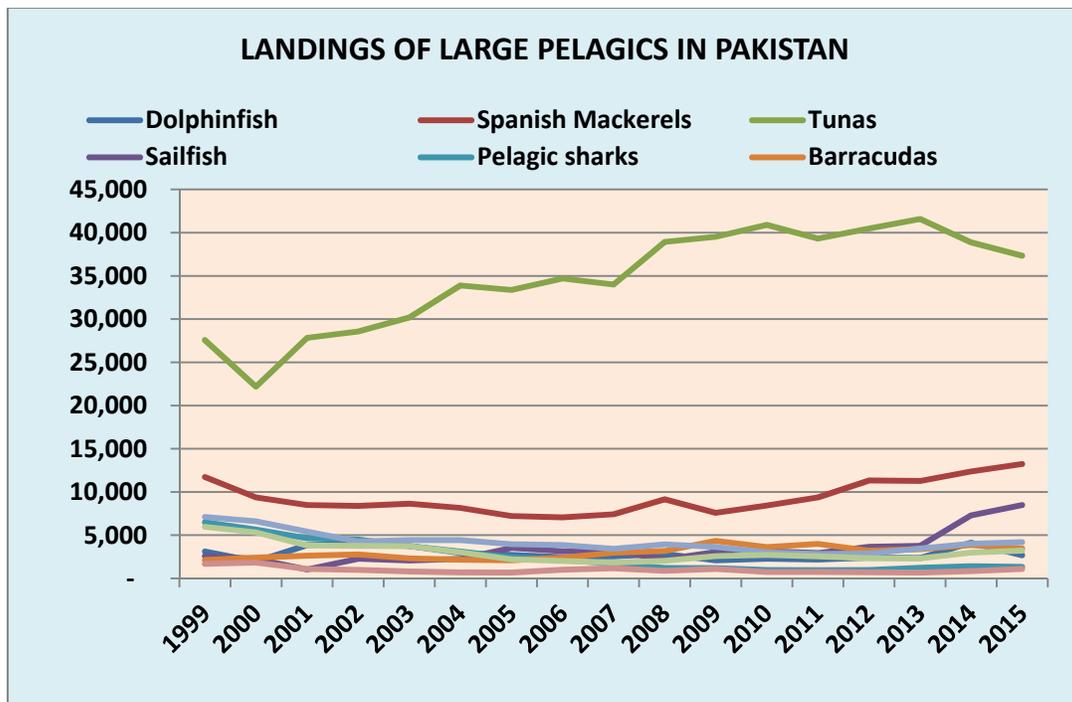


Fig. 1. Variation in landings of major groups of large pelagic based on Government of Pakistan's Statistics

In addition to tuna, a number of other commercially important species are caught in gillnets. These included billfishes, narrow-barred Spanish mackerel, dolphinfish, queenfishes, barracuda and unicorn leatherjacket filefish.

## **BILLFISHES**

This group includes fishes belonging to families Istiophoridae and Xiphidae which are mainly found in the offshore waters. In Pakistan, there is no aimed fishery for billfishes and these are landed as components of the catch of tuna gillnet fisheries. According to Government of Pakistan's Statistics annual landings of billfish is 3,97 m. tons whereas according to the Observer Programme of WWF-Pakistan, annual landings of billfish is estimated to be 4,650 m. tons. Billfishes are not consumed locally, therefore, these are gilled, gutted and beheaded onboard for transport to canneries in Iran which is done through land routes or through transshipment at high seas or at Gwadar. Six species belonging to six genera and two families of billfishes are reported from Pakistan. Of these, one species i.e. *Xiphias gladius* belongs to family Xiphidae whereas all other species belonged to family Istiophoridae.

### **Swordfish (*Xiphias gladius*)**

Swordfish is the rarest of the billfish found in Pakistan (Fig.2). It is mainly found in August to October and April and May. This species is locally known as Somali Asp or Ghora because of their abundance along Somali coast and around Socotra Island (Yemen). Their landing in Pakistan is insignificant as it is seldom caught in commercial quantities.



