



## **Billfish fishery along the Indian coast with special reference to the Indo-Pacific sailfish *Istiophorus platypterus* (Shaw and Nodder 1792)**

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### **Abstract**

The landings of the billfishes along the Indian coast are showing an increasing trend since the 1990s and the estimated annual average landing during 2000-2007 was 4317 t. Drift gillnets-cum-longline/handlines operated from mechanized and motorized craft contributed to the catches. Along the east coast, peak catches occur during July-September and along the west coast during October-March. *Istiophorus platypterus*, *Makaira* spp. and *Xiphias gladius* were recorded, of which, the sailfish *I. platypterus* was the most dominant. Fork length of *I. platypterus* in the landings at Cochin Fisheries Harbour during 2005-2007 ranged from 80 cm to 300 cm and was dominated by the length group 120 to 250 cm. Although a by-catch, sailfishes are of considerable economic value and detailed studies on the fishery and biological aspects from the Indian EEZ are needed to assess stock status on a regional basis.

**Keywords:** Billfish, sailfish, drift gillnet, longline, by-catch

### **Introduction**

In the Indian Ocean, the estimated billfish catch is reported to have tripled from 14,568 t in 1983 to 52,221 t in 1995 and the average annual catch during 2002 - 2006 was around 24,000 t (Campbell and Tuck, 1998). The catch of billfish in the western region of the Indian Ocean (FAO Area 51) is always higher than the eastern region (FAO Area 57) and the countries with high catches of sailfish are Iran, Sri Lanka, India and Pakistan. Studies on billfish fisheries (which includes marlins, spearfish, swordfish and sailfish) to understand their distribution, abundance and biology are available for different regions (De Sylva, 1957, 1974; Morrow, 1964; Williams, 1970; Chiang *et al.*, 2004; Hoolihan, 2004, 2006; Hoolihan *et al.*, 2004; Nelson and Fitchett, 2006; Hoolihan and Luo, 2007). From Indian waters, a few reports on the billfish landings from commercial fishing vessels as well as from exploratory surveys in the oceanic region using longlines by the Fishery Survey of India are available (Silas and Rajagopal, 1962; Balan, 1981; Silas and Pillai, 1982,1985;Muthiah,

1985; Siraimeetan, 1985; Sudarsan *et al.*, 1988; John *et al.*, 1995; Somvanshi *et al.*, 1998; Bhargava *et al.*, 2005; Prabhakar Raj *et al.*, 2005; Sivaraj *et al.*, 2005; Varghese *et al.*, 2005).

Sailfish are apex predators in the oceanic food chain, feeding primarily on small schooling fish such as sardines, anchovies, crustaceans and cephalopods. They are highly sought by sport fishermen and certain countries in the western Indian Ocean have used areas of congregation of sailfishes to develop a recreational fishery/tourism earning valuable foreign exchange (Hoolihan, 2004). However, in most other countries in the Indian Ocean region, they are by-catch in drift gillnets and longlines operated for large pelagics such as oceanic tunas and sharks. They are considerably under-valued and are vulnerable to over-exploitation. Sailfish are reported to migrate to coastal waters for feeding and spawning and have an affinity for the shelf area thereby forming part of coastal fisheries of many countries in the Indian Ocean including India (Campbell and Tuck, 1998). Being a highly migratory species, the sailfish

move freely across international borders and Exclusive Economic Zones (EEZs) and contribute to fisheries on their migratory routes. An understanding of the local fisheries is an important step to assess the sailfish stock. Data on fishing effort and size groups of sailfish in the landings are essential from the countries of the Indian Ocean region to make a quantitative regional assessment of the stocks (Campbell and Tuck, 1998; Uozmi, 2003; IOTC, 2008). Along the Indian coast, the sailfish is emerging as a significant fishery and no detailed studies have been published based on observations of landings by the commercial fishing fleet.

### Material and methods

The sailfish fishery was studied at the Cochin Fisheries Harbour during the period 2005-2007. Weekly observations were made on the mechanized drift gillnet-cum-hook and line fleet comprising of 210 units targeting pelagic oceanic sharks and tunas in which billfishes form a considerable by-catch (Boopenderanath and Hameed, 2007). Gillnets up to 2000 m long with a mesh size of 90 to 100 mm and devoid of footropes and sinkers for effective entangling are operated at more than 300 m depth mostly during May-October. Hooks and line are operated during November-April depending on the availability of the resources (Saly and Hridayanathan, 2006). During the weekly observations, the species composition as well as length group of the billfish landed by the drift gillnet / longline units were studied. Length measurements (from tip of lower jaw to caudal fin fork,  $L_{JFL}$ ) were taken for 30 to 50 *Istiophorus platypterus* whenever available and grouped into 10 cm length classes. A total of 1406 sailfishes were measured during the period of study. The weight of sailfish landed on each observation day was estimated by collecting information on the number of fishes landed classified as <100 cm, 101-150 cm, 151-200 cm and >200 cm  $L_{JFL}$  groups and applying the length-weight relationship  $W = 0.0069 L^{1.559}$  (length in cm, weight in kg) determined by Varghese *et al.* (2005). Raising factor for the monthly length frequency dataset was obtained by dividing the monthly catch (in weight) estimated

