Southeast Asian Fisheries Development Center

Training Department

CRUISE REPORT ON RESEARCH ACTIVITY

M.V.SEAFDEC 1 Cruise No. 81-3/2010

20 – 26 December 2010

Fixed Fish Aggregating Device experiment in Andaman Sea

TD/RP/146

This report is base on preliminary data

For readers who may need data in the report, please contact to:

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Cruise Report for Research Activities

1. Cruise Summary

Vessel name: M.V.SEAFDEC
Cruise no.: 81-3/2010 **Leg:** 2
Duration: 20-26 December 2010
Project Title: Experiment on setting " Fixed FAD(Fish Aggregating Device)" in Andaman Sea for creating new fishing ground
Covered water: Andaman Sea
Port of call: Phuket
Objective:

1. to monitor fixed FAD that were deploy in 2008
2. to deploy two set of deep sea fixed FAD at depth 500 m in Andaman Sea
3. to collect environmental and fishery resource data/information prior deploy new fixed FAD

2. Lists of personals on board

SEAFDEC Researchers

No.	Position	Name	E-mail address
1	Chief scientist	Mr. Isara Chanrachkij	isara@seafdec.org
2	Fishing gear technologist	Mr. Sayan Promjinda	sayan@seafdec.org
3	Assistant Fishing gear technologist	Mr. Komson Poufa	-
4	Oceanographer	Ms. Penchan Longmanee	penchan@seafdec.org
5	Oceanographer	Dr. Natinee Sukramongkol	natinee@seafdec.org
6	Oceanographer	Mr. Sukchai Arnupapboon	sukchai@seafdec.org
7	Assistant oceanographer	Mr. Yuttapong Pongaksorn	Walailuk University student
8	Assistant oceanographer	Mr. Phanuphong Phutthasi	Walailuk University student
9	Observer	Dr. Chumnarn Pongsri	sg@seafdec.org

Deep sea fishery technology research and development institute researchers

No.	Position	Name
1	Senior fishery researcher	Mr. LT.Phithak Chaidee
2	Fishery researcher	Mr. Pittanet U-tat
3	Fishery researcher	Mr. Watcharapong Chumchurn
4	Fishery researcher	Mr. Prasit Luesrithavornsin

Ship personals

No.	Position	Name
1	Captain	Mr. Sonchai Bumrasarinpai
2	Chief Officer	Mr. Nobphadol Somjit
3	Second Officer	Mr. Anurak Loog-on
4	Third Officer	Mr. Aussawin Buachuay
5	Chief Engineer	Mr. Montien Paewsakul
6	Second Engineer	Mr. Theerawat Paiwal
7	Third Engineer	Mr. Kttinai Sukdit
8	Assistant researcher	Mr. Chainarong Chaopaknam
9	Assistant researcher	Mr. Somyos Pronprasert
10	Boatswain	Mr. Vanich Chaopaknam
11	Steersman	Mr. Somkiat Phetrasatien
12	Steersman	Mr. Yuttachai How-harn
13	Steersman	Mr. Jaroon Po-U
14	Able Seaman	Mr. Woraphat Soodkangwan
15	Fitter	Mr. Nuttapong Chaitanavisut
16	Oiler	Mr. Dum Tanyacharoen
17	Oiler	Mr. Watchara Panasri
18	Oiler	Mr. Huttachai Chuypanit
19	Cook	Mr. Veeraphon Vorakun
20	Assistant Cook	Mr. Saichol Kornnoom
21	Ship boy	Mr. Marut Sangpuek

3. Activity time table

Date/Time	Time	Particulars
20 Dec 2010	09:15-11:30	Ship orientation , activity discussion and assignment
	19:00	Leave from Phuket Marine Biological Center (PMBC) port
21 Dec 2010	08:00	Arrive station no. 1 (SEAFDEC fixed FAD2008)
	08:05-08:35	Flow meter calibration
	09:00-09:55	Oceanographic survey by CTD cast
	11:00-14:10	Larvae survey by Neuston net and pelagic fish survey by trolling line
	15:15-15:45	Shooting drifting vertical line (Op#1)
	17:45-19:54	Shooting pelagic longline (Op#1)
	21:30-23:30	Handline squid jigging (Op#1)
22 Dec 2010	07:30-09:25	Hauling drifting vertical line (Op#1)
	10:50-13:25	Hauling pelagic longline (Op#1)
	15:45	Arrive station no. 2 (DOF fixed FAD2008)
	15:55-16:25	Oceanographic survey by CTD cast
	16:45-20:15	Larvae survey by Neuston net and pelagic fish survey by trolling line
23 Dec 2010	05:30	Arrive station no. 4 (location for deploying type 1 FAD)
	05:40-06:15	Oceanographic survey by CTD cast
	06:30-10:20	Larvae survey by Neuston net and pelagic fish survey by trolling line
	11:20	Arrive station no.3 (reference location)
	11:25-11:55	Oceanographic survey by CTD cast
	12:30-15:55	Larvae survey by Neuston net and pelagic fish survey by trolling line
	16:05-16:25	Shooting drifting vertical line (Op # 2)
	17:45-18:55	Shooting pelagic longline (Op # 2)
	20:10-23:45	Handline squid jigging (Op # 2)
24 Dec 2010	06:35-08:25	Hauling pelagic longline (Op # 2)
	09:35-10:35	Hauling drifting vertical line (Op # 2)
	11:45	Arrive station no.5 (location for deploying type2 FAD)
	11:45-12:15	Oceanographic survey by CTD cast
	12:25-16:15	Larvae survey by Neuston net and pelagic fish survey by trolling line
	16:30-16:50	Shooting drifting vertical line (Op # 3)
	17:50-19:00	Shooting pelagic longline (Op # 3)
	20:20-23:00	Handline squid jigging (Op # 3)
25 Dec 2010	07:00-08:00	Hauling drifting vertical line (Op # 3)
	09:10-11:25	Hauling pelagic longline (Op # 3)
	13:20-13:30	Deploy SEAFDEC fixed FAD , bullet type at station no. 5
	15:20-15:30	Deploy SEAFDEC fixed FAD , float line type at station no. 4
	16:05-16:26	Shooting drifting vertical line (Op # 4)
	20:20-23:00	Handline squid jigging (Op #4)
26 Dec 2010	06:50-07:50	Hauling drifting vertical line (Op #4)

4. Observation summary

4.1 Station

Objectives of this survey are to monitor two fixed FAD that were deployed in 2008 at depth about 1000 m. and to collect environmental and fishery resource information prior deploy two set of fixed FAD at depth 500 m in Andaman Sea. Five survey stations were conducted; two stations at the 2008 set FAD, two stations at the new deploy location and one station at the reference station. The new deployed FAD locations at about 500 meter depth are base on result of discussion among related researcher (35 persons) from Department of Fishery, Fish Market Organization, Private sector and SEAFDEC at SEAFDEC/TD on Tuna Fishery Development in Andaman Sea during 9-10 February 2010 (http://map.seafdec.org/FixedFADs/milestone6.php). Result of deployed fixed FAD in 2008 show that they can aggregate tuna. However, the locations are quite far for Thai Fisherman. The meeting suggests to deploy fixed FAD at the most nearest coastal area to aggregate tuna. Therefore 500 meter depth in Andaman sea was location to experiment the potential of fixed FAD to aggregate tuna. Figure 1 show location of five survey station.

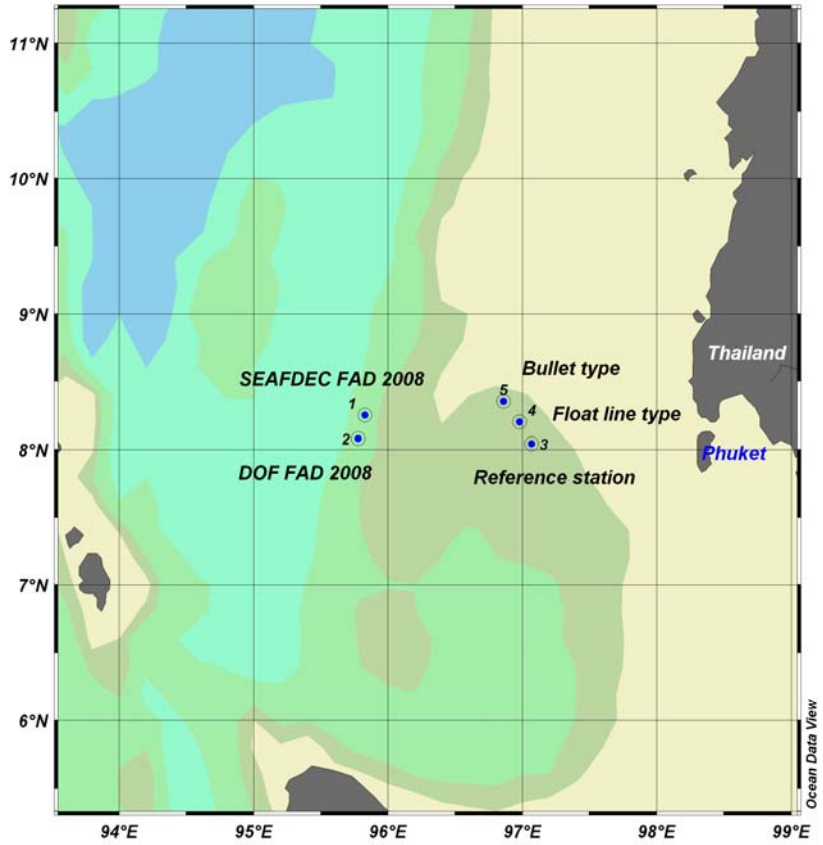

Fig.1 Location of survey area and position of deployed Fish Aggregating Device (FAD)

4.2 Physical and chemical parameter

FSI Integrated Conductivity, Temperature and Depth Profiler system (ICTD) model P/N 8001 (Fig. 2) and DT-2000 Desk unit were operated to obtain water temperature and conductivity in each water depth. The real-time data were acquired from CTD system and process by using the Acq2000 software. Raw data were averaged to one meter interval. There

are twelve Niskin water sample bottles attached with the CTD system to collect water sample from twelve standard depths (surface to 500 meter). Water sample were collected to determine pH, dissolve oxygen and nutrient at onboard laboratory as fast as possible.

pH were measured by Accument 1002 handheld pH/mV/ion meter. Dissolved oxygen (DO) was determined by Wrinkle procedure (Strickland and Parsons,1972). At each sample depth, three replication of water sample were collected to determine concentration of dissolved nitrite, nitrate, phosphate and silicate follow Strickland and Parsons,1972. Results of water sample analysis are appeared in Annex I. Table 1 is summary information of CTD cast.

Table 1 Summary of CTD cast.

St.	Date	Time	Lat	Long	Bottom depth (m)	Water sample depth (m)	Thermocline depth (m)	Remarks
1	21-Dec-10	9:57	08_15.19 N	095_49.52 E	891	0, 10, 20, 30, 50, 75, 100, 125, 200, 230, 300, 500	50-200	at SEAFDEC FAD 2008
2	22-Dec-10	15:57	08_04.63 N	095_46.62 E	876	0, 10, 20, 30, 50, 75, 100, 142, 200, 250, 300, 500	85-260	at DOF FAD 2008
4	23-Dec-10	5:45	08_11.75 N	096_58.87 E	500	0, 10, 20, 30, 50, 75, 100, 125, 200, 300, 450, 450	20-250	survey location for new deploy (Float line type)
3	23-Dec-10	11:24	08_02.13 N	097_04.49 E	516	0, 10, 20, 30, 50, 75, 100, 125, 200, 250, 300, 450	45-206	survey location for reference point
5	24-Dec-10	11:43	08_21.04 N	096_51.71 E	498	0, 10, 20, 30, 50, 75, 100, 125, 200, 250, 300, 450	40-250	survey location for new deploy (Bullet type)
5.1	24-Dec-10	16:09	08_20.88 N	096_51.82 E	495	50, 60, 70, 80, 90, 100	-	for checking peak of nitrite concentration

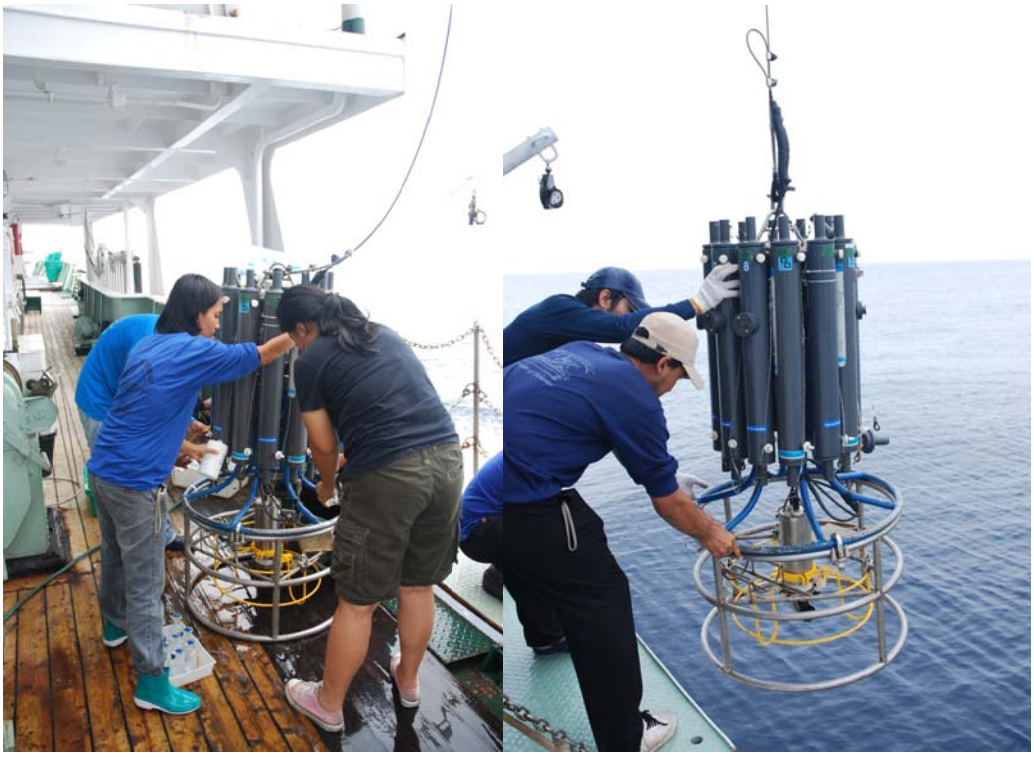

Fig.2 Conductivity Temperature and Depth Profiler system equipped with water sampler

4.3 Biological parameter

4.3.1 Fish larvae

In order to study the effective of FAD to aggregate low trophic level organism including zooplankton, larvae and juvenile fish, the Neuston net ; square shape frame (100 cm. x 70 cm.) attached with 1000 µm mesh size net and 75 cm long (Fig 3) was trawled at surface against current direction follow track in figure 4. Each trawl is taken about 7 to 10 minute with 2 knot trawling speed. Total distance of each station is nine nautical mile. There are about 17 to 21 sub stations of Neuston net trawl in each survey station. Details of the Neuston net operation and flow meter calibration are appeared in Annex II. Sample were preserve in 10 % formalin in sea water buffered with sodium borate. Result will later calculate for abundance then plot versus distance from FAD.

