2014

CRUISE REPORT ON

RESEARCH ACTIVITY

Joint Research Program on Tuna Resources in Sulu and Sulawesi Seas

M.V.SEAFDEC2 CRUISE SURVEY NO.47-3/2014

17 OCTOBER – 8 DECEMBER 2014

CAPTURE FISHERIES TECHNOLOGY DIVISION
SOUTHEAST ASIAN FISHERIES DEVELOPMENT CENTER
TRAINING DEPARTMENT

TD/RP/181

Contens

Cruise Report of Research Activity

1. Cruise Summary

Vessel name: **M.V.SEAFDEC 2**

Cruise no: M.V.SEAFDEC 2 No.47-3/2014

Period: 17 Oct – 8 Dec 2014 (53 days)

Area: Sulu and Sulawesi Seas

Port of call: Puerto Princesa (Philippines), Zamboanga (Philippines), Sandakan (Malaysia), Bitung(Indonesia).

Objective: : To carry out the following joint research survey on:

1. Oceanographic survey (ICTD, Bongo net, Neuston net, Current indicator) for 63 stations.
2. Hydro-acoustic survey by scientific echo sounder. Scientific echo sounder will be operate according to track of sailing.
3. Fishing trial by trolling, handline and short "longline" at any survey station or any appropriate position.

2. List of personal on board

2.1 Ship personals

No.	Name	Position
1.	Mr. Vudhirat Vudthipanyo	Captain
2.	Mr. Nanthawat Phungsuk	Chief Engineer
3.	Mr. Aussawin Buachuay	Chief Officer
4.	Mr. Suren Pruksarat	Second Officer
5.	Mr. Padung Ngowlimhuat	Second Engineer
6.	Mr. Kittinai Sukdit	Third Engineer
7.	Mr. Boontarin Wora-in	Third Engineer
8.	Mr. Tana Rungjoy	Boatswain
9.	Mr. Pradit Kui-prasert	Steersman
10.	Mr. Anan Khanseta	Able Seaman
11.	Mr. Somyos Pronprasert	Fishing assistant
12.	Mr. Plew Shodok	Oiler
13.	Mr. Chanchai Chid U dom	Oiler
14.	Mr. Veeraphon Vorakun	Cook
15.	Mr. Chanchai Chid U dom	Ship's Boy

2.2 Researchers from SEAFDEC/TD

No.	Name	Responsibility	Contact address	Period of duty
1	Mr. Isara chanrajkij	Chief scientist	Isara@seafdec.org	22 Oct- 4 Nov
2	Mr. Sayan Promjinda	Chief scientist	sayan@seafdec.org	22 Oct – 1 Dec
3	Mr. Sukchai Arnupapboon	Fisheries Oceanographer	sukchai@seafdec.org	22 Oct – 1 Dec
4.	Mr.Nakaret Yasook	Fishing gear technologist	nakaret@seafdec.org	22 Oct – 1 Dec
5.	Ms. Pontipa Luadnakrob	Fisheries Oceanographer	pontipa@seafdec.org	22 Oct – 1 Dec
6.	Mr. Komson Pofa	Assist. Fishing gear technologist	komsanp@seafdec.org	17 Oct – 8 Dec

2.3 Indonesia national researchers

No.	Name	Responsibility	Contact address	Period of duty
1.	Mr. M. Taufik	Chief scientist	RIMF/BPPL, Jakarta Taufik.brpl@gmail.com	22 -28 Nov
2.	Mr. Asep Priatna	Acoustic Fisheries	RIMF/BPPL, Jakarta Aseppri.brpl@gmail.com	22 -28 Nov
3.	Mr.Ahmad Zamroni	Genetic	RIMF/BPPL, Jakartar a.samroni@kkp.go.id	22 -28 Nov
4.	Mr.Enjah Rahmat	Fishing Gear	RIMF/BPPL, Jakartar enjahrahmat@yahoo.com	22 -28 Nov
5.	Mr.Rodo Lasniroha	Acoustic Fisheries	RIMF/BPPL, Jakartar Rodo.lasnoroha@gmail.com	22 -28 Nov
6.	Mrs.Yoke H.R.	GIS and Remote sensing	RIMF/BPPL, Jakartar Yoke.hany@gmail.com	22 -28 Nov
7.	Mr. Karsono Wagiyo	Fish larvae	RIMF/BPPL, Jakartar k_giyo@yahoo.com	22 -28 Nov

2.4 Malaysia national researchers

No.	Name	Responsibility	Contact address	Period of duty
1	Ms. Masazurah binti A. Rahim	Chief scientist	FRI Bata Maung	22 -28 Nov
2	Mr. Saifulhak bin Yahya		FRI Kg Acheh	22 -28 Nov
3	Mr. Ruzelan bin Jusoh		SEAFDEC/MFRDMD	22 -28 Nov
4	Mr. Jamil bin Musel		FRI Bintawa	22 -28 Nov

2.5 Philippines national researchers

No.	Name	Responsibility	Contact address	Period of duty
1	Mr. Valeriano Borja	Chief scientist	BFAR-NFRDI	25 Oct-13Nov
2	Mr. Ryan Reyes		BFAR-NFRDI	25 Oct-2 Nov
3	Mr. Marvin Tobias		BFAR-NFRDI	25 Oct-2 Nov
4	Mr. Rojer Fortaliza		M.V. DA-BFAR	25 Oct-2 Nov
5	Ms. Riczyneth Arinque	Oceanographer	M.V. DA-BFAR Rhamneth1982@gmail.com	25 Oct-28 Nov
6	Mr. Remar Asucion	Fishing gear technologist	M.V. DA-BFAR remarasuncion@gmail.com	25 Oct-28 Nov

3. Report in General

M.V. SEAFDEC Cruise No.47-3/2014 is a Joint Research Program on Tuna Resources Survey in the Sulu and Sulawesi Seas within the EEZ of Indonesia, Malaysia and Philippines. The scope of the survey activities were includes the following:

- Research on tuna early life history using fish larvae sampling net and Bongo net in the near shore and off shore of the SSS, in order to determine the relative abundance and species composition of the fish larvae;
- Oceanographic survey using the Conductivity-Temperature and Depth (CTD) attached with other sensors, namely: pH, DO, Fluorescence, among others;
- Use of scientific hydro-acoustic during the track survey; and
- Scanning sonar survey on the FADs, and fish sampling by "short" Pelagic longline, Hand line and Trolling line

Cruise survey is scheduled from 17 October to 8 December 2014, by dividing into 3 leg. Respecting to cruise order M.V. SEAFDEC2 Cruise No. 47-3/2014, sixty-two (62) survey stations for hydro acoustic tracks and oceanographic survey stations (OS) have been detailed to collect larvae and plankton by using Bongo net, neuston net and environment parameters are collected by CTD, are conducted during trip. To determine the relative concentration of FADs in the SSS will be observed and recorded through binocular observation and radar recordings during the track survey. The determining the species compositions and size of fish caught at FADs using appropriate fishing gear *e.g*. "short" Pelagic longline, trolling, and hand line fishing.

The first leg is carried out from 25 October to 2 November 2014. Area of survey is Sulu sea in the EEZ of the Philippines. Two (2) ports, Puerto Princesa and Zamboanga are defined as Port of Calls (Fig.1). Total numbers of oceanographic survey stations are twenty five (25) stations. Twenty five (25) hydro acoustic tracks are carried out recording by using hydroacoustic survey equipment (FQ-80). The fishing trials by sampling gear, trolling line are conducted in the same time during towing bongo net and neuston net. Hand line fishing operations will conducted during operated the CTD. Two (2) "short" Pelagic longline fishing operations are conducted during this trip. Six (6) researchers from the Philippines were participated in this leg.

The second leg is carried out from 5 to 13 November 2014. Area of survey is in the Moro Gulf and from the north to central of Celebes seas within EEZ of the Philippines water and Malaysia waters. Port of call is Zamboanga, Philippines and Sandakan, Malaysia (Fig.2). Total numbers Oceanographic survey station are twenty- one (21), and two (2) "short" Pelagic longline fishing operation. Twenty one (21) hydro acoustic tracks are carried out recording by using hydroacoustic survey equipment (FQ-80). The fishing trials by sampling gear, trolling line are conducted in the same time during towing bongo net and neuston net. Hand line fishing operations are conducted during operated the CTD. Five (5) trolling line fishing operation are conducted around FADs. The vessel will be sailing circle around FADs

about 5 rounds or 15 minutes. Fish sampling are collected from three (3) station of fishing boat at the FADs for genetic study. Three (3) researchers from Philippines participated in this leg.

The third leg is conducted during from 22 to 28 November 2014. Port of call is Bintung, Indonesia. Area of survey is in the Celebes sea and in the north of Sulawesi sea in EEZ of Indonesia waters (Fig.3). Total numbers Oceanographic survey station and hydro acoustic track are Seventeen (17), The fishing trials by sampling gear, trolling line are conducted in the same time during towing bongo net and neuston net. Hand line fishing operations are conducted during operated the CTD. Two (2) scientific echosounder survey was carries out around the FADs using portable type (Simrad EK-60), to conduct on the small boat (rescue boat) together with the fishing trail by trolling line. Seven (7) researchers from Indonesia and four (4) researchers from Malaysia were participated in this leg. On this trip, Station No.49 is abandoned regarding to the limitation of survey period.

Overall result from five survey trips are sixty two (62) oceanographic survey operations by CTD, Bongo net, and Neuston net. Four (4) fishing operations are conducted by “short” Pelagic longline. Sixty four (64) hand line fishing operations are conducted and sixty seven (67) trolling line fishing operations are conducted. Sixty two (62) acoustic tracks, approximately 3,039.8 nm are recorded of fisheries resource abundance by hydro acoustic equipment (FQ-80). The map of all survey station was show in (Fig.4)

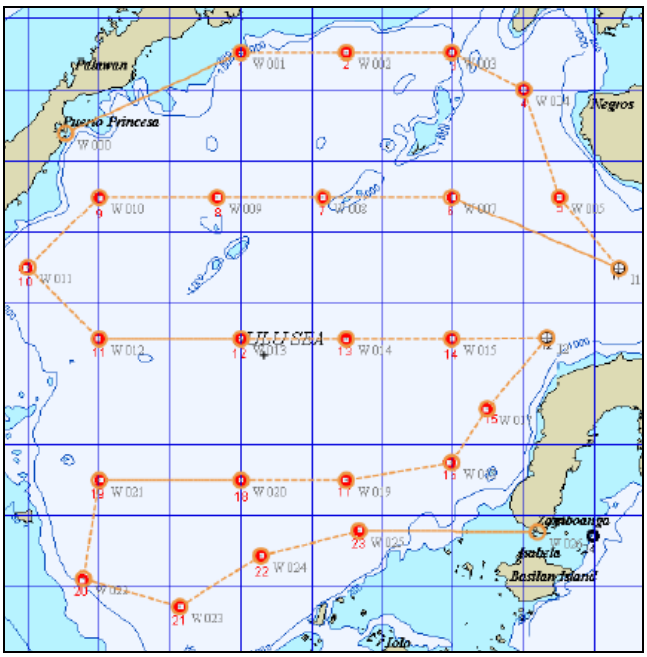


Fig.1 The survey station in Leg 1, 25 stations in Sulu sea

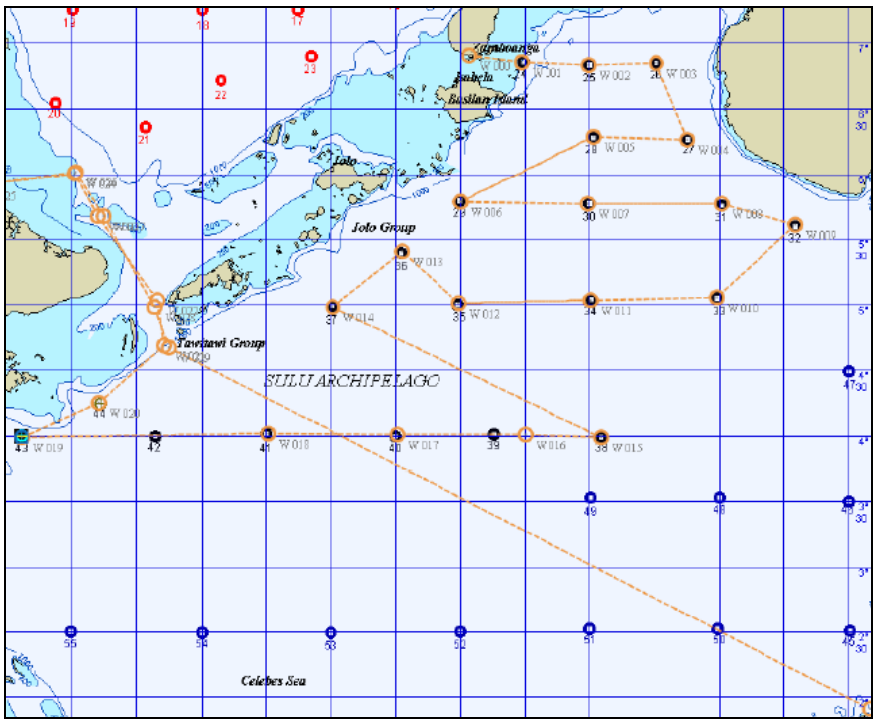


Fig.2 The survey station in Leg 2, 21 stations in Celebrace sea

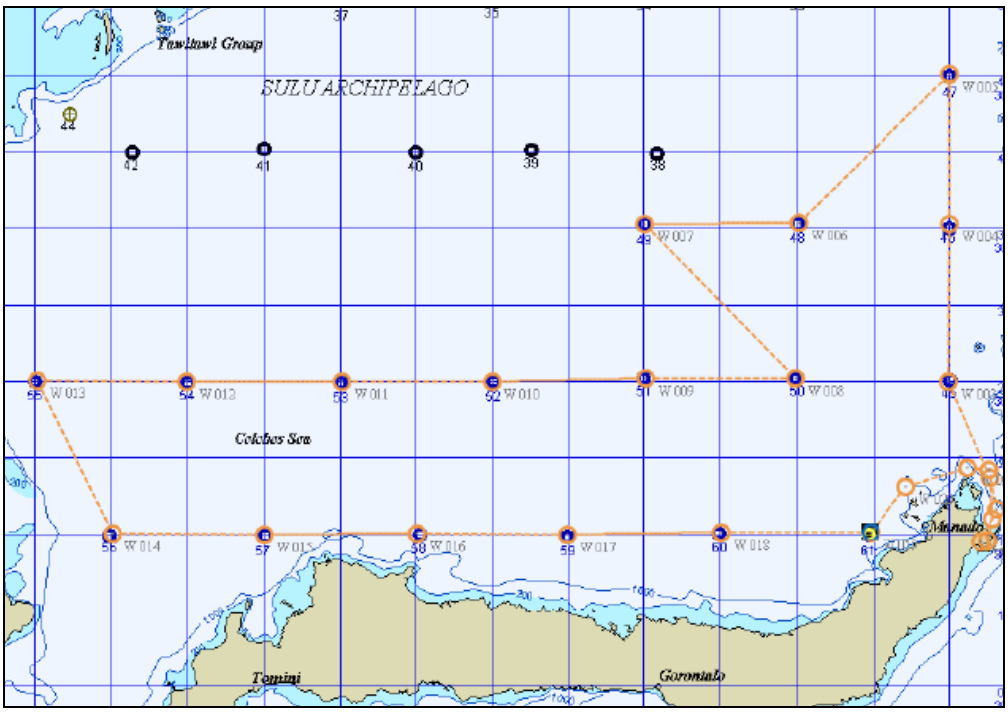


Fig.3 The survey station in Leg 3, 17 stations in Celebrace sea and north Sulawesi sea

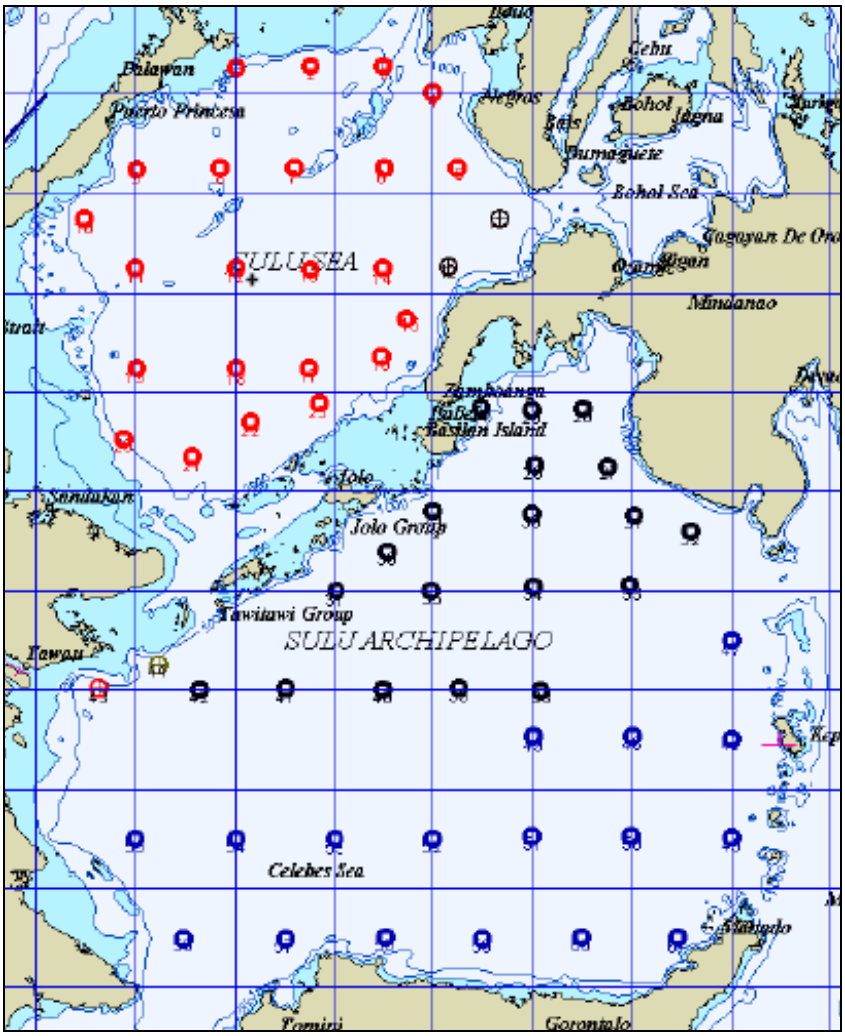


Fig. 4 Map showing the survey stations

The general observation from cruise survey is concluded that;

1. In case of participants from member counties unable to join the survey, according to the permit letter. The document of permission letter should be complete before starting the cruise survey about 1 month.

