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# Some Observations on the Distribution, Abundance and Biology of Indo-Pacific Sailfish (*Istiophorus platypterus*) Along the Coast of Pakistan

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## **ABSTRACT**

Billfish form important part of the landings of tuna and tuna like fishes from Pakistan. Its landings during 2018 were reported to be about 3,521 m. tons. Indo-Pacific sailfish (*Istiophorus platypterus*) contributed 2,154 m. tons. Contribution of Indo-Pacific sailfish in total billfish landings was 61.18 %, therefore, this species is considered to be most important billfish species. This species is harvested by tuna gillnets vessels from continental shelf and slope area during August and November whereas in winter it is mainly harvested from central Arabian Sea (in the EEZ of Pakistan and beyond). Indo-Pacific sailfish is one of the highly migratory and oceanodromous species which is regularly being fished in all countries of the Arabian Sea. High value of  $E_{max} = 0.575$  is indicative that there are symptoms of over-exploitation of the stocks of Indo-Pacific sailfish by Pakistani tuna fleets. Because of high demand *Istiophorus platypterus* is sent to neighbouring country where it fetches comparatively higher prices.

## **INTRODUCTION**

Pelagic gillnetting is an important component of the coastal and offshore fisheries of Pakistan, as about 700 fishing vessels are engaged in harvesting of tuna and tuna like fishes. Historically pelagic gillnetting is one of the oldest fisheries of the area. Gillnets consisting of multifilament nylon nets are used for catching tunas and other pelagic species which include billfishes. Information about tuna gillnet fisheries of Pakistan is known through the work of Moazzam (2011, 2012, 2014, 2018), Moazzam and Ayub (2015), Moazzam and Nawaz (2014), Moazzam, *et al.* (2016), and Nawaz and Moazzam (2014).

Six species of billfishes belonging to six genera and two families are reported from Pakistan. Of these, one species i.e. swordfish (*Xiphias gladius*) belongs to family Xiphiidae whereas all other species belonged to family Istiophoridae. These species form an important part of the landings of tuna gillnet vessels operating in coastal and offshore waters.

Billfish form important part of the landings of tuna and tuna like fishes from Pakistan. Its landings during 2018 were reported to be about 3,521 m. tons. Indo-Pacific sailfish (*Istiophorus platypterus*) contributed about 2,154 m. tons, black marlin (*Istiompax indica*) 943 m. tons, striped marlin (*Kajikia audax*) 328 m. tons whereas Indo-Pacific blue marlin (*Makaira mazara*) contributed only 96 m. tons. Contribution of shortbill

spearfish (*Tetrapturus angustirostris*) and swordfish (*Xiphias gladius*) was insignificant. Contribution of Indo-Pacific sailfish (*Istiophorus platypterus*) in total billfish landings, therefore, was 61.18 %, therefore, this species is considered to be most important billfish species.

Limited information about the billfish landings of Pakistan is available. Some scanty information is available through the work of Moazzam (2011), Moazzam and Usmani ((2004), Osmany *et al.*, (2009) and Rashid (1966). Moazzam (2013), however, provided some details of billfish fisheries of Pakistan including species composition, gears, fishing boats, area of fishing and other aspects of the fisheries. However, no study have dealt with different species of billfishes including Indo-Pacific sailfish (*Istiophorus platypterus*).

Present paper provides information about some aspects of population biology of Indo-Pacific sailfish (*Istiophorus platypterus*) including distribution, abundance and some of its population parameters.

## **MATERIALS AND METHODS**

The information presented in the present study is based on the interaction with fishermen that are engaged in gillnet fishing for tuna and tuna like species in coastal and offshore waters of Pakistan. WWF-Pakistan crew based programme is the major source of the data presented in this paper (Moazzam, 2019). Data collected from Crew Based Observer Programme from 75 observers during 2018 is used for analysis of population parameters. Fork length of a total 1,855 *Istiophorus platypterus* were measured for the present study. The data was put month-wise into the FiSAT II ant an interval of 40 cm. The analysis was done in FiSAT II (FAO-ICLARM Stock Assessment Tool) software.

## **RESULTS AND DISCUSSIONS**

Indo-Pacific sailfish (*Istiophorus platypterus*) is one of the dominating bycatch of the tuna gillnet fishing vessels operating along Pakistan coast (Fig. 1-2). It is a slender, elongated and fairly compressed fish having a characteristic a high, sail-like first dorsal fin. Being an oceanic and epipelagic species, Indo-Pacific sailfish is widely distributed in Indian, Pacific and Atlantic Oceans. Along the coast of Pakistan, this species is mainly found to be inhabiting offshore waters along the continental margin (Fig. 3). It is dominating species of the billfish found along the coast of Pakistan.