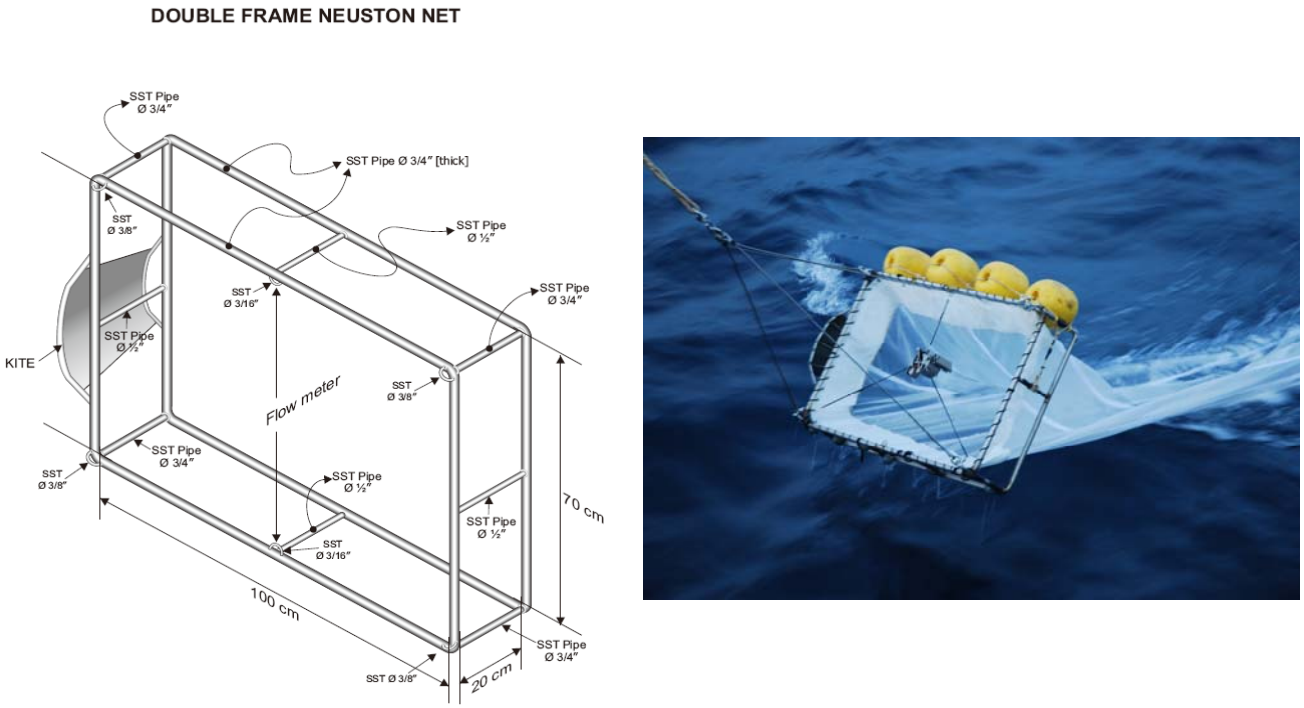

Fig. 3 Double frame Neuston net

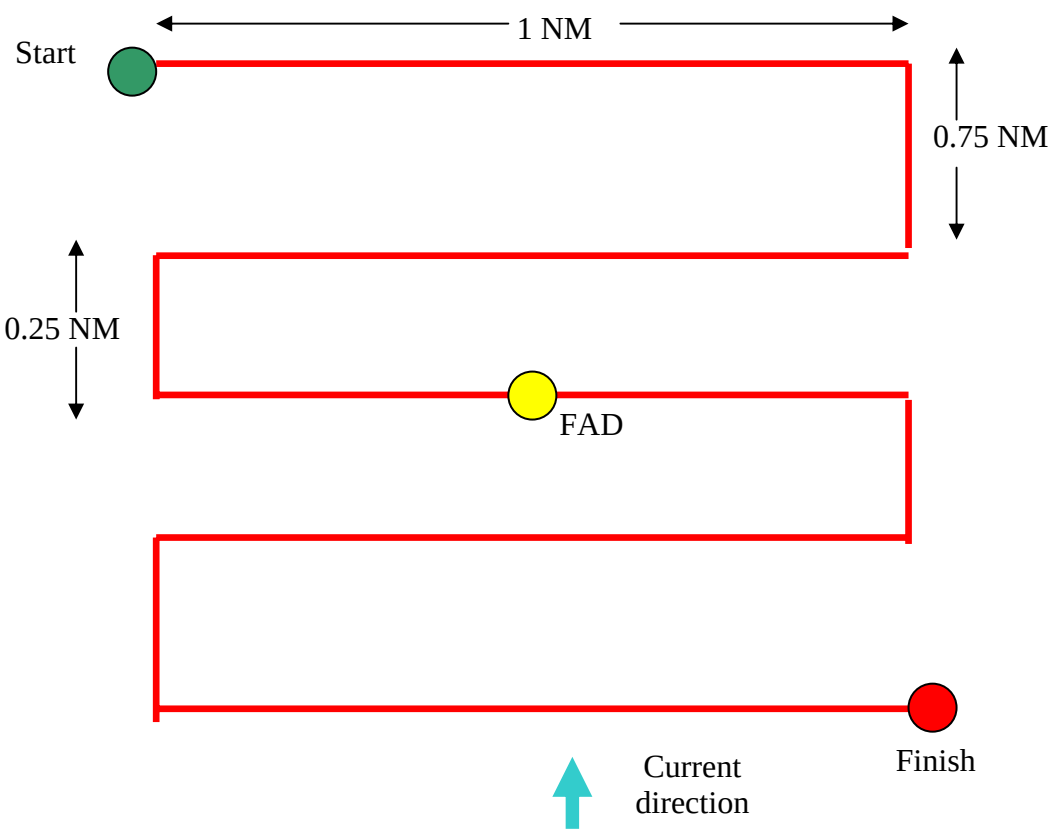

Fig. 4 Route and direction of Neuston trawl

4.3.2 Pelagic fish survey by trolling line

Along Neuston trawl, five trolling line (Fig. 6) were operate at the stern deck to study abundance of pelagic fish around FAD. Four *Thunnus albacares* (Yellowfin tuna) were caught at station no. 2 (DOF FAD 2008). There average size is 1.8 kg (Fig.5). Partial detail of trolling line operation is appear in table no.2.Fishing logsheets are in Annex III

Fig.5 Yellow fin tuna from trolling line at operation no.2

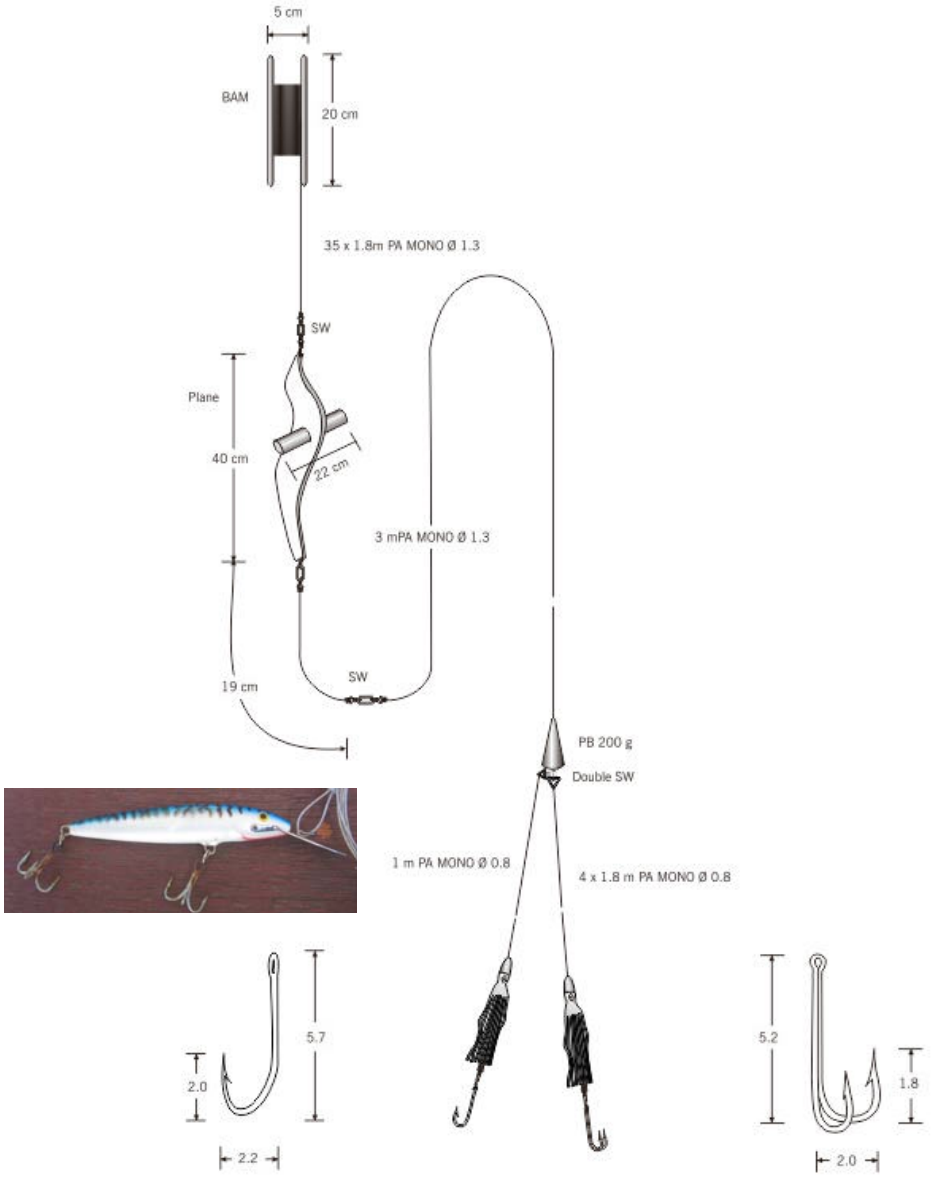

Fig.6 Schematic diagram of trolling line

Table 2. Partial detail of trolling line

Op. no.	St. no.	Start			Finish			No. of catch	Total weight (kg)	Average weight (kg)
		Lat.(N)	Long.(E)	Time	Lat.(N)	Long.(E)	Time			
1	1	08°14.6	95°50.5	11:00	08°15.5	95°48.4	15:45	Non	0	0
2	2	08°05.3	95°47.8	16:13	08°04.1	95°45.0	20:15	4	7.05	1.8
3	4	08°12.1	96°59.7	06:32	08°10.8	96°57.7	10:20	Non	0	0
4	3	08°02.2	97°03.4	12:33	08°02.1	97°05.7	15:55	Non	0	0
5	5	08°21.9	96°51.4	12:25	08°19.8	96°52.4	15:45	Non	0	0

Note: Op. no. = Trolling line operation number
St. no. = Oceanographic station number

4.3.3 Pelagic fish survey by drifting vertical line (DVL)

Four operations of drifting vertical line (Fig.7 and 8) were carried out near SEAFDEC FAD 2008, reference station and new deployed bullet and float line type FAD. Total distances of DVL are 0.64-1.33 NM with 6-9 line per set. There are 8 hooks per line. Fishing log were appended in Annex IV. Highest catch is at SEAFDEC FAD2008 with 4.17 ind./100 hook (Table 3)

Table 3. Partial detail of drifting vertical line

Op.no.	Date	Activity	Start		Finish	Immersion	Sea depth(m)	Thermocline	Hook No.	Total catch(no.)	Total catch (kg)	Hook rate (no./100 hook)
1	21-22/Dec/2010	Shooting	Time	1513	1545	16 hrs.	891	50-200 m	72	3	14.7	4.1667
	at St. no.1		Lat	08°16'.08 N	08°15'.00 N	17 min		28.4-13.9 °C				
	SEAFDEC FAD		Long	095°49'.58E	095°49'.44 E							
		Hauling	Time	0730	0923							
			Lat	08°13'.20 N	08°12'.50 N							
			Long	096°04'.00 E	096°06'.40 E							
2	23-24/Dec/2010	Shooting	Time	1605	1625	17 hrs.	516	45-206 m	48	1	2.6	2.0833
	at St.no.3		Lat	08°04'.09 N	08°02'.31 N	30 min		28.4-13.0°C				
	Reference st.		Long	097°04'.36E	097°03'.52 E							
		Hauling	Time	0935	1034							
			Lat	08°14'.81 N	08°15'.41 N							
			Long	097°04'.10 E	097°04'.47 E							
3	24-25/Dec/2010	Shooting	Time	1632	1652	14 hrs.	498	40-250 m	48	1	3.4	2.0833
	at St.no.5		Lat	08°21'.21 N	08°20'.83 N	28 min		28.4-14.0°C				
	Bullet type		Long	096°51'.49E	096°50'.68 E							
		Hauling	Time	0700	0914							
			Lat	08°25'.50 N	08°17'.31 N							
			Long	096°51'.20 E	096°39'.27 E							
4	25-26/Dec/2010	Shooting	Time	1605	1626	14 hrs.	500	20-250 m	48	0	0	0
	at St.no.4		Lat	08°11'.66 N	08°11'.75 N	43 min		28.6-12.3°C				
	Float line type		Long	096°56'.67E	096°55'.70 E							
		Hauling	Time	0648	0751							
			Lat	08°12'.30 N	08°12'.04 N							
			Long	096°55'.20 E	096°55'.63 E							