Fig.2. Swordfish (*Xiphias gladius*)

It was observed that mainly juveniles reaching a length of about 1.2 m (inclusive of the prolonged beak) were caught during March to May whereas large specimens (reaching upto 3.2 m inclusive of the beak) are caught during August to October. *Xiphias* although has a cosmopolitan distribution in tropical, temperate and sometimes cold waters of all oceans but it is of very rare occurrence in the Northern Arabian Sea. Because of their rarity in commercial catches, there is no separate market for swordfish.

### **Indo-Pacific sailfish (*Istiophorus platypterus*)**

Indo-Pacific sailfish is one of the common species of billfish found in shelf and offshore waters of Pakistan (Fig. 3). This species is one of the commonest of the all the billfishes found in Pakistan. WWF-Pakistan revealed that it contributes to about 34 % of total landings of the billfishes. It was observed to have a distribution more close to coast as compared to other congeners.



Fig. 3. Indo-Pacific sailfish (*Istiophorus platypterus*)

Tuna gillnetters operating in offshore waters of Pakistan regularly catch Indo-Pacific sailfish. It has bimodal distribution with a peak in February and April with maxima in March (Fig. 4). Another peak was observed between September and December with a peak in December. This species is not reflected in the catches during Mid May to Mid August because of close season observed by tuna gillnet operators during this period.

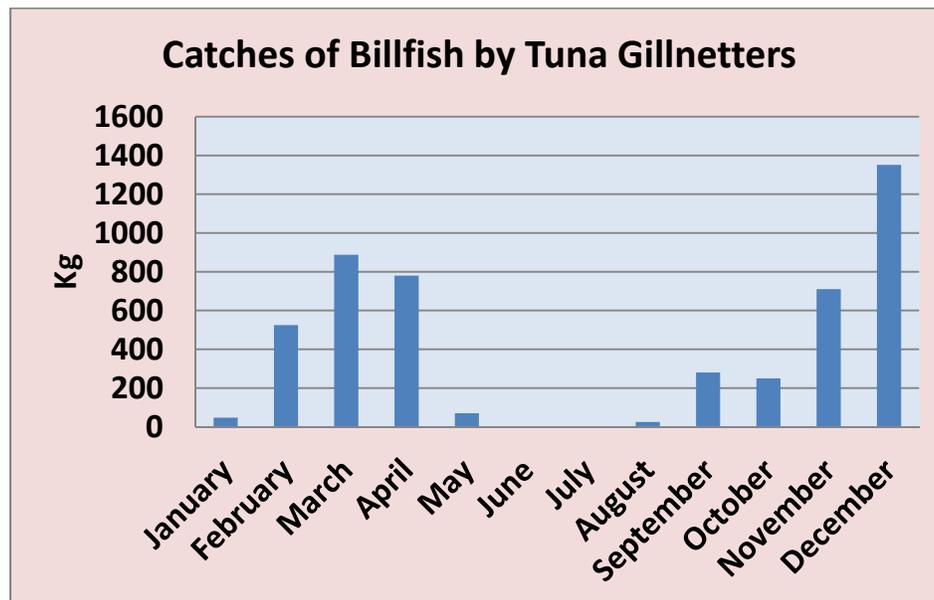


Fig. 4. Catches of Indo-Pacific sailfish (*Istiophorus platypterus*)

**Black Marlin (*Makaira indica*) (= *Istiompax indica*)**

Black marlin (Fig. 5) is caught throughout the year along both Sindh and Balochistan coast. It is another of the billfish which is found more abundant near the coast as compare to offshore areas. Typified by its rigid pectoral fins which cannot be folded back against sides of body, this species was observed to attain a total length of 4 m (with beak) and a weight of about 600 kg.

Separate statistics for this species is not recorded or represented in Government of Pakistan’s annual landings data. Data collected through WWF-Pakistan’s Observer Programme reveals that black marlin is estimated to contribute for about 30 % of the total billfish landings of Pakistan. It is found through throughout the year with peak season during August and December with maxima in October and a minor peak during January and March with peak in March (Fig. 6).