by the Fishery Resources Assessment Division (FRAD) of CMFRI by the summed up catch for all the observation days in the month.

Data on the landings along each maritime state during 1985-2007 estimated through a multistage stratified random sampling method by the FRAD was used to study the catch trends. Maritime states along the west coast (Gujarat, Maharashtra, Karnataka and Kerala) and east coast (Andhra Pradesh, Tamil Nadu and Union Territory of Pondicherry), where billfish landings were reported, were analysed for seasonal trends by summing catches recorded during January-March (I quarter), April-June (II quarter), July-September (III quarter) and October-December (IV quarter). Catches of billfishes were not recorded or were negligible in the other maritime states such as Goa, Orissa and West Bengal. Technical details of gillnet units operated from motorized/mechanized craft at various regions have been published earlier (Silas and Pillai, 1982; Muthiah, 1985; Siraimetan, 1985; Pravin *et al.*, 1998; Jayaprakash *et al.*, 2002).

### Results and Discussion

**Fishery:** The annual average billfish landings increased from 864 t during 1985 - 1989 to 4317 t during 2000-2007 (Fig. 1). The estimated annual landings during 2000-2007 ranged from 843 t (2000) to 6650 t (2004). The southeast coast contributed the maximum (55%) followed by the southwest (28%), northwest (16%) and northeast

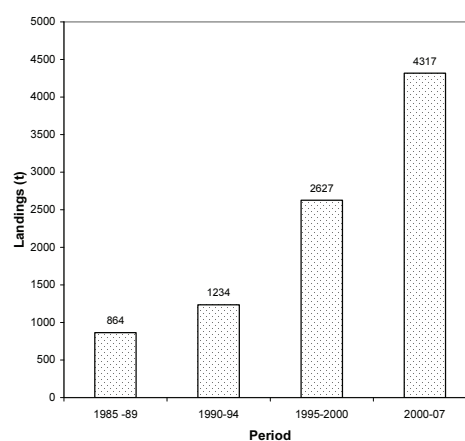


Fig. 1. Annual average billfish landings along the Indian coast during 1985 - 2007

(1%) coasts (Fig. 2). Among the states, Andhra Pradesh was the leading contributor (39%) to the billfish landings followed by Kerala (28%), Tamil Nadu (15%), Maharashtra (10%) and Gujarat (5%).

Peak landings of billfishes occurred during July- September (III quarter) along the east coast, and during October-December (IV quarter) and January to March (I Quarter) along the west coast

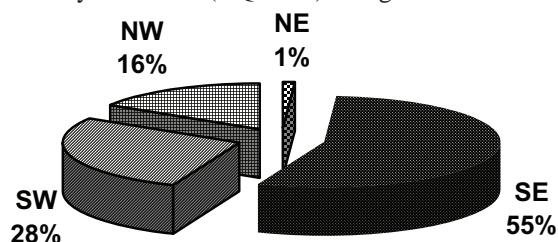


Fig. 2. Contribution of four coastal zones to the billfish landings along the Indian coast

(Fig. 3). Along the Tamil Nadu coast, the catches were high from January to September compared to Andhra Pradesh and Pondicherry where catches peaked during July-September, gradually declining thereafter. Earlier reports on billfish landings along the east coast are from Tuticorin. Here, Hornell (1917) observed peak catches during November-

February; Silas and Rajagopal (1962) reported July to September as well as November to February; and Siraimetan (1985) reported June to October for peak landings. In the present study, it is observed that the billfish landings occur for a more extended period along the Tamil Nadu coast than has been reported earlier. Along the west coast, in Gujarat and Kerala, the fishery started in September with peak catches during January-March, declining thereafter. Along the Maharashtra and Karnataka coasts the fishery commenced in July with peak catches during October-December, which gradually closed by May. Earlier, Varghese *et al.* (2005) reported peak abundance of billfishes such as the sailfish along the northwest coast during January-March especially at 16°, 15° and 22° N lat. Balan (1981) and Muthiah (1985) also reported peak catches of billfishes during September-December along the Calicut and Mangalore coasts, respectively.

