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Catch and depth distribution of pelagic fishes caught in a Chinese observer trip in the water of eastern Solomon Islands

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Abstract: To understand the depth distribution of longline fishing gear and pelagic fishes, TDRs were deployed during a longline observer trip from July 24th to November 20th, 2012 in the water of eastern Solomon Islands (06°50′–18°00′ S, 160°48′–173°08′E). Hook No. for most commonly captured species was recorded and their distribution was analyzed. Change in depth for longline gear was also recorded. The information in this report improves our understanding of loneline sinking and vertical distribution of pelagic species in this area.

1. Introduction

Many studies have been conducted to understand the depth of longline gear by practical methods (e.g., Mizuno et al., 1999; Yoshinori et al., 2006; Song et al., 2011) or theoretical calculations (e.g.,Wan et al., 2005; Bigelow et al., 2006; Song et al., 2011). However, few such studies were conducted in waters around Solomon Islands.

The purpose of this paper is to find out the vertical pattern of longline fishing gear targeting albacore tuna and vertical distribution of pelagic species around the water of Solomon Islands. The information in this report improves our understanding of loneline sinking and vertical distribution of pelagic species in this area, therefore, to help develop mitigation methods for bycatch species.

2. Data collection

Data were collected in a Chinese longline observer trip conducted around water of Solomon Islands between July 21 and November 20, 2012. The longline vessel operated was “Zhongshui 811” which targeted albacore (ALB) in this trip. A total of 98 sets were recorded by an onborard observer and TDRs were deployed during that period (Fig. 1). Hook No. for individuals captured was recorded.

The longline was configured with mainline 908 m, branchline 19 m, branchline interval 35 m, and floatline 25 m long. Setting was usually between 6:00 am and 12:30 pm. Hauling was mostly between 17:00 pm and 5:00 am. Three TDRs (TYPE LAT180-0843, LAT180-0852, and LAT180-0872) were deployed 40 times during the trip (Fig. 2). The TDR was tied at the connection point of mainline and branchline. Depth data was converted from water pressure data recorded by the TDR. Capture depth of individual fish was calculated as depth recorded by TDR plus branchline length, i.e., the shoaling effect was neglected.

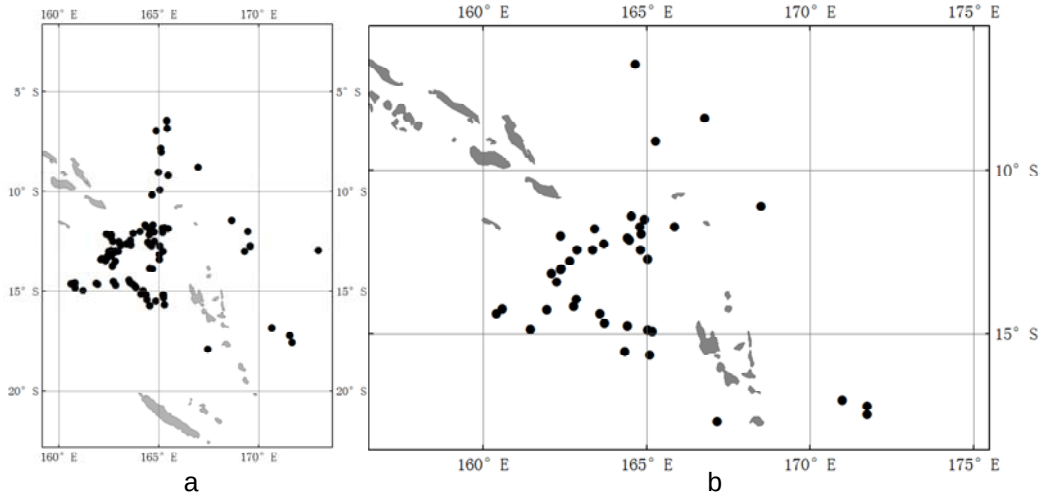

Fig.1 Distribution of 98 observation sites (Panel a) and 40 TDR deployed sites (panel b) in the eastern Solomon Islands.

