

# **INDICES OF YELLOWFIN AND SKIPJACK TUNAS CAUGHT BY LONG LINING IN NORTH-EASTERN ARABIAN SEA AND ANDAMAN & NICOBAR WATERS**

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## **Abstract**

Yellowfin tuna and skipjack tuna are the two major components of tuna fisheries in the Indian EEZ. The data collected through the exploratory tuna longline surveys by the Fishery Survey of India vessels in the North-eastern Arabian Sea and Andaman and Nicobar Waters during the period 2000-06 are considered for calculating the Hooking Rate (HR) and Catch Rate (CR) for the yellowfin tuna, skipjack tuna and aggregate HR for all fish caught in the operations. An attempt has been made to know the trends over the years as well as seasonal variations in the hooking rate from both the regions. The results indicate that there have been peak years for hooking rates corresponding to the years 2003 and 2005. The trends also exhibit that the tuna fisheries in the Indian EEZ can thrive on the higher hooking rates during pre-monsoon and monsoon seasons in the Arabian Sea and similar higher hooking rates during monsoon and post-monsoon seasons in the Andaman and Nicobar Waters.

## **Introduction**

The seas around India are known for abundance of yellowfin tuna and skipjack tuna. The exploratory surveys for the oceanic tunas and tuna-like fishes were commissioned in the year 1980 with one long liner and further strengthened in 1989 by deploying two more multi-filament long liners followed by induction of two monofilament longliners in 2005. This has enabled the Fishery Survey of India (FSI) to have extensive coverage for tuna and allied resources assessment in time and space. The present paper provides the details of abundance indices of yellowfin and skipjack tunas based on the exploration carried out in the Indian EEZ along North-eastern Arabian Sea and around Andaman and Nicobar Islands during 2000-2006.

## **Material and methods**

Data on yellowfin and skipjack tunas are collected by deploying the longliners **Yellow Fin** and **Blue Marlin**.

The vessel **Yellow Fin**, conducted the survey operation in the North-eastern Arabian Sea and simultaneously the vessel **Blue Marlin** explored the Andaman and Nicobar Waters for tuna and tuna like resources, using the conventional multi-filament long line gear with 5 branch lines per basket. The vessels made about 100-120 baskets per sets during the period operating 7,96,091 hooks. The bait fishes such as mackerel, sardine and threadfin bream and occasionally squids were used during the operation. The yellowfin and skipjack tunas caught in the longline operation were measured for their weight to nearest kilogram and length to nearest centimeter. The abundance indices were worked out and expressed as hooking rate as per percentage of fish caught per 100 hooks and catch rate as weight of the tunas in kg per 100 hooks operated. The indices thus computed show region-wise, year-wise trend in abundance and their seasonality.

## **Results**

The catch and effort data collected following the above mentioned method and analyzed as the hooking rate and catch rate in respect of Yellowfin Tuna (YFT) and Skipjack Tuna (SKJ) are presented hereunder region-wise :

### ***Arabian Sea***

The hooking rate and catch rate obtained for YFT, SKJ and all fish in the North-eastern Arabian Sea of the Indian EEZ and the number of hooks operated during 2000-06 are presented in Table-1 and Fig.1. These results are furnished below :

**Hooking rate :** The trend in the hooking rate for YFT and SKJ follow similar pattern with higher hooking rate for both species recorded in the year 2003. However, the hooking rate for skipjack tuna in the years 2000 and 2006 were found to be much higher than those of yellowfin tuna and all fish during the corresponding years. The trend in the hooking rate of yellowfin tuna and skipjack tuna follow the same general pattern as hooking rate of all fishes according to the longline operations in the Arabian Sea. Thus, rate of YFT was found to be in the range of 0.2 to 0.6% (Fig.1) whereas the hooking rate of skipjack tuna was found to fluctuate between 0.002 and 0.18% annually. The aggregate hooking rate for all fish was found to vary from 0.3 to 1.2%.

**Catch rate :** The catch rate in respect of yellowfin tuna range from minimum 24 kg in the year 2001 to 187 kg in the year 2003 per 100 hooks (Table-1). In the case of skipjack tuna the catch rate was minimum (0.03 kg) in the year 2004 whereas maximum catch rate of 12 kg per 100 hooks was recorded in the year 2000. The all fish catch rate was at its peak in year 2006 (329 kg/100 hooks). However, the trend in the catch rate of all fish and YFT are found to be similar (Fig.1).