2. The port of call at Bitung, Indonesia is inconvenient for load fuel and provision, because of other fishing boat are inner alongside, so M.V.SEAFDEC2 have to outer alongside

Fishing activities

1. The duration for fishing operation of Pelagic longline should be extend for fishing activities and put into the schedule of cruise survey at least 6 hrs. per operation.

Acoustic survey

1. Should have time at least a half day for acoustic survey around the FADs by using the service boat in each survey station.

2. The participants from each country should have authorities to responsible for the acoustic survey at least 1 person. To conduct the survey by FQ80 equipment on deck.

4. Report on fishing activities

4.1 Report on "Short" Pelagic longline

Four pelagic longline fishing operations are conducted in the area of Sulu and Celebes seas, Philippines Waters. Two (2) fishing operation are carried out during the first leg and two (2) fishing operation is conducted during the second leg. Sea depth of fishing ground around deep sea area of Sulu and Celebes sea is deeper than 4,500 m. except on operation one sea depth is 1,800 m.(Fishing logs: Appendix 3.1). Twenty to twenty five (20-25) hooks were setting between float interval and interval between each branch line is 40 m. Numbers of hooks were set for "short" what deployed are 175 - 300 hooks/operation in order to avoid the main line have entangle with FADs. Distance of main line setting is approximate 3 to 5 nautical miles (nm). Construction of pelagic longline is label in appendix 4.1. Eight hundred and eighty eight (888) hooks are totally deployed during 4 fishing operations. There are few operations, regarding to the limitation of survey period, unable to set on standard numbers (300 hooks) because various troubles. The troubles are described as below;

Pelagic longline fishing operation No.1 at station No.12 is conducted on 29 October 2014 Two hundred and eighteen (218) are deployed at this station. During shooting operation, main line shooter is found malfunction at the small pulley, then fishing operation has to stop before reaching 300 hooks.

Pelagic longline fishing operation No.4 at station No.38 is conducted on 10 November 2014. One hundred and seventy five hooks (175) are deployed at this station. Cause by number of bait limited, regarding to unable to buy bait from Sandakan port. Twenty five (25) hooks were setting between float intervals in order to set the hook to 300 meter of depth.

Three different types of bait were used in the first leg i.e., Purpleback flying squid, Milk fish and Indian mackerel, baiting will be alternately by basket. Two types of hooks were used during the survey operation i.e., "J"hook and stainless steel circle hook. During hauling in every fishing operation, the main line was cut, because of the quality of main line was degenerate by using for five years ago.

Setting operation is operated in the early morning and hauling before afternoon. Immersion period is between 7-8 hours. From the observation, no tuna was caught. The dominant species is Snake mackerel *(Gempylus serpens),* two Blue shark *(Prionace glauca*), and one Sword fish *(Xiphias gladius*) were caught in operation 3. No fish were caught in operation 4. The summaries of fishing operation are show in appendix 2 table 1.

4.2 Report on Trolling and Hand line fishing

The fishing trials by sampling gear, trolling line are conducted in the same time during towing bongo net and neuston net. Hand line fishing operations are conducted during CTD operation**.** Sixty two (62) trolling line and hand line fishing operations are conducted during oceanographic survey operation by using Surface and sub-surface trolling with feathers, squid and plastic lures and artificial bait. The surface trolling (splashing float) will be use during the vessel sailing on the cruise track and the Sub-surface trolling (diving board) will be used

on the fish larvae and plankton net sampling operation. Construction of trolling and hand line is label in (appendix 4.2). Five (5) trolling line fishing operations are conducted around the FADs, the vessel have sailing around the FADs. The fishing operation will be trolling at the stern deck of vessel. Trolling time is about 15 minute per time.

In the leg 3, two (2) trolling and hand line fishing operations are conducted on the small boat together with hydro acoustic survey around the FADs. Trolling line fishing operation No. 53 and No. 60 are conduct on 24 and 26 November, respectively. Trolling time is about 1 hour, making the track survey like a flower by setting FADs at center. Then small boat will drift for hand line fishing and setting underwater video camera for FADs observation. The summaries fishing operation is show in table 2 and table 3 as in appendix 2.

5. Oceanographic survey

5.1 Physical oceanography

5.1.1 Physical and chemical character of water

There were 62 oceanographic survey stations completed during leg I, II and III. The survey station is showed in Figure 5. Physical and chemical characteristic of water including conductivity, temperature, fluorescence, dissolved and oxygen was measuring using SeaBird 911 CTD. It was deployed from the sea surface to approximately 10 meter above the sea bottom or Maximum 750 m when the depth deeper than 750 m. During retrieving CTD, Carousel water sample (Niskin Bottles) which is a part of CTD system was used for collecting water samples from standard depth. The CTD deploying information is showed in table 4.

Figure 5. CTD Deployment during cruise survey

5.1.2 Nutrient

Sea water samples from Carousel water sample were filtrated through Whatman GF/C (1.2 µm) filter paper and subsampling to transport tubes is showed in figure 6.and kept for nutrient analysis at SEAFDEC/Training Department chemical laboratory. Nitrite plus, nitrate and phosphate samples were kept in the freezer at -25 ºC. While, silicate samples were stored in dark and temperature room. The depth of water samples are shown in appendix 5 as in table 4**.**

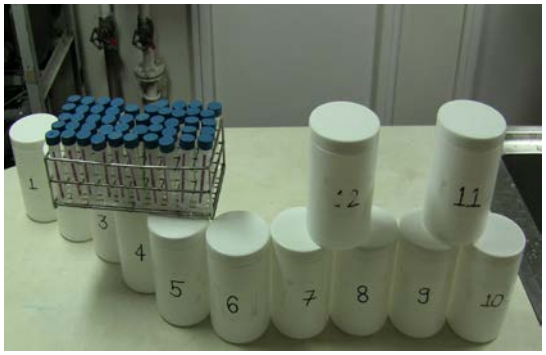


Figure 6. Water samples were filtrated for nutrient analysis

5.2 Biological oceanography

5.2.1 Fish larvae and Zooplankton

The 55 cm diameter bongo frames was attached with zooplankton and larval fish net with mesh size of 330 µm and 500 µm, respectively. TSK flow meters no. 7035 and no. 7240 was respectively attached at the aperture of zooplankton net and larval fish net to measure the water volume passing through the net. Both TSK flow meters were calibrated before and after the survey period which calibration data is show in appendix 5 as table 5.

Bongo net was oblique tow with 2-2.5 knots approximately ship speed. Angle of towing cable was maintained at 45^{o}. Towing depth was observed using Net SONDE (depth meter). The operations depth of Bongo was from surface to 150 m. However, some station bongo net was not dropped to 150 m because of strong current and limit length of wire reason.

Towing time for downward and upward was 15 minute each. Specimens of Bongo net were kept in plastic bottles and preserved in 10% seawater/formalin added by borax buffer solution immediately after each haul. Partial details of Bongo net operation show in appendix 5, as table 6 and Figure 7 show bongo net operation.

Figure 7. Bongo frame attached with TSK flow meters at mouth aperture

5.2.2 Fish Juvenile

The operations on rectangular-Neuston net (Fig.8) with mesh size of upper part 1,000 µm and lower part 600 µm was conducted for the fish juveniles collection at the surface layer with towing speed between 2-3 knots and approximated towing time of 30minute. This gear was operated as surface tow due to the larvae of several species of commercially important pelagic fishes is known to occur in the surface layer.
The rectangular Neuston net (70 cm x 110 cm) was attached with TSK flow meters no. 7021. Its calibration is show in table 5. Specimens of Neuston net were kept in plastic bottles and preserved in 10% seawater/formalin added by borax buffer solution immediately after each haul. Partial details of Neuston net operation show in appendix 5, table 7.

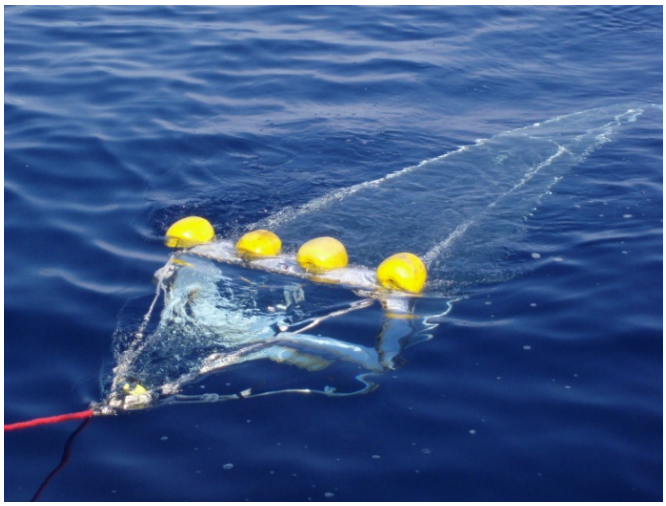


Figure 8. Neuston net operation

5.3 Preliminary analysis of oceanographic parameters

All 63 oceanographic stations were conducted during survey in day and night time with Sea depth varies between 360 m (St. no. 24) and 5485 m (St. no. 53). Figure 9 shows data from each particular area. The water column data at Sulu and Sulawesi Seas show that mix layer was very thin. With descent into the water column, the warm, low salinity and high oxygen surface water was above the top of thermocline at 50-70 m. In thermocline layer, Sulu Sea temperature, salinity and oxygen were rapidly cooler, salter and lower until 200 m with temperature change from 27.5 to 15.0 ^{o}C, Salinity 33.50 to 34.25 psu and oxygen 5.5 to 2.5 mg/l. While Sulawesi Sea gave way to cooler, salter and lower until 300 m with temperature change from 27.5 to 10.0 ^{o}C, Salinity 34.25 to 34.50 psu and oxygen 5.5 to 3.5 mg/l. Additionally, Salinity transect at latitude 4 showed that there was a pronounced salinity maximum in the 70 to 170 m accessing from east to westward. Figure 10 and 11 show line transect of temperature, salinity and oxygen in Sulu Seas and Sulawesi Sea, respectively.

In deeper layer (below thermocline to 750 m), the water characteristics between Sulu Sea and Sulawesi Seas quit different. It seem to be that there was little exchange water flow occurring between deep layer with marked property differences was perhaps a product of the topographic barriers of Sulu Archipelago. Figure 12 show temperature, salinity and oxygen in Sulu and Sulawesi Seas at 750 m. However, in shallow water there was a sight of water exchange particularly in Sibutu Passage as show in figure 13.