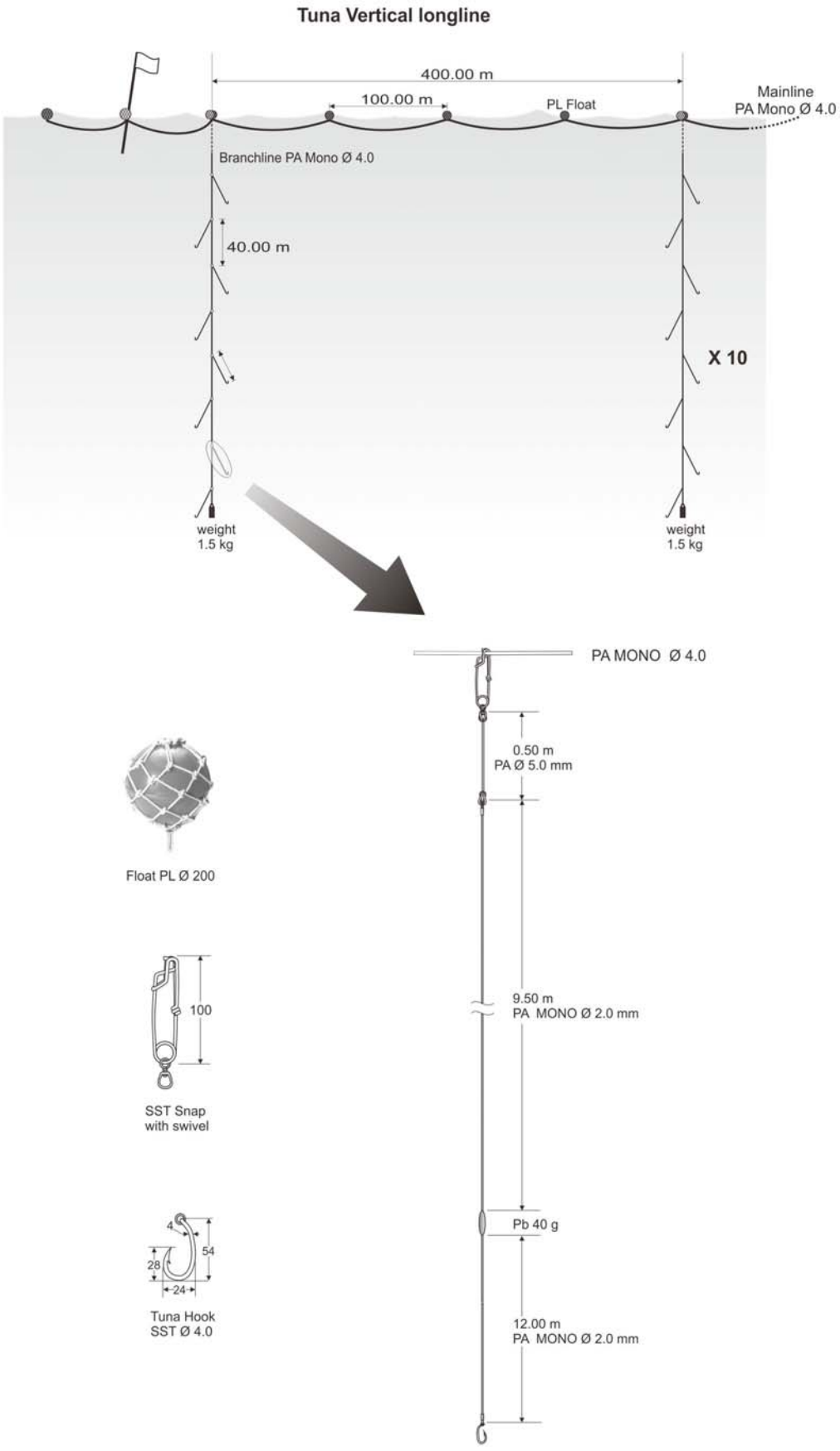

Fig. 7 Schematic diagram of drifting vertical line

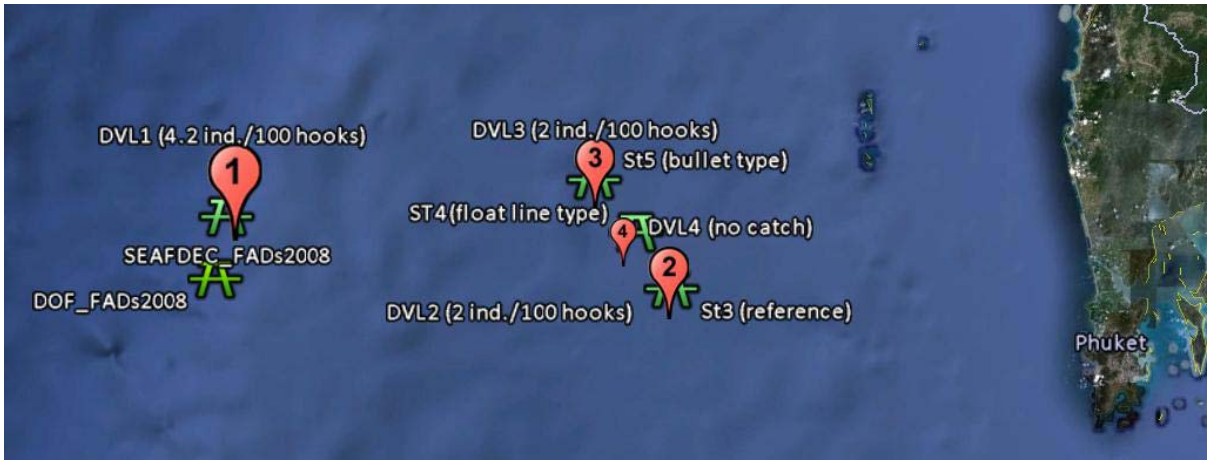

Fig. 8 Location of drifting vertical line fishing operation. Size of symbol denote catch rate.

4.3.4 Pelagic fish survey by Tuna longline

Three operation of Tuna longline (TLL) were operated near SEAFDEC FAD2008, between reference station and float line type station and near bullet type station. Figure 9 show location of Tuna longline fishing operation. Total hook number of each operation are 400 hooks. Highest catch is at SEAFDEC FAD2008 with 3.8 ind. /100 hooks, 292.8 kg total weight. Partial details of Tuna longline operation are in table 4. Fishing logsheets were appended in Annex V. In order to measure hook depth, two Temperature/Depth recorders were attached at the deepest and shallowest hook. Depth of hook varies from 43 m to 285 m. Figure 10-12 show plot of temperature and depth versus time of each Tuna longline operation. Catch compose with Yellowfin tuna, Sward fish, Oil fish, Bigeye Thresher shark, Hairtail and etc. Figure 13 show activities during Tuna longline fishing operation.

Table 4 Partial detail of Tuna longline operation

Op.no.	Date	Activity	Start		Finish	Immersion	Sea depth(m)	Thermocline/ depth of hook	Hook No.	Total catch(no.)	Total catch (kg)	Hook rate (no./100hook)
1	21-22/Dec/2010 at St. no.1 SEAFDEC FAD	Shooting	Time	1745	1954	17 hrs. 05 minute	890	50-200 m 28.4-13.9 °C / 43-155 m	400	15	292.8	3.75
			Lat	08°22'.60	08°29'.40							
			Long	095°43'.30	095°48'.7							
		Hauling	Time	1050	1325							
			Lat	08°25'.99	08°30'.86							
			Long	096°06'.4	096°00'.1							
2	23-24/Dec/2010 at St.no.3 Reference st.	Shooting	Time	1745	1853	12 hrs. 50 minute	500	45-206 m 28.4-13.0°C / 60-120	400	2	5.4	0.50
			Lat	08°03'.77	08°08'.00							
			Long	096°57'.83	096°51'.7							
		Hauling	Time	0635	0826							
			Lat	08°13'.80	08°10'.86							
			Long	096°51'.4	096°56'.5							
3	24-25/Dec/2010 at St.no.5 Bullet type	Shooting	Time	1751	1858	15 hrs. 23 minute	498	40-250 m 28.4-14.0°C / 65-284	400	11	16.9	2.75
			Lat	08°21'.63	08°18'.79							
			Long	096°45'.02	096°39'.0							
		Hauling	Time	0914	1122							
			Lat	08°17'.31	08°22'.31							
			Long	096°39'.2	096°44'.4							

Fig. 9 Location of Tuna longline fishing operation. Size of symbol denote catch rate.

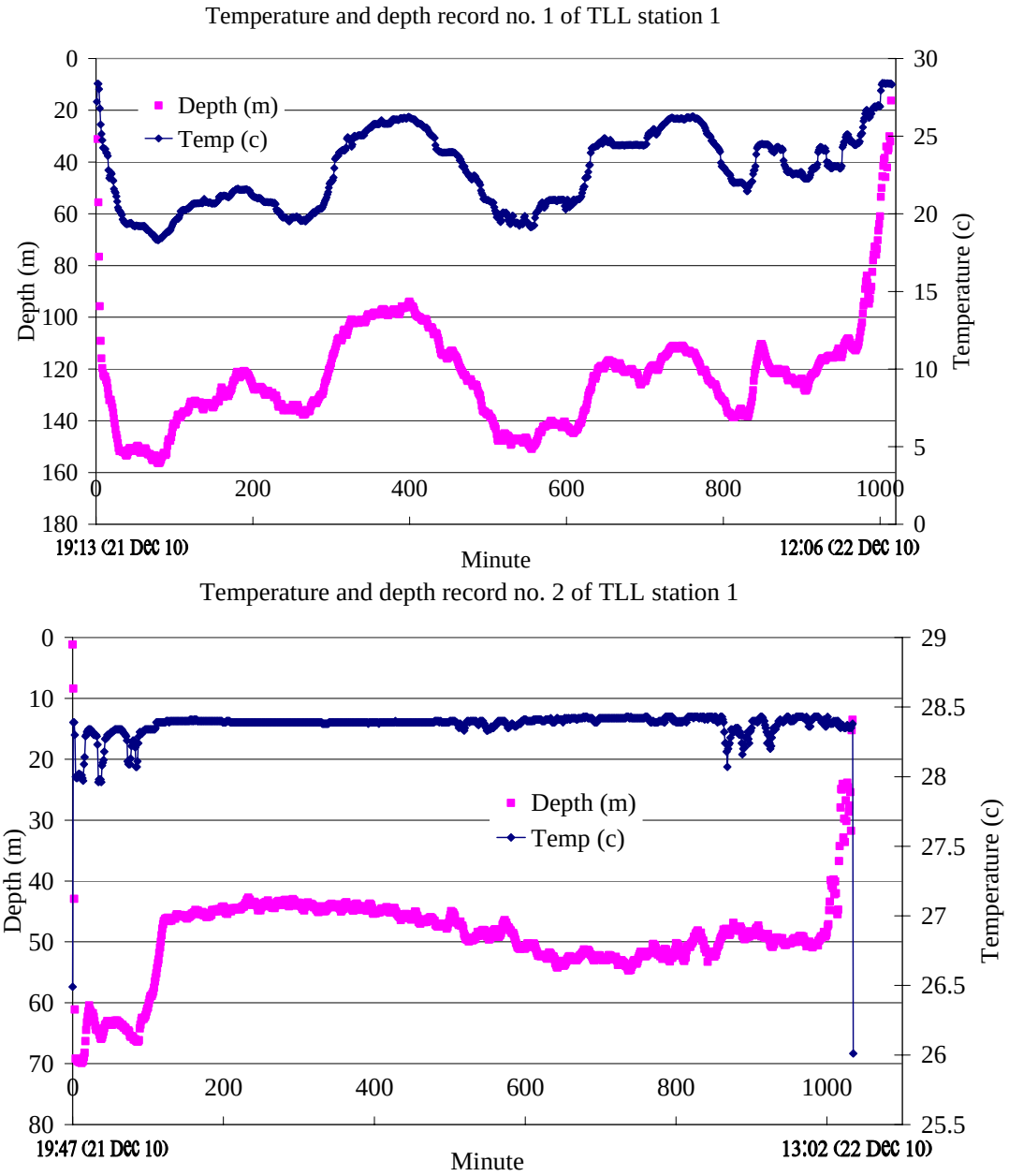

Fig. 10 Temperature (°c) and depth (m) recorded from deepest and shallowest hook of TTL1

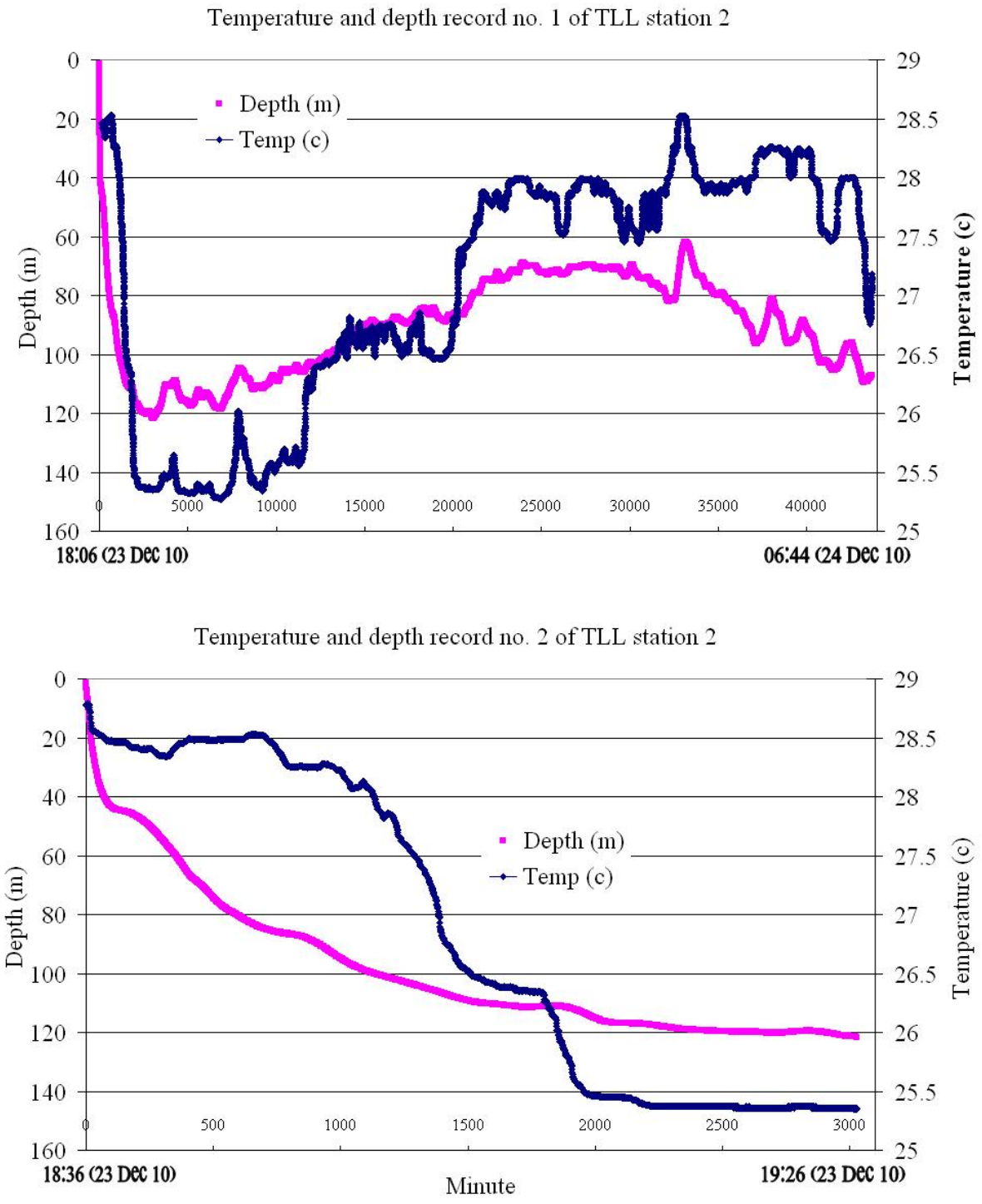

Fig. 11 Temperature (°c) and depth (m) recorded from deepest and shallowest hook of TTL2

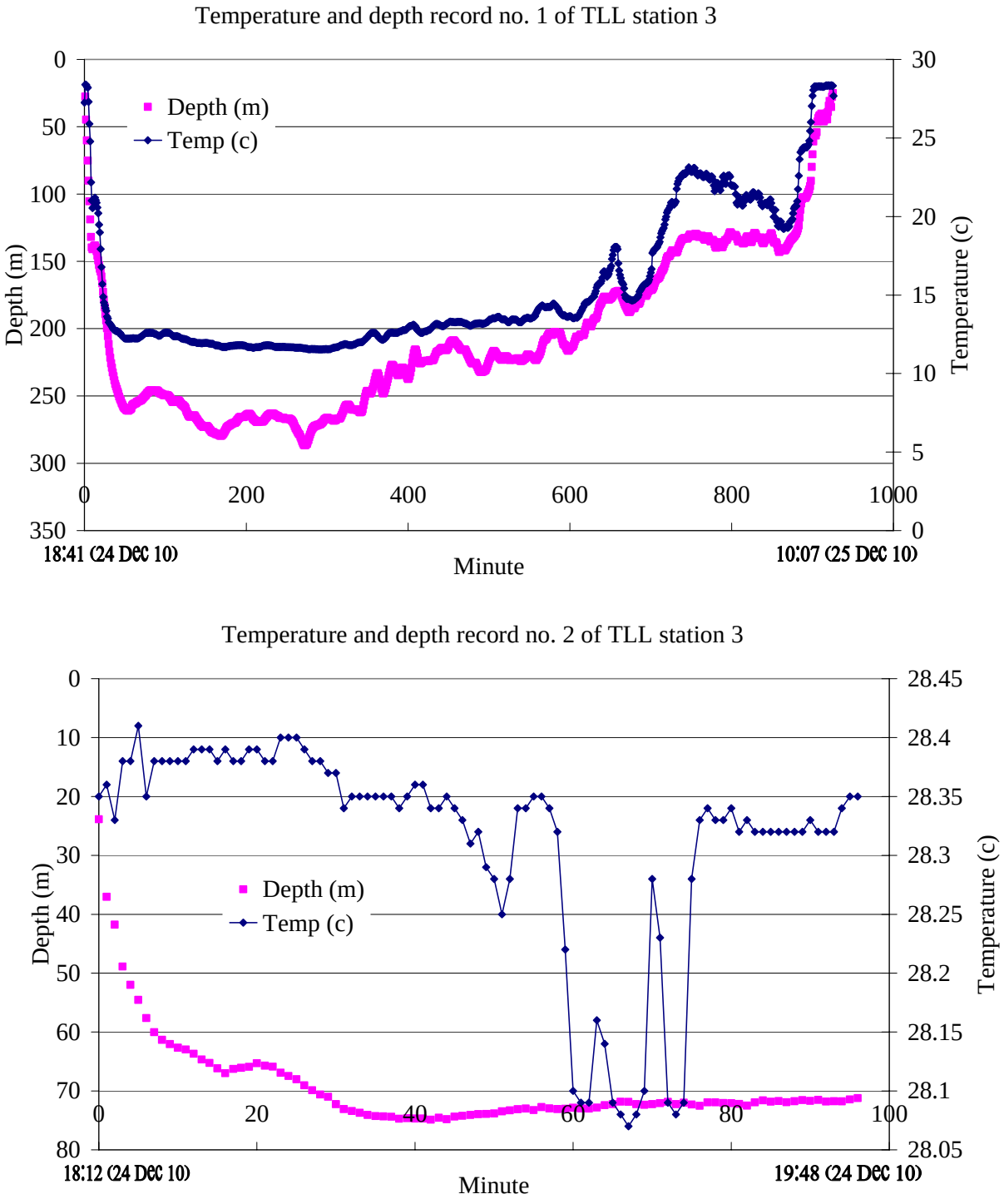

Fig. 12 Temperature (°c) and depth (m) recorded from deepest and shallowest hook of TTL3

Fig. 13 Activity during Tuna longline fishing operation.

