Received: 5 October 2015
IOTC-2015-WPM06-14

Data collection methodology in India and status on tuna fisheries

AUTHORS: P. Chalapati Rao*, Premchand* and Sanjay Pandey**

*** Fishery Survey of India, Mumbai**

**** Department of Animal Husbandry, Dairying & Fisheries, Ministry of Agriculture & Farmers' Welfare, New Delhi**

ABSTRACT

The Indian marine fishery consists of two distant segments, the coastal and deep sea fisheries. The coastal fishery around the mainland and islands is of multi-craft and multi-gear and not exclusively for tuna fishery except in Lakshadweep Islands. In Lakshadweep Islands coastal tunas are targeted by pole & line fishery. The Institutes/organizations collecting marine fisheries statistics are (i) Department of Animal Husbandry, Dairying & Fisheries (DAHDF), Ministry of Agriculture & Farmers Welfare through Department of Fisheries of various maritime states/UTs, (ii) Fishery Survey of India (FSI) and (iii) the Central Marine Fisheries Research Institute (CMFRI). The Fishery Survey of India (FSI) has been carrying out routine surveys and assessment of fishery resources in the EEZ for sustainable exploitation and management of marine fishery resources. The Central Marine Fisheries Research Institute (CMFRI), Kochi undertakes land-based samplings to estimate fish landings from the Indian EEZ.

Deep sea tuna fisheries statistics are being collected exclusively by tuna long liners owned by Fishery Survey of India (FSI) and Indian owned tuna fishing vessels operating under the Letter of Permission granted by the DAHDF.

More than 70% of the catch was still obtained from coastal fisheries. Further to complement the data from the cruises, land-based data collection is vital. It is cost-effective and also provides information of a range of parameters, which at times are constrained from the cruises. India has a strong base in this area.

1. INTRODUCTION:

India is one of the major fish producing countries with a share around 5.5% of the total fish produced world wide. Total fish production (both inland and marine) has increased from a level of 0.75 million tones in 1950-51 to 9.583 million tones in 2013-14. Marine fish production is increased to 3.44 million tones during 2013-14 from 2.78 million tones during 2004-05.

Being a vast country with a coastline of 8118 km with around 1400 landing centres and also with an Exclusive Economic Zone of 2.02 million sq.km. fish landing takes place continuously on the coastline. Exploitation of marine fisheries is increased over a period of time due to improvement in fishing methods, exploring deeper waters and increase of diversified fishing craft. Traditional crafts are motorized and mechanized crafts started operating with different gears including trawl nets, gill nets, longline. In recent times, targeted fishery for exploiting tuna and tuna like fishers is emerging.

2. STATUS OF DATA COLLECTION :

2.1 Coastal tuna fisheries :

In the context of India, Fisheries is a state subject and monitoring, assessment and management of resources exploited in the coastal waters wrest with the respective state Government. For the monitoring and management of fisheries all maritime states realized the need for landings statistics. Landings data for coastal fisheries collected by Department of Fisheries of various maritime states collated by Fisheries statistics cell, Department of Animal Husbandry Dairying and Fisheries(DAHDF), Ministry of Agriculture at National level.

Besides, maritime states, Central Marine Fisheries Research Institute *(CMFRI)* which is a national level research Institute established in 1947 under Indian council for Agricultural Research (ICAR) involved in the monitoring and assessment of exploited marine resources. It had evolved scientific data collection method for marine landings and started making state/region-wise, gear-wise and resource wise estimates. Over a period of time some of the states adopted similar approach followed by the CMFRI and some of the states devised their own methods.

To bring the uniformity among the maritime states/ UTs for collecting marine landings data, Department of Animal Husbandry, Dairying and fisheries(DAHDF), Govt. of India has asked all maritime states to adopt data collection methodology followed by CMFRI since 10^{th} Plan under CSS " Strengthening of Database and Information networking for Fisheries Sector".

Further, the maritime states/ UTs, are being provided financial assistance by Union Government for the recruitment of the manpower on contract basis for collection of marine fish landings data since XI^{th} five year plan under Central Sector Scheme on "Strengthening of Database and Geographical information System for Fisheries Sector".

2.1.1 Methodology:

The methodology adopted by CMFRI for estimating marine landings is of multi- stage stratified random sampling over time and space which is described below:

The stratification of space is made by dividing each maritime state into several zones on the basis of fishing practices and geographical considerations. A zone may be either single centre zone where huge landings take place or multiple centre zones. Usually, landing centres are classified into two categories based on the landings such as major if the number of boats arrived at the landing centre is 100 or above and other landing centres as minor.