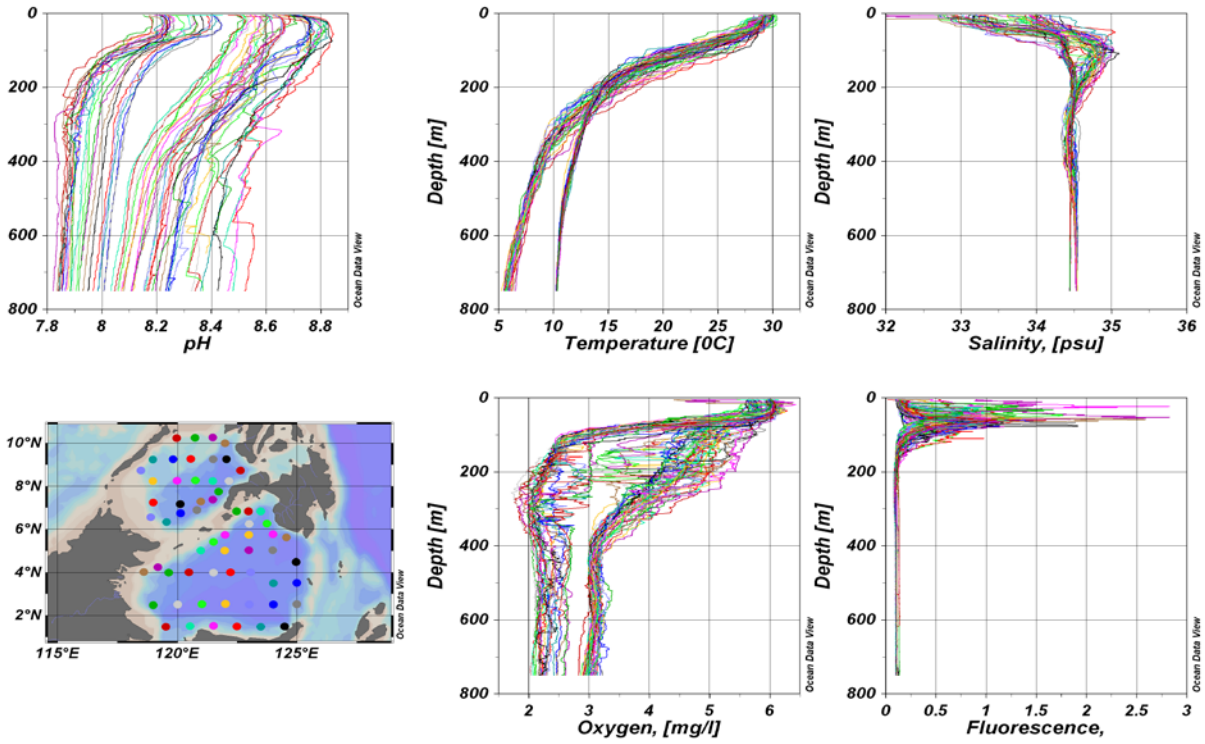


Figure 9. CTD data obtained on cruise

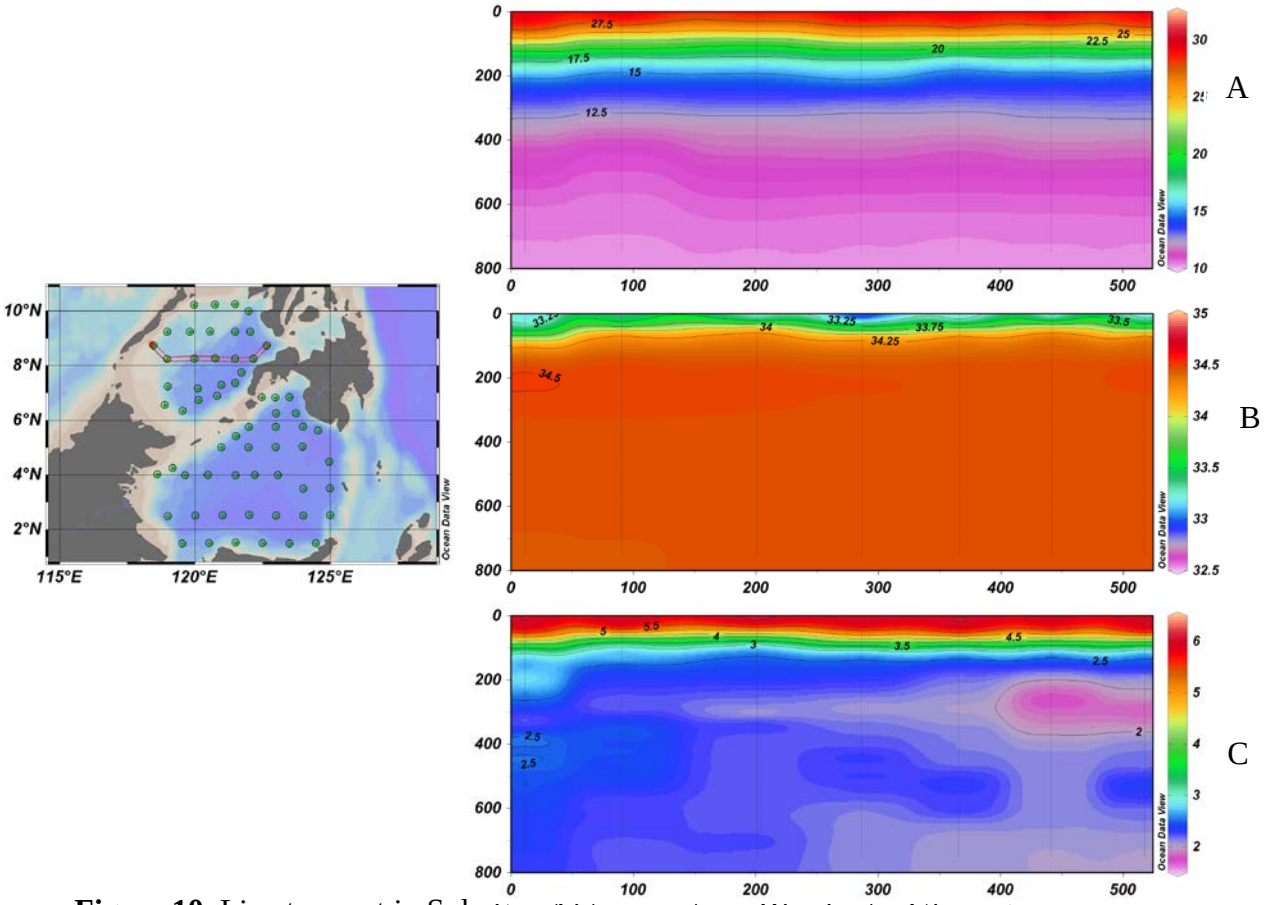


Figure 10. Line transect in Sulu Sea A) temperature B) salinity C) oxygen

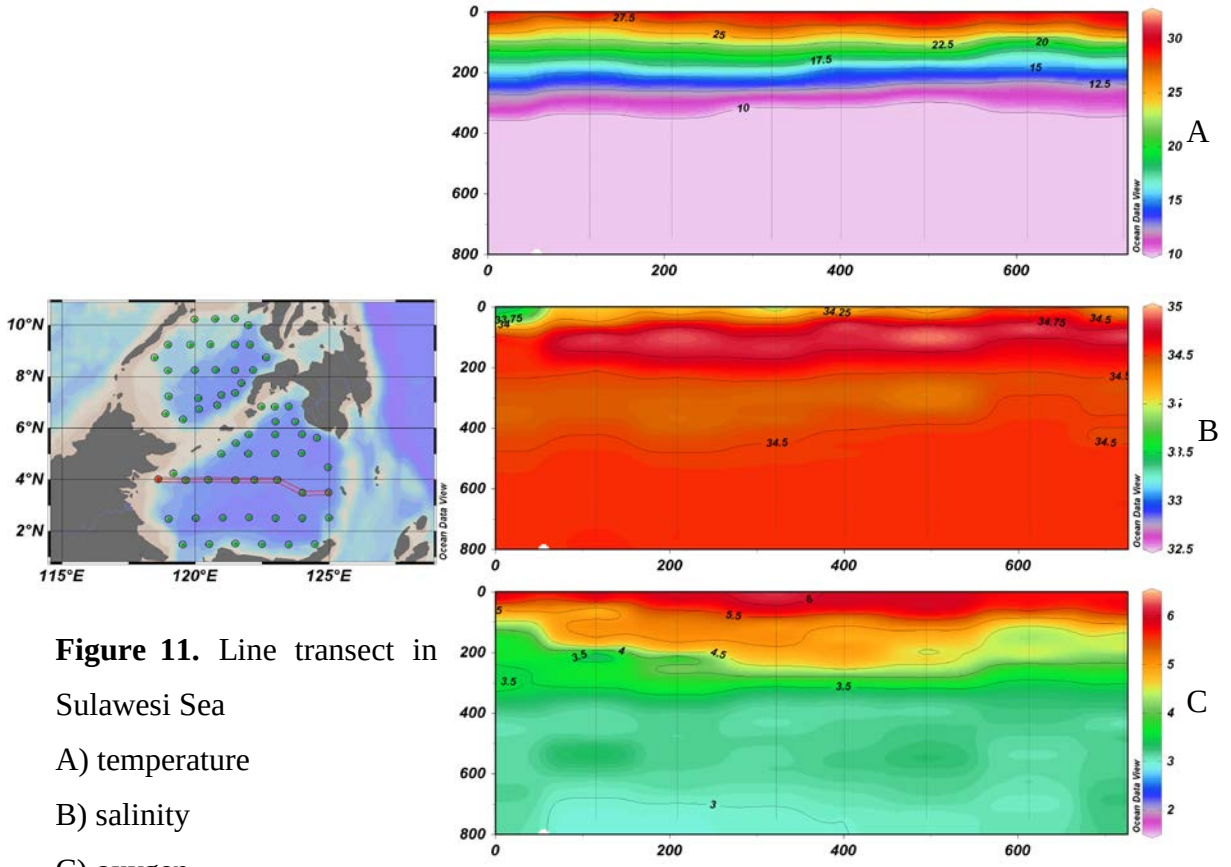


Figure 11. Line transect in Sulawesi Sea

A) temperature

B) salinity

C) oxygen

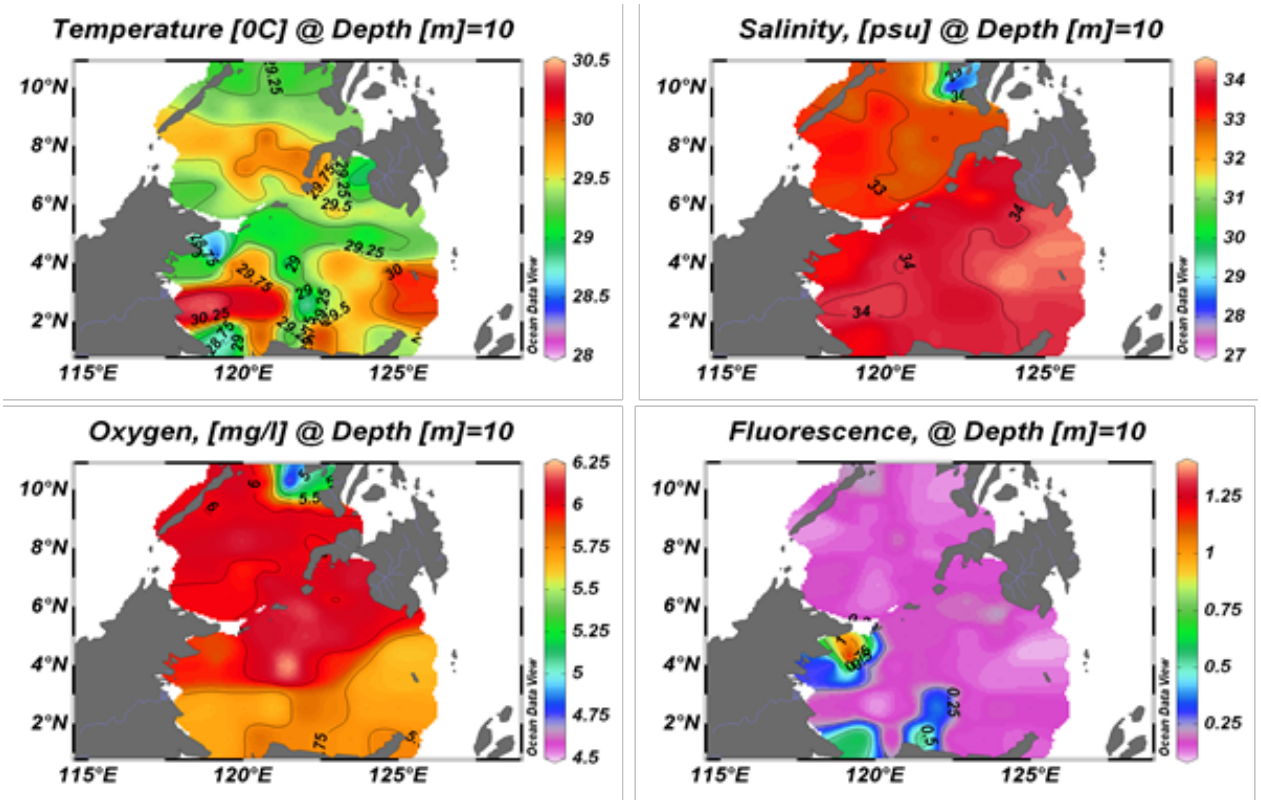


Figure 12. Horizontal plot of temperature (°C), salinity (PSU), dissolved oxygen (mg/l) and fluorescence (micro g/l**)** at surface layer.

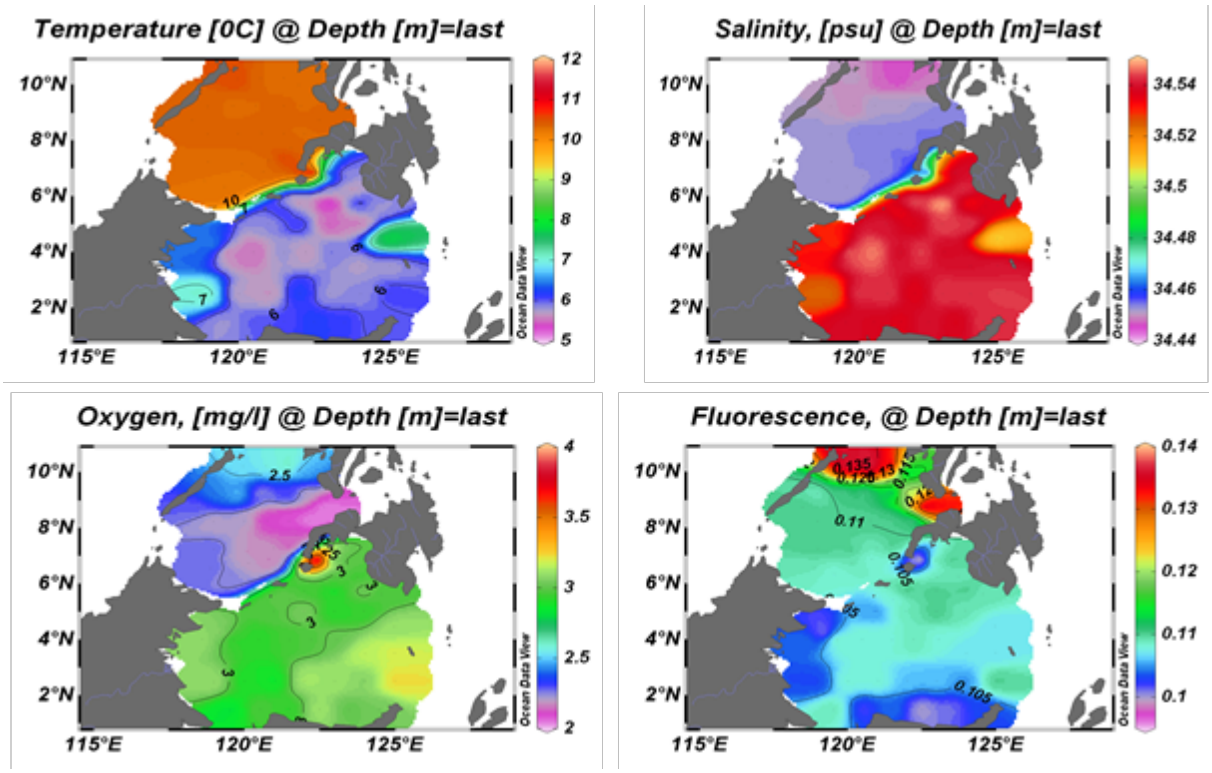


Figure 13. Horizontal plot of temperature (°C), salinity (PSU), dissolved oxygen (mg/l) and fluorescence (micro g/l**)** at 750 m. depth

6. Genetic study

The total of 132 was collected for DAN analysis including 37 Yellowfin tunas, 45 skipjack tunas, 1 Bigeye scad, 1 Blue shark, 8 Bullet tunas, 2 Dolphins, 24 Frigate tunas, 1 Greater amberjack, 1 Kawakawa, 3 Pelagic string ray, 2 Rainbow, 5 Round scads, 1 Sickle promfet and 1 swordfish. The fishing gear used to catch fish specimen were Hand line, trolling line and pelagic longline (PLL) which they were operated either M.V. SEAFDEC 2 staff or local fisherman.(Fig.14)

To collect tissue, 2nd dorsal fin was cut approximately 1.5 cm X 0.5 cm (length x width). (Fig.15). immediately, place the cut tissue into a vial that contains 95%-100% ethanol. Every 1-2 hours change the ethanol in all of the tubes and replace with fresh 95-100% ethanol. A final change should be done after another 6-8 hours. This will be done until ethanol is clean (at least 2 times). The summaries of DNA tissue collection are show in Appendix 6 table 8-10.

Figure 14. Fish sampling from local fishing boat for Genetic study

Figure 15. DNA tissue collection at 2nd dorsal fin of Skipjack tuna

7. FADs Inventory

Strengthen collaborative research among the three countries surrounding the Sulu-Sulawesi Sea, through the conduct of

1) Study on the use of FADs in SSS areas

2) Assessment of the status and trends of tuna stocks and the estimated maximum sustainable yield; and

3) Increase awareness of stakeholders on sustainable exploitation and management of tuna.

During the collaborative survey in SSS waters in this cruise. The content of **Study on the use of FADs in SSS areas** will be done by the following topics

- Distribution of FADs in SSS waters.
- Species Composition, sizes and relative depth of distribution in FADs.
- Types of FADs (designs and materials used, if possible investment costs)

7.1 Methodology

1. Determining the relative concentration of FADs in SSS

The observation survey was conducted based on the cruise track using radar and binocular within the range which could be detected and observed. Each FADs found from radar will be confirmed by sight observation. The survey was made only during daytime. A logsheet will be provided to record pertinent will be listed such as vessel's position when the *Payao* was sited, *Payao*s relative position to the vessel, its type. Scanned floating objects were determined whether if boat, *Payao* or others and plotted using QGIS Plotting Software

7.2 Results

Most of FADs found are drum types made of steel tube, some FADs were made of Styrofoam covered with fishing net and some FADs were made of bamboo (Fig.16 type of FADs). All FADs is anchor FADs. The total number of FADs were found in this cruise survey are 287 FADs. The first leg, 21 FADs are found from Puerto Princesa to Zambounga, Philippines. 5 (five) FADs are made of Styrofoam, 4 FADs made of bamboo, 6 FADs made of steel drum, 2 FADs made of plastic drum and 4 FADs are unidentified type of FADs. In table 11 as appendix 7 will show the list of FADs location were found during the survey. In leg 2, 154 (one hundred and fifty four) of FADs are found from Zambounga, Philippines to Sandakan, Malaysia. Most of FADs are made of steel drum. 4 FADs only are made from bamboo, which were found near shore. When the vessel was leave from Sandakan, Malaysia to Bitung of Indonesia for the survey in Leg3 the observation will be start when the vessel was passed Tawi tawi province of Philippines till arrive at Bitung. 56 (Fifty six) FADs are found during the vessel sailing on the track. All of FADs are made of steel drum. In leg 3, 56 (Fifty six) FADs are found during the survey. Most of FADS made of steel drum. 5 FADs are made of bamboo and 2 FADs are made of Styrofoam. The FADs position are plotted in the map of the survey was show in Figure. 17. The table of FADS survey are show in appendix 7 table 11.

Figure. 16 Type of FADs were found in this cruise

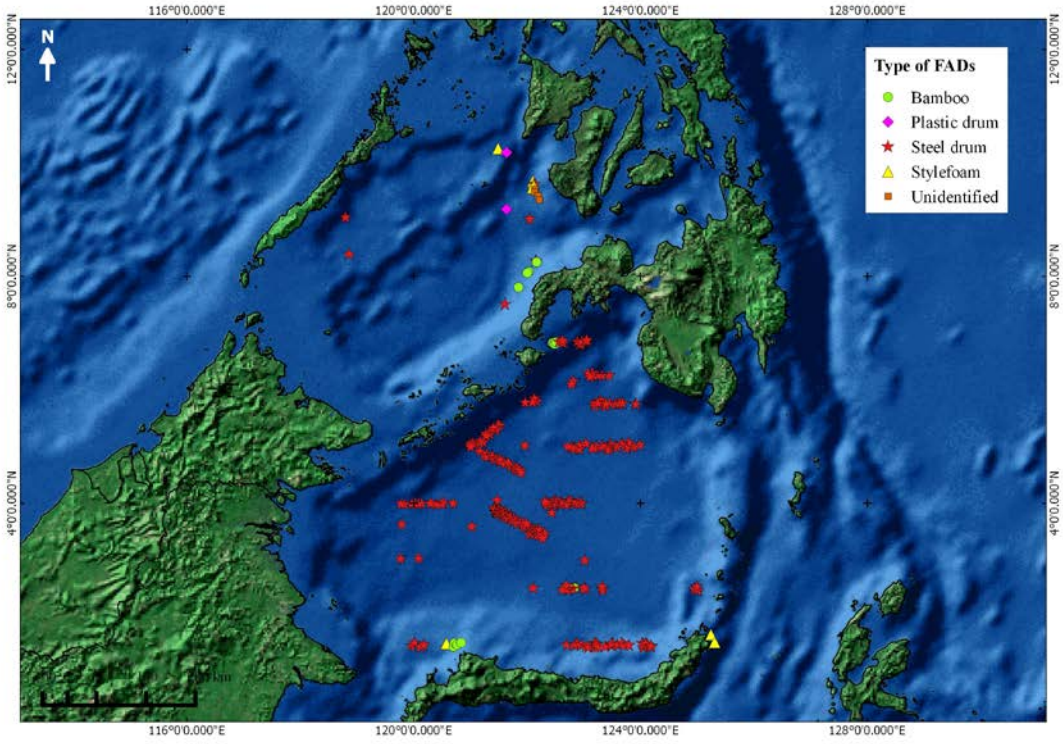


Figure. 17 Distribution of FADs were found in the cruise survey

8. Hydroacoustic survey in Sulu and Sulawesi Sea

The acoustic survey on tuna and pelagic marine resources abundance were conducted in Sulu and Sulawesi Sea during 17 October to 8 December 2014 by using the scientific echosounder on board M.V.SEAFDEC2 namely Furuno FQ80 and the additional survey around FADs by using the portable scientific echosounder namely SIMRAD EK60. The hydroacoustic survey using Furuno FQ80 were recorded both of low frequency (38 kHz) and high frequency (120 kHz). The short pulse length and 1500 m/s of sound speed were use in this survey. Ship speed ere 10 – 12 knots depend on sea stage. The survey range started from water surface to 250 m depth. Regarding the uncomplicated management of data files, survey data from station to another station was recorded in one folder except the survey track from station 37 to 38 in LEG 2 were separated to 4 folders and survey track from station 57 to 58 in LEG 3 were separated to 2 folders. All together 64 tracks have been surveyed. For more information of each track please find in logsheet are show in Appendix 8 Table 12. The hydroacoustic using SIMRAD EK60 were done in LEG 3 in Sulawesi Sea close to the survey station No.51 and 57. SIMRAD EK60 was installed on the service boat of M.V. SEAFDEC 2. The track survey using service boat had survey around the FADs No.239 and No.253. The frequency of 120 kHz was use only with the maximum 250 m depth of survey. The survey area located within a radius of 500 m around the FADs was shown in figure 18 and 19.