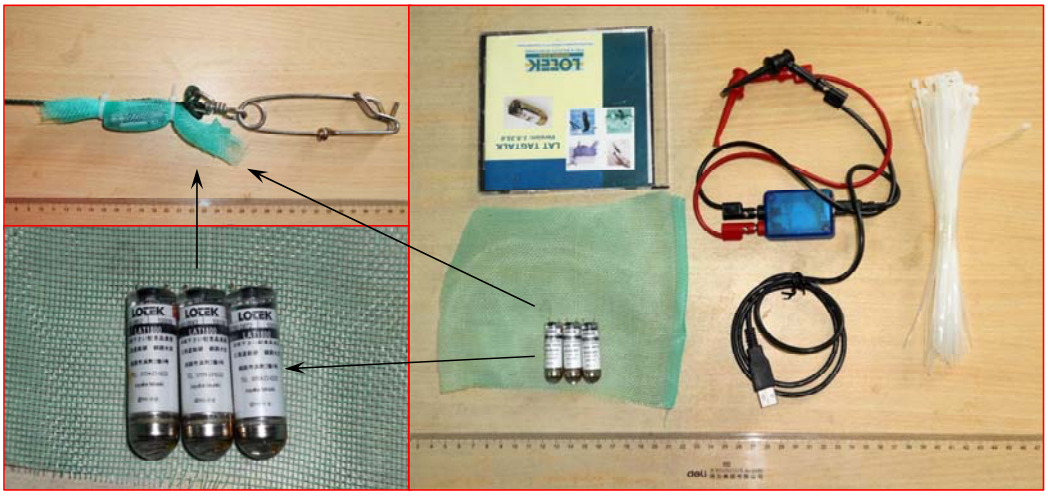

Fig. 2 TDRs and their associated equipments used in the observer trip

3. Results

3.1 Catch statistics

A total of 44 species (9911 individuals) were recorded during the observer trip. Thirteen species were identified as dominant species, which accounted for 96.6% of the total catch (Table 1). 1153 individuals were observed with hook No. recorded.

Table 1 Total catch of 13 dominated species and their number of hook No. available

Species	Scientific name	Code	Catch (number)	Hook No. recorded	Percentage (%)
Albacore tuna	*Thunnus alalunga*	ALB	5442	213	3.9
Yellowfin tuna	*Thunnus albacares*	YFT	844	126	14.9
Bigeye tuna	*Thunnus abesus*	BET	292	46	15.8
Skipjack tuna	*Katsuwonus pelamis*	SKJ	293	44	15.0
Wahoo	*Acanthocybium solandri*	WAH	636	99	15.6
Escolar	*Lepidocybium flavobrunneum*	LEC	978	135	13.8
Common dolphinfish	*Coryphaena hippurus*	DOL	140	140	100
Pelagic stingray	*Dasyatis violacea*	PLS	174	44	25.3
Opah	*Lampris guttatus*	LAG	47	47	100
Great barracuda	*Sphyraena barracuda*	GBA	119	119	100
Longnose lancetfish	*Alepisaurus ferox*	ALX	451	79	17.5
Slender mola	*Ranzania laevis*	RZV	75	40	53.3
Blue marlin	*Makaira nigricans*	BUM	79	21	26.6

3.2 Percentage of catch by hook No.

Percentages of catch by hook No. for common species were listed in Table 2. It was shown that 62.7% of individuals of ALB were caught on hooks No. 5–9 (Depths range from 194.6–242.1 m, nearly 50% was captured on depth near 200 m). 67% of individuals of YFT were captured on hooks No.4–7 (155–208 m, most in 155–194 m). 61% of individuals of BET were captured on hooks No.6–9 (199–242 m, most in 209–242 m). Skipjack was rarely caught by hook deeper than No. 7, and most of the individuals (88%) were captured on hooks No.2–5 (109–194.6 m, most in 155-195 m). 87% of individuals of wahoo were captured on hooks No.1–5 (75.7–194.6 m, most in 109–155 m). Escolar shows similar percentage with YFT. 96.4% of individuals of dolphinfish and 99.2% of great barracuda were captured on hook No.1 (75.7m), indicating that these two species tended to stay near sea surface.