One zone and a calendar month are taken as the basis of space-time stratum. If in a zone, there are 20 landing centres, there will be 20 x 30 = 600 landing centre days in that zone for that month (of 30 days). For observation purpose, a month is divided

into 3 groups such as 1-10, 10-20, 20- up to end of the month. From each group, a cluster of 6 consecutive days are selected systematically, with a random start with a sampling interval of ten days. Thus from the first five days of the month, a day is selected randomly, which together with next 5 consecutive days (6 days in all) form the first cluster. The next 6 days from the other groups follow systematically. For example, the observation starts from the 3rd of the month and continue up to 8th in the first group then the next cluster starts from 13th and last cluster on 23rd systematically. Cluster days are (3rd,4th), (5th,6th), (7th, 8th); (13th,14th), (15th,16th), (17th, 18th); (23rd,24th), (25th,26th), (27th,28th). Normally, in a month, there are 9 clusters of 2 days each.

In each zone, three centres are selected for observation over 6 cluster days and each selected centre is observed for two consecutive days. The observation is made from 1200 hrs to 1800hrs on the first day and 600 hrs to 1200 hrs on the second day, in a centre. The intervening period of these two days i.e., data collected by enquiry from 1800 hrs of the first day of observation to 600 hrs of the 2nd day of observation of a landing centre day is termed as night landing.

The night landings obtained by enquiry on the second day covering the period of 1800 hrs of the first day to 0600 hrs of the next day are added to the day landings so as to arrive at the landings for one day(24 hrs). Thus in a 10 day period, data from 3 centre-days are sampled and consequently in a month 9 landing centre-days are sampled.

Selection of units and recording of landings :

Selection of boats/crafts for recording of landings on sample basis. When the number of boats landed is 15 or less, the total landings from all the boats are enumerated for catch composition for that category. When the total number of boats exceed 15, the following procedure is followed to sample the number of boats.

Number of boats	Fraction to be examined
Less than or equal to 15	100%
Between 16 and 19	First 10 and the balance 50 %
Between 20 and 29	1 in 2
Between 30 and 39	1 in 3
Between 40 and 49	1 in 4
And so on	

From the boats, the catchers are normally removed in baskets of standard size. The weight of fish contained in these baskets being known, the weight of fish in catch boat and observation is obtained.

Estimation Procedure :

From the landings of the observed fishing units, the landings for all the units landed during the observation period are estimated. By adding the quantities landed during

the two 6-hours periods and during the night (12- hours) the quantity landed for a day(24-hours) at a centre that is the landings for each centre day included in the sample will be estimated. From these, the monthly zonal landings are obtained.

While making the estimation for a zone, centre wise estimates are made separately for minor, medium and large centres and added together for the zone. For example, in a zone 5 minor, and 2 major centres are existing. Estimates are made each landing centre type and finally monthly estimates are to be arrived for the zone

2.2 Oceanic tuna fishery

For oceanic fisheries, voyage reports received by the Fishery Survey of India (FSI) from the Indian owned tuna fishing vessels operating under the Letter of Permission (LOP) scheme and data collected by the Fishery Survey of India survey vessels are prime source.

3.Tuna fisheries statistics:

In the coastal fisheries around mainland estimates of the CMFRI, UTs of Lakshadweep and Andaman & Nicobar Islands are considered. In respect of oceanic fishery, the voyage reports of Indian owned tuna fisheries vessels operating under Letter of Permission (LOP) and data collected by four survey vessels of the Fishery Survey of India (FSI) are considered.

Tuna production in respect of coastal tunas during 2008 to 2013 was in the range of 0.92 lakh tones to 0.82 lakh tones . Lowest catch of 0.53 Lakh tonnes was recorded during 2010. Kawakawa was the dominant species in the range of 35% to 40% during the said period. Bill fishes during 2008 to 2013 ranged from 6175 tonnes to 9646 tonnes and the highest catch of 10043 tonnes was recorded during 2011. Production of bill fishes was comprised of sword fish, sail fish and marlin. Seerfishes during the same period ranged from 0.57 Lakh tones to 0.42 Lak tones. Major contributor of seer fishes was narrow barred seer fish (55-75%) followed by Indo-pacific seer fish.