4.3.5 Squid jig handline

Squid abundance around FADs was estimated from catch of handline squid jig fishing (Fig.14). M.V.SEAFDEC drifted at night near FAD location (Fig.15). Light was turn on from 20:00 to 23:00. Five squid jig handline start squid jigging from 20:20. Jigging period is between 2-3 hours. Most of catch are purple back flying squid (*Sthenoteuthis oualanensis*). A diamond squid (*Thysanoteuthis rhombus*) were cough at operation no. 2. Highest catch rate is at operation no.1 near SEAFDEC FAD2008, 1.46 ind./hook/hr (table no.5). Survey period is in full moon week that might be reason of low catch rate. Logsheet of squid jig handline is appended in Annex VI.

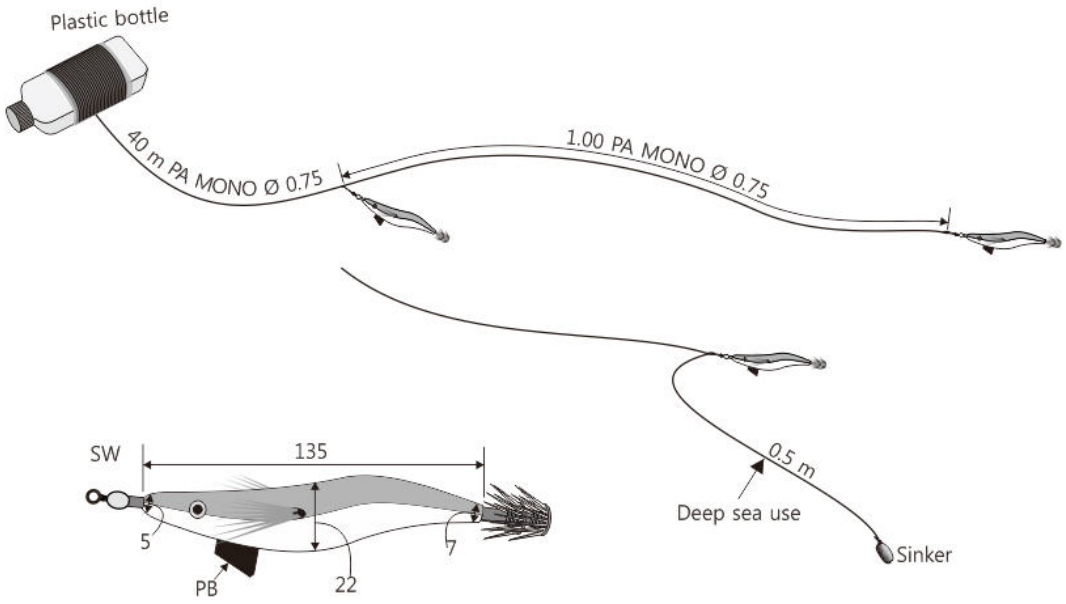

Fig. 14 Schematic diagram of Squid jig handline

Fig. 15 Location of Squid jigging. Size of symbol denote catch rate in individual/jig/hour.

Table 5. Partial detail of squid jigging handline.

Op.no.	Date	Activity	Start		Finish	Jigging period	Sea depth(m)	No. of jig	Total catch by weight (g)	Total catch by individual (ind.)	Catch rate (ind./jig/hr)
1	21-Dec-10 at St. no.1 SEAFDEC FAD	Luring	Time	20:00	00:00	2 hrs.	891	5	650	4	1.46
		Jigging	Time	20:10	23:45						
			Lat	08°15'.04 N	08°14'.41 N						
			Long	095°50'.07 E	095°51'.56 E						
2	23-Dec-10 at St.no.3 Reference st.	Luring	Time	20:00	00:00	3 hrs. 35 min	500	5	760	4	0.2
		Jigging	Time	2010	2345						
			Lat	08°02'.10 N	08°05'.83 N						
			Long	097°04'.30 E	097°02'.11 E						
3	24-Dec-10 at St.no.5 Bullet type	Luring	Time	2000	2300	2 hrs. 40 min	498	5	90	2	0.15
		Jigging	Time	2020	2300						
			Lat	08°21'.58 N	08°24'.11 N						
			Long	096°52'.22 E	096°52'.65 E						
4	25-Dec-10 at St.no.4 Float line type	Luring	Time	2000	2300	2 hrs. 40 min	500	5	2,241	16	1.2
		Jigging	Time	2020	2300						
			Lat	08°13'.20 N	08°14'.5 N						
			Long	096°57'.20 E	096°58'.7 E						

4.4 Bottom topography survey

While conducting biological survey using Neuston net, sea depth from echo sounder were recorded every 5 min. Results were plot to observed general pattern of bottom topography of FAD deployment area. The previous deployed fixed FADs in 2008 were at 800 – 920 meter depth with slope 2.4-3.2. The new deployed fixed FADs are at flatter and shallower area with slope 0.09-0.2 and depth 490-520 m. Figure 16- 20 show topography plot of station 1 to 5.

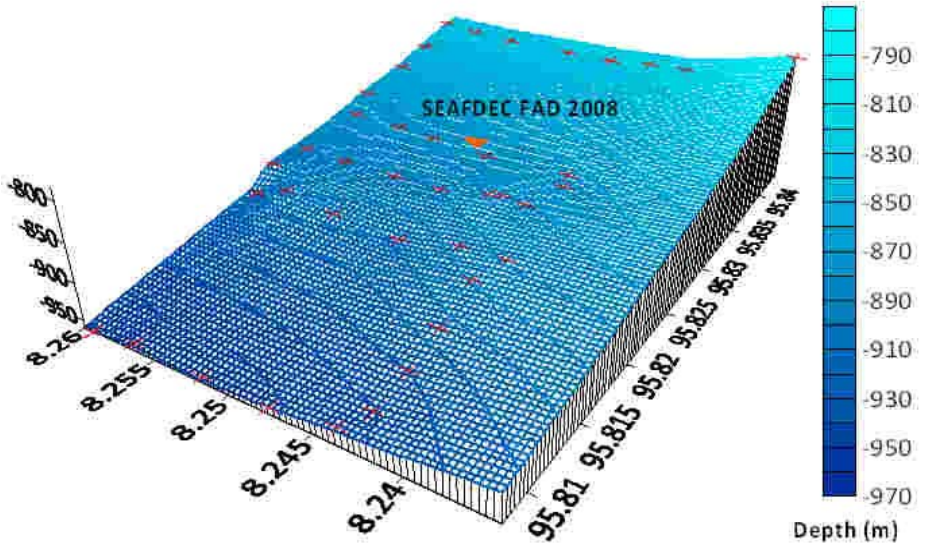

Fig.16 Bottom topography of station no.1, red triangle denoted location of SEAFDEC fixed FAD deployed in 2008

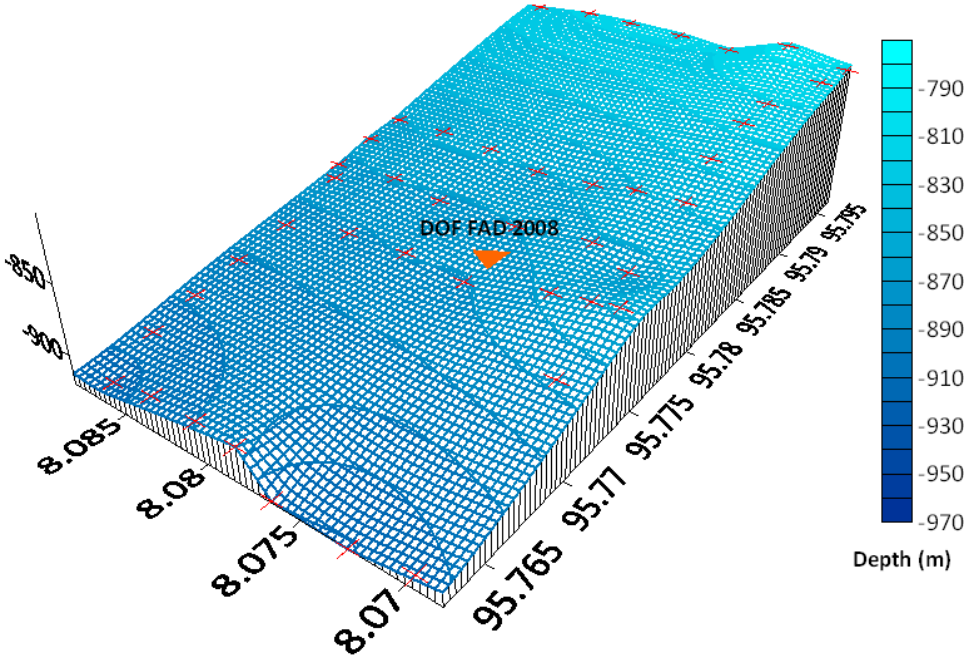

Fig.17 Bottom topography of station no.2, red triangle denoted location of Department of Fisheries fixed FAD deployed in 2008

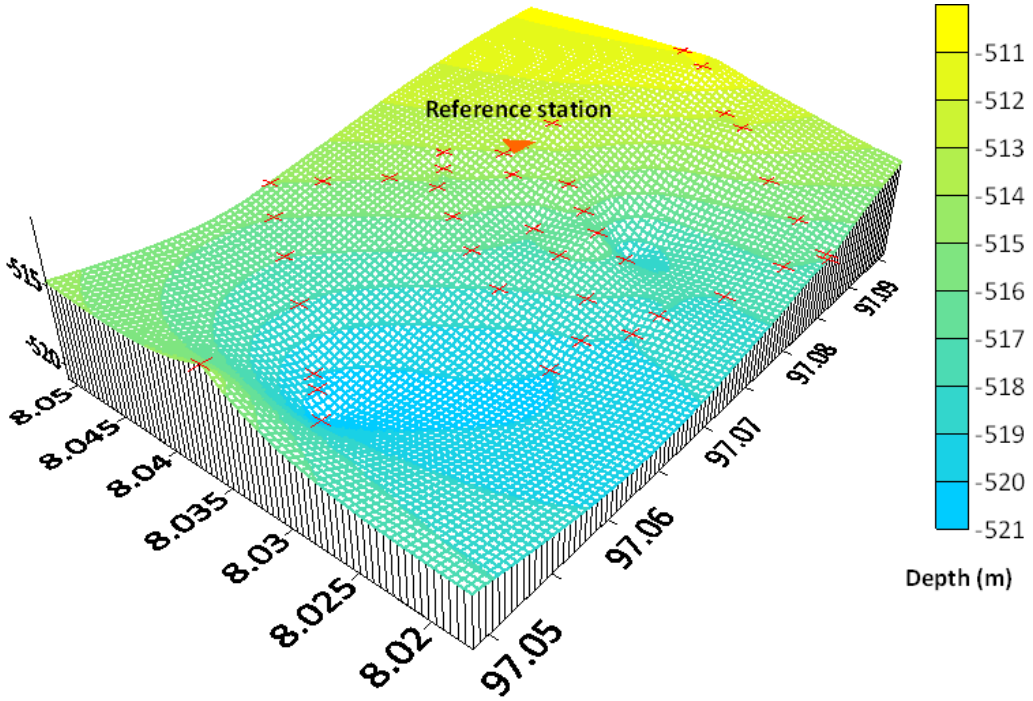

Fig.18 Bottom topography of station no.3, red triangle denoted location of reference station.

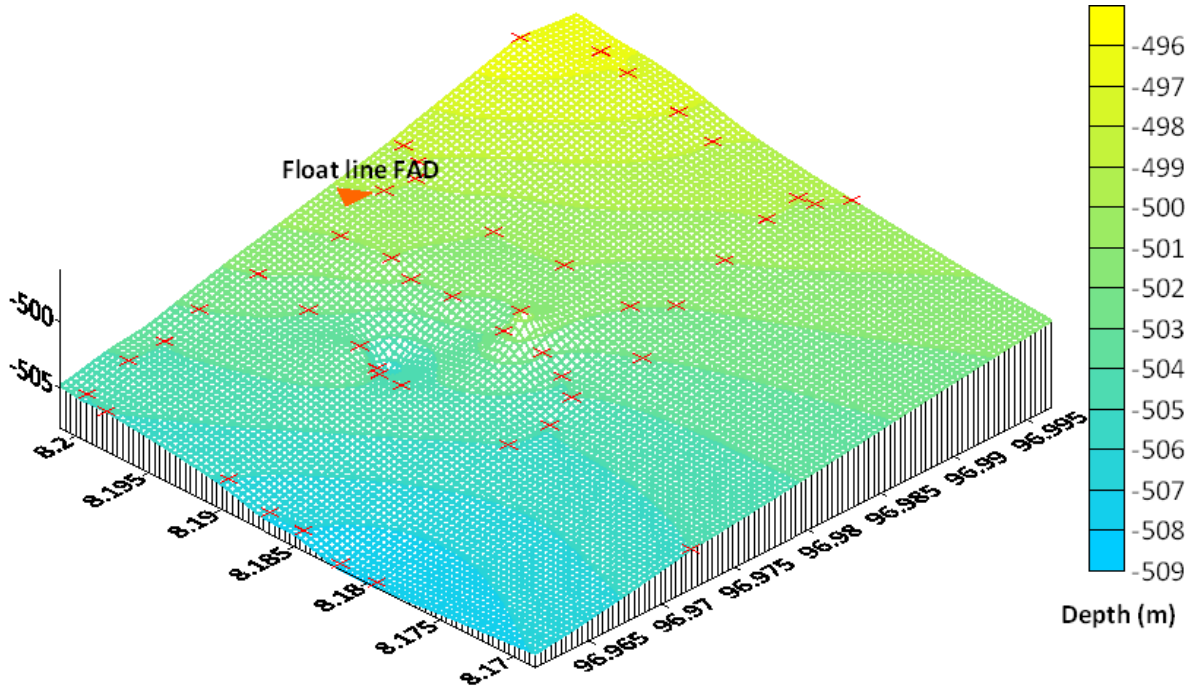

Fig.19 Bottom topography of station no.4, red triangle denoted location of new deployed float line type fixed FAD.