Fig.5. Black Marlin (*Makaira indica*)

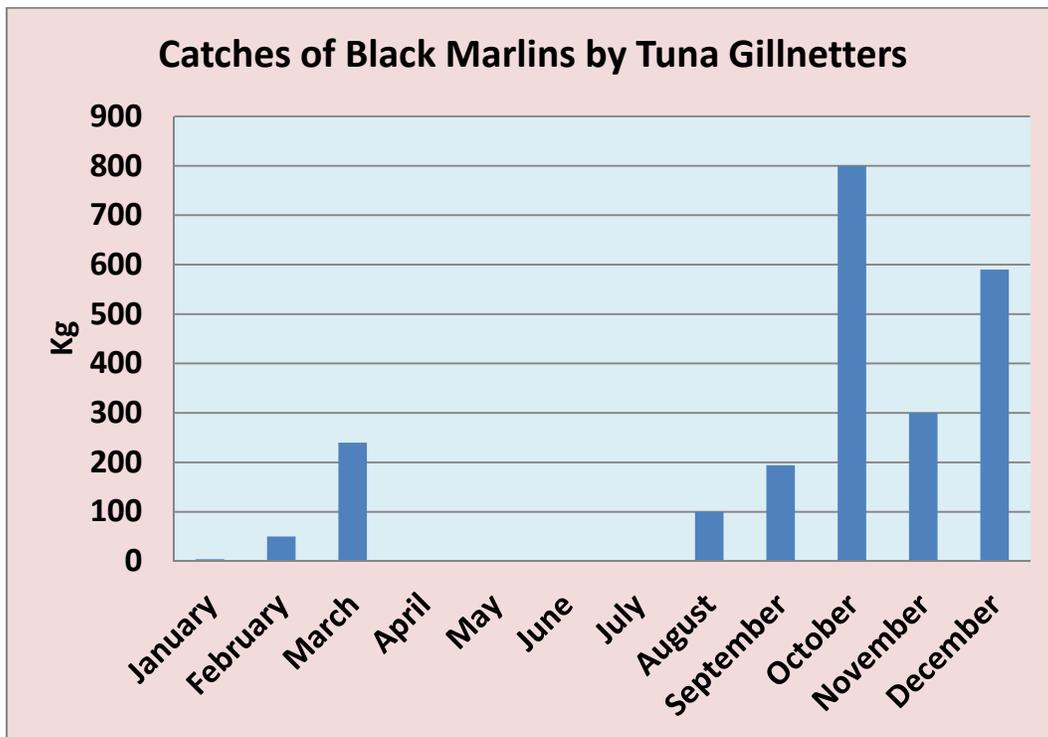


Fig. 6. Catches of Black Marlin (*Makaira indica*)

**Striped Marlin (*Kajikia audax*) (=Tetrapturus audax)**

Striped marlin is found have a distribution more oceanic and caught mainly during January and April when most of the pelagic gillnetters operates in comparatively deeper oceanic waters. It

was observed to grow to large size attaining a length of about 3.5 m and a weight upto 200 kg (Fig. 7). Separate statistics of this species is not recorded.



Fig. 7. Striped Marlin (*Kajikia audax*).

**Blue Marlin (*Makaira nigricans*) (= *Makaria mazara*)**

Indo-Pacific Blue marlin (Fig. 8) is also a oceanic species which is caught mainly during January and April. Previously mainly referred as *Makaira mazara* (Indo-Pacific blue marlin) is comparatively rare occurrence in Pakistan but still very large specimens of this species can be seen at landing centers. It can attain a length of 3.5 m with a weight of about 650 kg. Separate statistics of this species is not recorded.



Fig. 8. Blue Marlin (*Makaira nigricans*).

**Shortbill spearfish (*Tetrapturus angustirostris*)**

Shortbill spearfish (Fig. 9) is of rare occurrence along the coast of Pakistan. It is rarest of the commercial species found in Pakistan. Found mainly in oceanic waters it is seldom caught in coastal waters. Separate statistics of this species is not recorded.



Fig. 9. Shortbill spearfish (*Tetrapturus angustirostris*)

## **DOLPHINFISH**

Among the commercial bycatch dolphin fish are of immense importance. There are two species of dolphin fish i.e. common dolphinfish (*Coryphaena hippurus*) and pompano dolphinfish (*C. equiselis*). Of these, common dolphinfish (Fig. 10) is the most dominating one whereas pompano dolphinfish is seldom caught.

