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OBSERVATION OF CHINESE TUNA PURSE SEINE FISHERY IN THE WCPFC WATERS DURING 2006-2007

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Observation of Chinese Tuna Purse Seine Fishery in the WCPFC Waters during 2006-2007

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Abstract: Based on the data collected by two scientific observers who worked onboard two Chinese tuna purse seiners operating at 04°00′N-05°00′S, 146°00′E-160°00′E between Oct. 22, 2006 and Feb. 20, 2007, the paper reported fishing activities, the catch composition and biological feature of the catch. The two vessels have done 96 sets during the time period, of which free school sets and associated school sets are 78 and 18 respectively, caught 2107 ton of fish(1894 mt skipjack, 200 mt yellowfin tuna and 13mt bigeye tuna).

Keywords: tuna purse seine fishery, set types, catch size composition, WCPFC Waters

1 Introduction

China–mainland began her tuna purse seine (PS) fishery in the Western and Central Pacific Ocean in 2001. To the end of 2006, there are 9 purse seiners operating in WCPO waters. The size of the tuna purse seiners are between approximate 1000 GRT, with carrying capacity approximate 800-900 t accordingly. Skipjack, Skipjack, both in the free swimming school and associated school, is the targeting species of the tuna purse seining fleet.

In 2003 the tuna purse seining fleet was required by Tuna Working Group of Distant Water Fisheries Branch , China Fisheries Association to collect fishing information and catch data, including fishing ground, volume and species composition of catch (Lin and Ding,2005;Yang and Chen,2005). In Oct 2006 two scientific observers sent by Shanghai Fisheries University to “JINHUI NO.6” and “JINHUI NO.3”, two purse seiners of Shanghai Deepsea Fisheries Co.,Ltd. The two observers also did some research work related to fishing gear and fishing method during their observer missions onboard the above mentioned purse seiners which were operating in the Western and Central Pacific Ocean between Oct 2006 and Feb 2007

This paper presents information on fishing vessel, fishing area , searching for the fish school,

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biological features of main targeting species based on observer's program in the Western and Central Pacific Ocean between Oct 2006 to Feb 2007.

2 General information

Purse seiners JINHUI NO.6 and JINHUI NO.3 belong to Shanghai Deepsea Fisheries Co.,Ltd and their main dimensions are listed in Table.1. The purse seine nets used are 1644.5m long and 394.3m in stretched height, which were supplied by KUNSHAN KINGCHOU FISHNET MFG CO.,LTD. The operating activities are listed in Table.2 and Figure.1.

Tab.1 Main dimension of JINHUI NO.6 and No.3

Vessel's name	Gross tonnage(ton)	Length(m)	Breadth(m)	Depth(m)	Main engine (Kw)	Speed (Knot)
JINHUI NO.6	1198	62.82	12.24	7.25	2206	14
JINHUI NO.3	995	56.64	12.20	7.20	2086	14

Tab.2 Operating activities of JINHUI NO.6 and No.3 (Oct,2006-Feb.2007)

Trip no.	Vessel's Name	date	Number of Sets	Fishing area
1	JINHUI NO.6	06.10.23-06.11.18	35	146°00′E-160°00′E 04°00′N-05°00′S
2	JINHUI NO.3	06.11.17-06.12.09	11	
3	JINHUI NO.6	07.01.26-07.02.20	50	

Note: between Dec 09, 2006 and Jan 26 2006, JINHUI NO.6 and JINHUI NO.3 was at Philippine for repair

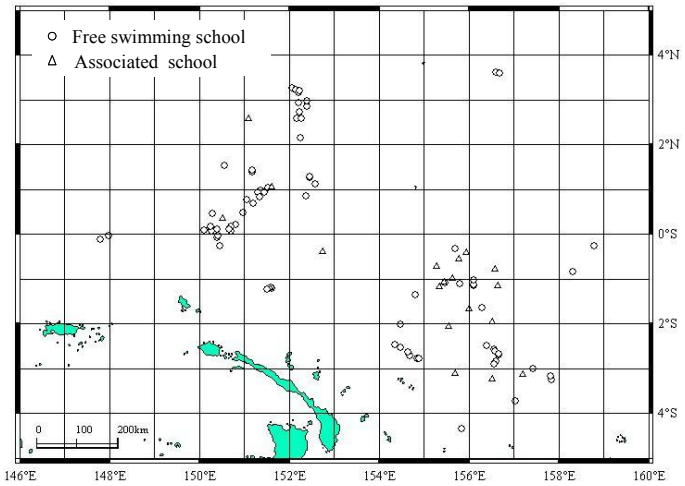


Fig.1 Position of sets

3 Searching for fish school

The purse seiners search for fish school through identifying floating logs and locating free