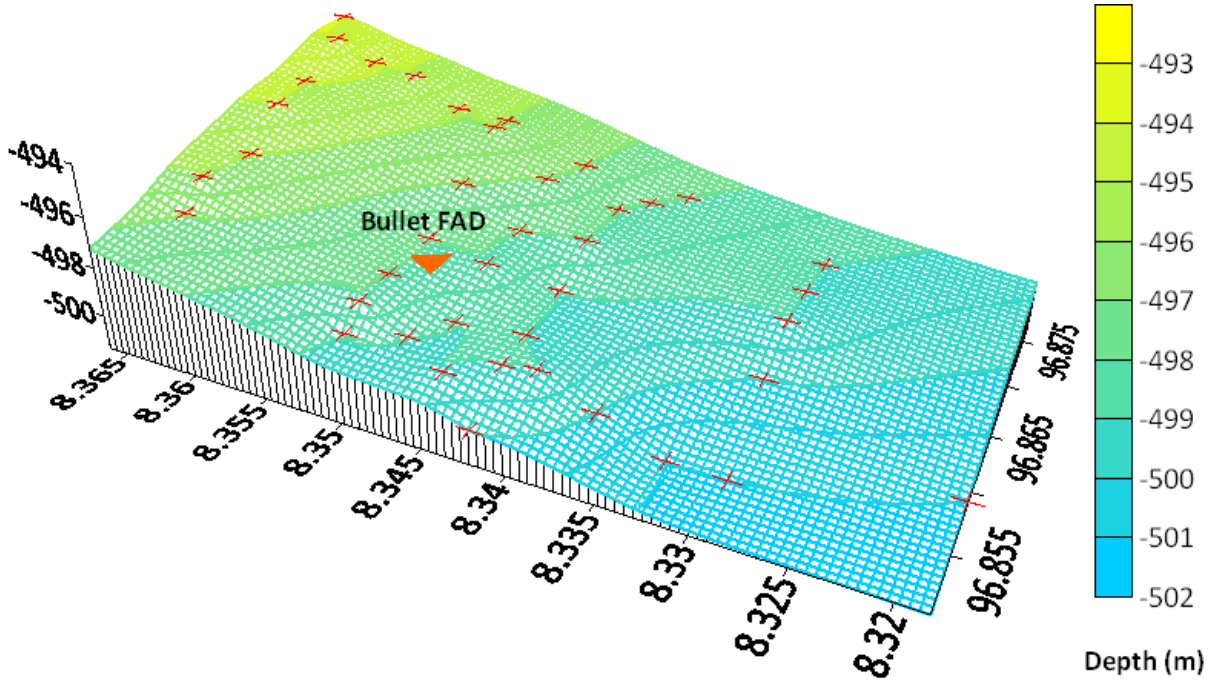

Fig.20 Bottom topography of station no.5, red triangle denoted location of new deployed bullet type fixed FAD.

5. Fish Aggregating Device (FAD) deployment

After pre survey (4.2-4.4), two type of fixed FAD were deployed in order to aggregate tuna. The float line type (Fig.21) was deployed at station no. 4. Another one bullet type (Fig.22.) was deployed at station no. 5. Table 6 show location of new deployed fixed FAD recorded when let go anchor.

Table 6. Location of new deployed fixed FAD recorded when let go anchor

No.	Location	Sea depth (m)
Float line type fixed FADs	L08°11′.65N λ096°59′.14 E	501 m
Bullet type fixed FADs	L08°21′.67N λ096°52′.33 E	495 m

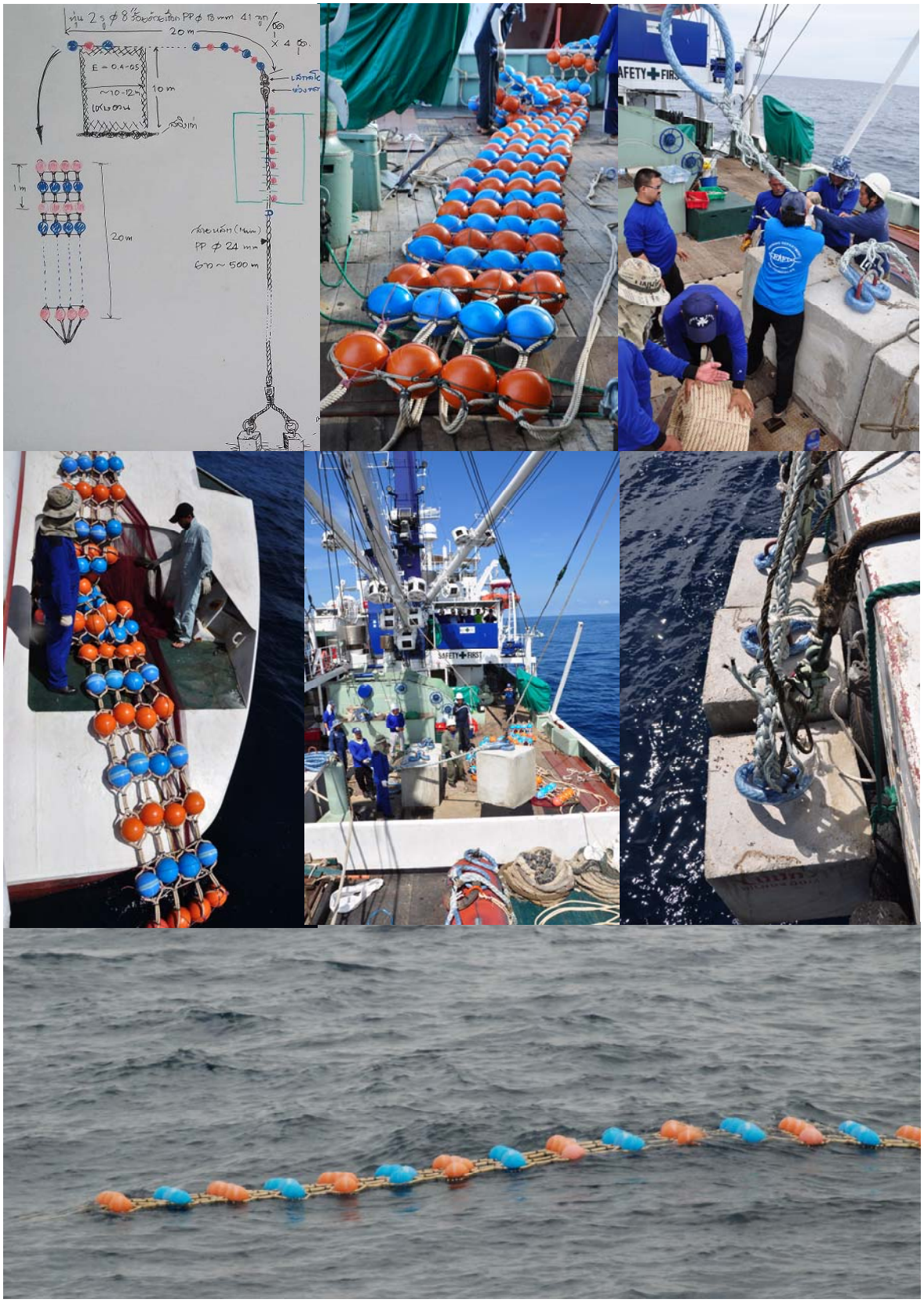

Fig. 21 Schematic diagram of float line type fixed FAD and deployment activities.

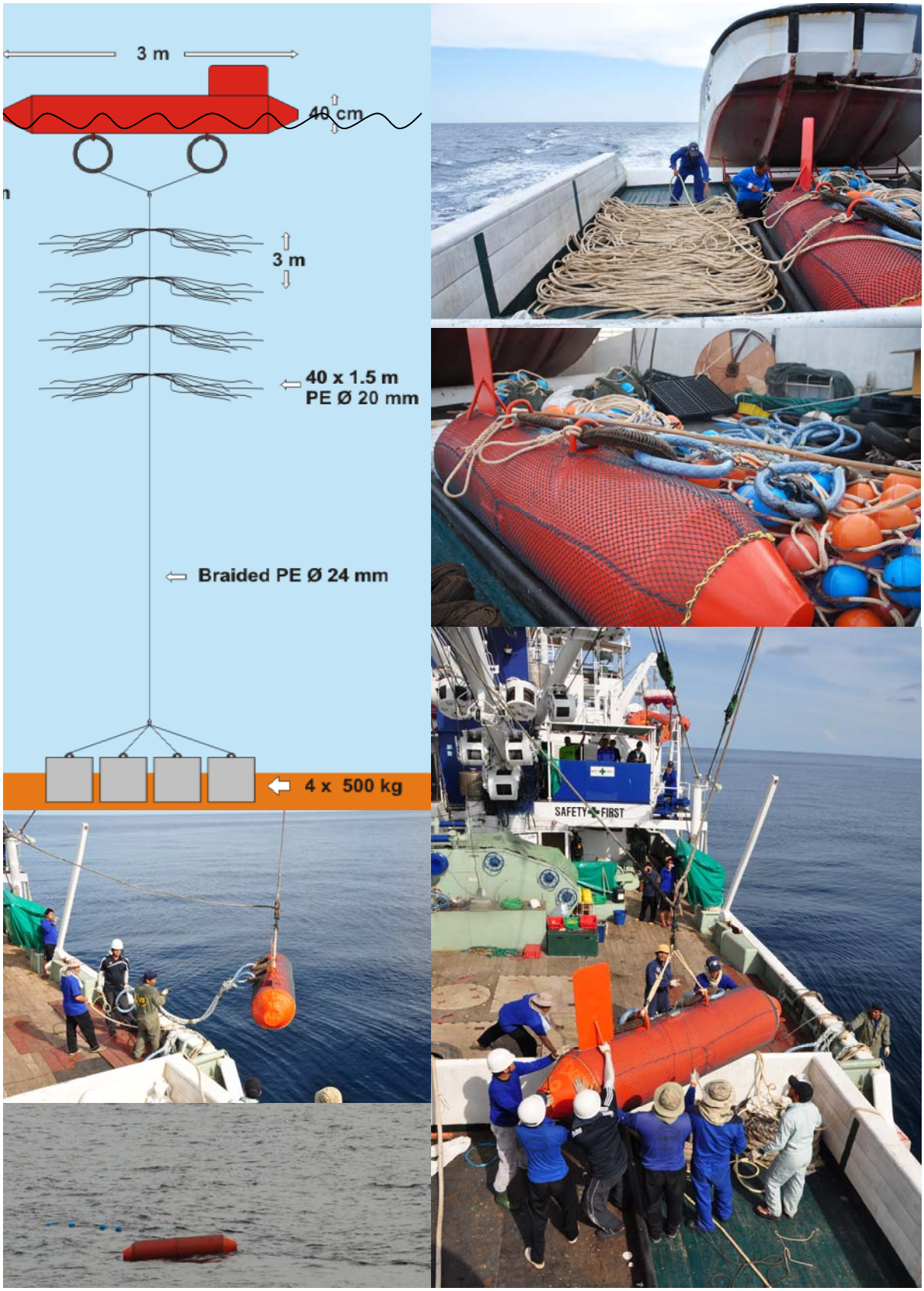

Fig.22 Schematic diagram of bullet type fixed FAD and deployment activities

References

Strickland J.D.H. and T.R.Parson.1972. Practical Handbook of Seawater Analysis. Fisheries Research Board of Canada 167.

Annex I Chemical parameter summary

St.	Sample no.	Sample depth (m)	DO (ml/l)	pH	No_2 (uM)	No_3 (uM)	Po_4 (uM)	Si (uM)
1	1	500	1.700	7.532	nd	426.483	84.828	no data
1	2	300	1.556	7.564	nd	350.221	79.886	no data
1	3	230	1.328	7.623	nd	406.296	73.861	no data
1	4	200	1.342	7.635	nd	417.511	75.307	no data
1	5	125	3.283	7.888	nd	240.314	45.539	no data
1	6	100	6.416	8.074	nd	101.248	14.807	no data
1	7	75	7.250	8.144	0.342	92.972	4.805	no data
1	8	50	8.147	8.196	nd	11.696	nd	no data
1	9	30	8.175	8.202	nd	22.067	nd	no data
1	10	20	8.089	8.206	nd	8.540	nd	no data
1	11	10	8.178	8.208	nd	12.147	nd	no data
1	12	0	7.954	8.209	nd	7.638	nd	no data
2	1	500	1.478	7.435	nd	1395.459	77.476	1415.712
2	2	300	1.276	7.553	nd	1157.701	70.848	1175.426
2	3	250	2.374	7.600	nd	1615.273	69.160	1065.863
2	4	200	1.524	7.678	nd	1366.300	60.965	804.418
2	5	142	4.472	7.963	nd	552.091	26.678	201.820
2	6	100	7.110	8.119	0.095	216.324	7.516	nd
2	7	75	7.638	8.164	0.274	86.276	1.189	nd
2	8	50	8.114	8.201	nd	28.380	nd	nd
2	9	30	8.239	8.201	nd	26.577	nd	nd
2	10	20	8.127	8.204	nd	19.362	nd	nd
2	11	10	8.156	8.207	nd	35.595	nd	nd
2	12	0	7.966	8.210	nd	43.712	0.948	11.678
3	1	450	1.539	7.472	nd	1417.889	86.394	1314.844
3	2	300	1.406	7.571	nd	1059.009	83.502	1095.427
3	3	250	1.301	7.613	nd	1390.973	82.538	1053.689
3	4	200	1.400	7.648	nd	906.341	76.753	884.416
3	5	125	3.856	7.923	nd	682.680	40.116	333.412
3	6	100	6.055	8.066	nd	272.334	25.051	187.617
3	7	75	7.631	8.166	0.379	50.548	5.648	nd
3	8	50	8.154	8.194	nd	12.598	4.684	nd
3	9	30	8.175	8.202	nd	16.656	3.238	nd
3	10	20	8.013	8.200	nd	13.500	1.551	nd
3	11	10	8.064	8.200	nd	15.754	1.430	nd
3	12	0	7.984	8.194	nd	22.518	2.997	nd
4	1	450	1.607	7.544	nd	798.821	90.010	1427.885
4	2	450	1.726	7.574	nd	nd	nd	nd
4	3	300	2.286	-	nd	nd	nd	nd

Annex I Chemical parameter summary (cont.)

St.	Sample no.	Sample depth (m)	DO (ml/l)	pH	No_2 (uM)	No_3 (uM)	Po_4 (uM)	Si (uM)
4	4	200	1.719	7.678	nd	976.018	69.643	860.359
4	5	125	4.491	7.960	nd	438.727	35.657	231.819
4	6	100	7.116	8.120	nd	240.318	10.409	nd
4	7	75	7.952	8.188	0.298	12.300	2.997	nd
4	8	50	7.940	8.195	0.031	17.077	2.515	nd
4	9	30	8.169	8.202	nd	33.341	2.153	nd
4	10	20	8.051	8.204	nd	20.715	2.635	nd
4	11	10	8.057	8.198	nd	72.572	0.466	nd
4	12	0	7.893	8.203	nd	51.829	nd	nd
5	1	450	1.422	7.546	nd	3142.756	78.802	1197.165
5	2	300	1.658	7.564	nd	2848.923	74.343	nd
5	3	250	1.173	7.602	nd	2739.016	74.463	992.820
5	4	200	1.270	7.611	nd	2752.474	71.932	887.895
5	5	125	3.265	7.871	nd	1664.619	41.562	434.279
5	6	100	4.413	7.962	nd	1281.066	26.377	201.820
5	7	75	7.237	8.153	0.298	228.747	5.166	nd
5	8	50	7.886	8.205	0.031	43.682	2.033	nd
5	9	30	8.060	8.212	nd	33.341	2.033	nd
5	10	20	8.133	8.204	nd	31.537	1.069	nd
5	11	10	8.192	8.205	nd	36.046	2.033	nd
5	12	0	8.039	8.205	nd	57.691	1.671	nd
5a	1	100	no data	no data	nd	no data	no data	no data
5a	2	90	no data	no data	nd	no data	no data	no data
5a	3	80	no data	no data	0.409	no data	no data	no data
5a	4	70	no data	no data	0.443	no data	no data	no data
5a	5	60	no data	no data	nd	no data	no data	no data
5a	6	50	no data	no data	nd	no data	no data	no data

Annex II

1. Flow meter calibration

Before			After			
7021			7021			
Rep.	revolution	tow distance	Rep.	revolution	tow distance	
1	152	20	1	145	20	
2	128	20	2	145	20	
3	133	20	3	155	20	
4	135	20	4	150	20	Distance pre revolution
5	126	20	5	160	20	0.14229
6	136	20	6	145	20	
7	138	20	7	140	20	
8	132	20	8	-	20	
9	130	20	9	-	20	
10	140	20	10	140	20	
Before			After			
7035			7035			
Rep.	revolution	tow distance	Rep.	revorution	tow distance	
1	142	20	1	155	20	
2	-	20	2	155	20	
3	-	20	3	155	20	
4	133	20	4	160	20	Distance pre revolution
5	142	20	5	160	20	0.13289
6	145	20	6	150	20	
7	-	20	7	150	20	
8	-	20	8	155	20	
9	-	20	9	155	20	
10	-	20	10	150	20	