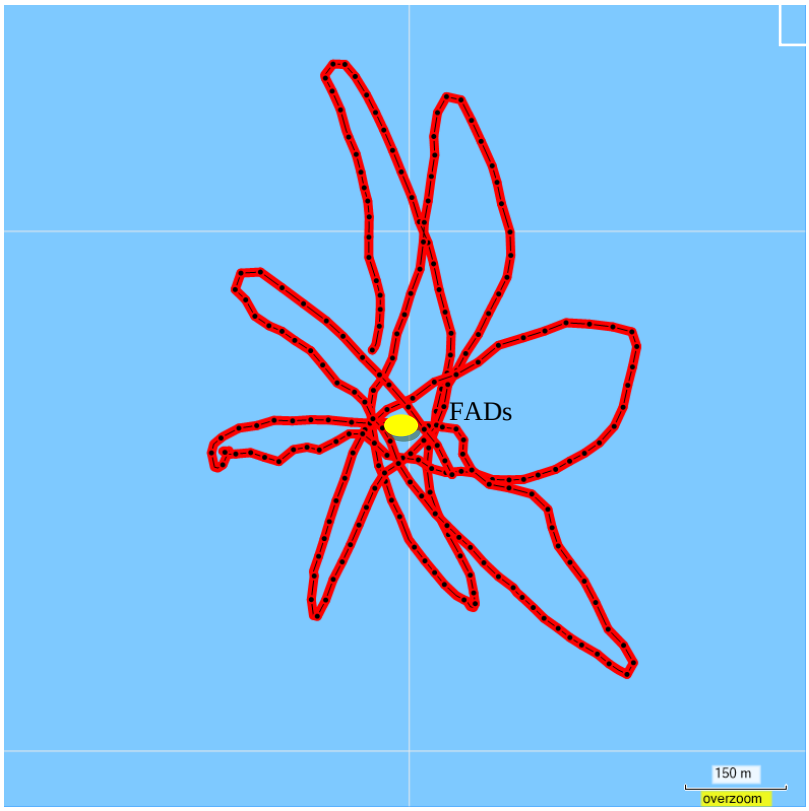


Figure. 18 The acoustic track survey around the FADs No.239

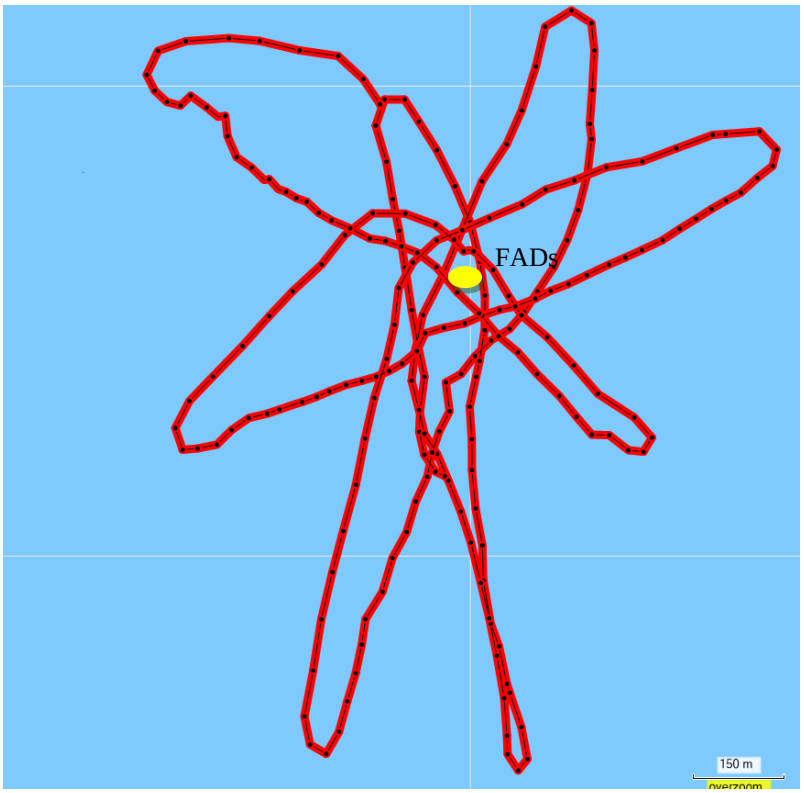


Figure. 19 The acoustic track survey around the FADs No.253

Appendix: I

Research activities of M.V. SEAFDEC2
Cruise 47-3/2014: Tuna Resources Survey in Sulu and Sulawesi Sea

Date	Time	Activities	Remark
17 Oct 14	0845	Leaved SEAFDEC/TD for Hai Phong, Vietnam	
22 Oct 14	1000	Arrived Puerto princesa Pilot station	
	1100	Alongside at port of Puerto princesa	
	1800	Researcher from SEAFDEC/TD embark onboard	

Leg I: 25 October to 2 November 2014

Date	Time	Activities	Remark
25 Oct 14	0810	Leave port of Puerto Princesa for research survey	
	0950-1022	Flow meter calibration	L09°46′.57N λ118°56′.29E
	1722 1730-1800 1803-1834 1835-1942	Oceanographic survey op.1 at station no.1 - Neuston net, sea depth 1,200 m - Bongo net , sea depth 1,200 m - CTD , sea depth 1,200 m	L10°15′.41N λ119°00′.00E L10°15′.28N λ119°00′.00E L10°14′.21N λ119°59′.66E L10°13′.62N λ119°58′.87E
	1730-1942	Trolling line and Hand line fishing operation 1 were conducted during OS. Operation And then proceeded to St. OS1.	
	2011-0030	Acoustic survey from station no.1 to station 2	L10°15′.24N λ119°59′.93E
26 Oct 14	0030 0035-0105 0106-0137 0140-0245	Oceanographic survey op.2 at station No.2 - Bongo net , sea depth 1,450 m - Neuston net, sea depth 1,436 m - CTD , sea depth 1,436 m	L10°15′.16N λ120°45′.11E L10°15′.41N λ120°45′.10E L10°14′.98N λ120°45′.10E L10°14′.52N λ120°44′.98E
	0033-0245	Trolling line and Hand line fishing operation 2 were conducted during OS. operation And then proceeded to St.No.3	
	0302-0714	Acoustic survey from station No.2 to station No.3	L10°15′.41N λ120°45′.24E
	0714 0717-0748 0749-0820 0832-0919	Oceanographic survey op.3 at station No.3 - Neuston net, sea depth 986 m - Bongo net , sea depth 986 m - CTD , sea depth 986 m	L10°15′.50N λ121°29′.90E L10°15′.44N λ121°29′.93E L10°15′.33N λ121°29′.91E L10°15′.21N λ121°29′.16E
	0714-0919	Trolling line and Hand line fishing operation 3 were conducted during OS. operation And then proceeded to St.No.4	
	0942-1254	Acoustic survey from station No.3 to station No.4	L10°15′.39N λ121°30′.04E
	1254 1255-1325 1328-1353 1401-1458	Oceanographic survey op.4 at station No.4 - Bongo net , sea depth 3,828 m - Neuston net, sea depth 3,828 m - CTD , sea depth 3,828 m	L09°59′.96N λ122°00′.02E L09°59′.89N λ121°59′.97E L09°59′.92N λ121°59′.84E L09°59′.92N λ121°59′.84E
	1254-1458	Trolling line and Hand line fishing operation 3 were conducted during OS. operation And then proceeded to St.No.4	
	1500-1908	Acoustic survey from station No.4 to station No.5	L10°15′.39N λ121°30′.04E

Date	Time	Activities	Remark
26 Oct 14	1908 1912-1943 1944-2014 2019-2110	Oceanographic survey op.5 at station No.5 - Bongo net , sea depth 3,353 m - Neuston net, sea depth 3,353 m - CTD , sea depth 3,353 m	L09°15′.00N λ122°15′.01E L09°14′.96N λ122°14′.95E L09°14′.99N λ122°14′99E L09°14′.99N λ122°14′.99E
	1910-2110	Trolling line and Hand line fishing operation 5 were conducted during OS. operation And then proceeded to St.No.I1	
	2120-0045	Acoustic survey from station No.5 to station No.I1	L09°14′.74N λ122°15′.04E
27 Oct 14	0045 0050-0123 0125-0155 0200-0252	Oceanographic survey op.6 at station No.I1 - Neuston net, sea depth 5,124 m - Bongo net , sea depth 5,124 m - CTD , sea depth 5,124 m	L08°44′.33N λ122°40′.01E L08°44′.24N λ122°39′.82E L08°44′.06N λ122°39′.47E L08°44′.02N λ122°39′.01E
	0048-0252	Trolling line and Hand line fishing operation 6 were conducted during OS. operation And then proceeded to St.No.6	
	0255-0948	Acoustic survey from station No.I1 to station No.6	L08°43′.90N λ122°38′.68E
	0948 0950-1021 1023-1053 1058-1149	Oceanographic survey op.7 at station No.6 - Bongo net , sea depth 4,460 m - Neuston net, sea depth 4,460 m - CTD , sea depth 4,460 m	L09°14′.88N λ121°29′.89E L09°15′.08N λ121°29′.93E L09°14′.91N λ121°29′.95E L09°14′.66N λ121°30′.04E
	0950-1149	Trolling line and Hand line fishing operation 7 were conducted during OS. operation And then proceeded to St.No.7	
	1150-1645	Acoustic survey from station No.6 to station No.7	L09°14′.92N λ121°29′.50E
	1645 1648-1718 1720-1750 1752-1850	Oceanographic survey op.8 at station No.7 - Neuston net, sea depth 1,630 m - Bongo net , sea depth 1,630 m - CTD , sea depth 1,630 m	L09°15′.00N λ120°35′.00E L09°14′.94N λ120°34′.91E L09°14′.98N λ120°34′.40E L09°15′.21N λ120°34′.20E
	1647-1852	Trolling line and Hand line fishing operation 8 were conducted during OS. operation And then proceeded to St.No.8	
	1853-2245	Acoustic survey from station No.7 to station No.8	L09°15′.15N λ120°33′.52E
	2245 2246-2315 2317-2347 2350-0050	Oceanographic survey op.9 at station No.8 - Bongo net , sea depth 1,541 m - Neuston net, sea depth 1,543 m - CTD , sea depth 1,536 m	L09°15′.07N λ119°50′.02E L09°15′.13N λ119°50′.08E L09°15′.12N λ119°49′.69E L09°14′.86N λ119°49′.41E
	2246-0050	Trolling line and Hand line fishing operation 9 were conducted during OS. operation And then proceeded to St.No.9	
28 Oct 14	0100-0510	Acoustic survey from station No.8 to station No.9	L09°14′.91N λ119°49′.85E
	0510 0512-0542 0545-0615 0617-0720	Oceanographic survey op.10 at station No.9 - Neuston net, sea depth 2,000 m - Bongo net , sea depth 2,000 m - CTD , sea depth 2,000 m	L09°15′.00N λ119°00′.00E L09°14′.98N λ118°59′.91E L09°14′.37N λ118°59′.45E L09°13′.91N λ118°58′.95E
	0512-0720	Trolling line and Hand line fishing operation 10 were conducted during OS. operation And then proceeded to St.No.10	
	0722-1027	Acoustic survey from station No.9 to station No.10	L09°12′.91N λ118°57′.92E

Date	Time	Activities	Remark
28 Oct 14	1027 1031-1100 1102-1132 1136-1238	Oceanographic survey op.11 at station No.10 - Bongo net , sea depth 2,000 m - Neuston net, sea depth 2,000 m - CTD , sea depth 2,000 m	L08°45′.01N λ118°30′.05E L08°44′.81N λ118°29′.81E L08°44′.66N λ118°29′.57E L08°44′.30N λ118°29′.09E
	1031-1238	Trolling line and Hand line fishing operation 11 were conducted during OS. operation And then proceeded to St.No.11	
	1300-1642	Acoustic survey from station No.10 to station No.11	L08°44′.04N λ118°30′.91E
	1642 1645-1715 1717-1747 1751-1905	Oceanographic survey op.12 at station No.11 - Neuston net, sea depth 2,100 m - Bongo net , sea depth 2,100 m - CTD , sea depth 2,100 m	L08°15′.00N λ118°59′.92E L08°15′.09N λ118°59′.95E L08°14′.29N λ118°59′.79E L08°13′.95N λ118°59′.11E
	1645-1905	Trolling line and Hand line fishing operation 12 were conducted during OS. operation And then proceeded to St.No.12	
	1927-0111	Acoustic survey from station No.11 to station No.12	L08°14′.90N λ118°00′.14E
29 Oct 14	0111 0118-0147 0150-0220 0223-0313	Oceanographic survey op.13 at station No.12 - Bongo net , sea depth 1,836 m - Neuston net, sea depth 1,836 m - CTD , sea depth 1,836 m	L08°14′.45N λ120°00′.03E L08°14′.78N λ119°59′.68E L08°14′.92N λ119°59′.68E L08°15′.12N λ119°59′.81E
	0115-0313	Trolling line and Hand line fishing operation 13 were conducted during OS. operation And then proceeded to St.No.13	
	0330-0423	Shooting PPL fishing operation 1. To deployed 218 hooks , sea depth 3,700 m.	L08°14′.97N λ119°59′.67E – L08°16′.58N λ119°55′.61E
	1035-1249	Hauling PPL fishing operation 1.	L08°16′.82N λ119°35′.19E – L08°16′.59N λ119°57′.66E
	1313-1707	Acoustic survey to station No.13	L08°14′.99N λ120°00′.08E
	1707 1709-1739 1743-1813 1817-1920	Oceanographic survey op.14 at station No.13 - Neuston net, sea depth 3,700 m - Bongo net , sea depth 3,700 m - CTD , sea depth 3,700 m	L08°15′.00N λ120°45′.00E L08°15′.08N λ120°45′.04E L08°15′.43N λ120°45′.63E L08°15′.95N λ120°45′.63E
	1709-1920	Trolling line and Hand line fishing operation 14 were conducted during OS. operation And then proceeded to St.No.14	
	1932-2327	Acoustic survey to station No.14	L08°14′.89N λ120°46′.14E
30 Oct 14	2327 0005-0102 0105-0132 0138-0210	Oceanographic survey op.15 station No.14. - CTD , sea depth 4,600 m - Bongo net , sea depth 4,600 m - Neuston net, sea depth 4,600 m	L08°14′.99N λ121°30′.24E L08°14′.48N λ121°29′.88E L08°13′.86N λ121°29′.37E L08°13′.79N λ121°29′.37E
	0100-0210	Trolling line and Hand line fishing operation 15 were conducted during OS. operation And then proceeded to St.No.I 2	
	0220-0610	Acoustic survey from station No.14 to station No. I 2	L08°14′.95N λ121°30′.14E
	0601 0603-0633 0636-0706 0710-0802	Oceanographic survey op.16 at station No. I 2 - Neuston net, sea depth 3,400 m - Bongo net , sea depth 3,400 m - CTD , sea depth 3,400 m	L08°15′.01N λ122°10′.00E L08°14′.99N λ122°09′.85E L08°14′.67N λ122°09′.92E L08°14′.56N λ122°09′.84E