The high catch rate of albacore tuna occurred in depth 170-220 m and temperature around 21□. Dolphinfish was mostly captured on brachline No. 1. A high catch rate was also observed for wahoo in water shallower than 150 m. Yellowfin tuna, skipjack, and escolar were mostly captured in depth around 180-200 m; while bigeye tuna and blue marlin were mainly captured in depth at 210-260 m.

Table 2 Depth distribution by hook No. for 12 commonly captured species

Species	Percentage of catch on different hook No. (%)												
codes	1	2	3	4	5	6	7	8	9	10	11	12	13
ALB	2.3	3.8	4.7	5.6	**18.8**	14.6	12.7	12.7	8.9	5.6	4.2	3.3	2.8
YFT	0	5.6	9.5	**23.0**	22.2	13.5	8.7	7.1	4.8	2.4	1.6	1.6	0
BET	0	0	4.3	6.5	6.5	8.7	13.0	15.2	**23.9**	6.5	4.3	4.3	6.5
WAH	14.1	**33.3**	18.2	13.1	9.1	5.1	2.0	2.0	0	1.0	1.0	0	0
LEC	2.2	5.2	14.1	20.7	18.5	**26.7**	8.1	3.0	1.5	0	0	0	0
ALX	0	0	2.5	1.3	11.4	21.5	**26.6**	16.5	10.1	3.8	2.5	2.5	1.3
DOL	**96.4**	2.1	0.7	0.7	0	0	0	0	0	0	0	0	0
GBA	**99.2**	0.8	0	0	0	0	0	0	0	0	0	0	0
SKJ	4.5	9.1	13.6	25.0	**40.9**	6.8	0	0	0	0	0	0	0
BUM	0	0	0	0	0	4.8	14.3	**38.1**	33.3	9.5	0.0	0.0	0.0
RZV	0.0	7.5	30.0	**42.5**	17.5	2.5	0	0	0	0	0	0	0
PLS	2.3	15.9	**40.9**	25.0	11.4	4.5	0	0	0	0	0	0	0
LAG	0	0	0	0	0	0	0	0	2.1	2.1	19.2	31.9	**44.7**

3.3 Depth of mainline and hooks

The hook depths and temperatures recorded by TDRs attached on the mainline were shown in Table 3.

Table 3 The depths of hooks on mainline (hook depth = TDR depth + brachline length)

Hook No.	Number of Samples	Recorded depth /m		Recorded T /□		Hook depth /m
		Average	SD	Average	SD	
1	6	56.65	2.67	24.06	0.19	75.65
2	4	90.30	2.47	23.87	0.12	109.3
3	5	107.49	5.76	23.47	0.60	126.49
4	5	136.20	24.99	23.12	0.74	155.2
5	5	175.58	15.58	21.71	0.73	194.58
6	5	179.88	29.03	21.68	1.26	198.88
7	6	189.91	18.43	21.34	1.19	208.91
8	6	199.62	15.28	21.17	0.36	218.62
9	6	223.13	7.75	20.45	0.72	242.13
10	3	242.21	18.69	20.00	0.38	261.21
11	6	249.95	5.78	20.30	1.09	268.95
12	9	258.66	11.42	19.67	1.40	277.66
13	24	267.63	18.37	19.60	0.84	286.63

3.4 Depth variation of mainline under different sea conditions

The TDR records showed that the mainline sinking was impacted by sea surface conditions which represented by wave height. Figures 3-7 showed the pattern of hook depth changed with different wave height. Higher wave height increased the time needed for mainline sinking.