Landings of billfish during 2018 were reported to be 3,521 m. tons; of which Indo-Pacific sailfish (*Istiophorus platypterus*) contributed 2,154 m. tons (61.18 % of total billfish landings). Other dominating species of billfishes are black marlin (*Istiompax indica*) 943 m. tons, striped marlin (*Kajikia audax*) 328 m. tons whereas Indo-Pacific blue marlin (*Makaira mazara*) contributed only 96 m. tons (Khan and Moazzam, 2019). Data for landings of Indo-Pacific sailfish is not separately recorded, therefore, information about any change in its landings pattern along Pakistan coast is not known.



Fig. 1 Indo-Pacific sailfish (*Istiophorus platypterus*)



Fig. 2, Indo-Pacific sailfish (*Istiophorus platypterus*)-A dominating bycatch of tuna gillnetters.

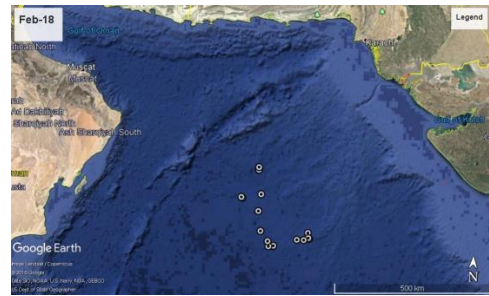
### Distribution

Fig. 3 presents seasonal distribution along the Pakistan coast (Arabian Sea). Indo-Pacific sailfish is found throughout the year. Gillnetting for large pelagics in Indo-Pacific sailfish is continued throughout the year except during May to July (in some years extended to August) because of voluntary close season observed by tuna gillnetters in Pakistan.

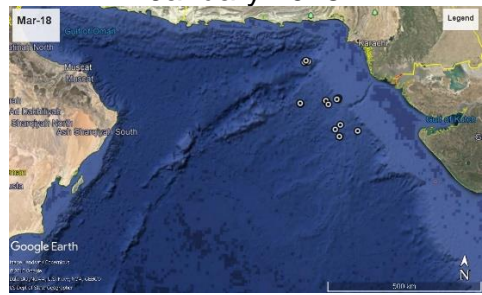




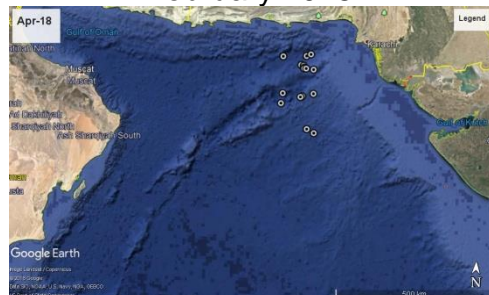
January 2018



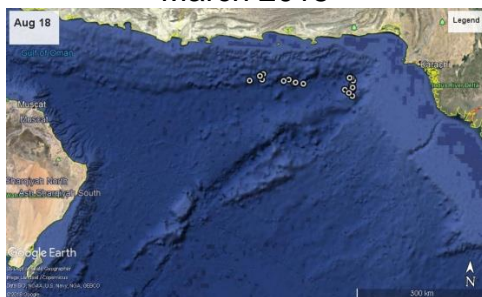
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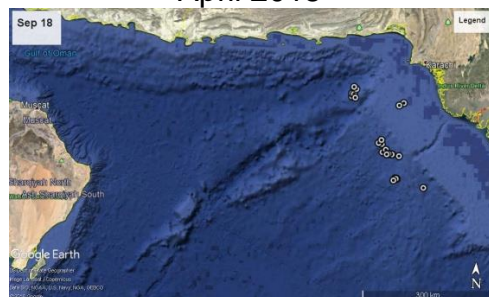
March 2018



April 2018



August 2018



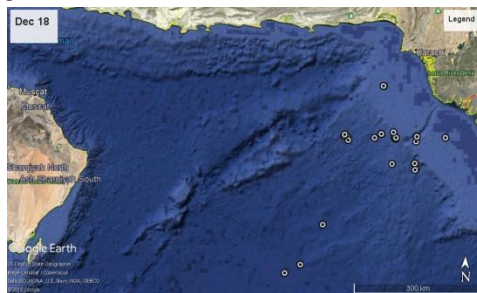
September 2018



October 2018



November 2019



December 2018

Fig. 3. Fishing grounds of Indo-Pacific sailfish (*Istiophorus platypterus*) during 2018.