Date	Time	Activities	Remark
30 Oct 14	0603-0802	Trolling line and Hand line fishing operation 16 were conducted during OS. operation And then proceeded to St.No.15	
	0831-1145	Acoustic survey from station No.I2 to station No. 15	L08°13′.22N λ122°08′.55E
	1145 1152-1220 1222-1250 1253-1350	Oceanographic survey op.17 at station No. 15 - Bongo net , sea depth 4,150 m - Neuston net, sea depth 4,150 m - CTD , sea depth 4,150 m	L07°44′.96N λ121°44′.89E L07°44′.91N λ121°44′.76E L07°44′.97N λ121°44′.41E L07°44′.67N λ121°44′.00E
	1150-1350	Trolling line and Hand line fishing operation 17 were conducted during OS. operation And then proceeded to St.No.16	
	1357-1600	Acoustic survey from station No.15 to station No. 16	L07°43′.09N λ121°43′.67E
	1600 1602-1632 1635-1705 1707-1802	Oceanographic survey op.18 station No.16 - Neuston net, sea depth 5,200 m - Bongo net , sea depth 5,200 m - CTD , sea depth 5,200 m	L07°22′.66N λ121°30′.15E L07°22′.57N λ121°30′.21E L07°21′.87N λ121°29′.80E L07°21′.58N λ121°29′.80E
	1602-1802	Trolling line and Hand line fishing operation 18 were conducted during OS. operation And then proceeded to St.No.17	
	1817-2050	Acoustic survey from station No.16 to station No. 17	L07°22′.35N λ121°28′.96E
	2050 2055-2125 2128-2158 2200-2258	Oceanographic survey op.19 at station No. 17 - Bongo net , sea depth 4,594 m - Neuston net, sea depth 4,594 m - CTD , sea depth 4,594 m	L07°17′.50N λ120°57′.92E L07°17′.53N λ120°59′.82E L07°17′.60N λ120°59′.44E L07°17′.25N λ120°59′.25E
	2055-2250	Trolling line and Hand line fishing operation 19 were conducted during OS. operation And then proceeded to St.No.18	
31 Oct 14	2310-0355	Acoustic survey from station No.17 to station No. 18	L07°17′.40N λ120°57′.12E
	0410-0505	Shooting PLL operation 2, to deployed 300 hooks Sea depth 4,000 m.	L07°15′.13N λ120°04′.63E- L07°10′.15N λ120°07′.54E
	0513-0602 0605-0634 0639-0709	Oceanographic survey op.20 at station No. 18 - CTD , sea depth 4,000 m - Bongo net , sea depth 4,000 m - Neuston net, sea depth 4,000 m	L07°09′.88N λ120°07′.71E L07°09′.85N λ120°07′.79E L07°10′.08N λ120°07′.69E
	0515-0710	Trolling line and Hand line fishing operation 20 were conducted during OS. operation And then proceeded to St.No.19	
	0955-1238	Hauling PLL operation 2,	L07°10′.94N λ120°07′.77E- L07°12′.04N λ120°06′.53E
	1300-1850	Acoustic survey from station No.18 to station No. 19	L07°15′.30N λ120°06′.00E
	1850 1852-1922 1925-1955 1958-2050	Oceanographic survey op.21station No.19 - Neuston net, sea depth 3,000 m - Bongo net , sea depth 3,000 m - CTD , sea depth 3,000 m	L07°15′.00N λ119°00′.00E L07°15′.00N λ119°00′.07E L07°14′.57N λ119°00′.20E L07°14′.20N λ119°00′.09E
	1852-2050	Trolling line and Hand line fishing operation 21 were conducted during OS. operation And then proceeded to St.No.20	
	2050-0019	Acoustic survey from station No.19 to station No. 20	L07°13′.48N λ119°00′.00E

Date	Time	Activities	Remark
1 Nov 14	0019 0022-0050 0055-0123 0125-0210	Oceanographic survey op.22station No.20 - Bongo net , sea depth 899 m - Neuston net, sea depth 899 m - CTD , sea depth 899 m	L06°33′.40N λ118°53′.12E L06°33′.42N λ118°53′.08E L06°33′.32N λ118°53′.17E L06°33′.15N λ118°53′.62E
	0020-0210	Trolling line and Hand line fishing operation 22 were conducted during OS. operation And then proceeded to St.No.21	
	0220-0555	Acoustic survey from station No.20 to station No. 21	L06°33′.30N λ118°53′.81E
	0555 0558-0628 0630-0700 0702-0749	Oceanographic survey op.23station No.21 - Neuston net, sea depth 3,300 m - Bongo net , sea depth 3,300 m - CTD , sea depth 3,300 m	L06°21′.70N λ119°33′.58E L06°21′.61N λ119°33′.61E L06°21′.20N λ119°33′.67E L06°20′.36N λ119°33′.48E
	0558-0750	Trolling line and Hand line fishing operation 23 were conducted during OS. operation And then proceeded to St.No.22	
	0805-1143	Acoustic survey from station No.21 to station No.22	
	1143 1145-1215 1218-1248 1252-1340	Oceanographic survey op.24station No.22 - Bongo net , sea depth 4,548 m - Neuston net, sea depth 4,548 m - CTD , sea depth 4,548 m	L06°43′.10N λ120°08′.30E L06°43′.21N λ120°08′.47E L06°43′.57N λ120°08′.63E L06°43′.82N λ120°08′.78E
	1145-1340	Trolling line and Hand line fishing operation 24 were conducted during OS. operation And then proceeded to St.No.23	
	1343-1732	Acoustic survey from station No.21 to station No.22	
	1732 1735-1805 1806-1837 1840-1928	Oceanographic survey op.25station No.23 - Neuston net, sea depth 4,500 m - Bongo net , sea depth 4,500 m - CTD , sea depth 4,500 m	L06°53′.59N λ120°49′.99E L06°53′.54N λ120°50′.00E L06°53′.38N λ120°50′.00E L06°53′.23N λ120°49′.52E
	1735-1928	Trolling line and Hand line fishing operation 25 were conducted during OS. operation And then proceeded to Zambounga	
	2230	Let go anchor	L17°08′.70N λ107°19′.80E
2 Nov 14		Proceeded to Zambounga port	
	0900	Alongside at Port of Zambounga	

Leg II: 5 to 14 November 2014

Date	Time	Activities	Remark
5 Nov 14	0810	Leave port of Zambounga for research survey	
	1032 1035-1104 1106-1135 1137-1203	Oceanographic survey op.26station No.24 - Bongo net , sea depth 436 m - Neuston net, sea depth 410 m - CTD , sea depth 365 m	L06°50′.01N λ122°30′.00E L06°49′.89N λ122°29′.93E L06°49′.99N λ122°29′.66E L06°49′.80N λ122°29′.27E
	1035-1203 1218-1238	Trolling line and Hand line fishing operation 26 were conducted during OS. operation And then proceeded to FADs #1 and FADs #2 position for trolling	L06°49′.92N λ122°28′.52E / L06°48′.52N λ122°29′.25E
	1255-1540	Acoustic survey to station No.25	

Date	Time	Activities	Remark
5 Nov 14	1540 1542-1612 1614-1644 1646-1735	Oceanographic survey op.27 station No.25 - Neuston net, sea depth 3,092 m - Bongo net , sea depth 3,092 m - CTD , sea depth 3,092 m	L16°49′.97N λ122°59′.96E L16°49′.85N λ122°59′.98E L16°49′.57N λ122°59′.54E L16°49′.48N λ122°59′.04E
	1540-1753	Trolling line and Hand line fishing operation 27 were conducted during OS. operation And then proceeded to station No.26	
	1747-2033	Acoustic survey from station No.25 to station No.26	
	2033 2036-2105 2107-2137 2140-2235	Oceanographic survey op.28station No.26 - Bongo net , sea depth 4,463 m - Neuston net, sea depth 4,463 m - CTD , sea depth 4,463 m	L06°50′.00N λ123°30′.00E L06°49′.14N λ123°20′.22E L06°49′.79N λ123°29′.88E L06°49′.86N λ123°29′.74E
	2036-2235	Trolling line and Hand line fishing operation 28 were conducted during OS. operation And then proceeded to station No.27	
	2236-0216	Acoustic survey from station No.26 to station No.27	
6 Nov 14	0216 0218-0238 0245-0322 0330-0412	Oceanographic survey op.29 station No.27 - Neuston net, sea depth 3,978 m - Bongo net , sea depth 3,978 m - CTD , sea depth 3,978 m	L06°15′.13N λ123°44′.93E L06°15′.07N λ123°44′.86E L06°15′.56N λ123°44′.84E L06°15′.71N λ123°45′.09E
	0217-0412	Trolling line and Hand line fishing operation 29 were conducted during OS. operation And then proceeded to station No.28	
	0425-0833	Acoustic survey from station No.27 to station No.28	
	0833 0826-0857 0858-0928 0930-1022	Oceanographic survey op.30station No.28 - Bongo net , sea depth 4,198 m - Neuston net, sea depth 4,198 m - CTD , sea depth 4,198 m	L06°15′.01N λ123°00′.01E L06°15′.05N λ122°59′.98E L06°14′.89N λ122°59′.99E L06°14′.14N λ123°00′.30E
	0826-1020	Trolling line and Hand line fishing operation 30 were conducted during OS. operation And then proceeded to station No.29	
	1030-1623	Acoustic survey from station No.28 to station No.29	
	1623 1625-1655 1657-1725 1732-1823	Oceanographic survey op.31station No.29 - Neuston net, sea depth 4,100 m - Bongo net , sea depth 4,100 m - CTD , sea depth 4,100 m	L05°45′.33N λ122°00′.67E L05°45′.33N λ122°00′.67E L05°45′.33N λ122°00′.67E L05°45′.33N λ122°00′.67E
	1625-1823	Trolling line and Hand line fishing operation 31 were conducted during OS. operation And then proceeded to station No.30	
	1831-0052	Acoustic survey from station No.29 to station No.30	
7 Nov 14	0052 0054-0125 0127-0157 0207-0258	Oceanographic survey op.32station No.30 - Bongo net , sea depth 4,640 m - Neuston net, sea depth 4,640 m - CTD , sea depth 4,640 m	L05°44′.91N λ122°59′.93E L05°44′.89N λ122°59′.90E L05°44′.93N λ123°00′.00E L05°45′.01N λ122°59′.25E
	0052-0258	Trolling line and Hand line fishing operation 32 were conducted during OS. operation	
	0327-0406	Shooting PLL operation 3, to deployed 197 hooks Sea depth 4,640 m.	L05°43′.52N λ123°02′.69E – L05°40′.41N λ123°05′.20E
	1000-1130	Hauling PLL fishing operation 3	L05°44′.96N λ123°07′.96E – L05°49′.03N λ123°08′.52E

Date	Time	Activities	Remark
7 Nov 14	1153-1644	Acoustic survey from station No.30 to station No.31	
	1337-1348	Trolling fishing operation were conduct when the fish school was found during cruising on track survey	L05°44′.95N λ123°27′.74E
	1644 1645-1715 1718-1748 1749-1840	Oceanographic survey op.33station No.31 - Neuston net, sea depth 3,6000 m - Bongo net , sea depth 3,600 m - CTD , sea depth 3,600 m	L05°45′.00N λ123°59′.95E L05°45′.00N λ124°00′.00E L05°45′.12N λ123°59′.94E L05°45′.84N λ124°00′.12E
	1645-1840	Trolling line and Hand line fishing operation 33 were conducted during OS. operation And then proceeded to station No.32	
	1925-2242	Acoustic survey from station No.31 to station No.32	
	2242 2245-2315 2317-2352 2353-0055	Oceanographic survey op.34station No.32 - Bongo net , sea depth 4,774 m - Neuston net, sea depth 4,774 m - CTD , sea depth 4,774 m	L05°36′.65N λ124°35′.10E L05°36′.61N λ124°35′.10E L05°37′.34N λ124°34′.64E L05°37′.83N λ124°34′.07E
	2245-0055	Trolling line and Hand line fishing operation 34 were conducted during OS. operation And then proceeded to station No.32	
8 Nov 14	0118-0547	Acoustic survey from station No.32 to station No.33	
	0547 0549-0619 0622-0652 0655-0743	Oceanographic survey op.35station No.33 - Neuston net, sea depth 4,800 m - Bongo net , sea depth 4,800 m - CTD , sea depth 4,800 m	L05°00′.03N λ124°00′.00E L05°00′.04N λ123°59′.88E L05°00′.57N λ123°59′.40E L05°01′.34N λ123°58′.98E
	0549-0743	Trolling line and Hand line fishing operation 35 were conducted during OS. operation And then proceeded to station No.32	
	0815-1337	Acoustic survey from station No.33 to station No.34	
	1337 1338-1408 1413-1442 1445-1537	Oceanographic survey op.36station No.34 - Bongo net , sea depth 4,824 m - Neuston net, sea depth 4,824 m - CTD , sea depth 4,824 m	L05°00′.00N λ123°00′.00E L05°00′.13N λ122°59′.96E L05°00′.78N λ122°59′.95E L05°01′.18N λ122°59′.55E
	1338-1537	Trolling line and Hand line fishing operation 36 were conducted during OS. operation And then proceeded to station No.35	
	1600	Drifting at FADs, collect the fish sample from hand line fishing boat	L05°03′.10N λ123°02′.05E
	1648-2159	Acoustic survey from station No.34 to station No.35	
	2159 2200-2230 2235-2305 2310-0000	Oceanographic survey op.37station No.35 - Neuston net, sea depth 4,882 m - Bongo net , sea depth 4,882 m - CTD , sea depth 4,882 m	L05°00′.01N λ122°00′.04E L05°00′.06N λ121°59′.86E L04°59′.90N λ121°59′.24E L05°00′.08N λ121°59′.32E
	2220-0000	Trolling line and Hand line fishing operation 36 were conducted during OS. operation And then proceeded to station No.35	
9 Nov 14	0008-0312	Acoustic survey from station No.35 to station No.36	
	0312 0313-0343 0345-0415 0418-0517	Oceanographic survey op.38 station No.36 - Bongo net , sea depth 3,963 m - Neuston net, sea depth 3,963 m - CTD , sea depth 3,963 m	L05°24′.13N λ121°32′.55E L05°24′.18N λ121°32′.55E L05°24′.34N λ121°32′.11E L05°24′.63N λ121°31′.26E

Date	Time	Activities	Remark
9 Nov 14	0313-0517	Trolling line and Hand line fishing operation 38 were conducted during OS. operation And then proceeded to station No.37	
	0533-0849	Acoustic survey from station No.36 to station No.37	
	0849 0852-0922 0925-0955 1000-1045	Oceanographic survey op.39station No.37 - Neuston net, sea depth 4,490 m - Bongo net , sea depth 4,490 m - CTD , sea depth 4,490 m	L05°00′.01N λ121°00′.00E L05°00′.02N λ120°59′.90E L05°00′.10N λ120°59′.30E L05°00′.05N λ120°59′.30E
	0852-1045	Trolling line and Hand line fishing operation 39 were conducted during OS. operation And then proceeded to station No.38	
	1112-0102	Acoustic survey from station No.36 to station No.37	
	1610	Drifting at FADs, asking the fish sample from purse seine working boat, no have sample	L04°38′.76N λ121°42′.89E
10 Nov 14	0102 0103-0134 0135-0206 0208-0259	Oceanographic survey op.40 station No.38 - Bongo net , sea depth 4,852 m - Neuston net, sea depth 4,852 m - CTD , sea depth 4,852 m	L04°00′.01N λ123°04′.86E L04°00′.05N λ123°04′.08E L03°59′.62N λ123°04′.58E L03°59′.43N λ123°04′.33E
	0102-0259	Trolling line and Hand line fishing operation 40 were conducted during OS. operation	
	0318-0354	Shooting PLL operation 4, to deployed 174 hooks Sea depth 4,852 m.	L04°01′.42N λ123°01′.76E- L04°01′.34N λ122°58′.75E
	1000-1133	Hauling PLL fishing operation 3	L04°01′.01N λ122°54′.09E- L04°01′.57N λ122°53′.55E
	1240-1648	Acoustic survey from station No.38 to station No.39	
	1648 1650-1720 1723-1753 1756-1845	Oceanographic survey op.41station No.39 - Neuston net, sea depth 4,900 m - Bongo net , sea depth 4,900 m - CTD , sea depth 4,900 m	L03°59′.98N λ122°48′.49E L03°59′.98N λ122°14′.79E L03°59′.88N λ122°14′.15E L03°59′.55N λ122°13′.59E
	1650-1845	Trolling line and Hand line fishing operation 41 were conducted during OS. operation And then proceeded to station No.41	
	1852-2238	Acoustic survey from station No.39 to station No.40	
	2238 2240-2312 2314-2344 2346-0040	Oceanographic survey op.42 station No.40 - Bongo net , sea depth 4,904 m - Neuston net, sea depth 4,904 m - CTD , sea depth 4,940 m	L04°00′.00N λ121°30′.00E L04°00′.09N λ121°30′.01E L03°59′.11N λ121°30′.55E L03°58′.79N λ121°30′.82E
	2240-0040	Trolling line and Hand line fishing operation 39 were conducted during OS. operation And then proceeded to station No.38	
11 Nov 14	0100-0625	Acoustic survey from station No.40 to station No.41	
	0625 0627-0657 0658-0728 0731-0820	Oceanographic survey op.43 station No.41 - Neuston net, sea depth 4,500 m - Bongo net , sea depth 4,500 m - CTD , sea depth 4,500 m	L04°00′.00N λ120°29′.98E L04°00′.08N λ120°29′.88E L03°59′.89N λ120°29′.69E L03°59′.90N λ120°29′.55E
	0627-0820	Trolling line and Hand line fishing operation 43 were conducted during OS. operation	
	1020	Philippines security disembark onboard	
	1040	Drifting at FADs , collect fish sample from fishing boat and then proceed to station No.42	L03°59′.08N λ120°29′.42E