In respect of oceanic fishery, the catch of tuna and tuna likes fishes is in the range of 0.02 LT to 0.56 Lakh tones and is in the increasing trend. Most prominent species in oceanic tuna fishery were yellow fin tuan and skipjack tuna. In recent years skipjack tuna catch is in increasing trend. In the entire tuna/ tuna like fishes production more than 70% of catch was derived from coastal fisheries.

Table 1. Nominal catch of tuna & tuna like fisheries from the coastal fisheries in India: (Tonnes)

Sl. No.	Species	2008	2009	2010	2011	2012	2013
Tunas							
1	Yellowfin tuna	13506	13228	9289	9971	16507	15673
2	Bigeye tuna	17	829	38			
3	Skipjack tuna	22060	15591	4893	8759	5782	7078
4	Albacore tuna	1051	243	42	380		
5	Longtail tuna	7514	6111	6092		14455	13118
6	Bullet tuna	2863	3493	4910	7106	6230	3070
7	Frigate tuna	6186	5240	6283	5409	3516	4653
8	Kawakawa	32401	24931	21271	32938	32765	39736
9	Striped bonito	3886	800	179	339	2079	1960
10	Dogtooth tuna	14	252	12	37	40	1
11	Neritic tuna NEI	2640			539		
Tuna total		92139	70718	53009	77255	81374	85289
Bill fishes							
12	Sword fish	883	636	680	1585	744	1835
13	Sailfish	4407	6350	6742	7080	3820	4487
14	Marlin	883	2086	1009	1383	1652	3324
15	Billfishes NEI	2					
Bill fishes total		6175	9072	8431	10048	6216	9646
Seer fishes							
16	Narrow barred seerfish	32155	30026	25393	30295	42416	26761
17	Indo-Pacific seerfish	23764	22052	16444	18295	13685	14927
18	Streaked seerfish	12	17	16	11		
20	Wahoo	61	229	119	45	69	36
21	Seerfish NEI	1313					
Seer fishes total		57305	52324	41972	49354	56170	41724
Grand Total		155619	132114	103412	136657	143760	136659

Table 2 : Nominal catch of tuna & tuna like fisheries from oceanic fisheries (in tones)

Sl. No.	Species/ Year	2008	2009	2010	2011	2012	2013
1	Yellowfin tuna	1682	1680.59	10888.3	10577.15	14091.3	18944.9
2	Bigeye tuna	6	0.18			4.34	0.02
3	Skipjack tuna	0.3	0.04	12911.7	8063.15	15834.31	27210.32
4	Other tunas					4534.31	3244.37
5	Sword fish	299	544	93.75	394.03	200.25	91.05
6	Sailfish	311	418.88	148.44	760.29	610.82	80.22
7	Marlin	238	499.4	161.69	411.1	576.43	71.67
8	Seerfish						1254
9	Sharks					12.723	5221.51
10	Others	301.1	4.86		3061.56	0.39	0.81
Total		2839	3147.95	24203.9	23267.28	35864.68	56118.87

References:

John. M.E., Pillai.N.G.K. 2009. Current status of tuna fisheries in India. 2009. IOTC-2009-SC-Info05

MOA. 2014. Hand book in Fisheries Statistics-2014. Department of Animal Husbandry ,Dairying and Fisheries, Ministry of Agriculture, government of India.pp89

Premchand, MK Sajeevan and A. Tiburtius 2013. India's National Report to the Scientific Committee of Indian Ocean Tuna Commission,2013. IOTC-2013-SC16-NR09

Premchand, MK Sajeevan, A.Tiburtius, Rajashree B Sanadi and Rahul kumar B Tailor. 2014 . India's National Report to the Scientific Committee of Indian Ocean Tuna Commission,2014. IOTC-2014-SC17-NR09

Vijayakumaran K, and Sijo P. Varghese.2010. Update on the status of tuna fisheries in India.IOTC-2010-SC-Inf 12

Vijayakumaran K, and Sijo P. Varghese.2011. India's National Report to the Scientific Committee of Indian Ocean Tuna Commission,2011. IOTC-2011-SC14-NR09

Vijayakumaran K amd S.P. Varghese. 2012. India's National Report to the Scientific Committee of Indian Ocean Tuna Commission, 2012. IOTC-2012-SC15-NR09

Somavanshi V.S., Pillai N.G.K. and John. M.E. .1999. Current status of Fisheries for tunas and tuna-like fishes in India. WPDCS99-16

Srinath.M, Somy Kuriakosy, Mini K.G. 2005. Methodology for estimation of marine fish landing in India. CMFRI Special Publication No.86. pp57.