swimming school by using telescope and sea-bird radar. Tuna purse seiner starts to search for fish school after the vessel left the port. Once the floating log is found, echo sounder and 360°sonar was used to detect the amount of the fish school before determining if it is necessary to attach a pre-made netting to the floating log or not. If a potential floating log is found, the fishing vessel usually attached a 30m long rectangular-shaped netting and buoy to the log, made the floating log a FAD (we define the fish school attracted by this type of FAD a associated school). Every morning, fishing vessel checkes the FAD/FADs she made the last day or a few days ago one by one, and determine if to set net or retrieve the netting and buoy. In usual, the log is abandon after one set. When FAD supplies a good catch, the netting and buoy will be kept to the log for next set.

The positions of the free swimming and the associated school which were found during our observer mission are showed in Figure 2. Between Oct.24.2006 to Nov.17.2006, the fishing vessel had detected 30 free schools and 23 associated schools, and made 30 sets for free school and 5sets for associated schools. Between Jan.26.2007 and Feb.20.2007, the vessel had detected 67 free schools and 9 associated schools, and made 46 sets for free school and 4 sets for associated school.

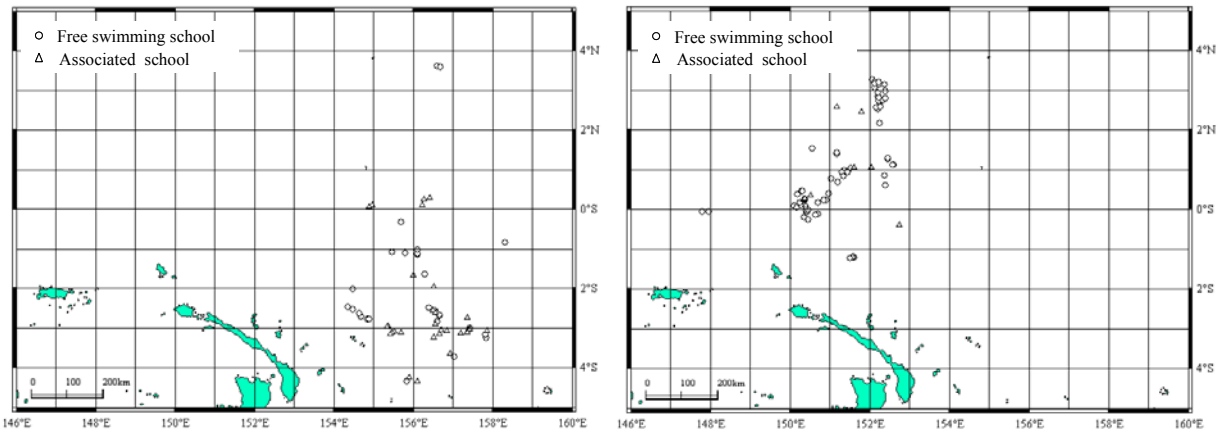


Fig.2 Distribution of fish schools

a (left). Oct.24.2006 - Nov.17.2006 b (right). Jan.26- Feb 20 2007

4 Catch data

Between Oct 23 2006 and Feb 22 2007, total fishing effort (operation days + searching days) was 63 days. A total number of 96 sets have done during the time period, among which free school sets and associated school sets are 78 and 18 respectively, accounting for 81.2% and 19.8% of total sets made.