Date	Time	Activities	Remark
11 Nov 14	1042-1513	Acoustic survey from station No.41 to station No.42	
	1513 1515-1545 1547-1617 1619-1710	Oceanographic survey op.44 station No.42 - Bongo net , sea depth 3,435 m - Neuston net, sea depth 3,435 m - CTD , sea depth 3,435 m	L03°59′.69N λ119°40′.14E L03°59′.91N λ119°39′.98E L03°59′.66N λ119°39′.88E L03°59′.42N λ119°39′.58E
	1515-1710	Trolling line and Hand line fishing operation 44 were conducted during OS. operation And then proceeded to station No.43	
	1716-2248	Acoustic survey from station No.42 to station No.43	
	2248 2252-2322 2324-2354 2356-0045	Oceanographic survey op.45 station No.43 - Neuston net, sea depth 3,435 m - Bongo net , sea depth 3,435 m - CTD , sea depth 3,435 m	L04°00′.01N λ118°36′.23E L04°00′.46N λ118°36′.23E L04°00′.73N λ118°36′.60E L04°00′.88N λ118°37′.09E
	2252-0045	Trolling line and Hand line fishing operation 44 were conducted during OS. operation And then proceeded to station No.43	
12 Nov 14	0055-0405	Acoustic survey from station No.43 to station No.44	
	0405 0409-0439 0442-0512 0515-0605	Oceanographic survey op.46 station No.44 - Bongo net , sea depth 2,200 m - Neuston net, sea depth 2,200 m - CTD , sea depth 2,200 m	L04°14′.96N λ119°11′.91E L04°14′.88N λ119°11′.97E L04°15′.11N λ119°11′.98E L04°14′.52N λ119°12′.00E
	0607	Proceed to Sandakan port, Malaysia	
13 Nov 14	0200	Drop anchor out of Sandakan	
14 Nov 14	0900	Staff from DOF Malaysia embark, to discuss about the cruise plan and schedule at Sandakan	
15 Nov 14	0900	1 researcher from Philippines disembark onboard	
17 Nov 14	0800	Heave up anchor and proceed to Bitung , Indonesia	
19 Nov 14		Alongside at fisheries port of Bitung	
20 Nov 14		To discuss among researcher from 3 country about the cruise survey for Leg 3 at the office of fisheries at Bitung port.	

Leg III: 22 to 28 November 2014

Date	Time	Activities	Remark
20 Nov 14	1300	Researcher from Indonesia 8 persons, Malaysia 4 persons embark onboard	
22 Nov 14	0800	Departure ceremony onboard M.V.SEAFDEC 2	
	0900	Leave Fisheries port for survey station No. 45	
	1645 1647-1717 1720-1750 1752-1864	Oceanographic survey op.47 station No.45 - Neuston net, sea depth 3,200 m - Bongo net , sea depth 3,200 m - CTD , sea depth 3,200 m	L02°30′.14N λ125°00′.04E L02°30′.14N λ125°00′.04E L02°30′.45N λ125°00′.00E L02°30′.14N λ125°00′.00E
	1647-1845	Trolling line and Hand line fishing operation 47 were conducted during OS. operation And then proceeded to station No.46	
	1847-0005	Acoustic survey from station No.45 to station No.46	
23 Nov 14	0005 0006-0038 0040-0110 0112-0205	Oceanographic survey op.48 station No.46 - Bongo net , sea depth 2,550 m - Neuston net, sea depth 2,550 m - CTD , sea depth 2,559 m	L03°30′.00N λ124°59′.91E L03°29′.91N λ124°59′.91E L03°30′.04N λ124°59′.82E L03°30′.03N λ124°59′.79E

Date	Time	Activities	Remark
23 Nov 14	0006-0205	Trolling line and Hand line fishing operation 48 were conducted during OS. operation And then proceeded to station No.47	
	0207-0745	Acoustic survey from station No.46 to station No.47	
	0745 0746-0815 0817-0847 0851-0953	Oceanographic survey op.49 station No.47 - Neuston net, sea depth 5,400 m - Bongo net , sea depth 5,400 m - CTD , sea depth 5,400 m	L04°30′.00N λ125°00′.00E L04°29′.98N λ124°59′.99E L04°29′.24N λ124°59′.41E L04°28′.34N λ124°58′.42E
	0746-0953	Trolling line and Hand line fishing operation 48 were conducted during OS. operation And then proceeded to station No.47	
	0955-1648	Acoustic survey from station No.47 to station No.48	
	1648 1650-1720 1723-1753 1754-1840	Oceanographic survey op.50 station No.48 - Bongo net , sea depth 4,500 m - Neuston net, sea depth 4,500 m - CTD , sea depth 4,500 m	L03°30′.00N λ124°00′.00E L03°30′.18N λ124°00′.06E L03°29′.77N λ124°00′.49E L03°29′.87N λ124°00′.61E
	1650-1840	Trolling line and Hand line fishing operation 50 were conducted during OS. operation And then proceeded to station No.50	(to skip station No.49)
	1850-0020	Acoustic survey from station No.48 to station No.50	
24 Nov 14	0020 0023-0053 0055-0125 0130-0220	Oceanographic survey op.51 station No.50 - Neuston net, sea depth 4,842 m - Bongo net , sea depth 4,842 m - CTD , sea depth 4,842 m	L02°31′.15N λ124°00′.20E L02°31′.17N λ124°00′.24E L02°30′.17N λ124°00′.35E L02°30′.37N λ124°00′.70E
	0022-0220	Trolling line and Hand line fishing operation 51 were conducted during OS. operation And then proceeded to station No.51	(to skip station No.49)
	0229-0836	Acoustic survey from station No.50 to station No.51	
	0836 0839-0910 0911-0942 1032-1132	Oceanographic survey op.52 station No.51 - Bongo net , sea depth 5,055 m - Neuston net, sea depth 5,055 m - CTD , sea depth 5,055 m	L02°30′.00N λ123°00′.00E L02°29′.92N λ123°00′.15E L02°29′.95N λ123°00′.49E L02°30′.21N λ123°00′.17E
	0837-0940	Trolling line and Hand line fishing operation 52 were conducted during OS. operation	
	0955-1140 1028-1140	To conducted the scientific acho sounder on the small boat around the FADs, to fishing by trolling and hand line at the floating hut with FADs as op. 53(no. 239)	L02°30′.21N λ123°00′.16E
	1210-1815	Acoustic survey from station No.51 to station No.52	
	1815 1818-1848 1851-1921 1925-2032	Oceanographic survey op.53 station No.52 - Bongo net , sea depth 5,400 m - Neuston net, sea depth 5,400 m - CTD , sea depth 5,400 m	L02°30′.00N λ122°00′.00E L02°30′.06N λ121°59′.99E L02°30′.84N λ122°00′.49E L02°31′.53N λ122°00′.49E
	1818-2030	Trolling line and Hand line fishing operation 54 were conducted during OS. operation And then proceeded to station No.53	
	2035-0306	Acoustic survey from station No.52 to station No.53	
25 Nov 14	0306 0308-0340 0341-0412 0415-0517	Oceanographic survey op.54 station No.53 - Neuston net, sea depth 5,485 m - Bongo net , sea depth 5,485 m - CTD , sea depth 5,485 m	L02°29′.99N λ121°00′.12E L02°29′.93N λ121°00′.15E L02°30′.43N λ121°00′.80E L02°30′.65N λ121°02′.24E

Date	Time	Activities	Remark
25 Nov 14	0307-0515	Trolling line and Hand line fishing operation 55 were conducted during OS. operation And then proceeded to station No.54	
	0540-1130	Acoustic survey from station No.53 to station No.54	
	1130 1134-1203 1205-1237 1238-1327	Oceanographic survey op.55 station No.54 - Bongo net , sea depth 5,230 m - Neuston net, sea depth 5,230 m - CTD , sea depth 5,230 m	L02°30′.01N λ120°00′.00E L02°30′.12N λ120°00′.13E L02°30′.15N λ121°00′.92E L02°30′.08N λ120°01′.03E
	1133-1327	Trolling line and Hand line fishing operation 56 were conducted during OS. operation And then proceeded to station No.54	
	1337-1924	Acoustic survey from station No.54 to station No.55	
	1924 1926-1950 1957-2028 2030-2135	Oceanographic survey op.56 station No.55 - Neuston net, sea depth 4,200 m - Bongo net , sea depth 4,200 m - CTD , sea depth 4,200 m	L02°30′.00N λ119°00′.00E L02°29′.91N λ119°00′.31E L02°29′.25N λ119°00′.63E L02°28′.53N λ119°00′.47E
	1926-2135	Trolling line and Hand line fishing operation 57 were conducted during OS. operation And then proceeded to station No.56	
	2153-0244	Acoustic survey from station No.55 to station No.56	
26 Nov 14	0244 0245-0320 0325-0353 0355-0458	Oceanographic survey op.57 station No.56 - Bongo net , sea depth 4,218 m - Neuston net, sea depth 4,218 m - CTD , sea depth 4,218 m	L01°26′.22N λ119°01′.64E L01°29′.81N λ119°30′.20E L01°29′.22N λ119°31′.28E L01°28′.74N λ119°32′.13E
	0245-0455	Trolling line and Hand line fishing operation 58 were conducted during OS. operation And then proceeded to station No.57	
	0520-0947	Acoustic survey from station No.56 to station No.57	
	0947 0950-1020 1021-1053 1100-1145	Oceanographic survey op.58 station No.57 - Neuston net, sea depth 2,760 m - Bongo net , sea depth 2,760 m - CTD , sea depth 2,760 m	L01°29′.98N λ120°30′.04E L01°29′.95N λ120°30′.26E L01°29′.55N λ120°30′.00E L01°29′.52N λ120°30′.84E
	0950-1145	Trolling line and Hand line fishing operation 59 were conducted during OS. operation	
	1215-1432	- To conducted the scientific acho sounder on the small boat around the FADs, to fishing by trolling and hand line at the floating hut with FADs as op. 60 (FADs. No. 253) - To Collect the fish sampling from hand line fishing boat around FADs,	L01°31′.29N λ120°35′.30E
	1905	Acoustic survey from station No.57 to station No.58	
	1905 1907-1937 1939-2010 2012-2105	Oceanographic survey op.59 station No.58 - Bongo net , sea depth 3,100 m - Neuston net, sea depth 3,100 m - CTD , sea depth 3,100 m	L01°30′.00N λ121°30′.00E L01°30′.05N λ121°30′.08E L01°30′.61N λ121°30′.49E L01°30′.84N λ121°30′.76E
	1907-2105	Trolling line and Hand line fishing operation 61 were conducted during OS. operation And then proceeded to station No.59	
	2120-0237	Acoustic survey from station No.57 to station No.58	

Date	Time	Activities	Remark
27 Nov 14	0237 0238-0310 0312-0341 0345-0440	Oceanographic survey op.60 station No.59 - Neuston net, sea depth 2,760 m - Bongo net , sea depth 2,760 m - CTD , sea depth 2,760 m	L01°29′.94N λ122°29′.90E L01°30′.00N λ122°30′.01E L01°29′.63N λ122°30′.16E L01°29′.21N λ122°30′.08E
	0238-0440	Trolling line and Hand line fishing operation 62 were conducted during OS. operation And then proceeded to station No.60	
	0450-1024	Acoustic survey from station No.59 to station No.60	
	1024 1025-1055 1105-1133 1135-1224	Oceanographic survey op.61 station No.60 - Bongo net , sea depth 3,100 m - Neuston net, sea depth 3,100 m - CTD , sea depth 3,100 m	L01°30′.01N λ123°30′.00E L01°27′.78N λ123°30′.16E L01°28′.93N λ123°29′.48E L01°28′.66N λ123°29′.94E
	1025-1224	Trolling line and Hand line fishing operation 63 were conducted during OS. operation	
	1237-1330	Handline fishing operation 64 at FADs. No. 274 And use scanning sonar for check the fish school around FADs	L01°27′.81N λ123°27′.62E
	1354-1917	Acoustic survey from station No.60 to station No.61	
	1917 1919-1949 1931-2022 2025-2120	Oceanographic survey op.62 station No.59 - Neuston net, sea depth 2,760 m - Bongo net , sea depth 2,760 m - CTD , sea depth 2,760 m	L01°30′.00N λ124°29′.88E L01°29′.89N λ124°29′.94E L01°29′.58N λ124°29′.51E L01°29′.10N λ124°29′.15E
	2125-2150	Calibration flow meter	
	2200	Proceed to Bitung fisheries port	
28 Nov 14	0900	Alongside at Fisheries port	
1 Dec 14	0930	Proceed to SEAFDEC /TD , Thailand	

Appendix 2.

Table 1. Pelagic longline fishing

Op./ St.	Date	Shooting				Hauling				Number of hook	Immersion time	Sea depth (m)	Thermocline m/°C	Dept of hook no.1	Depth of hook no.10
		Start		Finish		Start		Finish							
1/ 12	29-Oct-14	Time	0330	Time	0423	Time	1035	Time	1249	218	7 hrs. 46 minute	1,836	20-350 29-15°C	40	370
		Lat	08°14'.97	Lat	08°16'.58	Lat	08°16'.82	Lat	08°16'.59						
		Long	119°59'.67	Long	119°55'.61	Long	119°55'.19	Long	119°57'.66						
2/ 18	31-Oct-14	Time	0410	Time	0505	Time	0955	Time	1238	300	7 hrs 27 minute	4,500	30-300 m 29-15°C	60	249
		Lat	07°15'.13 N	Lat	07°10'.15 N	Lat	07°10'.94 N	Lat	07°12'.04 N						
		Long	120°04'.63E	Long	120°07'.54	Long	120°07'.77E	Long	120°06'.53E						
3/ 30	7-Nov-14	Time	0327	Time	0406	Time	1000	Time	1130	195	7 hrs. 2 minute	4,640	30-400 m 29.1-9.0°C	47	100
		Lat	05°43 '.52	Lat	05°40 '.14	Lat	05°44 '.96	Lat	05°49 '.03						
		Long	123°02'.69	Long	123°05'.20	Long	123°07'.96	Long	123°08'.52						
4/ 38	10-Nov-14	Time	0318	Time	0354	Time	1000	Time	1133	175	7 hrs. 12 minute	4,860	30-400 m 29.3-8.2°C	90	318
		Lat	04°01 '.42	Lat	04°01 '.34	Lat	04°01 '.01	Lat	04°01 '.57						
		Long	123°01'.79E	Long	122°58'.75	Long	122°54'.29E	Long	122°53'.55						
					Total					888					

Table 2. Hand line fishing

Op./ St.	Date	Shooting				Number of line	fishing time	Sea depth (m)	Total cath (number)	Total catch weight(kg)
		Start		Finish						
2/ 2	26-Oct-14	Time	0140	Time	0245	2	1 hrs. 05 minute	1,450	3	1.6
		Lat	10°14 '.52	Lat	10°14 '.52					
		Long	120°44'.98E	Long	120°44'.98E					
7/ I1	27-Oct-14	Time	0200	Time	0252	2	52 minute	5,124	5	2.6
		Lat	08°44 '.02	Lat	08°44 '.02					
		Long	122°39'.01E	Long	122°39'.01E					
22/ 20	1-Nov-14	Time	0125	Time	0210	2	45 minute	899	2	1.1
		Lat	06°33 '.15	Lat	06°33 '.15					
		Long	118°53'.62E	Long	118°53'.62E					
Total						**6**			**10**	**5.3**

Table 3. Trolling line fishing

Op./ St.	Date	Shooting				Number of line	fishing time	Sea depth (m)	Total cath (number)	Total catch weight(kg)
		Start		Finish						
53 51	24-Nov-14	Time	1028	Time	1028	1	1 hrs. 12 minute	5,055	1	1.5
		Lat	02°10 '.31	Lat	02°10 '.31					
		Long	123°00'.16	Long	123°00'.16					
60/ 57	26-Nov-14	Time	1315	Time	1432	1	1 hrs. 17 minute	2,760	1	1.0
		Lat	01°31 '.29	Lat	01°31 '.29					
		Long	120°35'.30E	Long	120°35'.30E					
Total						**2**			**2**	**2.5**