### **Common dolphinfish (*Coryphaena hippurus*)**

Total annual landings according to Government of Pakistan's Statistics is 2,674 m. tons whereas according to the WWF-Observer Programme catches of dolphinfish is estimated to be 3,844 m. tons. Dolphinfish are caught throughout the year with two distinct peak; the first one during January and May with maxima in March whereas it is more abundant during August and December with maxima in December (Fig. 11).



Fig. 10. Common dolphinfish (*Coryphaena hippurus*)

This species is not reflected in the catches during Mid May to Mid August because of close season observed by tuna gillnet operators during this period. Small quantities of this species are

regularly caught by handlines and troll. Tuna gillnetters frequently involved in handline and trolling during the daytime when gillnets are not laid. In addition, there is an aimed troll fisheries based in coastal towns of Gwadar, Pasni, Jiwani, Sur, Pushukan and Gunz. In this fishery, dolphinfish is of common occurrence. Dolphinfish is mainly salted dried and exported to Sri Lanka. Small quantities are also locally consumed in chilled form.

**FILEFISHES (MONOCANTHIDAE)**

Two species of family Monacanthidae are represented in the bycatch of tuna gillnetters including unicorn leatherjacket filefish (*Alutrea monoceros*) and scribbled leatherjacket filefish (*Aluterus scriptus*).

**Unicorn leatherjacket filefish (*Alutrea monoceros*)**

In the past few years, landings of unicorn leatherjacket filefish (*Alutera monoceros*) have shown unprecedented increase. Similar increase in the landings of this species was noticed in India (Gosh et al., 2011). Although this species is also caught in other fishing gears including fish trawling and bottom set longlining but bulk of the landings unicorn leatherjacket filefish (Fig. 12) is contributed by tuna gillnetters operating in offshore waters of Pakistan. Now this fish in whole and dressed form is exported.