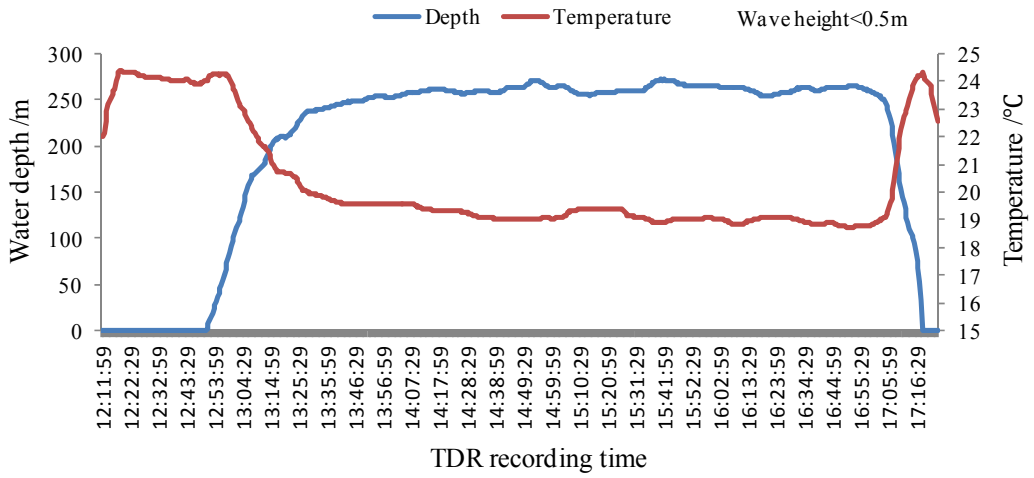

Fig.3 Variation of depth and temperature recorded by TDR attached on mainline with branchline No. 11

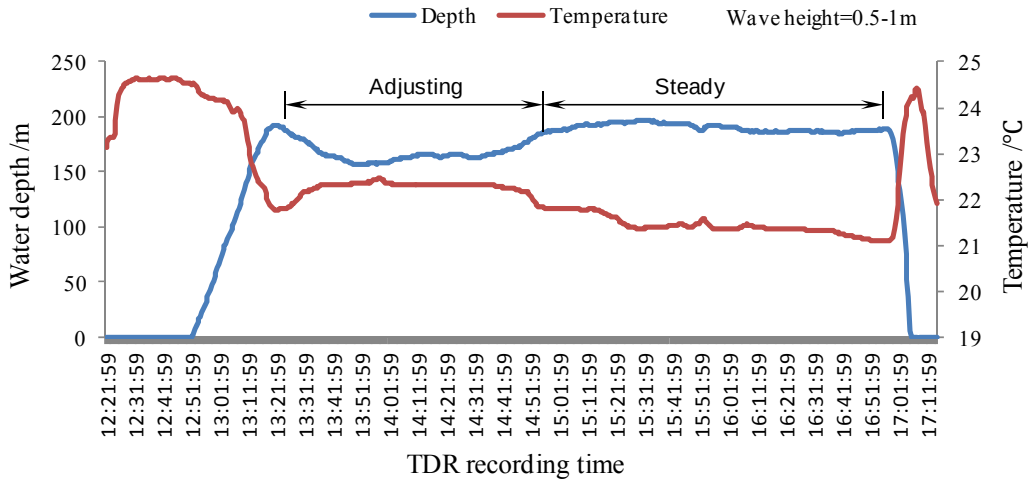

Fig.4 Variation of depth and temperature recorded by TDR attached on mainline with branchline No. 9