For the free schools sets, 46 out of the 78 sets were empty, accounting for 58.9% of total sets; for the associated sets, 1 out of 18 sets was empty, accounting for 5.6% of total associated set, see table.2

Total catch was 2107 mt, with 1894mt of skipjack which accounted for nearly 90% of the total catch, yellowfin and bigeye accounted for 9.5% (200mt) and 0.6%(13mt) of the total catch respectively. Catch per fishing day (operation days and searching days) was 33.5t. CPUE was 17.8t/set and 35.8t/set for free swimming school and associated school respectively (include empty sets), with the CPUE of 5-20t/set dominated (Table.2, Figure 3, Figure 4).

Tab.2 sets, catch and CPUE during the observation time unit：mt

School type	sets			catch				CPUE		
	total	Empty	Sets/day	total	SKY	YFT	BET	Catch/day	Catch/set[1]	Catch/set[2]
total	96	47	1.52	2107	1894	200	13	33.4	21.9	42.9
Free	78	46		1462	1320	135	7	----	18.7	45.6
Associated	18	1		645	574	65	6	----	35.8	37.9

Note: Catch/set[1]，sets including empty sets；Catch/set[2]，sets not including empty sets.

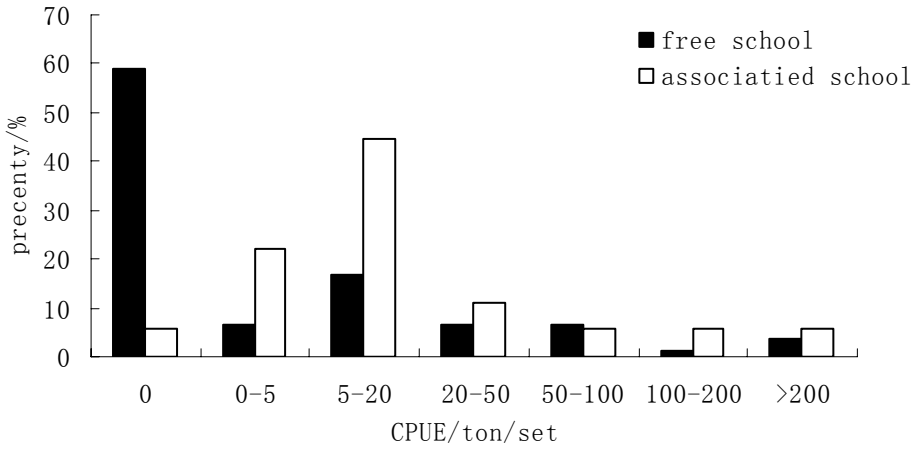


Fig.3 Frequency distribution of CPUE

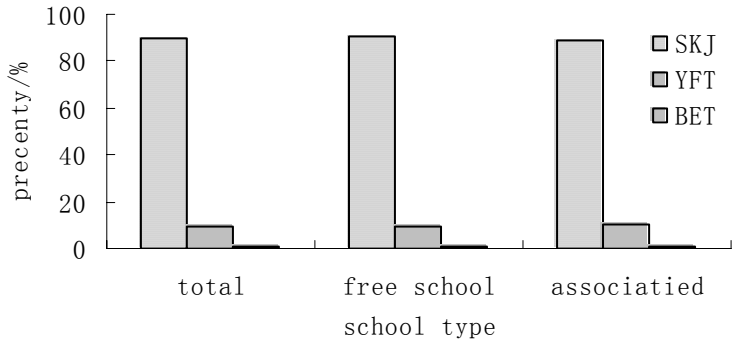


Fig.4 Catch composition for different school type

5 Biological feature of main targeting species

5.1 FL distribution of main targeting species

A total number of 1,838 skipjack was sampled when working onboard fishing vessel between Oct 23 2006 and Feb 22 2007. The fork length range of the sampled skipjack is from 264mm to 728mm, with mean fork length of 477.6mm, dominant size class 401-600mm (Figure 5).

A total number of 286 yellowfin tuna were sampled during the mission. The fork length of the sampled fish ranged from 246mm to 1697mm, with the dominant size class 301-500mm (Figure 6).

For skipjack, the average size of the free school was 513.2mm in fork length and 3045.7g in round weight respectively, with the dominant fork length size class 450-600mm; and that of the associated school was 420.9mm and 1636.5g respectively, with the dominant size class 300-450mm (Figure 7, Figure 8).