**Species composition:** The species composition of the billfish landings during 2005-2007 at Cochin Fisheries Harbour was the sailfish *Istiophorus platypterus* (74%), marlins *Makaira* spp. (16%) and swordfish *Xiphias gladius* (10%). Balan (1981)

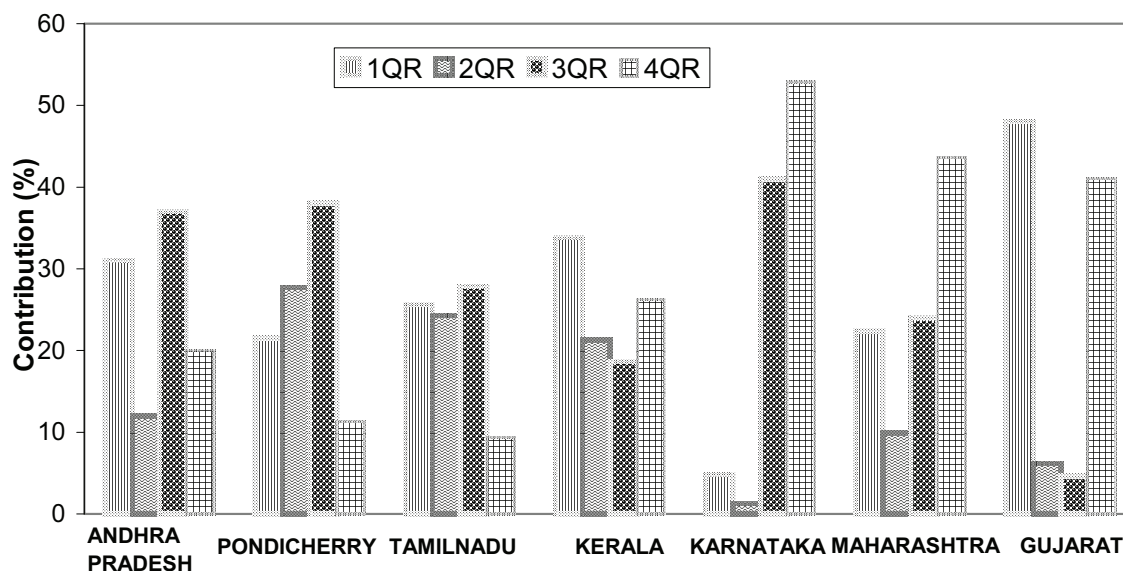


Fig. 3. Quarterwise contribution to the annual landings of billfish along the maritime states of India

reported occurrence of *M. indica* and *M. nigricans* along with *Istiophorus gladius* (= *I. platypterus*) in the coastal drift gillnet fishery along the Calicut coast but these did not form any significant fisheries. Muthiah (1985) reported *I. platypterus* and *M. indica* along the Karnataka coast while Siraimetan (1985) observed *I. platypterus* and the striped marlin (*Tetrapturus audax*) at Tuticorin. Silas and Rajagopal (1962), who recorded five species of billfishes along the Tuticorin coast viz., *I. gladius*, *M. indica*, *M. nigricans*, *T. audax* and *T. tenuirostratus* observed that at all the major centres of India where billfishes are landed, the sailfish predominates in numbers. In Cochin Fisheries Harbour also the same trend was observed.

The sailfish landings at Cochin Fisheries Harbour were 284 t, 438 t and 51 t during 2005, 2006 and 2007 respectively. The habitat preference of sailfish is reported to be waters above the thermocline and close to coasts or islands, which it shares with the yellowfin tuna (Suzuki *et al.*, 1977; Hoolihan and Luo, 2007). Favored environmental parameters such as water temperature of 29°–30° C and salinity of 32.2–33.3‰ are reported to influence sailfish abundance in coastal waters (Nakamura, 1985). Sailfish abundance in the coastal waters of the Arabian Gulf has also been reported to coincide with maximum availability of forage such as sardines and squids

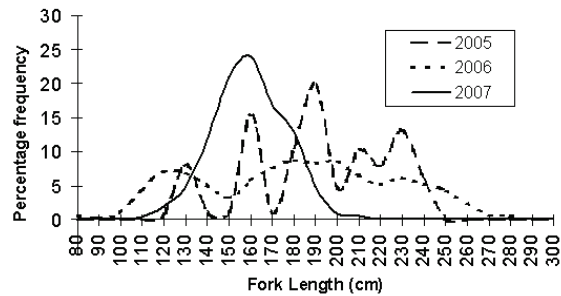


Fig. 4. Annual length frequency distribution of *I. platypterus* in the landings at Cochin Fisheries Harbour during 2005 - 2007

(Hoolihan and Luo, 2007). The recent development of a targeted fishery for yellowfin tuna using longlines up to 200 m depth along the Indian coast especially off Andhra Pradesh and Kerala is an important factor contributing to the increased landings of sailfish as by-catch.