2. Neuston trawl station no. 1

Station: 1 Date: 21/12/2010 Ship speed: 2.2-2.7 knot

Sub station	Flow meter serial No.	Start						
		Time	Lat. (N)		Long. (E)		Flow meter revolution	
			Degree	arcmin	Degree	arcmin		
1_1	7021	11:06	8	14.50	95	50.50	0	
1_2	7035	11:19	8	15.00	95	50.50	0	
1_3	7021	11:34	8	15.50	95	50.50	0	
1_4	7035	11:48	8	15.50	95	49.90	0	
1_5	7021	11:57	8	15.30	95	49.70	0	
1_6	7035	12:02	8	15.00	95	49.70	0	
1_7	7021	12:12	8	14.00	95	49.70	0	
1_8	7035	12:23	8	14.60	95	49.50	0	
1_9	7021	12:34	8	14.80	95	49.50	0	
1_10	7035	12:44	8	15.30	95	49.50	0	
1_11	7021	12:56	8	15.50	95	49.30	0	
1_12	7035	13:06	8	15.40	95	49.20	0	
1_13	7021	13:16	8	14.90	95	49.20	0	
1_14	7035	13:26	8	14.90	95	49.20	0	
1_15	7021	13:41	8	14.50	95	48.90	0	
1_16	7035	13:54	8	14.50	95	48.40	0	
1_17	7021	14:05	8	15.00	95	48.40	0	

Finish						Trawl distance (m)	Volume (m3)
Time	Lat. (N)		Long. (E)		Flow meter revolution		
	Degree	arcmin	Degree	arcmin			
11:16	8	15.00	95	50.50	4500	640.305	448.214
11:34	8	15.50	95	50.50	4620	613.952	429.766
11:47	8	15.50	95	49.90	5900	839.511	587.658
11:55	8	15.30	95	49.70	3260	433.221	303.255
12:00	8	15.00	95	49.70	1830	260.391	182.273
12:11	8	14.00	95	49.70	3380	449.168	314.418
12:21	8	14.60	95	49.50	3420	486.632	340.642
12:32	8	14.80	95	49.50	2600	345.514	241.860
12:42	8	15.30	95	49.50	3530	502.284	351.599
12:53	8	15.50	95	49.30	3862	513.221	359.255
13:05	8	15.40	95	49.20	3146	447.644	313.351
13:15	8	14.90	95	49.20	3555	472.424	330.697
13:24	8	14.50	95	49.20	3470	493.746	345.622
13:34	8	14.50	95	48.90	3670	487.706	341.394
13:51	8	14.50	95	48.40	4105	584.100	408.870
14:01	8	15.00	95	48.40	4420	587.374	411.162
14:14	8	15.50	95	48.40	4685	666.629	466.640

3. Neuston trawl station no. 2

Station: 2 Date: 22 Dec 2010 Ship speed: 2.2-2.8 knot

Sub station	Flow meter serial No.	Start						Finish						Trawl distance (m)	Volume (m3)
		Time	Lat. (N)		Long. (E)		Flow meter revolution	Time	Lat. (N)		Long. (E)		Flow meter revolution		
			Degree	Arcmin	Degree	Arcmin			Degree	Arcmin	Degree	Arcmin			
2_1	7021	16:43	8	5.12	95	47.79	0	16:51	8	4.88	95	47.78	3240	461.020	322.714
2_2	7035	16:53	8	4.78	95	47.78	0	17:01	8	4.50	95	47.78	3230	429.235	300.464
2_3	7021	17:04	8	4.41	95	47.77	0	17:11	8	4.13	95	47.76	2950	419.756	293.829
2_4	7035	17:14	8	4.10	95	47.72	0	17:22	8	4.22	95	47.50	2900	385.381	269.767
2_5	7021	17:24	8	4.24	95	47.44	0	17:33	8	4.24	95	47.16	3130	445.368	311.757
2_6	7035	17:39	8	4.28	95	46.99	0	17:48	8	4.05	95	47.00	2650	352.159	246.511
2_7	7021	17:50	8	4.64	95	47.00	0	17:57	8	4.91	95	47.01	2430	345.765	242.035
2_8	7035	17:59	8	5.00	95	47.01	0	18:08	8	5.29	95	47.03	2780	369.434	258.604
2_9	7021	18:11	8	5.20	95	46.92	0	18:18	8	5.26	95	46.69	2530	359.994	251.996
2_10	7035	18:24	8	5.25	95	46.77	0	18:32	8	4.90	95	46.76	3225	428.570	299.999
2_11	7021	18:35	8	4.77	95	46.76	0	18:42	8	4.42	95	46.76	3400	483.786	338.650
2_12	7035	18:48	8	4.25	95	46.69	0	18:55	8	4.23	95	46.38	3070	407.972	285.581
2_13	7021	19:04	8	4.26	95	46.53	0	19:12	8	4.58	95	46.51	2930	416.910	291.837
2_14	7035	19:14	8	4.70	95	46.51	0	19:22	8	5.03	95	46.52	3050	405.315	283.720
2_15	7021	19:27	8	5.22	95	46.44	0	19:35	8	5.24	95	46.18	2860	406.949	284.865
2_16	7035	19:37	8	5.24	95	46.12	0	19:44	8	5.24	95	45.85	3050	405.315	283.720
2_17	7021	19:48	8	5.15	95	45.8	0	19:56	8	4.89	95	45.77	2420	344.342	241.039
2_18	7035	19:58	8	4.79	95	45.75	0	20:06	8	4.50	95	45.70	2590	344.185	240.930
2_19	7021	20:08	8	4.45	95	45.75	0	20:16	8	4.16	95	45.76	2560	364.262	254.984

4. Neuston trawl station no. 3

Station no.: 3 Date: 23 Dec 2010 Ship speed: 2.3-3 knot

Sub station	Flow meter serial No.	Start					
		Time	Lat. (N)		Long. (E)		Flow meter revolution
			Degree	Arcmin	Degree	Arcmin	
3_1	7035	12:33	8	2.16	97	3.38	0
3_2	7021	12:43	8	2.38	97	3.56	0
3_3	7035	12:52	8	2.74	97	3.76	0
3_4	7021	13:05	8	2.91	97	4.10	0
3_5	7035	13:14	8	2.62	97	4.44	0
3_6	7021	13:29	8	2.53	97	4.43	0
3_7	7035	13:38	8	2.25	97	4.30	0
3_8	7021	13:47	8	1.93	97	4.16	0
3_9	7035	13:57	8	1.62	97	4.08	0
3_10	7021	14:06	8	1.67	97	4.36	0
3_11	7035	14:15	8	2.06	97	4.54	0
3_12	7021	14:27	8	2.37	97	4.82	0
3_13	7035	14:34	8	2.21	97	4.97	0
3_14	7021	14:46	8	1.98	97	4.73	0
3_15	7035	14:55	8	1.68	97	4.52	0
3_16	7021	15:06	8	1.39	97	4.44	0
3_17	7035	15:16	8	1.17	97	4.94	0
3_18	7021	15:28	8	1.09	97	5.16	0
3_19	7035	15:38	8	1.41	97	5.32	0
3_20	7021	15:47	8	1.78	97	5.53	0

Finish						Trawl Distance (m)	Volume (m3)
Time	Lat.		Long.		Flow meter revolution		
	Degree	Arcmin	Degree	Arcmin			
12:41	8	2.32	97	3.52	2350	312.292	218.604
12:50	8	2.68	97	3.72	3170	451.059	315.742
15:59	8	3.03	97	3.94	3390	450.497	315.348
13:13	8	2.64	97	4.38	4320	614.693	430.285
13:22	8	2.37	97	4.73	3845	510.962	357.673
13:36	8	2.32	97	4.32	2500	355.725	249.008
13:46	8	2.00	97	4.19	3270	434.550	304.185
13:55	8	1.64	97	4.00	3260	463.865	324.706
14:05	8	1.61	97	4.34	2950	392.026	274.418
14:13	8	1.97	97	4.49	2620	372.800	260.960
14:22	8	2.35	97	4.71	3030	402.657	281.860
14:33	8	2.28	97	5.02	2250	320.153	224.107
14:42	8	2.08	97	4.77	2350	312.292	218.604
14:53	8	1.76	97	4.58	2650	377.069	263.948
15:03	8	1.45	97	4.35	2980	396.012	277.209
15:14	8	1.21	97	4.83	4710	670.186	469.130
15:24	8	0.98	97	5.19	3810	506.311	354.418
15:35	8	1.34	97	5.28	2280	324.421	227.095
15:45	8	1.69	97	5.48	2830	376.079	263.255
15:55	8	2.09	97	5.71	2770	394.143	275.900

5. Neuston trawl station no. 4

Station no.: 4 Date: 23 Dec 2010 Ship speed: 2.4-3.4 knot

Sub station	Flow meter serial No.	Start					
		Time	Lat. (N)		Long. (E)		Flow meter revolution
			Degree	Arcmin	Degree	Arcmin	
3_1	7035	6:36	8	12.06	96	59.70	0
3_2	7021	6:45	8	11.76	96	59.71	0
3_3	7035	6:54	8	11.46	96	59.70	0
3_4	7021	7:03	8	11.15	96	59.70	0
3_5	7035	7:19	8	11.00	96	59.68	0
3_6	7021	7:28	8	10.99	96	59.26	0
3_7	7035	7:42	8	11.02	96	59.02	0
3_8	7021	7:51	8	11.54	96	58.98	0
3_9	7035	8:01	8	11.93	96	58.95	0
3_10	7021	8.22	8	11.73	96	58.68	0
3_11	7035	8:31	8	11.48	96	58.70	0
3_12	7021	8:41	8	11.16	96	58.70	0
3_13	7035	8:53	8	10.91	96	58.60	0
3_14	7021	9:05	8	11.06	96	58.31	0
3_15	7035	9:15	8	11.46	96	58.39	0
3_16	7021	9:25	8	11.98	96	58.27	0
3_17	7035	9:38	8	11.90	96	58.00	0
3_18	7021	9:50	8	11.92	96	57.67	0
3_19	7035	9:59	8	11.68	96	57.69	0
3_20	7021	10:07	8	11.41	96	57.70	0
3_21	7035	10:16	8	11.11	96	57.70	0

Finish						Trawl Distance (m)	Volume (m3)
Time	Lat. (N)		Long. (E)		Flow meter revolution		
	Degree	Arcmin	Degree	Arcmin			
6:43	8	11.83	96	59.72	3400	451.826	316.278
6:52	8	11.53	96	59.69	3430	488.055	341.638
7:01	8	11.22	96	59.70	3780	502.324	351.627
7:11	8	10.89	96	59.70	3940	560.623	392.436
7:26	8	11.00	96	59.36	3630	482.391	337.673
7:35	8	10.94	96	58.97	3750	533.588	373.511
7:50	8	11.39	96	58.99	2350	312.292	218.604
7:58	8	11.90	96	58.99	1880	267.505	187.254
8:16	8	11.89	96	58.67	2200	292.358	204.651
8:30	8	11.54	96	58.69	3150	448.214	313.749
8:40	8	11.21	96	58.70	2270	301.660	211.162
8:49	8	10.95	96	58.70	3560	506.552	354.587
9:01	8	10.97	96	58.40	2580	342.856	239.999
9:13	8	11.39	96	58.35	1470	209.166	146.416
9:23	8	11.82	96	58.40	1510	200.664	140.465
9:36	8	11.98	96	58.06	2570	365.685	255.980
9:46	8	11.97	96	57.72	3270	434.550	304.185
9:57	8	11.74	96	57.68	2940	418.333	292.833
10:00	8	11.47	96	57.70	3290	437.208	306.046
10:14	8	11.17	96	57.70	3430	488.055	341.638
10:23	8	10.86	96	57.69	3825	508.304	355.813

6. Neuston trawl station no. 5

Station no.: 5 Date: 24 Dec 2010 Ship speed: 2.2-2.8 knot

Sub station	Flow meter serial No.	Start					
		Time	Lat. (N)		Long. (E)		Flow meter revolution
			Degree	Arcmin	Degree	Arcmin	
5_1	7035	12:23	8	21.48	96	51.38	0
5_2	7021	12:34	8	21.78	96	51.72	0
5_3	7035	12:45	8	21.85	96	52.16	0
5_4	7021	12:59	8	21.73	96	52.42	0
5_5	7035	13:09	8	21.29	96	52.35	0
5_6	7021	13:21	8	21.09	96	52.17	0
5_7	7035	13;31	8	21.05	96	51.61	0
5_8	7021	13:45	8	21.03	96	51.28	0
5_9	7035	13:55	8	20.77	96	51.43	0
5_10	7021	14:05	8	20.79	96	51.93	0
5_11	7035	14:16	8	20.67	96	52.29	0
5_12	7021	14:29	8	20.55	96	52.23	0
5_13	7035	14:38	8	20.55	96	51.78	0
5_14	7021	14:48	8	20.53	96	51.33	0
5_15	7035	15:03	8	20.52	96	51.31	0
5_16	7021	15:12	8	20.80	96	51.29	0
5_17	7035	15:22	8	19.79	96	51.41	0
5_18	7021	15:31	8	19.80	96	51.78	0
5_19	7035	15:41	8	19.79	96	52.17	0

Finish						Trawl Distance (m)	Volume (m^3)
Time	Lat. (N)		Long. (E)		Flow meter		
	Degree	Arcmin	Degree	Arcmin			
12:30	8	21.70	96	56.51	2870	381.394	266.976
12:43	8	21.85	96	52.05	3915	557.065	389.946
12:53	8	21.87	96	52.53	4030	535.547	374.883
13:06	8	21.43	96	52.36	4150	590.504	413.352
13:16	8	21.00	96	52.33	4115	546.842	382.790
13:29	8	21.05	96	51.74	3970	564.891	395.424
13:39	8	21.06	96	51.23	3320	441.195	308.836
13:53	8	20.76	96	51.28	3530	502.284	351.599
14:03	8	20.79	96	51.80	4255	565.447	395.813
14:13	8	20.80	96	52.30	3950	562.046	393.432
14:23	8	20.34	96	52.31	4100	544.849	381.394
14:36	8	20.56	96	51.88	2785	396.278	277.394
14:46	8	20.54	96	51.46	2760	366.776	256.743
14:55	8	20.52	96	51.01	2730	388.452	271.916
15:10	8	20.19	96	51.29	3770	500.995	350.697
15:19	8	19.18	96	51.28	3560	506.552	354.587
15:30	8	19.80	96	51.70	3250	431.893	302.325
15:39	8	19.79	96	52.08	3440	489.478	342.634
15:48	8	19.78	96	52.44	3340	443.853	310.697

Annex III

Trolling line fishing logsheet :Operation No.1

Recorded by Sayan Promjinda

Cruise no: 81-3 /2010		Name of Vessel				Air temp:	27	°C
Survey St No:1(SEAFDEC's FADs)		M.V.SEAFDEC				Air pressure:	1010.5	mbar
Date: 21/ Dec/2010						Humidity :	84	%
Moon age: 15		Start trolling		Finish trolling		Water		
Wind		Time	1100	Time	1545	Surface temp:	28.8	°C
Spd (kt)	Direction	Latitude	08°14'.59 N	Latitude	08°15'.50 N	100 m. temp :	26.9	°C
6	100	Longitude	095°50'.50E	Longitude	095°48'.44 E	Thermocline :	50-200m./28.4-13.9°C	
Weather cond: bc		Memorandum: 1) Speed of vessel: 3.0 knots				Current		
Sea condition: Slight						Depth	Spd (kt)	Direction
Gear						5	0	245°
No. line: 5		Total catch in number:		0 pcs.		50	0.6	278°
Trolling time: 4 hour 45 min		Total catch in weight:		- kg		100	-	-