In Pakistan new fishing season for pelagic gillnetting starts from August when fishermen mainly prefer to fish along continental margin of Balochistan coast. *Istiophorus platypterus* catches were observed to be restricted to continental slope of Balochistan and in the Murray Ridge area. For next three months (September to November) the Indo-Pacific sailfish is caught predominantly on the continental shelf and slope along Sindh coast. In winters (December through February), Indo-Pacific sailfish is caught in offshore and central Arabian Sea.

With the start of spring season (March and April), the Indo-Pacific sailfish is caught along continental slope and offshore water within EEZ of Pakistan. Distribution pattern of the catches of Indo-Pacific sailfish indicates that this species is found mainly along continental margin and offshore waters of Pakistan. However, it does not mean that the distribution of this species is restricted to these fishing grounds only. The distribution pattern is reflective of the fishing intensity rather the distribution of the fish species.

### Population Parameters

Information about biological aspects of Indo-Pacific sailfish (*Istiophorus platypterus*) during January 2018 to December 2018 which indicates that among the 1,855 specimens of Indo-Pacific sailfish collected during sampling period, the sizes (fork length) ranges between 101 and 301 cm, however, class intervals with midpoint at 181 cm seems to be dominating (Fig. 4). The largest specimen has the length of 301 cm and smallest 101 cm.

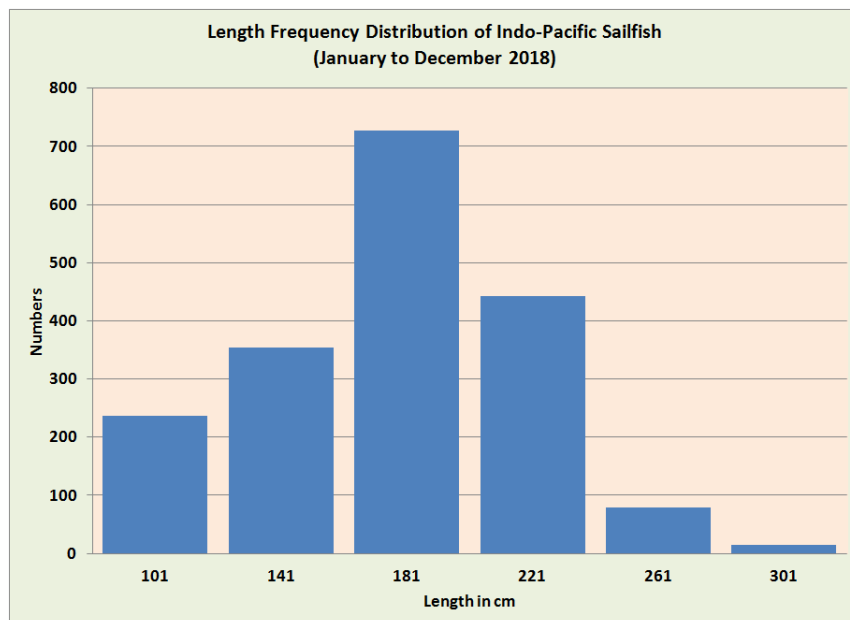


Fig. 4. Length Frequency Distribution of Indo-Pacific sailfish (*Istiophorus platypterus*) during 2018

The Von Bertalanffy growth parameters obtained for Indo-Pacific sailfish were  $L_{\infty}=431.55$  cm,  $K = 0.86$  year<sup>-1</sup> (Fig.5). The length-converted catch curve is shown in Fig. 6. The estimated instantaneous rate of mortality ( $Z$ ) for Indo-Pacific sailfish was 4.35 year<sup>-1</sup>(with 95% confidence interval of slope 2.75-5.95). Natural mortality and fishing mortality were estimated 0.72 year<sup>-1</sup> and 3.63 year<sup>-1</sup> respectively and exploitation rate was 0.83. The darkened full dots represent the points used in calculating through least square linear regression and the open dots represent the point either not fully recruited or close to  $L_{\infty}$ . The probability of capture curve (Fig.7) showed that the fork length of *Istiophorus platypterus* to be attained in 237.40 cm where the probability was 50%.

The recruitment pattern of Indo-Pacific sailfish population along Pakistan coast based on length frequency data collected for 2018 seems to significantly high during the breeding season as it indicates the strong seasonal recruitment (Fig. 8). Prolong recruitment was noticed during March to July with peak in May. There is a small peak during September to November.