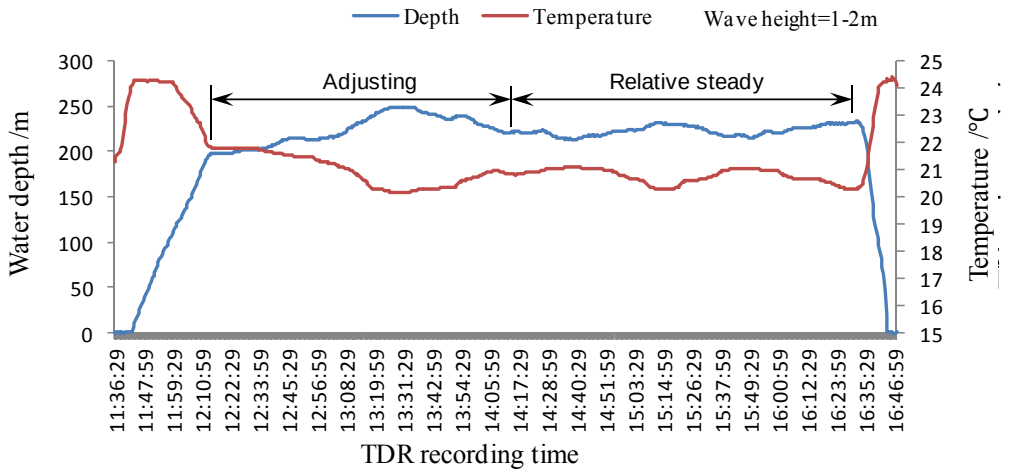

Fig.5 Variation of depth and temperature recorded by TDR attached on mainline with branchline No. 13

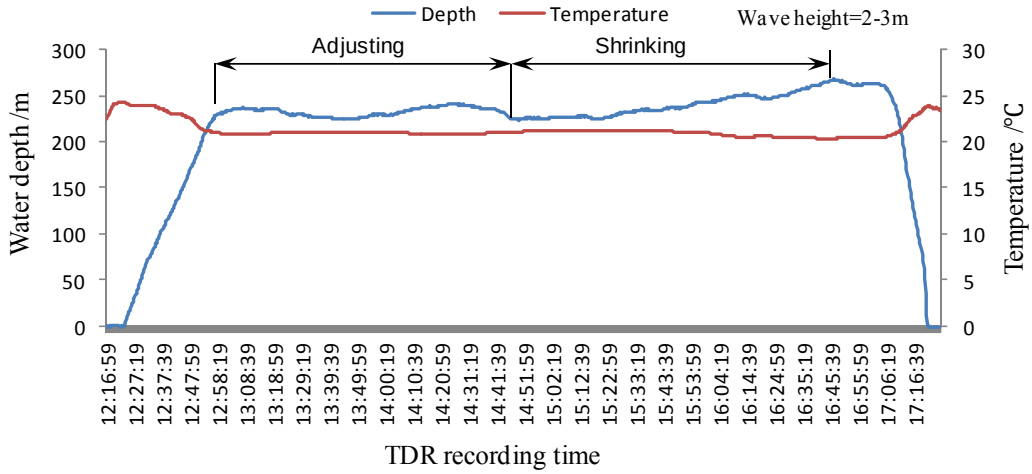

Fig.6 Variation of depth and temperature recorded by TDR attached on mainline with branchline No. 13

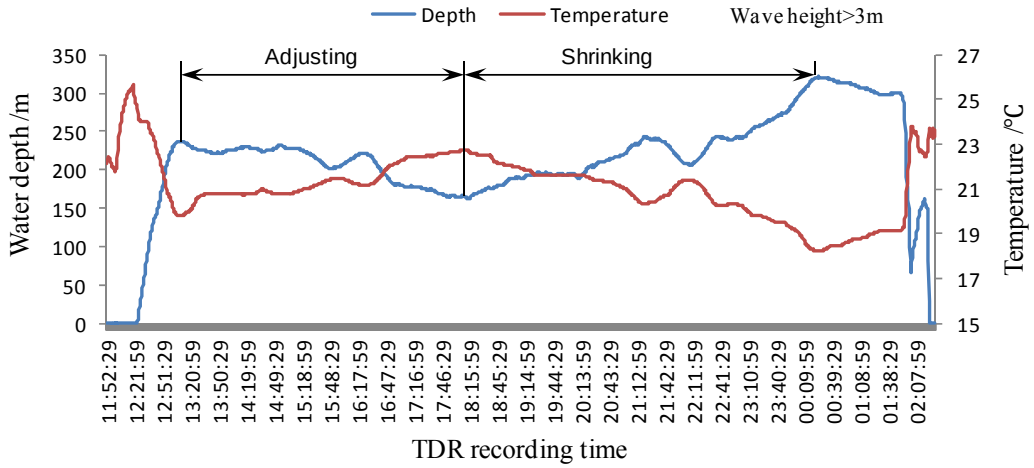

Fig.7 Variation of depth and temperature recorded by TDR attached on mainline with branchline No. 11

3.5 Depth variation after fish were caught

There was one set in which one yellowfin tuna was captured on the branchline with TDR attached (Fig. 8). There was another set in which an albacore and an escolar were captured on the branchline with TDR attached on the adjacent branchline (Fig. 9). Hook depth changed sharply when the fish bit.