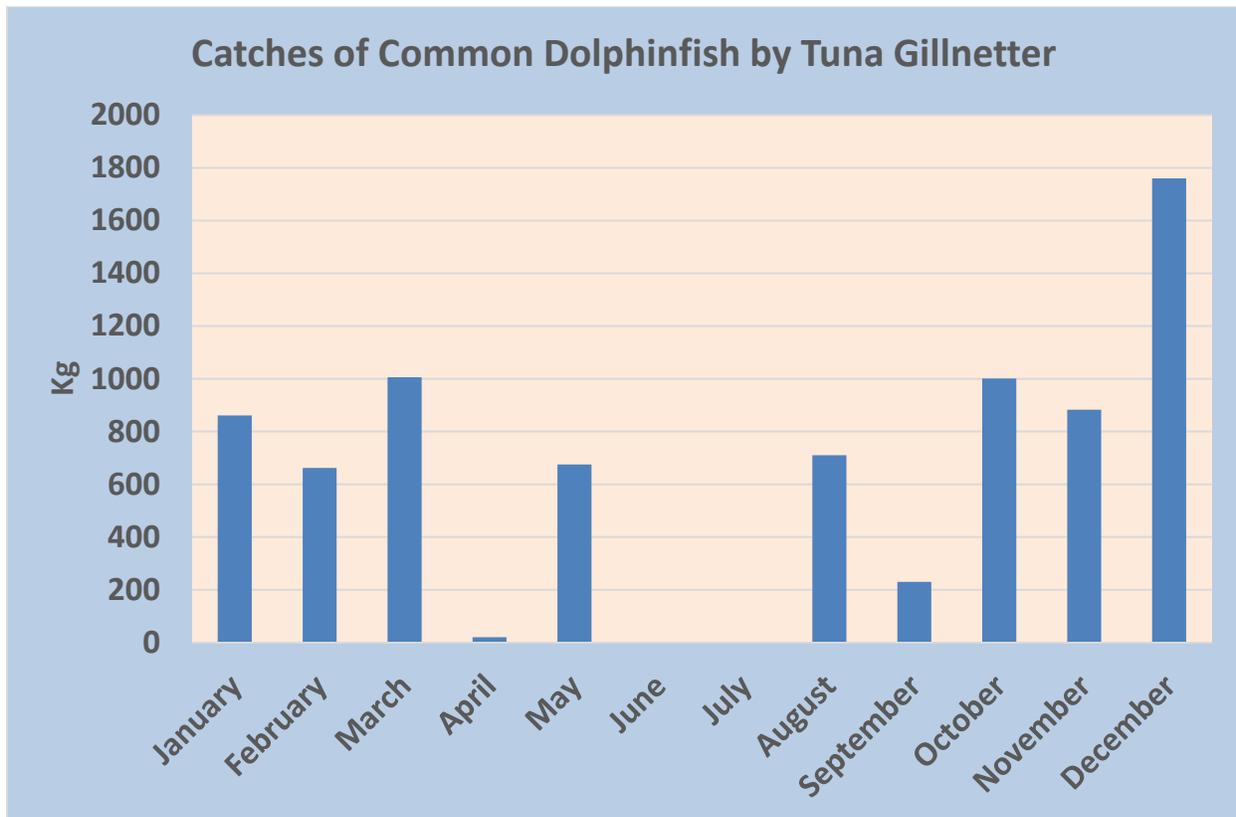


Fig. 11. Catches of Common dolphinfish (*Coryphaena hippurus*)



Fig. 12 Unicorn leatherjacket filefish (*Alutrea monoceros*)

*Alutrea monoceros* is found as an important bycatch throughout the year (Fig. 13). There is a dominating peak during September and December with maxima in October. This species is not reflected in the catches during Mid May to Mid August because of close season observed by tuna gillnet operators during this period.

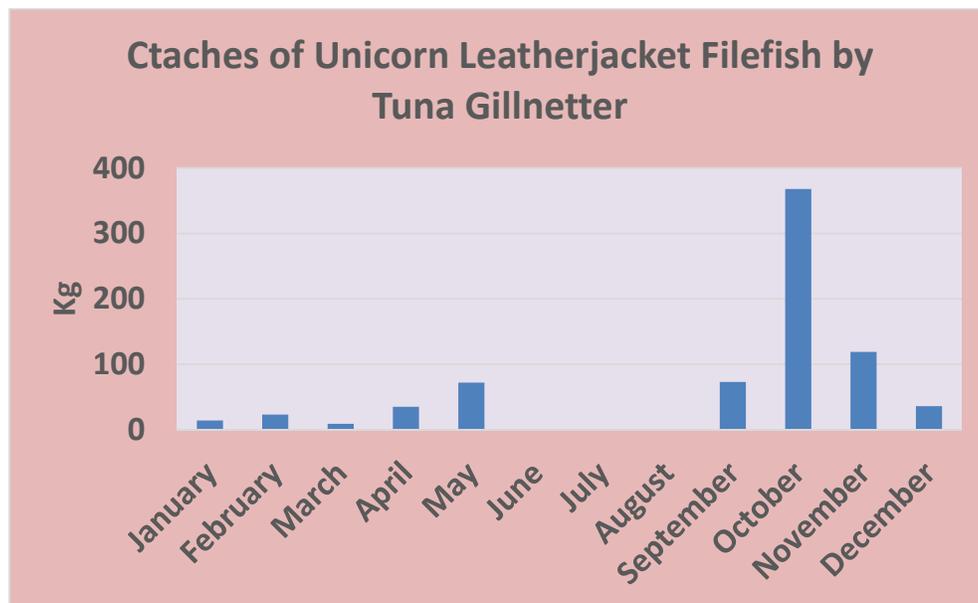


Fig. 13. Catches of Unicorn leatherjacket filefish (*Alutrea monoceros*)

## SPANISH MACKERELS

Two species of Spanish mackerels i.e. narrow-barred Spanish mackerel (*Scomberomorus commerson*) and Indo-Pacific king mackerel (*Scomberomorus guttatus*) are represented in the bycatch of tuna gillnetters in Pakistan. Of these, Indo-Pacific king mackerel is seldom caught whereas narrow-barred Spanish mackerel is found in appreciable quantities.