Length-structured virtual population analysis of *Istiophorus platypterus* based on data collected during 2018 is presented in Fig. 9 which indicates that the maximum number of Indo-Pacific sailfish is caught between 161 cm and 261 cm and the size class that faced maximum fishing mortality was 261 cm. From VPA it is evident that the survival rate was highest in 61 cm size group. This indicates that capture of small specimens and juveniles were comparatively less during the study period, As such the Indo-Pacific sailfish is not under immediate threat due to overfishing. However, to ascertain this, there is a need to study the data from other gears being used in Pakistan.

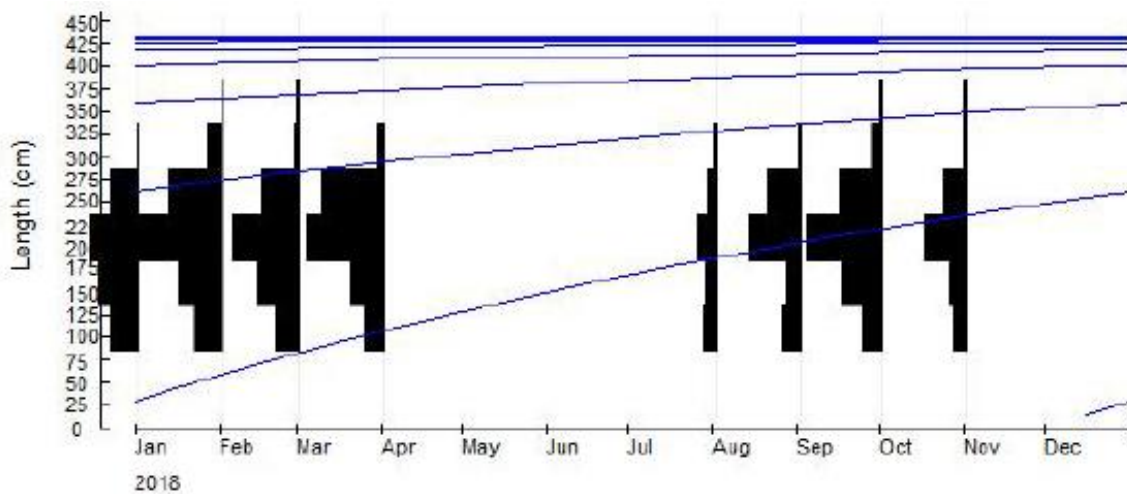


Fig. 5. von Bertalanffy growth curves of Indo-Pacific sailfish (*Istiophorus platypterus*) from Pakistan coast (Northern Arabian Sea).

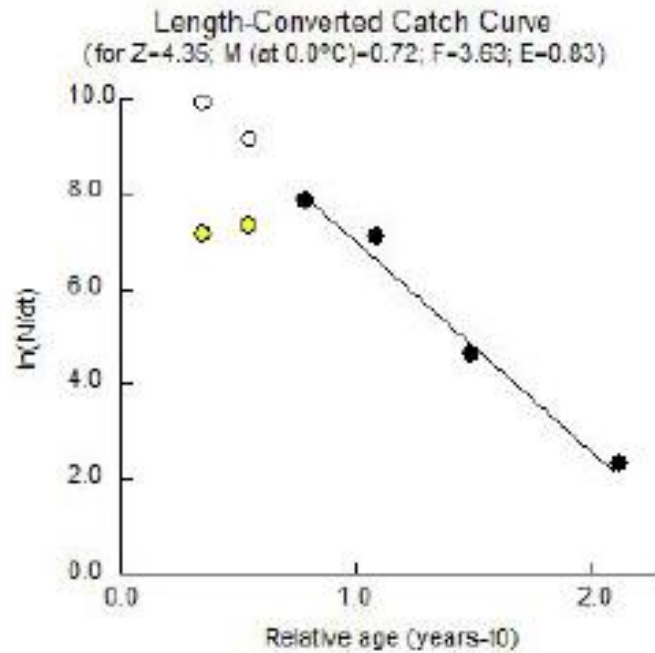


Fig. 6. Length-converted catch curve of Indo-Pacific sailfish (*Istiophorus platypterus*) from Pakistan coast (Northern Arabian Sea).