**Length frequency distribution:** The sailfish *I. platypterus* landed at Cochin Fisheries Harbour during the three years indicated occurrence of length groups of 80 to 300cm LjFL dominated by the 120 to 250 cm LjFL fishes (Fig. 4 and 5). Varghese *et al.* (2005) noted that in the longlines operated in oceanic waters along the northwest coast, sailfish in the size range 100 - 260 cm occurred in the catches with modal length of 180,

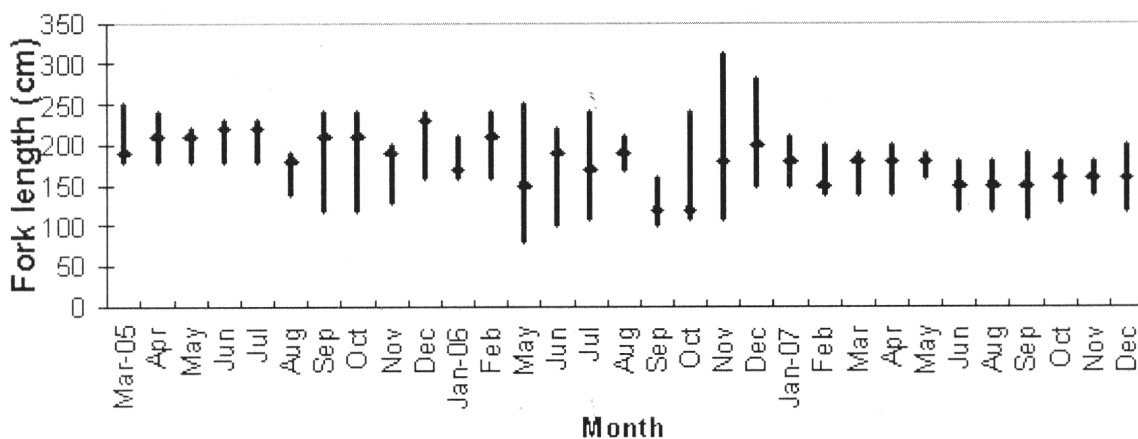


Fig. 5. Monthly length range and modal class of *I. platypterus* in the landings at Cochin Fisheries Harbour during 2005 - 2007

200 and 240 cm. Sivaraj *et al.* (2005) reported that the size groups 121 - 250 cm occurred in the Andaman Seas with females in the size range 151 - 250 cm and males in the size range 121 -230 cm. At Cochin, the annual mean size was 191, 182 and 160 cm during 2005, 2006 and 2007 respectively (Fig. 6). Considering the length at first maturity ( $L_m$ ) of 175 cm reported by Varghese *et al.* (2005),

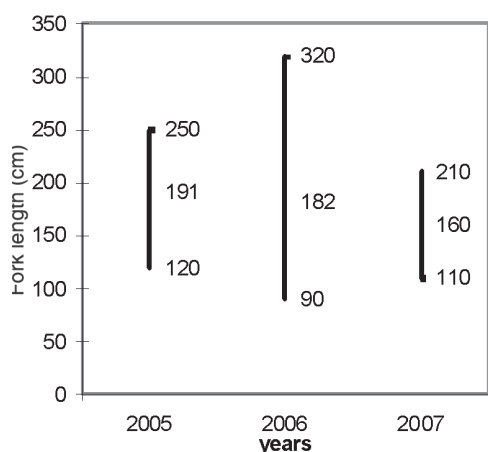


Fig. 6. Length range and mean length (annual) of *I. platypterus* in the landings at Cochin Fisheries Harbour during 2005 - 2007

the juveniles (below the  $L_m$ ) were estimated to contribute 28%, 42% and 81% to the number of sailfishes landed at Cochin Fisheries Harbour during 2005, 2006 and 2007 respectively. Whether this is due to changes in oceanographic parameters determining their abundance and distribution or any changes in fishing gears / grounds are not clear from this limited study. Targeted fishing for yellowfin tuna, hitherto an under-utilized resource in the Indian seas, is done by the fishermen in recent years and this is likely to result in increased by-catches of billfishes including sailfish. Hence, collection of length data from a developing fishery especially that of apex predators which contribute to the stability of the ecosystem, are important for stock assessment.

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