Fig. 14. Narrow-Barred Spanish Mackerel (*Scomberomorus commerson*)

### Narrow-Barred Spanish Mackerel (*Scomberomorus commerson*)

Narrow-barred Spanish mackerel (Fig. 14) is caught by a number of fishing gears including handline, longline as well as by gillnets being deployed in shallow coastal waters and bays. Although tuna gillnets being used in offshore waters do contribute in total landings, still major contribution in the landings is made by fishing methods being used in coastal waters. There is an aimed troll fisheries based in coastal towns of Gwadar, Pasni, Jiwani, Sur, Pushukan and Gunz. In this fishery, narrow-barred Spanish mackerel is the dominating species..

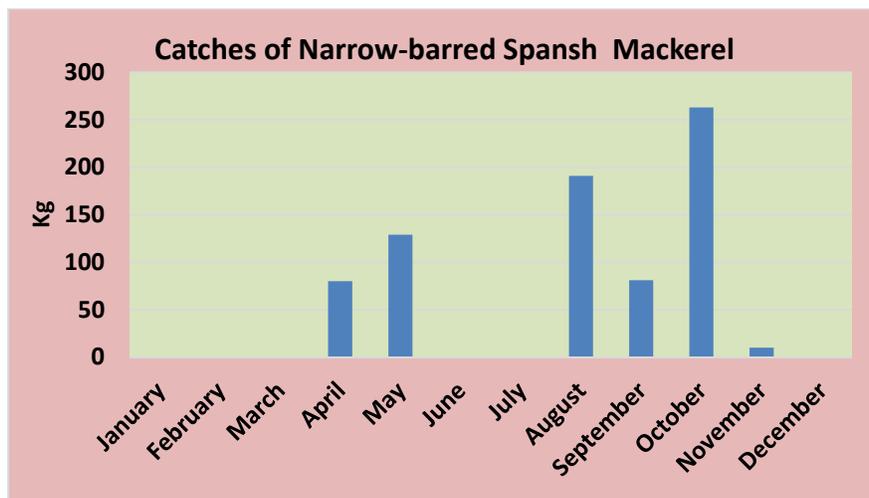


Fig. 15. Catches of Narrow-Barred Spanish Mackerel (*Scomberomorus commerson*)

In the offshore waters Narrow-barred Spanish mackerel is caught between April and December with a peak in October (Fig. 15). This species is not reflected in the catches of tuna gillnetters during Mid May to Mid August because of close season observed by tuna gillnet operators during this period

## QUEENFISHES

Queenfishes belonging to genus *Scomberoides* are represented in bycatch of tuna gillnetters by four species i.e. Talang queenfish (*S. commersonnianus*), doublespotted queenfish (*S. lysan*), barred queenfish (*S. tala*) and needlescaled queenfish (*S. tol*), however, with the exception of Talang queenfishes, other species of very rare occurrence.

### **Talang queenfish (*Scomberoides commersonnianus*)**

*Scomberoides commersonnianus* (Fig. 16) is also caught by a number of fishing gears including handline, as well as by gillnets being deployed in shallow coastal waters and bays. Although tuna gillnets being used in offshore waters do contribute in total landings, still major contribution in the landings is made by fishing methods being used in coastal waters. There is an aimed troll fisheries based in coastal towns of Gwadar, Pasni, Jiwani, Sur, Pushukan and Gunz. In this fishery, Talang queenfish is one of the species which is frequently caught but not among dominating species.. In the offshore waters *Scomberoides commersonnianus* is caught between throughout the year with a pronounced peak in October (Fig. 17). This species is not reflected in the catches of tuna gillnetters during Mid May to Mid August because of close season observed by tuna gillnet operators during this period.



Fig. 16. Talang queenfish (*Scomberoides commersonnianus*)