3.1 Pelagic longline fishing log sheet

PELAGIC LONGLINE FISHING LOGSHEET
Operation No.1

Recorded by Sayan Promjinda

Cruise no: 47-3 /2014		Name of Vessel				Air temp:	27.5	° C
Survey station No: 12		M.V.SEAFDEC 2				Air pressure:	1014	mbar
Date: 29 Oct 2014						Humidity :	92	%
Moon age: phase		Start shooting		Finish shooting		Water		
Wind		Time	0330	Time	0423	Surface temp:	29.6	°C
Spd (kt)	Direction	Latitude	08°14 '.97 N	Latitude	08°16 '.58 N	100 m. temp :	20	°C
2	230	Longitude	119°59'.67E	Longitude	119°55'.61 E	Thermocline :	20-350m./29-15° C	
Weather cond: Cloudy		Start hauling		Finish hauling		Current		
Sea condition: Smooth		Time	1035	Time	1249	Depth	Spd (kt)	Direction
Gear		Latitude	08°16'.82 N	Latitude	08°16'.59 N	10	0.1	186°
No. hook/basket: 20		Longitude	119°55'.19 E	Longitude	119°57'.66 E	50	0.6	013°
Total hook no: 218		Memorandum: 1) Speed of vessel: 5.5 knots				100	0.8	004°
Immersion time:		2) Setting distance: 4.5 NM /Course290°				Total catch in number:		
7 hrs 46 min.		3) Mainline paid out: 9,950 m (Setting machine)				5 pcs.		
Type of bait: Squid /		4) Sea depth: 1,836 m (Echo sounder)				Total catch in weight:		
Indian mackeral/Milkfish		5) Depth of hook: 40-370 m				**5.9 kg**		

PELAGIC LONGLINE FISHING LOGSHEET
Operation No.2

Recorded by Sayan Promjinda

Cruise no: 47-3 /2014		Name of Vessel				Air temp:	29.3	° C
Survey station No: 18		M.V.SEAFDEC 2				Air pressure:	1012	mbar
Date: 31 Oct 2014						Humidity :	85	%
Moon age: phase		Start shooting		Finish shooting		Water		
Wind		Time	0410	Time	0505	Surface temp:	29.9	°C
Spd (kt)	Direction	Latitude	07°15 '.13 N	Latitude	07°10 '.15 N	100 m. temp :	20	°C
2	40	Longitude	120°04'.63E	Longitude	120°07'.54 E	Thermocline :	30-300m./29-15° C	
Weather cond: Cloudy		Start hauling		Finish hauling		Current		
Sea condition: Smooth		Time	0955	Time	1238	Depth	Spd (kt)	Direction
Gear		Latitude	07°10 '.94 N	Latitude	07°12 '.04 N	10	0.3	052°
No. hook/basket: 20		Longitude	120°07'.77E	Longitude	120°06'.53E	50	0.2	001°
Total hook no: 300		Memorandum: 1) Speed of vessel: 7.0 knots				100	0.4	226°
Immersion time:		2) Setting distance: 5.7 NM /Course150°				Total catch in number:		
7 hrs 27 min.		3) Mainline paid out: 12,228 m (Setting machine)				5 pcs.		
Type of bait: Squid /		4) Sea depth: 4,500 m (Echo sounder)				Total catch in weight:		
Indian mackeral/Milkfish		5) Depth of hook: 60-249 m				**11.5 kg**		

PELAGIC LONGLINE FISHING LOGSHEET

Operation No.3

Recorded by Sayan Promjinda

Cruise no: 47-3 /2014		Name of Vessel				Air temp:	28.7	° C
Survey station No: 30		M.V.SEAFDEC 2				Air pressure:	1014.5	mbar
Date: 7 Nov 2014						Humidity :	92	%
Moon age: phase		Start shooting		Finish shooting		Water		
Wind		Time	0327	Time	0406	Surface temp:	29.5	°C
Spd (kt)	Direction	Latitude	05°43 '.52 N	Latitude	05°40 '.14 N	100 m. temp :	20	°C
2	020	Longitude	123°02'.69E	Longitude	123°05'.20 E	Thermocline :	30-400m./29.1-9.0° C	
Weather cond: Cloudy		Start hauling		Finish hauling		Current		
Sea condition: Slight		Time	1000	Time	1130	Depth	Spd (kt)	Direction
Gear		Latitude	05°44 '.96 N	Latitude	05°49 '.03 N	10	0.1	011°
No. hook/basket: 20		Longitude	123°07'.96 E	Longitude	123°08'.52E	50	0.9	046°
Total hook no: 195		Memorandum: 1) Speed of vessel: 5-7 knots				100	2	030°
Immersion time:		2) Setting distance: 4.2 NM /Course140°				Total catch in number:		
7 hrs 2 min.		3) Mainline paid out: 8,238 m (Setting machine)				6 pcs.		
Type of bait: Squid /		4) Sea depth: 4,640 m (Echo sounder)				Total catch in weight:		
Indian mackeral/Milkfish		5) Depth of hook: 47- 100 m				**95.8 kg**		

PELAGIC LONGLINE FISHING LOGSHEET

Operation No.4

Recorded by Sayan Promjinda

Cruise no: 47-3 /2014		Name of Vessel				Air temp:	28.9	° C
Survey station No: 38		M.V.SEAFDEC 2				Air pressure:	1013.5	mbar
Date: 10 Nov 2014						Humidity :	85	%
Moon age: 86% phase		Start shooting		Finish shooting		Water		
Wind		Time	0318	Time	0354	Surface temp:	29.9	°C
Spd (kt)	Direction	Latitude	04°01 '.42 N	Latitude	04°01 '.34 N	100 m. temp :	20	°C
2	270	Longitude	123°01'.79E	Longitude	122°58'.75 E	Thermocline :	40-400m./29.3-8.2° C	
Weather cond: Cloudy		Start hauling		Finish hauling		Current		
Sea condition: Smooth		Time	1000	Time	1133	Depth	Spd (kt)	Direction
Gear		Latitude	04°01 '.01 N	Latitude	04°01 '.57 N	10	0.1	228°
No. hook/basket: 25		Longitude	122°54'.29E	Longitude	122°53'.55 E	50	0.4	312°
Total hook no: 175		Memorandum: 1) Speed of vessel: 5-6 knots				100	0.4	334°
Immersion time:		2) Setting distance: 3.0 NM /Course 270°				Total catch in number:		
7 hrs 12 min.		3) Mainline paid out: 7,313 m (Setting machine)				0 pcs.		
Type of bait: Squid /		4) Sea depth: 4,860 m (Echo sounder)				Total catch in weight:		
Indian mackeral/Milkfish		5) Depth of hook: 90- 318 m				**00 kg**		

3.2 Handline fishing log sheet

HANDLINE FISHING LOGSHEET								
Operation No. 2								
Recorded by Sayan Promjinda								
Cruise no: 47-3/2014	Name of Vessel				Air temp:	28.5	° C	
Survey station No: 2	M.V.SEAFDEC 2				Air pressure:	1016	mbar	
Date: 26 Oct 2014					Humidity :	85	%	
Moon age:	Start fishing		Finish fishing		Water			
Wind	Time	0140	Time	0245	Surface temp:	29.2	°C	
Spd (kt) / Direction	Latitude	10°14 '.52 N	Latitude	10°14 '.52 N	100 m. temp :	NR	°C	
	Longitude	120°44'.98E	Longitude	120°44'.98E	Thermocline :	NR		
Weather cond:	Memorandom				Current			
Sea condition:					Depth	Spd (kt)	Direction	
Gear	sea depth = 1,450 m				10	0.3	242	
No. line 2	Total catch in numer 3 pcs.				25	0.4	244	
fishing time 1:05 hrs.	Total catch in weight 1.55 kg				50	0.4	213	

HANDLINE FISHING LOGSHEET								
Operation No. 7								
Recorded by Sayan Promjinda								
Cruise no: 47-3/2014	Name of Vessel				Air temp:	27.9	° C	
Survey station No: I1	M.V.SEAFDEC 2				Air pressure:	1015	mbar	
Date: 27 Oct 2014					Humidity :	72	%	
Moon age:	Start fishing		Finish fishing		Water			
Wind	Time	0200	Time	0252	Surface temp:	29.4	°C	
Spd (kt) / Direction	Latitude	08°44 '.02 N	Latitude	08°44 '.02 N	100 m. temp :		°C	
	Longitude	122°39'.01E	Longitude	122°39'.01E	Thermocline :			
Weather cond:	Memorandom				Current			
Sea condition:					Depth	Spd (kt)	Direction	
Gear	sea depth = 5,124 m				10	0.3	352	
No. line 2	Total catch in numer 5 pcs.				50	0.7	016	
fishing time 0:52 hrs.	Total catch in weight 2.63 kg				100	0.7	077	

HANDLINE FISHING LOGSHEET

Operation No. 22

Recorded by Sayan Promjinda

Cruise no: 47-3/2014		Name of Vessel				Air temp:	28.6	° C
Survey station No: 20		M.V.SEAFDEC 2				Air pressure:	1013	mbar
Date: 1 Nov 2014						Humidity :	92	%
Moon age:		Start fishing		Finish fishing		Water		
Wind		Time	0125	Time	0210	Surface temp:	29.1	°C
Spd (kt)	Direction	Latitude	06°33 '.15 N	Latitude	06°33 '.15 N	100 m. temp :		°C
		Longitude	118°53'.62E	Longitude	118°53'.62E	Thermocline :		
Weather cond:		Memorandom				Current		
Sea condition:						Depth	Spd (kt)	Direction
Gear		sea depth = 899 m				10	0.2	017
No. line 2		Total catch in numer 2 pcs.				50	0.5	339
fishing time 0:52 hrs.		Total catch in weight 1.1 kg				100	0.7	301

* Remark; Handline fishing logsheet was show only stations were caught

3.3 Trolling line fishing log sheet

TROLLING LINE FISHING LOGSHEET

Operation No. 53

Recorded by Sayan Promjina

Cruise no: 47-3/2014		Name of Vessel				Air temp:	29.8	° C
Survey station No: 51		M.V.SEAFDEC 2				Air pressure:	1015	mbar
Date: 24 Nov 2014						Humidity :	85	%
Moon age:		Start trolling		Finish trolling		Water		
Wind		Time	1028	Time	1140	Surface temp:	30.8	°C
Spd (kt)	Direction	Latitude	02°10 '.31 N	Latitude	02°10 '.31 N	100 m. temp :		°C
		Longitude	123°00'.16E	Longitude	123°00'.16E	Thermocline :		
Weather cond: clear		**Memorandom**				Current		
Sea condition: slight		1) speed of vessel 3 knot (on small boat)				Depth	Spd (kt)	Direction
Gear		fishing around FADs no. 239				10	0.5	217
No. line 1		Total catch in numer 1 pcs,				50	0.4	263
Trolling time : 1:12 hrs		Total catch in weight 1.5 kg				100	1	300

TROLLING LINE FISHING LOGSHEET

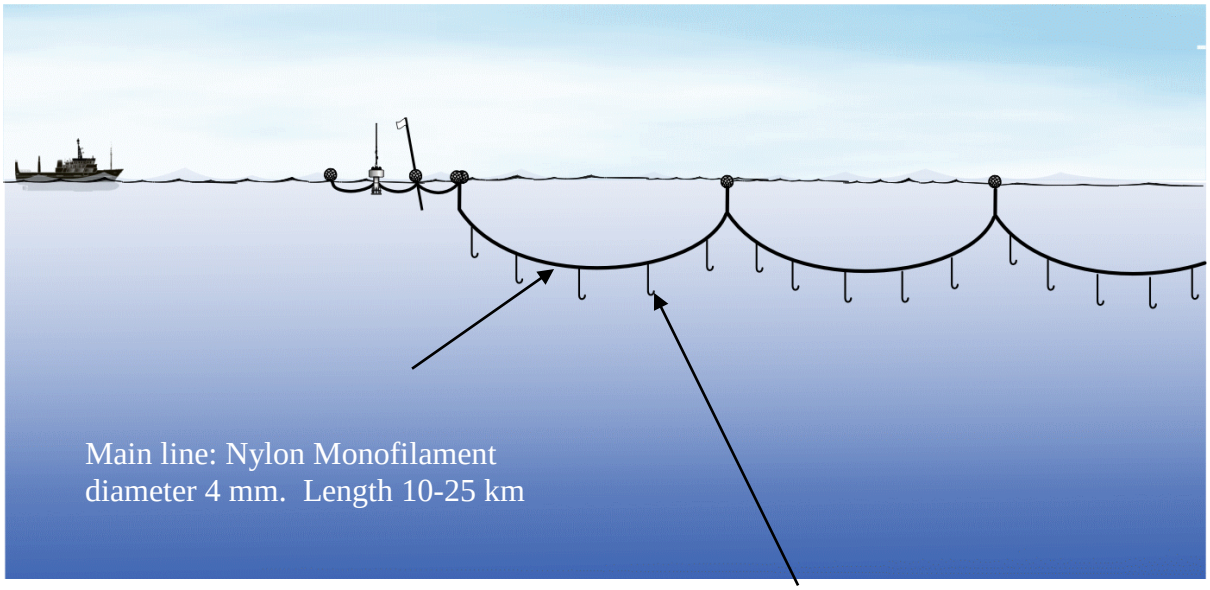
Operation No. 60

Recorded by Sayan Promjina

Cruise no: 47-3/2014		Name of Vessel				Air temp:	30.1	° C
Survey station No: 57		M.V.SEAFDEC 2				Air pressure:	1011.5	mbar
Date: 26 Nov 2014						Humidity :	67	%
Moon age:		Start trolling		Finish trolling		Water		
Wind		Time	1315	Time	1432	Surface temp:	30.4	°C
Spd (kt)	Direction	Latitude	01°31 '.29 N	Latitude	01°31 '.29 N	100 m. temp :		°C
		Longitude	120°35'.30E	Longitude	120°35'.30E	Thermocline :		
Weather cond: clear		**Memorandom**				Current		
Sea condition: slight		1) speed of vessel 4 knot (on small boat)				Depth	Spd (kt)	Direction
Gear		fishing aroung FADs no. 253				10	0.8	041
No. line 1		Total catch in numer 1 pcs,				50	0.8	044
Trolling time : 1 hrs		Total catch in weight 0.97 kg				100	0.3	299

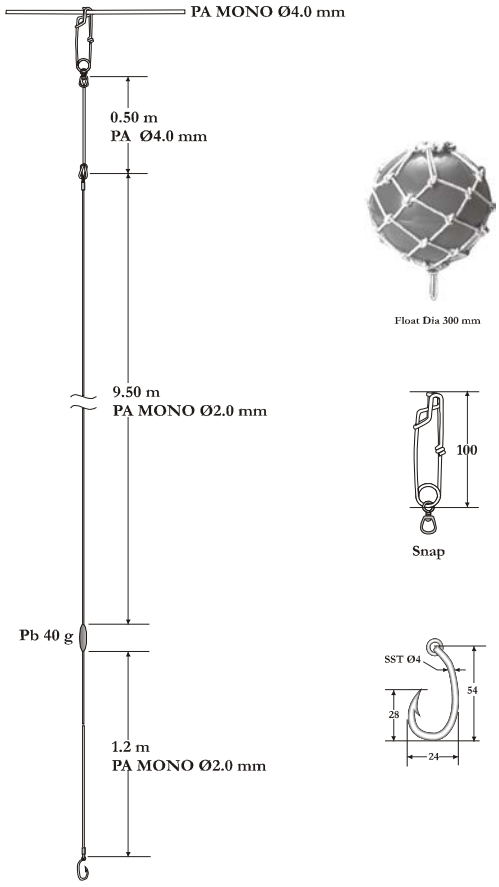
* Remark ; Trolling line fishing logsheet was show only the stations were caught

Appendix 4.1 Pelagic longline



Mainline

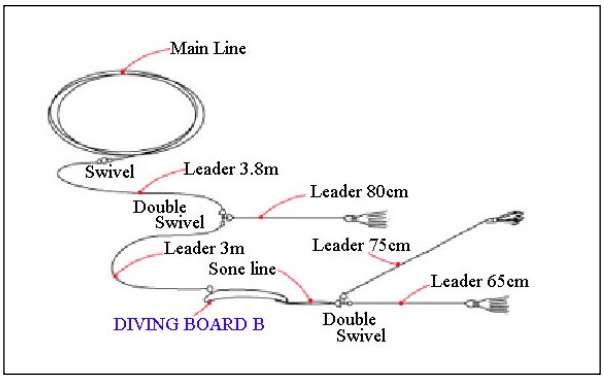
Mainline is constructed by Nylon monofilament diameter 4.0 mm. The weight per 1000 m is 12-14 kg. Breaking strength of mainline is 500-600 kgf. Mainline deployed without any joints or swivels. Length interval between buoy lines is standardized at 840 m (for 20 branch lines). The standard operational of pelagic longline has carried out onboard M.V. SEAFDEC2 is setting 25-30 kilometer within an operation.