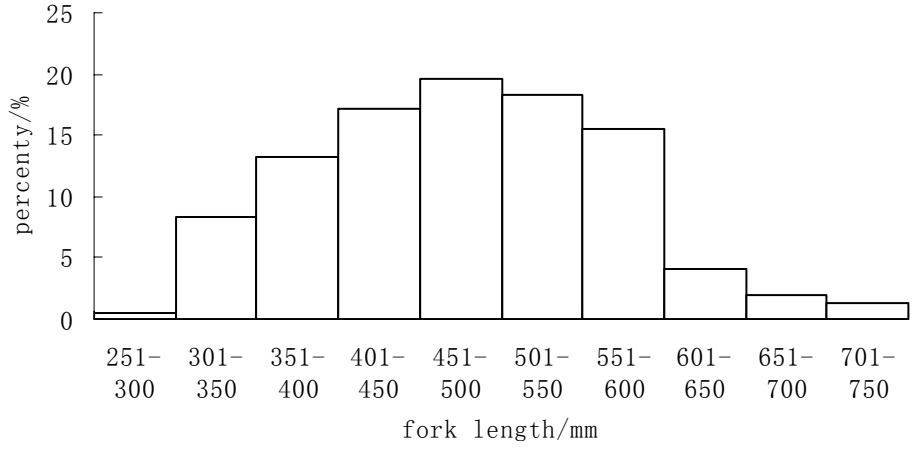


Fig.5 Length frequency distribution of skipjack

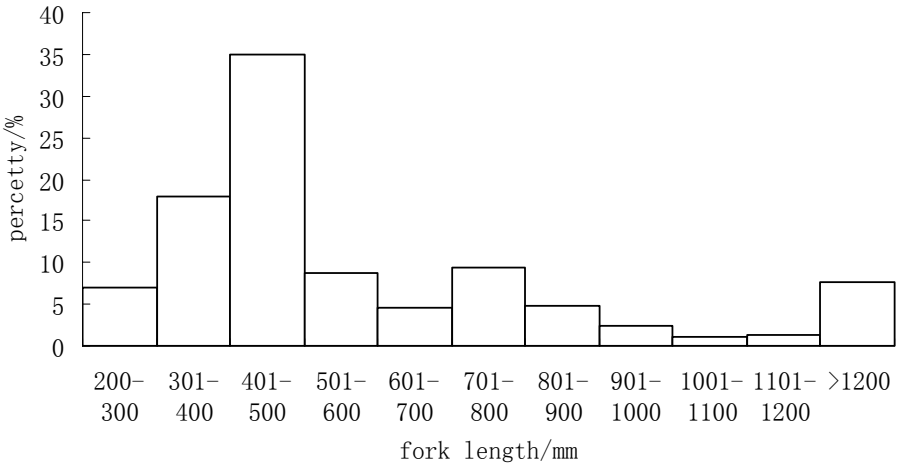


Fig.6 Length frequency distribution of yellowfin tuna

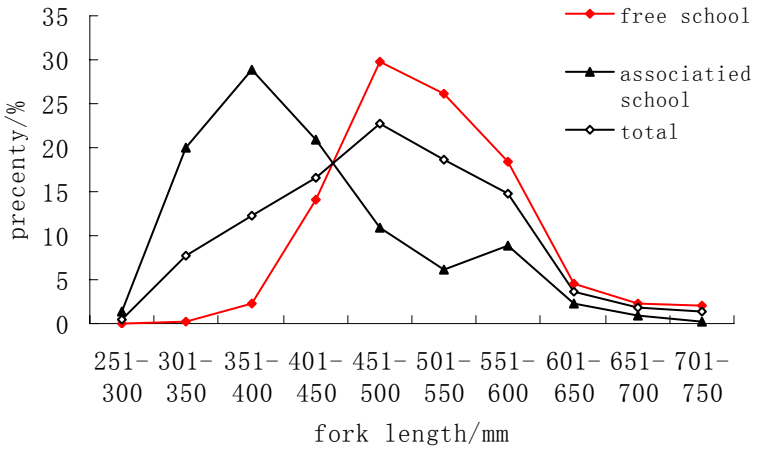


Fig.7 Length frequency distribution of skipjack for different school

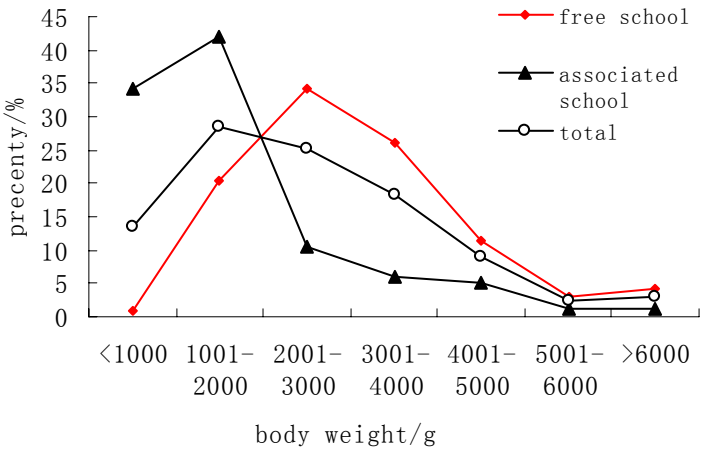