#### ***Andaman and Nicobar Islands***

The hooking rate and catch rate of yellowfin tuna and skipjack tuna explored in the Indian EEZ around the Andaman and Nicobar Waters during the period 2000-2006 are given in Table2 and their trends are presented in Fig.2.

**Hooking rate :** The hooking rate of yellowfin tuna in the Andaman and Nicobar waters during the period 2000-2006 is given in Table-2 and Fig.2. The HR is found to vary from 0.08 (in 2000) to 0.34% (in 2005). For the corresponding period, the hooking rate of skipjack tuna was found to fluctuate between 0.005 (in 2006) to 0.056% (in 2002). The hooking rate for all fish caught in the region during the period mentioned above varied from 0.6 (2000) to 1.0% (2002). The trends in the hooking rate for the YFT, SKJ and all fish were found to follow similar pattern with two peaks in the hooking rate during 2002 and 2005 for all the three categories (Fig.2).

**Catch rate :** The highest catch rate of yellowfin tuna was 107 kg per 100 hooks in the year 2005 with a minimum catch rate of 27 kg per 100 hooks recorded in the year 2000 (Table-2). In the case of skipjack tuna the catch rate was minimum 0.2 kg/ hooks during 2000 and 2006 (0.2 kg/100 hooks) and the maximum 1.3 kg/100 hooks in the year 2002 (Fig.2). For all fish category, the highest catch rate of 263 kg/100 hooks was recorded in the year 2005 and the lowest of 145 kg/100 hooks in the year 2001. The trends in the catch rate of yellowfin tuna, skipjack tuna and all fish caught in the longline operations in the Andaman and Nicobar waters were found to be similar to the trends in the hooking rate for the seven years period.

The results of survey in the two regions during the year 2000-06 show that there is significant change in the abundance indices in respect of hooking rates and the catch rates of YFT, SKJ and the all fish caught. In the Arabian Sea, there was a single peak of hooking rate as well as catch rate in the year 2003 whereas there were two peaks in the years 2002 and 2005 for the Andaman and Nicobar waters.

### **Seasonal variation**

The data on the catch and effort collected during the years 2000 to 2006 was pooled together to study seasonal variation in the HR and CR of YFT and SKJ. The data for three seasons viz. pre-monsoon (January-April), monsoon (May-August) and post-monsoon (September-December) were considered to know variations in HR for yellowfin tuna, skipjack tuna and all fish. The results thus obtained are given in Table-3 and Figs. 3 and 4 respectively.

### ***Month-wise hooking rate***

The month-wise trend in HR of YFT and SKJ and All fish have two peaks in the Arabian Sea corresponding to the months March and September whereas the Andaman and Nicobar waters have two peaks for yellowfin tuna during January and June and for skipjack tuna it corresponds to June and December (Fig.3). In the case of all fish, the highest hooking rate was observed to be in the month of August.

The index in the seasonal hooking rates for yellowfin tuna was at its peak during monsoon and declining on either side during pre-monsoon and post-monsoon seasons (Fig.4). In the case of skipjack tuna, the peak hooking rate was observed during pre-monsoon followed by a declining trend during monsoon and post-monsoon periods in the Arabian Sea. Interestingly, hooking rate in respect of all fish was at its peak during pre-monsoon and thereafter steadily declining through monsoon and post-monsoon seasons.

In the Andaman and Nicobar waters, the trend of yellowfin tuna as well as skipjack tuna exhibited an opposite trends to that of Arabian Sea (Fig.4). In this waters, the YFT registered the lowest hooking rates during monsoon period and SKJ registered the hooking rate during this period.

## **Discussion**

The trends in abundance indices of yellowfin tuna, skipjack tuna and all fish caught in longline operations in North-eastern Arabian Sea and Andaman and Nicobar waters within the Indian EEZ during the period 2000-06 show that in the Arabian Sea, the highest hooking rates and CR for YFT and All fish were registered during 2003 and 2005. However, highest HR and CR for SKJ was recorded during 2000.

The monthly and seasonal variations in the hooking rate exhibited by the yellowfin tuna, skipjack tuna and all fish lends the support for the general understanding that tuna fishing in the Indian EEZ can be carried out round the year with better hooking rates during pre-monsoon and monsoon seasons in the Arabian Sea and during monsoon and post-monsoon seasons in the Andaman and Nicobar waters within the Indian EEZ.