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Decadal trend in catch per unit effort for Skipjack by research purse-seiner "Nippon-maru" in the eastern Indian Ocean

Tatsuki Oshima & Ippei Fusejima
Japan Marine Fishery Resources Research Center (JAMARC) of Fisheries Research Agency

Abstract

Purse Seine catch data for Eastern Indian Ocean were collected from 1993 to 2010. The nominal CPUE (M.T./set) increased sharply in 2005 after staying relatively low for the first half of the period. Proportion of smaller Skipjack (<2.5kg) increased from 2002.

1. Introduction

Eastern part of the Indian Ocean (EIO) is considered to be less productive area for tuna purse seine fishery compared to areas like Western Indian Ocean (WIO) or Western & Central Pacific Ocean (WCPO). For Japanese purse seine fleet, the EIO is a subsidiary fishing ground following highly productive WCPO.

JAMARC did its first purse seine research cruise in the EIO in 1979. From 1993 to the present, we have conducted at least one cruise per year.

As there are not many purse seiners operating in this area, the number of catch data is limited. Therefore the data set we have collected could provide unique value to understand the characteristics of the fishing ground.

2. Materials and Methods

The data collected by Research purse seiners "Nippon-maru II & III" during period from 1993 to 2010 in EIO (70°E and eastward) were used for the analysis. Nippon-maru II was replaced by the III since October 2006. Total tonnage, length and capacity of both vessels are shown in table 1.

Table1. Dimensions of vessels used

	Nippon−maru II	Nippon−maru III
date of launch	July 1986	July 2006
length	72.5m	67.2m
international tonnage	1856	1817
capacity	1100t	900t

The largest mesh sizes of the nets were changed two times within the period. It was enlarged from 180mm to 210mm in 2002 and then 210mm to 270mm in 2006.

The total catch amount of each set was estimated on board according to the number and capacity of fish wells used. Species composition and size distribution were measured by research scientists on board during brailing. Total catch amount was then allocated to each species and size class according to the composition data. Weight categories that used in Japanese markets were applied.

3.Results

Fig.1 shows the percentage of the number of sets made for each school type. Most of the sets were made on FADs (90.4%) and on Logs and objects(8.6%). Sets on free schools were only 0.7%. This is due to a characteristic of EIO that the occurrence of free school is very rare.

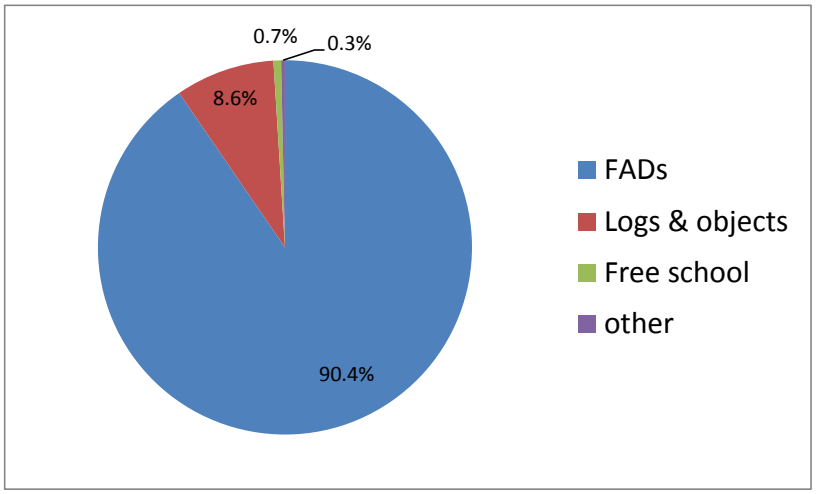

Fig.1. Percentage of the number of sets made for each school type

Catch data of FADs and Log & Objects operations were used for CPUE analysis (Table2).

Table 2. List of Catch data obtained by FADs and Log & Objects operations

Year	Vessel	Mesh size	No.of sets	catch SKJ (mt)	catch YFT(mt)	catch BET(mt)	catch total(mt)	catch/set SKJ	catch/set YFT	catch/set BET
1993	Nippon-maru II	180mm	59	1,105	469	197	1,781	18.7	7.9	3.3
1994	Nippon-maru II	180mm	81	1,420	597	403	2,420	17.5	7.4	5.0
1995	Nippon-maru II	180mm	164	2,207	600	497	3,311	13.5	3.7	3.0
1996	Nippon-maru II	180mm	151	2,326	534	387	3,255	15.4	3.5	2.6
1997	Nippon-maru II	180mm	141	2,106	455	444	3,025	14.9	3.2	3.1
1998	Nippon-maru II	180mm	119	2,165	391	422	2,980	18.2	3.3	3.5
1999	Nippon-maru II	180mm	112	1,624	439	438	2,512	14.5	3.9	3.9
2000	Nippon-maru II	180mm	85	1,340	444	573	2,367	15.8	5.2	6.7
2001	Nippon-maru II	180mm	116	1,422	365	477	2,267	12.3	3.1	4.1
2002	Nippon-maru II	180mm/210mm	123	1,681	380	552	2,615	13.7	3.1	4.5
2003	Nippon-maru II	210mm	161	2,380	641	781	3,802	14.8	4.0	4.9
2004	Nippon-maru II	210mm	143	2,100	568	752	3,420	14.7	4.0	5.3
2005	Nippon-maru II	210mm	146	3,855	988	922	5,765	26.4	6.8	6.3
2006	Nippon-maru II/III	210mm/270mm	86	2,388	310	662	3,360	27.8	3.6	7.7
2007	Nippon-maru III	270mm	105	2,319	515	751	3,585	22.1	4.9	7.2
2008	Nippon-maru III	270mm	130	2,098	468	784	3,350	16.1	3.6	6.0
2009	Nippon-maru III	270mm	90	1,528	364	863	2,755	17.0	4.0	9.6
2010	Nippon-maru III	270mm	92	1,735	471	867	3,080	18.9	5.1	9.4
total			2,133	36,463	9,105	10,987	56,635	17.1	4.3	5.2