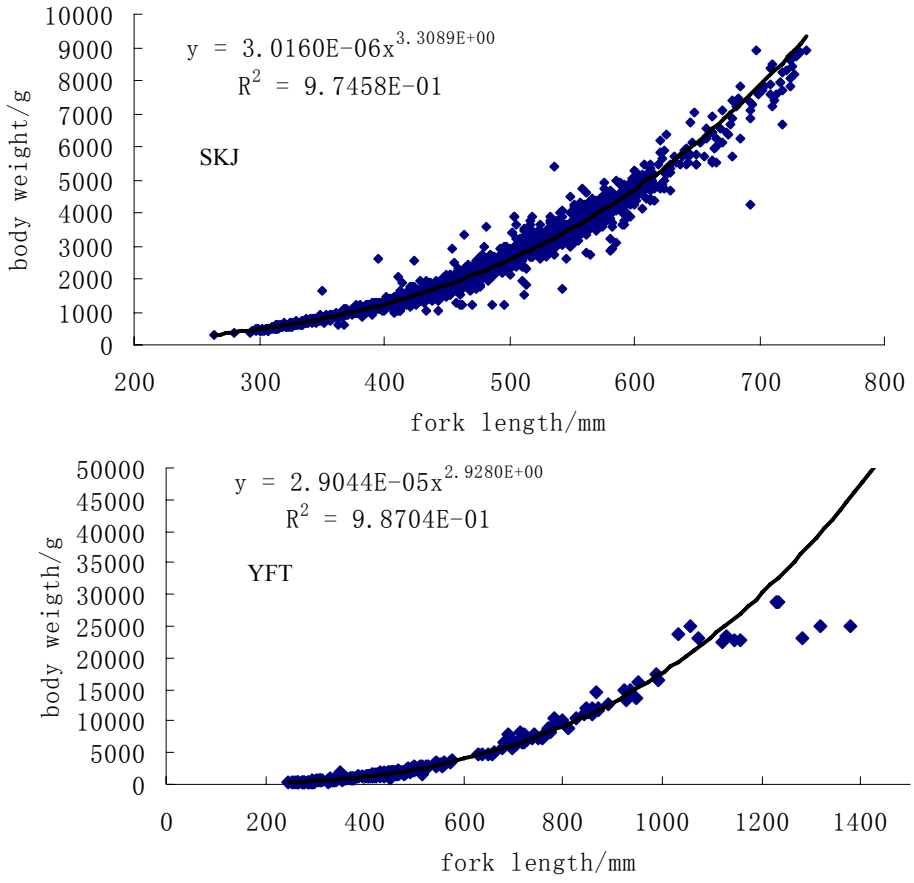
Fig.8 Round weight distribution of skipjack for different school

5.2 W-L relationship main targeting species

The fork length-weight relationship was evaluated for skipjack, yellowfin tuna and bigeye tuna respectively. The calculated parameters of fork length-weight relationships were presented in table 3 ,figure 9.