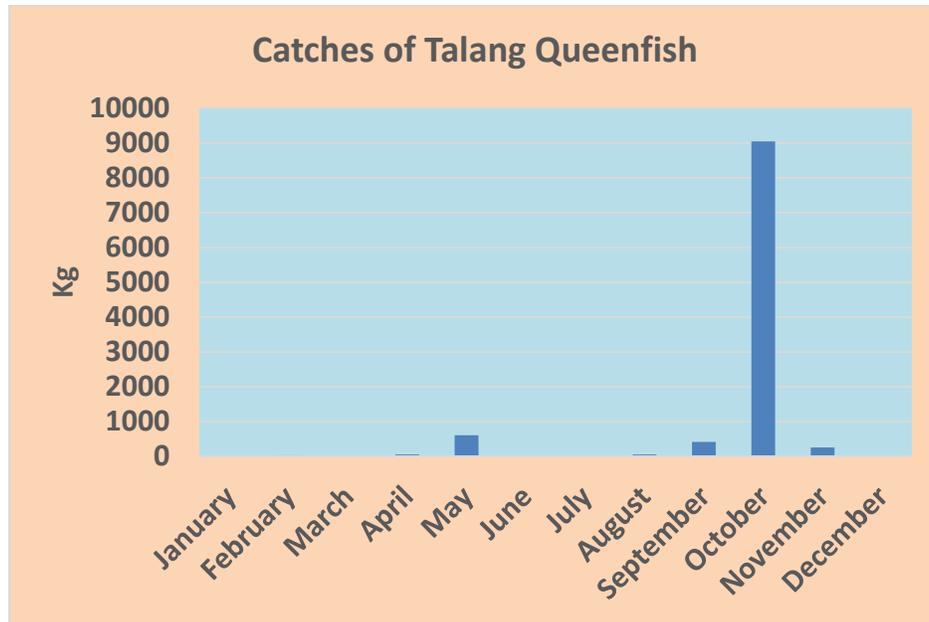


Fig. 17. Catches of Talang queenfish (*Scomberoides commersonianus*)

## OTHER SPECIES

A number of other species are also caught as bycatch of tuna gillnetting in offshore waters of Pakistan which includes rainbow runner (Fig. 18), tripletail (Fig. 19) and great barracuda (Fig. 20). However, there is neither any specific season for these species was noticeable nor these were found in large quantities.



Fig. 18. Rainbow runner (*Elagatis bipinnulata*)

Rough triggerfish (*Canthidermis maculata*) and largescale triggerfish (*Canthidermis macrolepis*) are also frequently encountered as bycatch of tuna gillnetting. An increase in numbers of includes rough triggerfish (Fig. 21) as well as largescale triggerfish (Fig. 22) is noticed. Although reasons for abrupt increase of these species are not known but it is believed to be on account of climate change and response of some fish species of changes in ecosystem dynamic because of increased fishing activities.



Fig. 19. Tripletail (*Lobotes surinamensis*)



Fig. 20. Great barracuda (*Sphyræna barracuda*)

Other species which are caught on tuna gillnet operations includes cobia (*Rachycentron canadum*), wahoo (*Acanthocybium solandri*), lesser bream (*Brama dussumieri*), Atlantic bream (*Brama brama*) and sickle pomfret (*Taractichthys steindachneri*) but their quantities are insignificant.



Fig. 21. Rough triggerfish(*Canthidermis maculate*)



Fig. 22. Largescale triggerfish (*Canthidermis macrolepis*)

## DISCUSSIONS

Tuna gillnet operations in the offshore waters of Pakistan including Exclusive Economic Zone (EEZ) and the Area Beyond National Jurisdiction (ABNJ) contribute substantially to the economy of Pakistan which includes 8 species of tuna as well as a large number of bycatch species. In addition to commercially important species, large number of ecologically important group of marine animals are caught which includes cetaceans (whales and dolphins), turtles, mobulid rays, sharks (including whale sharks), sunfishes, sea snakes and sea birds which are not covered under this paper.

Although, fishermen engaged in gillnetting target tuna species because these are readily marketed, still commercially important bycatch species especially during winter months (November through March) fetch very high prices in local markets. Some species such as narrow-barred Spanish mackerels, great barracuda, cobia, wahoo, queenfish and rainbow runners fetch high prices and demand in local market. *Alutrea monoceros* also fetches high prices because of their demand for export market.

There are anomalies in the data being provided by provincial fisheries departments which is collated by Marine Fisheries Department (Government of Pakistan) and published in form of an annual publication i.e. Handbook of Fisheries Statistics of Pakistan and those collected through Crew Based Observer Programme of WWF-Pakistan. A process of reconciliation of the two data has been started which hopefully resolve the disparity in the two data set. It is intended to provide IOTC with the reconcile data. In addition length frequency data being collected for tuna and bycatch species Crew Based Observer Programme of WWF-Pakistan is also being considered to be provided to IOTC.

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