Fig.2 shows the year by year trend of nominal CPUE (M.T./set) for Skipjack, Yellowfin and Bigeye caught by FADs and Log operations. CPUE before 2004 were relatively stable. In 2005 it increased sharply and the catch stayed relatively good until 2010 except for 2008. The two years of biggest catch were also accompanied by relatively frequent occurrence of free schools for the area ; 4.1% for2005 and 2.3% 2006 compared to 0.7% for overall period.

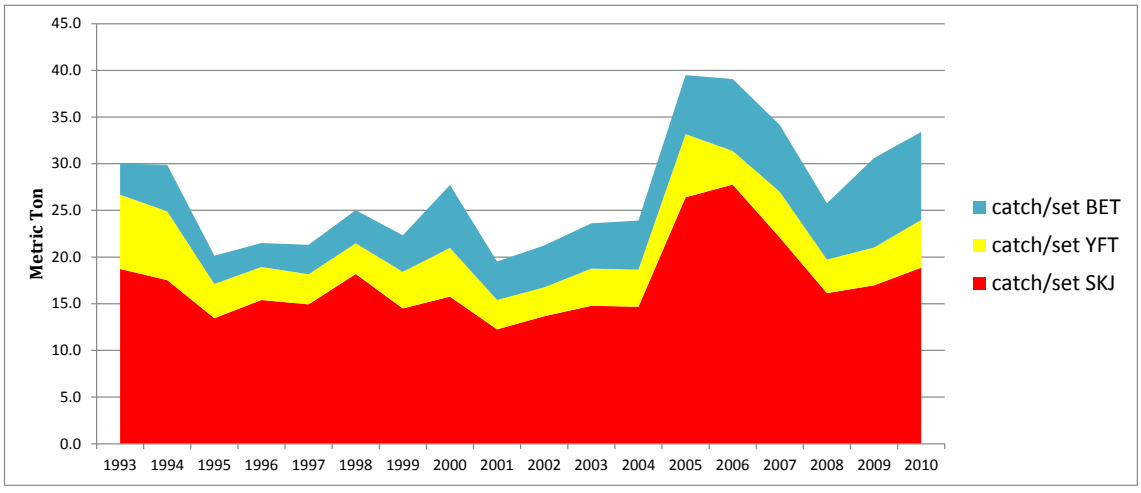

Fig.2. Trend of nominal CPUE (M.T./set) for SKJ, YFT and BET FADs and Log operations.

Fig.3 shows the year by year trend of nominal CPUE (M.T./set) for each size category of Skipjack. From 1993 to 1999 larger size Skipjack (>2.5kg and >4.5kg) were dominant. But after around 2002 smaller size classes (>1.8kg and <1.8kg) have been dominant except for 2007.

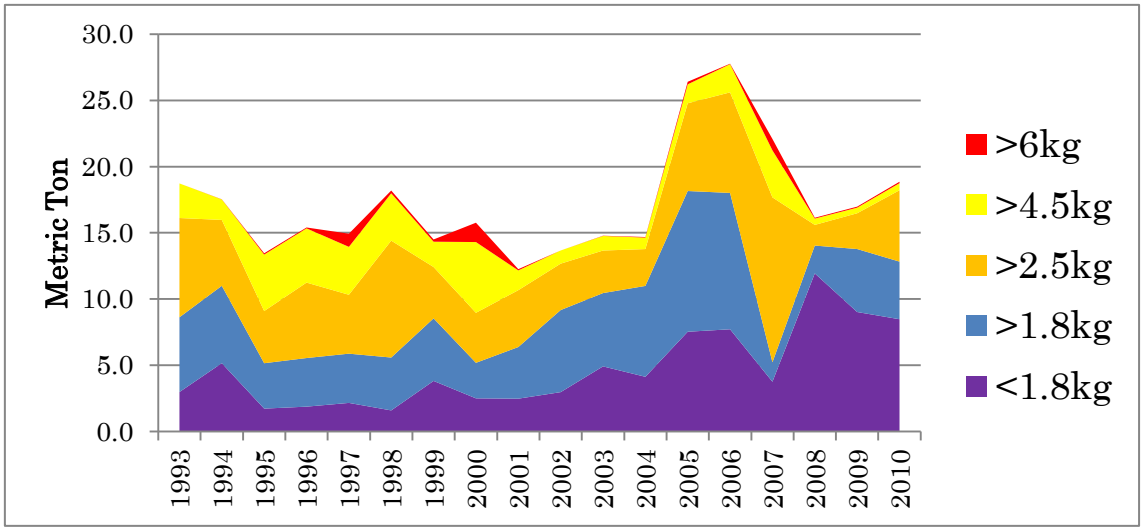

Fig.3. Trend of nominal CPUE (M.T./set) for each size category of Skipjack

4.Discussion

The change in vessels' power can be a factor when analyzing CPUE trend. However we took data from two different vessels as one set. Because in case of FAD or Log operations, the vessels ability like winch power or sonar resolutions doesn't affect much the amount of catch. The difference in mesh size can be a big factor for analyzing size categorical data and should be considered carefully. In this case, however, the proportion of smaller fish increased in spite of using larger mesh. Therefore the change in proportion can be considered as a true trend.