Tab.3 Regression parameters ($W=aL^b$) between fork length (mm) and round weight (g) for skipjack, yellowfin tuna and bigeye tuna

species	Sex	a	b	n (number)	R^2
	females	1.7085E-06	3.4036	619	0.9746
Skipjack	males	2.7157E-06	3.3283	491	0.9442
	mixed	3.0160E-06	3.3089	1839	0.9746
Yellow fin	mixed	3.8467E-05	2.8836	267	0.9835
Bigeye	mixed	3.1368E-05	2.9226	40	0.9272



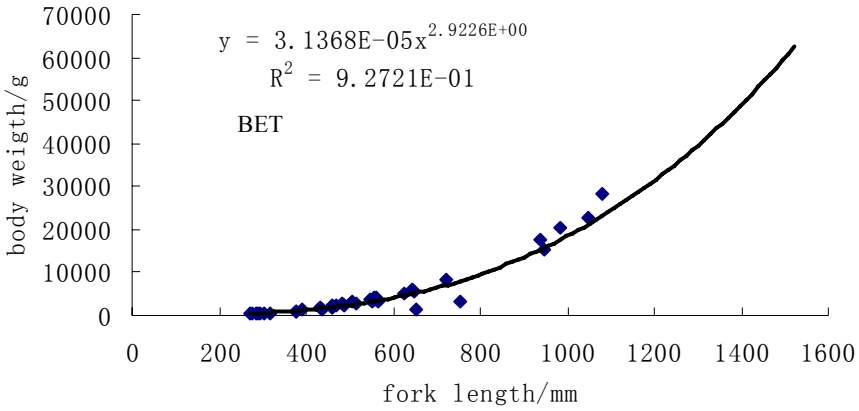


Fig.9 Weight-length relationship for SKJ, YFT, BET

6 Determining an associated school by fish image on echo sounder

Modern electronic fish founder has played an important role in detecting fish school. The amount and depth of the fish school aggregated below the FAD by reading the images of the fish schools displayed on the screen of echo sounder or sonar. The experienced fishing master even can identify the species of the fish aggregation.

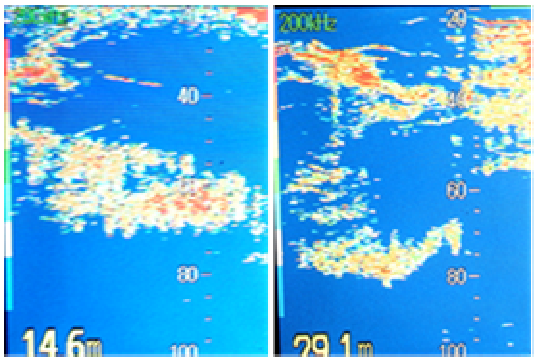
Figure 10 shows the some typical images of the logs associated fish school detected by echo sounder between NOV 28 and Dec 9,2006. Table 4 is the real catch harvested by the vessel each set. These images show that fish school aggregated below FAD usually occur at water layer between 20m to 100m. High density image at water layer between 60 and 100m usually indicates large amount of catch. Observation of the catch shows that small individual skipjack often occur at the depth between 40-80m, while big individual of skipjack, yellowfin and bigeye tuna occur in deeper waters.

Tab.4 the time and position of fish image on screen and its corresponding catch

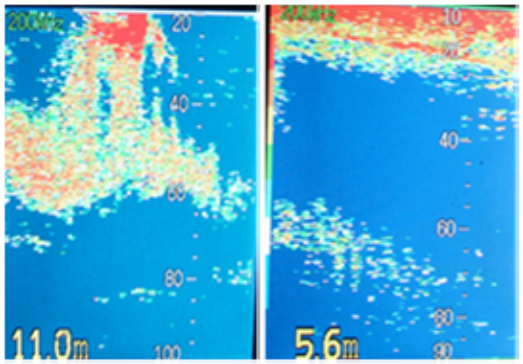
(Nov 11 2006 to Dec 9 2006)

date	time	position		Catch(t)			
		latitude	Longitude	total	skipjack	yellowfin	bigeye
2006.11.28	03：35：25	00°23.245′S	155°55.208′E	35	35	0	0
2006.11.29	03□57□00	00°31.573′S	155°45.612′E	20	15	5	0
2006.11.30	03：54：16	01°08.079′S	156°38.289′E	5	5	0	0
2006.12.06	04：23：02	00°57.485′S	155°36.985′E	115	100	10	5