Trolling line fishing logsheet :Operation No.2

Recorded by Sayan Promjinda

Cruise no: 81-3 /2010		Name of Vessel				Air temp:	285	°C
Survey St No:2(DOF'FADs)		M.V.SEAFDEC				Air pressure:	1005	mbar
Date: 22/ Dec/2010						Humidity :	77	%
Moon age: 16		Start trolling		Finish trolling		Water		
Wind		Time	1613	Time	2015	Surface temp:	28.5	°C
Spd (kt)	Direction	Latitude	08°05'.25 N	Latitude	08°04'.09 N	100 m. temp :	27.6	°C
10.2	90	Longitude	095°47'.79E	Longitude	095°45'.00 E	Thermocline :	85-260m./28.4-13°C	
Weather cond: bc		Memorandum: 1) Speed of vessel: 3.0 knots				Current		
Sea condition: Slight						Depth	Spd (kt)	Direction
Gear						5	0	339°
No. line :5 line		Total catch in number:		4 pcs.		50	0	117°
Trolling time:4 hour 2 min		Total catch in weight:		7.05 kg		100	0.1	171°

No.	Species	Length (cm)	Weight (kg)	Remarks
1	*Thunnus albacares*	TL = 52	1.80	08°05.16 N 095°46.77 E
	(Yellowfin tuna)	FL = 47		time:1829
		SL=43		stomach w.=45g
		GL = 10.5		
2	*Thunnus albacares*	TL = 56	1.60	08°04.25 N 095°46.69 E
	(Yellowfin tuna)	FL = 46		time:1845
		SL=42		stomach w.=55g
		GL = 7.4		
3	*Thunnus albacares*	TL = 48	1.65	08°04.25 N 095°46.69 E
	(Yellowfin tuna)	FL = 45		time:1850
		SL=42		stomach w.= 40g
		GL = 5.3		
4	*Thunnus albacares*	TL = 54	2.00	08°04.10 N 095°46.39 E
	(Yellowfin tuna)	FL = 50		time:1910
		SL=45		stomach w.= 40g
	Total		**7.05**	

Trolling line fishing logsheet
Operation No.3

Recorded by Sayan Promjinda

Cruise no: 81-3 /2010		Name of Vessel				Air temp:	30	°C
Survey St No:3(reference st)		M.V.SEAFDEC				Air pressure:	1008	mbar
Date: 23/ Dec/2010						Humidity :	72	%
Moon age: 17		Start trolling		Finish trolling		Water		
Wind		Time	1233	Time	1555	Surface temp:	29.2	°C
Spd (kt)	Direction	Latitude	08°02'.16 N	Latitude	08°02'.09 N	100 m. temp :	27.2	°C
8.7	130	Longitude	097°03'.38E	Longitude	097°05'.57 E	Thermocline :	45-206m./28.4-13°C	
Weather cond: bc		Memorandum: 1) Speed of vessel: 3.0 knots				Current		
Sea condition: Slight						Depth	Spd (kt)	Direction
Gear						5	0.2	354°
No. line : 5 line		Total catch in number:		0 pcs.		50	0.3	167°
Trolling time: 3hour 22 min		Total catch in weight:		- kg		100	-	-

Trolling line fishing logsheet
Operation No.4

Recorded by Sayan Promjinda

Cruise no: 81-3 /2010		Name of Vessel				Air temp:	26	°C
Survey St. No: 4(float line type)		M.V.SEAFDEC				Air pressure:	1007.5	mbar
Date: 23/ Dec/2010						Humidity :	84	%
Moon age: 17		Start trolling		Finish trolling		Water		
Wind		Time	0632	Time	1020	Surface temp:	28.8	°C
Spd (kt)	Direction	Latitude	08°12'.05 N	Latitude	08°10'.82 N	100 m. temp :	27.4	°C
5.2	30	Longitude	096°59'.70E	Longitude	096°57'.69 E	Thermocline :	20-250m./28.6-12.3°C	
Weather cond: bc		Memorandum: 1) Speed of vessel: 3.0 knots				Current		
Sea condition: Slight						Depth	Spd (kt)	Direction
Gear						5	0.1	019°
No. line : 5 line		Total catch in number:		0 pcs.		50	0.3	217°
Trolling time: 3 hour 48 min		Total catch in weight:		- kg		100	0.6	217°

Trolling line fishing logsheet
Operation No.5

Recorded by Sayan Promjinda

Cruise no: 81-3 /2010		Name of Vessel				Air temp:	32	°C
Survey St No:5 (bullet type)		M.V.SEAFDEC				Air pressure:	1008.5	mbar
Date: 24/ Dec/2010						Humidity :	63	%
Moon age: 18		Start trolling		Finish trolling		Water		
Wind		Time	1225	Time	1545	Surface temp:	28.9	°C
Spd (kt)	Direction	Latitude	08°21'.92 N	Latitude	08°19'.78 N	100 m. temp :	25.7	°C
8	70	Longitude	096°51'.37E	Longitude	096°52'.44 E	Thermocline :	40-250m./28.4-14.0°C	
Weather cond: bc		Memorandum: 1) Speed of vessel: 3.0 knots				Current		
Sea condition: Slight						Depth	Spd (kt)	Direction
Gear						5	0.2	354°
No. line: 5 line		Total catch in number:		0 pcs.		50	0.2	008°
Trolling time: 3 hour 20 min		Total catch in weight:		- kg		100	-	-

Annex IV

DRIFTING VERTILCAL LONGLINE FISHING LOGSHEET

Operation No.1

Recorded by Sayan Promjinda

Cruise no: 81-3 /2010		Name of Vessel				Air temp:	28	°C
Survey St.No:1(SEAFDEC FAD)		M.V.SEAFDEC				Air pressure:	1009	mbar
Date: 21-22/ Dec/2010						Humidity :	78	%
Moon age: 15-16		Start shooting 21/12/10		Finish shooting 21/10/10		Water		
Wind		Time	1513	Time	1545	Surface temp:	29	°C
Spd (kt)	Direction	Latitude	08°16'.08 N	Latitude	08°15'.00 N	100 m. temp :	26.9	°C
2.7	340	Longitude	095°49'.58E	Longitude	095°49'.44 E	Thermocline :	50-200m./28.4-13.9°C	
Weather cond: bc		Start hauling 22/12/10		Finish hauling 22/12/10		Current		
Sea condition: Slight		Time	0730	Time	0923	Depth	Spd (kt)	Direction
Gear		Latitude	08°13'.20 N	Latitude	08°12'.50 N	5	0.1	137
No. hook/line: 8		Longitude	096°04'.00 E	Longitude	096°06'.40 E	50	0.3	309
Total hook no: 72		Memorandum: 1) Speed of vessel: 3.0 knots				100	0.4	305
Immersion time: 16 hrs 17min.		2) Setting distance: 1.33NM /Course205°				Total catch in number: 3 pcs.		
		3) Sea depth: 891 m (Echo sounder)						
Type of bait: Mackeral scad		4) Depth of hook: 50 -320 m				Total catch in weight: 14.7 kg		
		Remark* hook no. 1 from the surface to bottom						

No.	Species	Length (cm)	Weight (kg)	Remarks
1	*Sphyraena barracuda*	TL = 88	3.70	Line 2 hook no. 6
	(Great barracuda)	FL = 81		sex= Male
		HL = 21		stomach weight = 170g
				GW= 15 g
				GL = 28.2 cm
2	*Xiphias gladius*	TL = 158	8.60	Line 3 hook no. 3
	(Sword fish)	FL = 141		sex= Female
		HL = 75.7		stomach weight = 160g
				GW= 20 g
				GL = 5.1 cm
3	*Dasyatis violacea*	DL = 37	2.40	Line 8 hook no. 3
	(Pelagic stingray)	DW = 43		sex= Male
		TL = 87		
	Total		**14.70**	

DRIFTING VERTILCAL LONGLINE FISHING LOGSHEET
Operation No.2

Recorded by Sayan Promjinda

Cruise no: 81-3 /2010		Name of Vessel				Air temp:	30	°C
Survey St No: 3(reference)		M.V.SEAFDEC				Air pressure:	1007	mbar
Date: 23-24/ Dec/2010						Humidity :	72	%
Moon age: 17-18		Start shooting 23/12/10		Finish shooting 23/12/10		Water		
Wind		Time	1605	Time	1625	Surface temp:	29.1	°C
Spd (kt)	Direction	Latitude	08°02'.09 N	Latitude	08°02'.31 N	100 m. temp :	27.2	°C
4	170	Longitude	097°04'.36E	Longitude	097°03'.52 E	Thermocline :	45-206m./28.4-13°C	
Weather cond: bc		Start hauling 24/12/10		Finish hauling 24/12/10		Current		
Sea condition: Slight		Time	0935	Time	1034	Depth	Spd (kt)	Direction
Gear		Latitude	08°14'.81 N	Latitude	08°15'.41 N	5	0.1	335°
No. hook/line: 8		Longitude	097°04'.10 E	Longitude	097°04'.47 E	50	0.3	323°
Total hook no: 48		Memorandum: 1) Speed of vessel: 2.5 knots				100	-	-
Immersion time: 17 hrs 30 min.		2) Setting distance: 0.64 NM /Course269°				Total catch in number: 1 pcs.		
		3) Sea depth: 516 m (Echo sounder)						
Type of bait: Mackeral scad		4) Depth of hook: 50 -320 m				Total catch in weight: 2.6 kg		
		Remark* hook no. 1 from the surface to bottom						

No.	Species	Length (cm)	Weight (kg)	Remarks
1	*Dasyatis violacea*	DL = 36	2.60	Line 1 hook no. 7
	(Pelagic stingray)	DW = 45		sex= Male
		TL = 62		

DRIFTING VERTILCAL LONGLINE FISHING LOGSHEET
Operation No.3

Recorded by Sayan Promjinda

Cruise no: 81-3 /2010		Name of Vessel				Air temp:	30	°C
Survey St. No: 5 (Bullet type)		M.V.SEAFDEC				Air pressure:	1007.75	mbar
Date: 24-25/ Dec/2010						Humidity :	72	%
Moon age: 18-19		Start shooting 24/12/10		Finish shooting 23/12/10		Water		
Wind		Time	1632	Time	1652	Surface temp:	29	°C
Spd (kt)	Direction	Latitude	08°21'.21 N	Latitude	08°20'.83 N	100 m. temp :	25.7	°C
5	0	Longitude	096°51'.49E	Longitude	096°50'.68 E	Thermocline :	40-250m/28.4-14°C	
Weather cond: bc		Start hauling 25/12/10		Finish hauling 25/12/10		Current		
Sea condition: Slight		Time	0700	Time	0914	Depth	Spd (kt)	Direction
Gear		Latitude	08°25'.50 N	Latitude	08°17'.31 N	5	0	235
No. hook/line: 8		Longitude	096°51'.20 E	Longitude	096°39'.27 E	50	0.3	307
Total hook no: 48		Memorandum: 1) Speed of vessel: 2.5 knots				100	NR	NR
Immersion time: 14 hrs 28 min.		2) Setting distance: 0.64 NM /Course270°				Total catch in number: 1 pcs.		
		3) Sea depth: 498 m (Echo sounder)						
Type of bait: Mackeral scad		4) Depth of hook: 50 -320 m				Total catch in weight: 3.4 kg		
		Remark* hook no. 1 from the surface to bottom						

No.	Species	Length (cm)	Weight (kg)	Remarks
1	*Dasyatis violacea*	DL = 40	3.40	Line 1 hook no. 4
	(Pelagic stingray)	DW = 50		sex= Male
		TL = 110		

DRIFTING VERTILCAL LONGLINE FISHING LOGSHEET

Operation No.4

Recorded by Sayan Promjinda

Cruise no: 81-3 /2010		Name of Vessel				Air temp:	30	°C
Survey St No: 4(Float line type)		M.V.SEAFDEC 2				Air pressure:	1007	mbar
Date: 25-26/ Dec/2010						Humidity :	72	%
Moon age: 19-20		Start shooting 25/12/10		Finish shooting 25/12/10		Water		
Wind		Time	1605	Time	1626	Surface temp:	29.6	°C
Spd (kt)	Direction	Latitude	08°11'.66 N	Latitude	08°11'.75 N	100 m. temp :	27.4	°C
4.8	330	Longitude	096°56'.67E	Longitude	096°55'.70 E	Thermocline :	20-250m/28.6-12.3°C	
Weather cond: bc		Start hauling 26/12/10		Finish hauling 26/12/10		Current		
Sea condition: Slight		Time	0648	Time	0751	Depth	Spd (kt)	Direction
Gear		Latitude	08°12'.30 N	Latitude	08°12'.04 N	5	0.1	115
No.hook/ line: 8		Longitude	096°55'.20 E	Longitude	096°55'.63 E	50	1.6	317
Total hook no: 48		Memorandum: 1) Speed of vessel: 2.5 knots				100	NR	NR
Immersion time: 14 hrs 43 min.		2) Setting distance: 0.9 NM /Course315°				Total catch in number: 0 pcs.		
		3) Sea depth: 500 m (Echo sounder)						
Type of bait: Mackeral scad		4) Depth of hook: 50 -320 m				Total catch in weight: 0 kg		
		Remark* hook no. 1 from the surface to bottom						

Annex V

PELAGIC LONGLINE FISHING LOGSHEET
Operation No.1

Recorded by Sayan Promjinda

Cruise no: 81-3 /2010		Name of Vessel				Air temp:	28	°C
Survey St No:1(SEAFDEC FAD)		M.V.SEAFDEC				Air pressure:	1007.5	mbar
Date: 21-22/ Dec/2010						Humidity :	77	%
Moon age: 15-16		Start shooting 21/12/10		Finish shooting 21/10/10		Water		
Wind		Time	1745	Time	1954	Surface temp:	28.5	°C
Spd (kt)	Direction	Latitude	08°22'.60 N	Latitude	08°29'.40 N	100 m. temp :	26.9	°C
6.4	350	Longitude	095°43'.30E	Longitude	095°48'.70 E	Thermocline :	50-200m./28.4-13.9°C	
Weather cond: bc		Start hauling 22/12/10		Finish hauling 22/12/10		Current		
Sea condition: Slight		Time	1050	Time	1325	Depth	Spd (kt)	Direction
Gear		Latitude	08°25'.99 N	Latitude	08°30'.86 N	5	0.1	069°
No. hook/basket: 20		Longitude	096°06'.40 E	Longitude	096°00'.12 E	50	0.3	320°
Total hook no: 400		Memorandum: 1) Speed of vessel: 7.0 knots				100	0.2	027°
Immersion time: 17 hrs 05 min.		2) Setting distance: 8.7 NM /Course042°				Total catch in number: 15 ind.		
		3) Sea depth: 890 m (Echo sounder)						
Type of bait: Mackeral scad		4) Depth of hook: 43 -155 m				Total catch in weight: 292.8 kg		
		5) Mainline paid out: 14,600 m						

No.	Species	Length (cm)	Weight (kg)	Remarks
1	*Alopias superciliosus*	TL = -	-	Basket 4 hook no. 6
	(Bigeyd Thresher shark)	HL = -		J - hook /was loosed during hual
				up on board
2	*Xiphias gladius*	TL = 270	65.00	Basket 4 hook no. 7
	(Sword fish)	FL = 255		J - hook sex= Female
		SL = 248		stomach weight = 1.1kg
		BL = 178		GW= 550 g
		EFL = 155		GL = 27.0 cm (matured)
		BD = 38		
		HL = 52		
3	*Ruveltus pretiosus*	TL =	0.30	Basket 7 hook no. 4
	(Oil fish)	FL = 38		C - hook / GW=3g, GL=9.9cm
				sex = Male (stage 3)
4	*Thunnus albacares*	TL =	50.00	Basket 7 hook no. 16
	(Yellowfin tuna)	FL = 143.0		Circle - hook /stomach w.=400g
				GW= 600 g
				GL = 34.5 cm/ sex = Male
5	*Dasyatis violacea*	DL = -	-	Basket 9 hook no. 14
	(Pelagic stingray)	DW = -		C - hook / was loosed during
		TL = -		hualed up on board
6	*Dasyatis violacea*	DL = 35	2.40	Basket 10 hook no. 5
	(Pelagic stingray)	DW = 44		J - hook sex= Male
		TL = 77		
7	*Alopias superciliosus*	TL = 276	58.00	Basket 11 hook no. 4
	(Bigeyd Thresher shark)	HL = 54		C - hook sex = Male
		BD = 32		