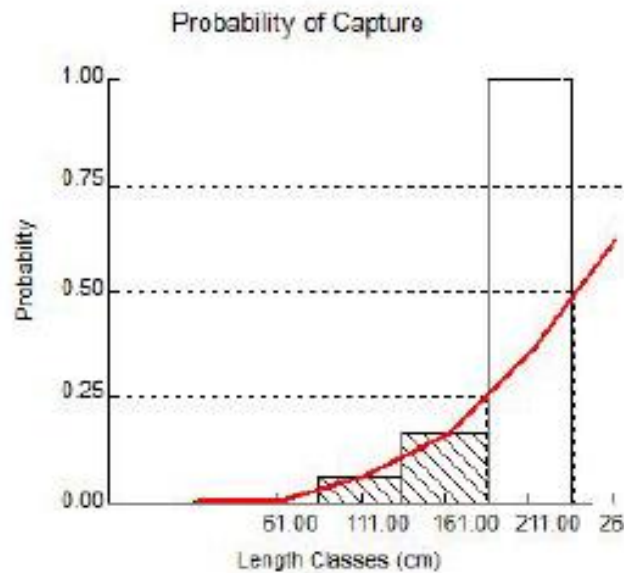


Fig. 7. Capture probability of each length class of Indo-Pacific sailfish (*Istiophorus platypterus*) from Pakistan coast (Northern Arabian Sea). (L25% = 185.53 cm, L50% or Lc = 237.48 cm and L75% = 289.40 cm)



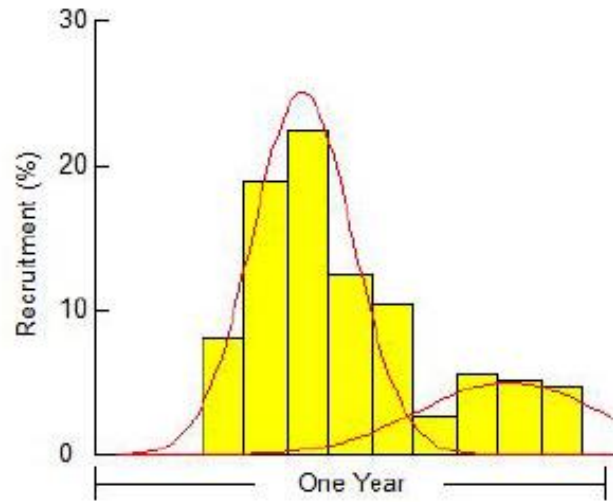


Fig. 8. Recruitment pattern of Indo-Pacific sailfish (*Istiophorus platypterus*) from Pakistan coast (Northern Arabian Sea).

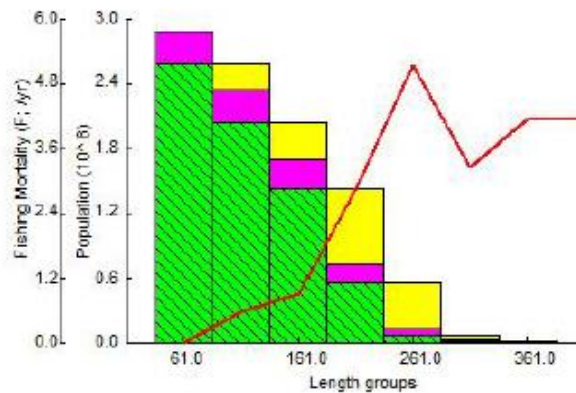


Fig. 9. Length-structured VPA of Indo-Pacific sailfish (*Istiophorus platypterus*) from Pakistan coast (Northern Arabian Sea) based on data collected during December 2016 to December 2018 (F. Mortality = fishing mortality)

Under the present fishing scenario, the relative yield per recruit (Y/R) increases steadily till the exploitation rate reach 0.58 and thereafter decline with increasing exploitation (Fig. 10). The relative Y/R and B/R of Indo-Pacific sailfish (*Istiophorus platypterus*) from Pakistan coast (Northern Arabian Sea) were determined as a function of  $L_c/L_\infty$  and  $M/K$ . The  $L_c/L_\infty$  value was observed to be 0.389 and  $M/K$  value was 1.00 (Fig. 10). The selection ogive routine was used in the analysis of relative yield per recruit and biomass per recruit analysis (Fig. 11) and produced values of  $E_{10} = 0.503$ ,  $E_{50} = 0.339$ ,  $E_{max} = 0.575$ .