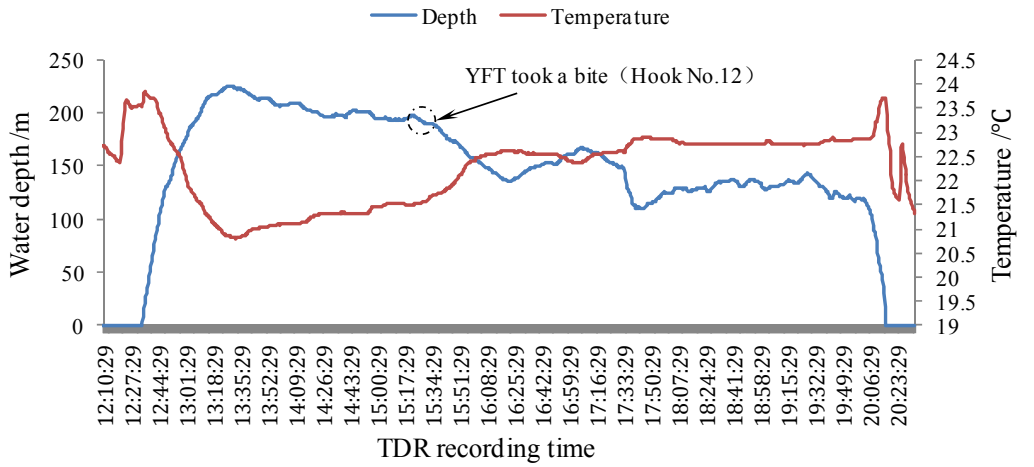

Fig.8 Depth variation after yellowfin tuna took a bite of hook No.12

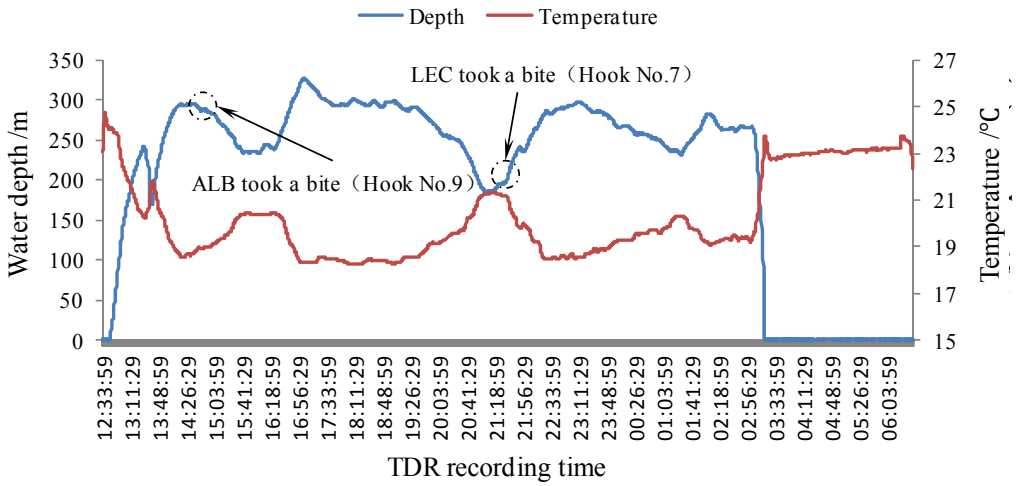

Fig.9 Depth variation after albacore tuna and escolar took a bite of hook No.10

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