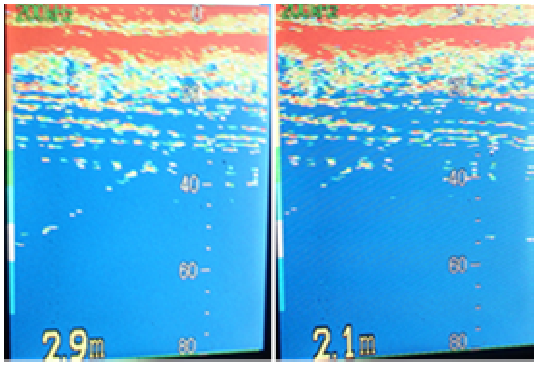
2006.12.08	03□04□00	01°32.315′S	155°33.764′E	No fishing
2006.12.09	04：30：51	02°01.560′S	155°32.729′E	>300(powerblock boom broken)



NOV.28.2006



NOV.29.2006



NOV.30.2006

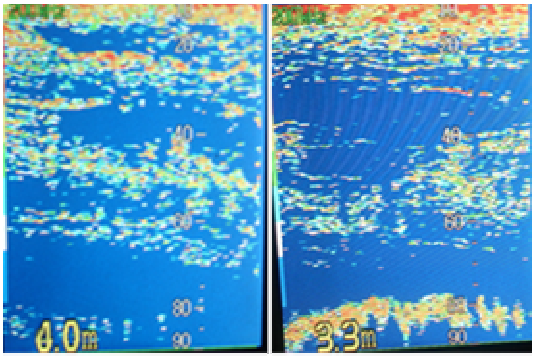


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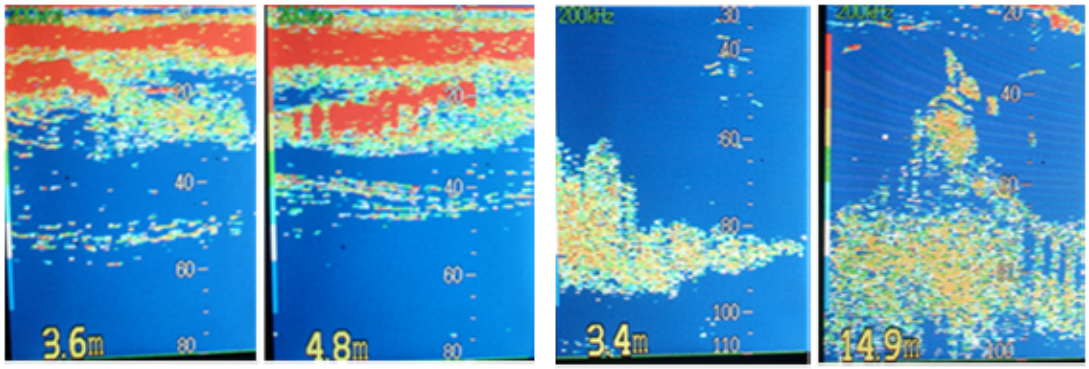
Fig.10 The image of associated school

7 Summary and discussion

Chinese tuna purse seine fleet has done more free school sets than the associated school sets in the Western and Central Pacific Ocean. Due to technical and experience reason, empty set rate reached 58% for free school, resulting lower CPUE(catch/set) when fishing free school than that for associated school. There is difference in fork length composition of skipjack between free school catch and associated school catch. Individual of free school catch is obviously bigger than that of the associated school catch. Catching which type of school will largely depend on the skill and favorite of the skipper. As usual, experienced skipper pays more attention to free school for the bigger fish, the other ways round, less experienced skipper mainly looks for associated school in order to reduce empty sets and labor force.

We should mention that 10% yellowfin tuna in the total catch in this paper is calculated based on logbook. In practice, small size yellowfin tuna was not sorted out from the catch and recorded separately in the logbook because of no difference in price between small size yellowfin and skipjack, consequently proportion of yellowfin tuna in the total catch is underestimated.



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