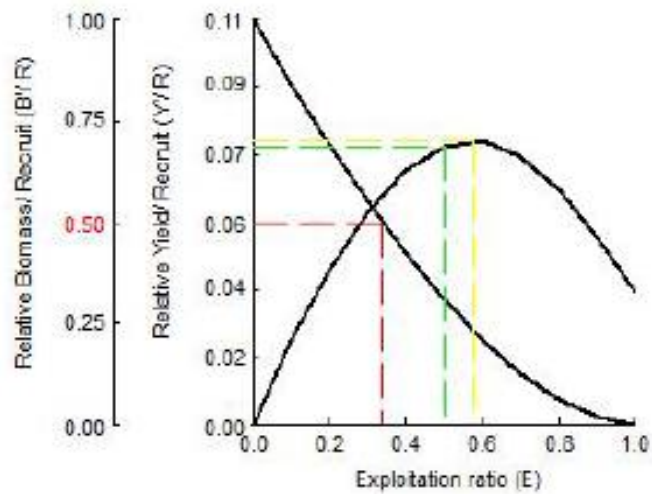


Fig. 10. Relative Y/R and B/R of Indo-Pacific sailfish (*Istiophorus platypterus*) from Pakistan coast (Northern Arabian Sea) using a knife-edge procedure using the selection ogive option ( $E_{10} = 0.503$ ,  $E_{50} = 0.339$ ,  $E_{max} = 0.575$ ).

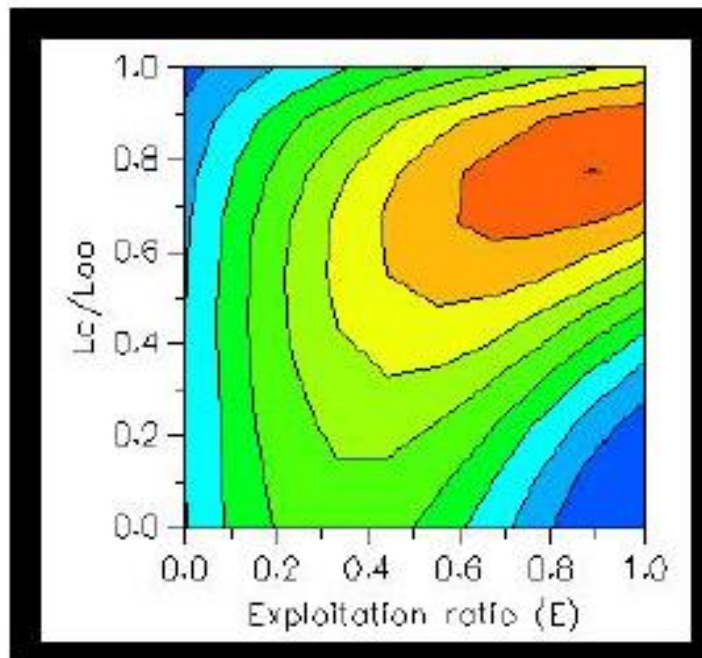


Fig. 11: Isopleths, showing optimum fishing activity both in terms of fishing effort and size of first capture (depicted with a star in the central curve) of Indo-Pacific sailfish (*Istiophorus platypterus*) from Pakistan coast (Northern Arabian Sea).

## Marketing

Indo-Pacific sailfish (*Istiophorus platypterus*) harvested by tuna gillnetters in Pakistan is degutted and beheaded on board. It is either landed at Karachi or Gwader Fish harbours and transported in chill form to neighbouring country either by land route or through carrier boats (tuna gillnetters based in Gwader and exclusively used as carrier boats) to same destination. Small quantities may be transshipped at high seas to boats from neighbouring country.



Fig. 12. Indo-Pacific sailfish (*Istiophorus platypterus*) degutted and beheaded on board.

## **CONCLUSION**

Indo-Pacific sailfish (*Istiophorus platypterus*) is an important epipelagic species which is mainly found along the continental margin along Pakistan coast. Its landings during 2018 were 2,154 m. tons which is about 61.18 of total billfish landings. Because of high demand *Istiophorus platypterus* is sent to neighbouring country where it fetches comparatively higher prices. This species is harvested using gillnets from continental shelf and slope area during August and November whereas in winter it is mainly harvested from central Arabian Sea (in the EEZ of Pakistan and beyond).

Indo-Pacific sailfish is one of the highly migratory and oceanodromous species (Riede, 2004) which is regularly being fished in all countries of the Arabian Sea. High value of  $E_{max} = 0.575$  is indicative that there are symptoms of over-exploitation of the stocks of Indo-Pacific sailfish by Pakistani tuna fleets. This required further detailed study to verify the status of stocks of Indo-Pacific sailfish in Pakistan and other Arabian Sea countries.

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