No.	Species	Length (cm)	Weight (kg)	Remarks
8	*Dasyatis violacea*	DL = 32	2.40	Basket 14 hook no. 3
	(Pelagic stingray)	DW = 43		J - hook / sex = Male
		TL = 73		
9	*Xiphias gladius*	TL = 153	9.70	Basket 14 hook no. 8
	(Sword fish)	FL = 142		J - hook sex= Female
		SL = 136		stomach weight = 370g
		BL = 95		GW= 10 g
		EFL = 82		GL = 6.4 cm
		BD = 21		
10	*Sphyraena barracuda*	TL = 96	4.40	Basket 15 hook no. 1
	(Great barracuda)	FL = 92		C - hook sex= Male (stage 3)
		BD = 12		stomach weight = 115g
				GW= 20 g
				GL = 26 cm
11	*Xiphias gladius*	TL = 167	13.00	Basket 15 hook no. 4
	(Sword fish)	FL = 155		C - hook sex= Female
		SL = 150		stomach weight = 370g
		BL = 112		GW= 25 g
		EFL = 94		GL = 9.5 cm
		BD = 19		
12	*Xiphias gladius*	TL = 205	22.00	Basket 15 hook no. 11
	(Sword fish)	FL = 187		C - hook sex= Female (stage 2)
		SL = 181		stomach weight = 325g
		BL = 127		GW= 78 g
		EFL = 100		GL = 17.5 cm
		BD = 28		
13	*Alopias superciliosus*	TL = 277	62.00	Basket 18 hook no. 7
	(Bigeyd Thresher shark)	HL = 55		J - hook sex = Male
		BD = 36		
		FL = 162		
14	*Thunnus albacares*	HL = 33	-	Basket 18 hook no. 7
	(Yellowfin tuna)			J - hook sex = Female(stage3-4)
				was bitten by shark, remained
				the head only
15	*Sphyraena barracuda*	TL = 88	3.60	Basket 19 hook no. 10
	(Great barracuda)	FL = 83		C - hook sex= Male
		BD = 11.5		stomach weight = 50g
				GW= 18 g
				GL = 19.5 cm
	Total		**292.80**	

PELAGIC LONGLINE FISHING LOGSHEET
Operation No.2

Recorded by Sayan Promjinda

Cruise no: 81-3 /2010		Name of Vessel				Air temp:	29	°C
Survey St No:3 to 4		M.V.SEAFDEC				Air pressure:	1007	mbar
Date: 23-24/ Dec/2010						Humidity :	78	%
Moon age: 17-18		Start shooting 23/12/10		Finish shooting 23/10/10		Water		
Wind		Time	1745	Time	1853	Surface temp:	29	°C
Spd (kt)	Direction	Latitude	08°03'.77 N	Latitude	08°08'.00 N	100 m. temp :	27.2	°C
3.6	330	Longitude	096°57'.83E	Longitude	096°51'.71 E	Thermocline :	45-206m./28.4-13°C	
Weather cond: bc		Start hauling 24/12/10		Finish hauling 24/12/10		Current		
Sea condition: Slight		Time	0635	Time	0826	Depth	Spd (kt)	Direction
Gear		Latitude	08°13'.80 N	Latitude	08°10'.86 N	5	0.2	050°
No. hook/basket: 20		Longitude	096°51'.40 E	Longitude	096°56'.51 E	50	0.7	254°
Total hook no: 400		Memorandum: 1) Speed of vessel: 7.0 knots				100	-	-
Immersion time: 12 hrs 50 min.		2) Setting distance: 7.1 NM /Course305°				Total catch in number: 2 ind.		
Type of bait: Mackeral scad		3) Sea depth: 500 m (Echo sounder)				Total catch in weight: 5.4 kg		
		4) Depth of hook: 60 -120 m						
		5) Mainline paid out: 17,020 m						

No.	Species	Length (cm)	Weight (kg)	Remarks
1	*Lepturacanthus savala*	TL = 135	1.10	Basket 2 hook no. 12
	(Savalani hairtail)	BD = 12		Circle- hook
2	*Xiphias gladius*	TL =	4.30	Basket 4 hook no. 4
	(Sword fish)	FL = 129.5		J - hook sex= Female
		SL = 80		stomach weight = 260 g
		BL = 53		GW= 5.0 g
		EFL =		GL = 3.9 cm
		BD = 16		
		HL = 52		
	Total		**5.40**	

PELAGIC LONGLINE FISHING LOGSHEET
Operation No.3

Recorded by Sayan Promjinda

Cruise no: 81-3 /2010		Name of Vessel				Air temp:	30	°C
Survey St No:5(bullet type)		M.V.SEAFDEC				Air pressure:	1007.5	mbar
Date: 24-25/ Dec/2010						Humidity :	72	%
Moon age: 18-19		Start shooting 24/12/10		Finish shooting 24/10/10		Water		
Wind		Time	1751	Time	1858	Surface temp:	28.8	°C
Spd (kt)	Direction	Latitude	08°21'.63 N	Latitude	08°18'.79 N	100 m. temp :	25.7	°C
4.8	10	Longitude	096°45'.02E	Longitude	096°39'.00 E	Thermocline :	40-250 m/ 28.4-14 °C	
Weather cond: bc		Start hauling 25/12/10		Finish hauling 25/12/10		Current		
Sea condition: Slight		Time	0914	Time	1122	Depth	Spd (kt)	Direction
Gear		Latitude	08°17'.31	Latitude	08°22'.31N	5	0	210
No. hook/basket: 20		Longitude	096°39'.27 E	Longitude	096°44'.44 E	50	0.3	310
Total hook no: 400		Memorandum: 1) Speed of vessel: 7.0 knots				100	-	-
Immersion time: 15 hrs 23 min.		2) Setting distance: 6.7 NM /Course240°				Total catch in number: 11 ind.		
		3) Sea depth: 498 m (Echo sounder)						
Type of bait: Mackeral scad		4) Depth of hook: 65 -284 m				Total catch in weight: 16.9 kg		
		5) Mainline paid out: 18,880 m						

No.	Species	Length (cm)	Weight (kg)	Remarks
1	*Lepturacanthus savala*	TL = 112	0.80	Basket 2 hook no. 12
	(Savalani hairtail)	BD = 12		Circle- hook/GW=20g,GL=16.5cm
				sex = Male
2	*Dasyatis violacea*	DL = 45	5.00	Basket 6 hook no. 16
	(Pelgic stingray)	DW = 54		J - hook sex= Female
		TL = 82		
3	*Lepturacanthus savala*	TL = 110	0.90	Basket 8 hook no. 3
	(Savalani hairtail)	BD = 9		J- hook/GW=5g,GL=19.5cm
				sex = Male
4	*Lepturacanthus savala*	TL =	0.90	Basket 8 hook no. 6
	(Savalani hairtail)	BD = 8.7		J- hook/GW=5g,GL=15.5cm
				sex = Male
5	*Dasyatis violacea*	DL = 38.5	3.30	Basket 6 hook no. 13
	(Pelgic stingray)	DW = 47		J - hook sex= Female
		TL = 102		
6	*Lepturacanthus savala*	TL = 112	1.00	Basket 12 hook no. 12
	(Savalani hairtail)	BD = 10		J- hook/GW=10 g,GL=16 cm
7	*Lepturacanthus savala*	TL =	1.80	Basket 12 hook no. 15
	(Savalani hairtail)	BD = 13		J- hook/GW=55 g,GL= 20 cm
8	*Lepturacanthus savala*	TL = -	-	Basket 13 hook no. 13
	(Savalani hairtail)	BD = -		C- hook (Remained only head)
9	*Lepturacanthus savala*	TL = 114	1.00	Basket 14 hook no. 9
	(Savalani hairtail)	BD = 11		J- hook/GW=10 g,GL=16.5cm
				sex = Male
				sex = Female

No.	Species	Length (cm)	Weight (kg)	Remarks
10	*Lepturacanthus savala*	TL = 111	1.00	Basket 14 hook no. 9
	(Savalani hairtail)	BD = 8.5		J- hook/GW=15 g,GL=17.5cm
				sex = Male
11	*Gempyrus serpen*	TL = 99.5	1.2	Basket 19 hook no. 14
	(Snake meckeral)	BD = 9.0		C- hook/GW= 95 g,GL=39 cm
		FL = 93		sex = Female
	Total		**16.90**	

Annex VI

SQUID JIGGING FISHING LOGSHEET
Operation No.1

Recorded by Sayan Promjinda

Cruise No.81-3/2010		Name of Vessel				Air temp.	28	°C
Survey St. No:1		M.V. SEAFDEC				Air press.	1008	mbar
(SEAFDEC FAD)		Start		Finish		Humidity	76	%
Date: 21-Dec-10		Time	2100	Time	2330	Water		
Moon age: 15		Start		Finish		Surface	28	°C
Wind		Time	2130	Time	2330	100 m. temp :	26.9	°C
Spd (kt)	Direction	Latitude	08°15'.04 N	Latitude	08°14'.41 N	Thermocline :	50-200 m/28.4-13.9°C	
3.5	150	Longitude	095°50'.07 E	Longitude	095°51'.56 E	Current		
Weather condition: bc		Total jigging time: 2 hrs				Depth (m)	Spd (kt)	Direction
Angling depth :30-50 °		Sea depth : 890 m				10	0.1	223
No. of Jig : 5 jig (handline)		Total catch by Individual : 9 ind.				50	0	310
Total catch by weight: 650 g		Catch rate: 1.46 ind./jig/hr				100	0.5	278

No.	Species	Mantle length(cm)	Weight (g)	Sex
	Line no.1 (21.30-23.20)	Bait Flying fish		
1	*Sthenoteuthis oualanensis*	16.3	170	Female
2	*Sthenoteuthis oualanensis*	12	70	Female
	Line no.2 (21.30-23.20)	Bait Flying fish		
3	*Sthenoteuthis oualanensis*	12.2	80	Male
	Line no.3 (21.30-23.20)	Bait Artificial shrimp		
4	*Sthenoteuthis oualanensis*	12	70	Male
	Line no.4 (21.30-22.30)	Bait Flying fish		
5	*Sthenoteuthis oualanensis*	11	50	Male
	Line no.5 (21.30-22.30)	Bait Artificial shrimp		
6	*Sthenoteuthis oualanensis*	12	70	Male
7	*Sthenoteuthis oualanensis*	11.5	50	Male
8	*Sthenoteuthis oualanensis*	11.5	50	Male
9	*Sthenoteuthis oualanensis*	10.5	40	Female
	Total		**650**	

SQUID JIGGING FISHING LOGSHEET
Operation No.2

Recorded by Sayan Promjinda

Cruise No.81-3/2010		Name of Vessel				Air temp.	27	°C
Survey St No: 3		M.V. SEAFDEC				Air press.	1008.5	mbar
reference station		Start		Finish		Humidity	84	%
Date: 23-Dec-10		Time	2000	Time	2400	Water		
Moon age:17		Start		Finish		Surface	29	oC
Wind		Time	2010	Time	2345	100 m. temp :	27.2	°C
Spd (kt)	Direction	Latitude	08°02'.10 N	Latitude	08°05'.83 N	Thermocline :	45-206 m/28.4-13°C	
9.5	110	Longitude	097°04'.30 E	Longitude	097°02'.11 E	Current		
Weather condition: bc		Total jigging time: 3 hrs 35 min				Depth (m)	Spd (kt)	Direction
No. of Jig : 5 jig (handline)		Sea depth : 500 m				10	0	339
Angling depth : 30-50°		Total catch by Individual : 4 ind.				50	0.8	174
Total catch by weight: 760 g		Catch rate: 0.2 ind./jig/hr				100	1.3	184

No.	Species	Mantle length(cm)	Weight (g)	Sex
1	*Thysanoteuthis rhombus*	26.5	500	Female
2	*Sthenoteuthis oualanensis*	10.5	60	Male
3	*Sthenoteuthis oualanensis*	11	80	Male
4	*Sthenoteuthis oualanensis*	14.5	120	Female
	Total		**760**	

SQUID JIGGING FISHING LOGSHEET
Operation No.3

Recorded by Sayan Promjinda

Cruise No.81-3/2010		Name of Vessel				Air temp.	28	°C
Survey St No:5		M.V. SEAFDEC				Air press.	1008.5	mbar
Bullet type FAD		Start Luring		Finish Luring		Humidity	77	%
Date: 24-Dec-10		Time	2000	Time	2300	Water		
Moon age: 18		Start Jigging		Finish Jigging		Surface	28.8	oC
Wind		Time	2020	Time	2300	100 m. temp :	25.7	°C
Spd (kt)	Direction	Latitude	08°21'.58 N	Latitude	08°24'.11 N	Thermocline :	40-250 m/ 28.4-14 °C	
4	010	Longitude	096°52'.22 E	Longitude	096°52'.65 E	Current		
Weather condition: bc		Total jigging time: 2 hrs 40 min				Depth (m)	Spd (kt)	Direction
No. of Jig: 5 jigs (handline)		Sea depth : 498 m				10	0	149
Angling depth : 30-50°		Total catch by Individual : 2 ind.				50	0.3	125
Total catch by weight: 90 g		Catch rate: 0.15 ind./jig/hr				100	0.5	126

No.	Species	Mantle length(cm)	Weight (g)	Sex
1	*Sthenoteuthis oualanensis*	10	25	Male
2	*Sthenoteuthis oualanensis*	12	65	Male
	Total		**90**	

SQUID JIGGING FISHING LOGSHEET
Operation No.4

Recorded by Sayan Promjinda

Cruise No.81-3/2010		Name of Vessel				Air temp.	30	°C
Survey St. No: 4		M.V. SEAFDEC				Air press.	1007	mbar
Float line type FAD		Start Luring		Finish Luring		Humidity	72	%
Date: 25-Dec-10		Time	2000	Time	2300	Water		
Moon age: 19		Start Jigging		Finish Jigging		Surface	29.6	oC
Wind		Time	2020	Time	2300	100 m. temp :	27.4	°C
Spd (kt)	Direction	Latitude	08°13'.20 N	Latitude	08°14'.5 N	Thermocline :	20-250 m/28.6-12.3 °C	
7.9	020	Longitude	096°57'.20 E	Longitude	096°58'.7 E	Current		
Weather condition: bc		Total jigging time: 2 hrs 40 min				Depth (m)	Spd (kt)	Direction
No. of Jig: 5 jigs (handline)		Sea depth : 500 m				10	0.1	115
Angling depth 30-50°		Total catch by Individual : 16 ind.(only squid)				50	1.6	317
Total catch by weight: 2.241 kg		Catch rate: 1.2 ind./jig/hr.(only squid)				100	-	-

No.	Species	Mantle length(cm)	Weight (g)	Sex
1	*Sthenoteuthis oualanensis*	12.0	65.0	Female
2	*Sthenoteuthis oualanensis*	11.5	70.0	Male
3	*Sthenoteuthis oualanensis*	12.5	90.0	Female
4	*Sthenoteuthis oualanensis*	10.0	25.0	Male
5	*Sthenoteuthis oualanensis*	16.9	210.0	Female
6	*Sthenoteuthis oualanensis*	16.5	215.0	Female
7	*Sthenoteuthis oualanensis*	11.5	70.0	Male
8	*Sthenoteuthis oualanensis*	16.3	190.0	Female
9	*Sthenoteuthis oualanensis*	22.0	450.0	Female
10	*Sthenoteuthis oualanensis*	12.0	70.0	Male
11	*Sthenoteuthis oualanensis*	16.5	165.0	Female
12	*Sthenoteuthis oualanensis*	19.4	310.0	Female
13	*Sthenoteuthis oualanensis*	12.5	70.0	Male
14	*Sthenoteuthis oualanensis*	19.4	190.0	Female
15	*Sthenoteuthis oualanensis*	18.3	24.0	Female
16	*Sthenoteuthis oualanensis*	18.3	27.0	Female
17	*Snake meckeral*	FL = 51.0		
		TL = 55.0		
	Total		**2241.0**	