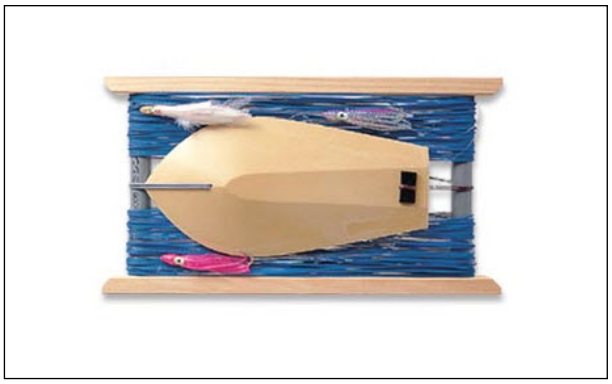


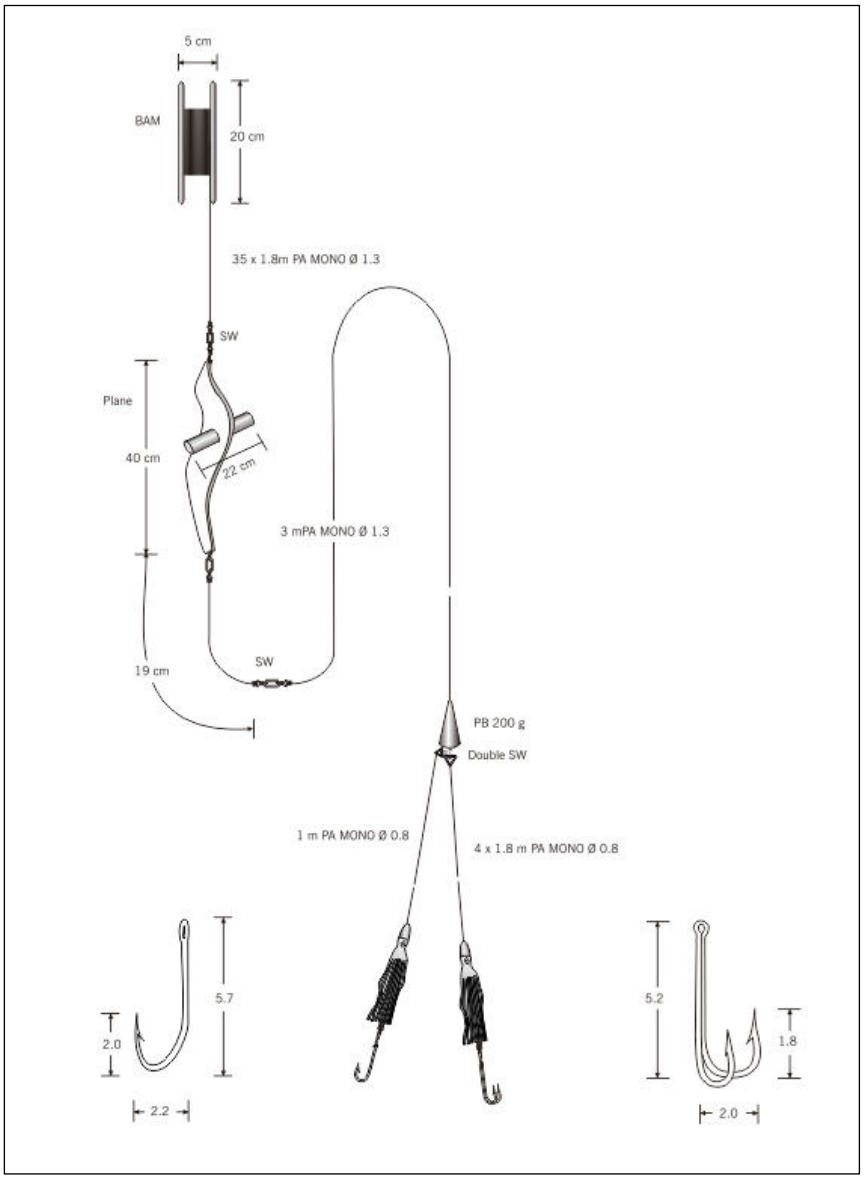
Branch line

Branch line is made by Nylon monofilament diameter 2.0 mm, 11 m length.
Two (2) types of hook design, Circle shape and J-shape, setting with branch line in order to investigate and compare the efficiency of both types.
M.V.SEAFDEC2 has standard operational of pelagic longline to deploy 500 hooks, in this survey was setting for 200-300 hooks within an operation mean that 20 and 25 hooks are set between float intervals.
Two sets of Temperature and Depth sensor (called T/D sensors) were attached at the branch line No.1 and No.10 in order to investigate the actual depth of hook. Branch No.1 and No.20 are presumed the shallowest layer and branch No.10 and 11 presumed the deepest layer within same float interval.

Appendix 4.2 Trolling line







Appendix 5. Oceanographic survey

Table 4. Partial detail of CTD deployment

St. No.	Date	Bottom Depth (m)	Start	Position		Depth of water sampling for nutrient analysis (m)
				Latitude	Longitude	
1	25-Oct-14	1168	18.38	10_13.43 N	119_58.74 E	5,10,25,50,200,300,610
2	26-Oct-14	1423	01.30	10_14.49N	120_44.97 E	5,10,25,50,75,100,125,300,750
3	26-Oct-14	986	08.25	10_15.26 N	121_29.45 E	5,10,25,75,100,125,150,200,500,750
4	26-Oct-14	3828	14.05	9_59.92 N	121_59.84 E	5,10,25,50,75,100,125,150,200,300,750
5	26-Oct-14	3353	20.19	9_14.75 N	122_15.04 E	5,10,25,50,75,100,125,150,200,300,500,750
I1	27-Oct-14	5124	01.59	8_44.02 N	122_39.00 E	5,10,25,50,75,100,125,150,200,300,500,750
6	27-Oct-14	4460	10.54	9_14.31 N	121_30.04 E	5,10,25,50,75,100,125,150,200,300,500,750
7	27-Oct-14	1630	17.56	9_15.21 N	120_34.19 E	5,10,25,50,75,100,125,150,200,300,500,750
8	27-Oct-14	1591	23.54	9_14.86 N	119_49.41 E	5,10,25,50,75,100,125,150,200,300,500,750
9	28-Oct-14	2000	06.20	9_13.90 N	118_58.94 E	5,10,25,50,100,125,150,200,300,500,750
10	28-Oct-14	1020	11.38	8_43.81 N	118_28.62 E	5,10,25,50,100,150,200,300,500,750
11	28-Oct-14	2100	17.55	8_13.92 N	118_59.09	5,10,25,50,75,100,125,150,200,300,500,730
12	29-Oct-14	1836	02.25	8_15.10 N	119_59.78 E	5,10,25,50,75,100,125,150,200,300,500,750
13	29-Oct-14	3700	18.20	8_16.01 N	120_45.65 E	5,10,25,50,75,100,125,150,200,300,500,750
14	30-Oct-14	4600	00.05	8_14.47 N	121_29.87 E	5,10,25,50,75,100,125,150,200,500,750
I2	30-Oct-14	3400	07.12	8_14.59 N	122_09.83 E	5,10,25,50,75,100,125,150,200,300,500,750
15	30-Oct-14	4950	13.00	7_44.64 N	121_43.98 E	5,10,25,50,75,100,125,150,200,300,500,750
16	30-Oct-14	5000	17.10	7_21.30 N	121_29.85 E	5,10,25,50,75,100,125,150,200,300,500,667
17	30-Oct-14	4594	22.01	7_17.26 N	120_59.25 E	5,10,25,50,75,100,125,150,200,300,500,750
18	31-Oct-14	4000	05.15	7_09.89 N	120_07.68 E	5,10,25,50,75,100,125,150,200,300,500,750
19	31-Oct-14	3000	20.03	7_14.13 N	119_00.09 E	5,10,25,50,100,125,150,200,300,500,750
20	1-Nov-14	1240	01.30	6_33.15 N	118_53.62 E	5,10,25,50,100,125,150,200,300,500,750
21	1-Nov-14	3300	07.05	6_20.36 N	119_32.48 E	5,10,25,50,100,125,150,200,300,500,750
22	1-Nov-14	4548	12.55	6_43.82 N	120_08.76 E	5,10,25,50,75,100,125,150,200,300,500,750
23	1-Nov-14	4500	18.43	6_53.23 N	120_49.52 E	5,10,25,50,75,100,125,150,200,300,500,750
24	5-Nov-14	360	11.42	6_49.78 N	122_29.24 E	5,10,25,50,75,100,125,150,200,300,320
25	5-Nov-14	3092	16.50	6_49.44 N	122_59.03 E	5,10,25,50,75,100,125,150,200,300,500,750
26	5-Nov-14	4546	21.43	6_49.86 N	123_29.73 E	5,10,25,50,75,100,125,150,200,300,500,750
27	6-Nov-14	3978	03.31	6_15.67 N	123_44.93 E	5,10,25,50,75,100,125,150,200,300,500,750
28	6-Nov-14	4198	09.33	6_14.96 N	123_00.30 E	5,10,25,50,75,100,125,150,200,300,500,750
29	6-Nov-14	4100	17.34	5_44.87 N	122_00.41 E	5,10,25,50,75,100,125,150,200,300,500,750
30	7-Nov-14	4640	02.08	5_44.96 N	122_59.69 E	5,10,25,50,75,100,125,150,200,300,500,750
31	7-Nov-14	3600	17.52	5_45.84 N	124_00.19 E	5,10,25,50,75,100,125,150,200,300,500,750
32	7-Nov-14	4774	23.55	5_37.80 N	124_33.13 E	5,10,25,50,75,100,125,150,200,300,500,750
33	8-Nov-14	4800	06.58	5_01.34 N	123_58.99 E	5,10,25,50,75,100,125,150,200,300,500,750
34	8-Nov-14	4824	14.49	5_01.18 N	122_59.55 E	5,10,25,50,75,100,125,150,200,300,500,750
35	8-Nov-14	4882	23.12	5_00.08 N	121_59.32 E	5,10,25,50,75,100,125,150,200,300,500,750
36	9-Nov-14	3963	04.22	5_24.64 N	121_31.24 E	5,10,25,50,75,100,125,150,200,300,500,750
37	9-Nov-14	4490	10.01	5_00.04 N	120_59.29 E	5,10,25,50,75,100,125,150,200,300,500,750
38	10-Nov-14	4852	02.10	3_59.45 N	123_04.35 E	5,10,25,50,75,100,125,150,200,300,500,750
39	10-Nov-14	4900	17.58	3_59.55 N	122_13.61 E	5,10,25,50,75,125,150,200,300,500,750
40	10-Nov-14	4941	23.50	3_58.82 N	121_30.78 E	5,10,25,50,75,100,125,150,200,300,500,750
41	11-Nov-14	4500	07.34	3_59.89 N	120_29.55 E	5,10,25,50,75,100,125,150,200,300,500,750
42	11-Nov-14	3435	16.23	3_59.30 N	119_39.54 E	5,10,25,50,75,100,125,150,200,300,500,750
43	11-Nov-14	3435	23.59	4_00.88 N	118_37.09 E	5,10,25,50,75,100,125,150,300,500,750
44	12-Nov-14	2200	05.17	4_14.51 N	119_12.00 E	5,10,25,50,75,100,125,150,200,300,500,750
45	22-Nov-14	3200	17.53	2_31.14 N	125_00.00 E	5,10,25,50,75,100,125,150,200,300,500,750
46	23-Nov-14	2550	01.14	3_30.04 N	124_59.79 E	5,10,25,50,75,100,125,150,200,300,500,750
47	23-Nov-14	5400	08.53	4_28.35 N	124_58.43 E	5,10,25,50,75,100,125,150,200,300,475
48	23-Nov-14	4500	17.58	3_29.91 N	124_00.62 E	5,10,25,50,75,100,125,150,200,300,500,750
50	24-Nov-14	5230	01.31	2_30.37 N	124_00.70 E	5,10,25,50,75,100,125,150,200,300,500,750

St. No.	Date	Bottom Depth (m)	Start	Position		Depth of water sampling for nutrient analysis (m)
51	24-Nov-14	5055	10.35	2_30.20 N	123_00.18 E	5,10,25,50,75,100,125,150,200,300,500,750
52	24-Nov-14	5400	19.26	2_31.58 N	122_01.02 E	5,10,25,50,75,100,125,150,200,300,500,640
53	25-Nov-14	5485	04.17	2_30.65 N	121_02.22 E	5,10,25,50,75,100,125,150,200,300,500,750
54	25-Nov-14	5230	12.40	2_30.08 N	120_01.22 E	5,10,25,50,75,100,125,150,200,300,500,750
55	25-Nov-14	4200	20.35	2_28.58 N	119_00.46 E	5,10,25,50,75,125,150,200,300,500,750
56	26-Nov-14	4218	03.58	1_28.76 N	119_32.12 E	5,10,25,50,75,100,125,150,200,300,500,750
57	26-Nov-14	2760	10.59	1_29.57 N	120_31.82 E	5,10,25,50,75,100,125,150,200,300,500,750
58	26-Nov-14	3100	20.15	1_30.87 N	121_30.76 E	5,10,25,50,75,100,125,150,200,300,500,750
59	27-Nov-14	3427	03.47	1_29.21 N	122_30.09 E	5,10,25,50,75,100,125,150,200,300,500,750
60	27-Nov-14	3870	11.40	1_28.67 N	123_29.44 E	5,10,25,50,75,100,125,150,200,300,500,750
61	27-Nov-14	1700	20.28	1_29.12 N	124_29.15 E	5,10,25,50,75,100,125,150,200,300,500,750

Table 5. Calibration data of three TSK flow meters

	Distance (m)	No. of Flowmeter and Revolution		
		7240	7035	7021
Before survey	30	205	210	220
	30	200	210	220
	30	200	200	200
	30	200	210	200
	30	200	210	200
	30	200	210	200
	30	200	210	200
	30	200	210	210
	30	200	210	200
	30	200	210	210
After survey	30	210	200	200
	30	200	210	200
	30	210	215	210
	30	200	200	190
	30	200	205	200
	30	200	205	190
	30	205	180	198
	30	200	210	200
	30	200	210	190
	30	195	200	190

Table 6. Partial details of Bongo net operation show

St. no.	Date	Bottom Depth (m)	Start	Position		Towing depth (m)	Flowmeter revolution	
				Lat	Long		500µm	330µm
1	25-Oct-14	1168	18:05	10_14.21 N	119_59.60 E	150	11670	10870
2	26-Oct-14	1423	00.30	10_15.39 N	120_45.12E	135	11110	10550
3	26-Oct-14	986	07.53	10_15.29 N	121_29.92 E	140	11170	10870
4	26-Oct-14	3828	12.57	9_59.86 N	121_59.99 E	150	11440	11330
5	26-Oct-14	3353	19.14	9_14.901 N	122_15.003 E	150	11120	10950
I1	27-Oct-14	5124	01.28	8_44.25 N	122_39.56 E	150	10610	10460
6	27-Oct-14	4460	09.50	9_15.05 N	121_30.04 E	145	11220	9140
7	27-Oct-14	1630	17.23	9_14.96 N	120_34.41 E	130	11920	11840
8	27-Oct-14	1591	22.48	9_15.11 N	119_50.01 E	150	11070	11080
9	28-Oct-14	2000	05.49	9_14.23 N	118_59.90 E	140	10680	10410
10	28-Oct-14	1020	10.34	8_44.82 N	118_29.89 E	145	10660	9230
11	28-Oct-14	2100	17.20	8_14.13 N	118_59.72 E	135	8710	8440
12	29-Oct-14	1836	01.20	8_14.80 N	119_59.93 E	140	10880	10570
13	29-Oct-14	3700	17.45	8_15.79 N	120_45.61 E	150	10620	9290
14	30-Oct-14	4600	01.10	8_13.78 N	121_29.39 E	150	11000	11260
I2	30-Oct-14	3400	06.41	8_14.57 N	122_09.84 E	150	11910	11820
15	30-Oct-14	4950	11.55	7_44.95 N	121_44.41 E	150	10310	10010
16	30-Oct-14	5000	16.38	7_21.88 N	121_30.10 E	120	10520	10270
17	30-Oct-14	4594	20.58	7_17.56 N	120_59.81 E	140	10450	10170
18	31-Oct-14	4000	06.08	7_09.84 N	120_07.76 E	150	10110	10930
19	31-Oct-14	3000	19.28	7_14.55 N	119_00.21 E	150	10770	9640
20	1-Nov-14	1240	00.25	6_33.13 N	118_59.26 E	150	10800	10710
21	1-Nov-14	3300	06.34	6_20.89 N	119_33.81 E	150	10270	10260
22	1-Nov-14	4548	11.50	6_43.21 N	120_08.50 E	150	11410	11360
23	1-Nov-14	4500	18.10	6_53.48 N	120_50.01 E	150	11230	10850
24	5-Nov-14	360.0	10.35	6_49.98 N	122_29.62 E	135	10770	10220
25	5-Nov-14	3092.0	16.17	6_49.61 N	122_59.53 E	150	9810	9440
26	5-Nov-14	4546.0	20.40	6_49.85 N	123_29.82 E	150	10440	9070
27	6-Nov-14	3978.0	02.54	6_15.46 N	123_44.88 E	120	12160	11770
28	6-Nov-14	4198.0	08.28	6_14.78 N	123_06.16 E	150	10130	10060
29	6-Nov-14	4100	17.00	5_45.20 N	122_00.51 E	150	10800	10380
30	7-Nov-14	4640	01.00	5_44.88 N	122_59.84 E	150	11010	11090
31	7-Nov-14	3600	17.20	5_45.11 N	123_59.83 E	150	10560	8020
32	7-Nov-14	4774	22.50	5_36.85 N	124_34.77 E	130	12900	12300
33	8-Nov-14	4800	06.26	5_00.55 N	123_59.39 E	130	10300	9440

St. no.	Date	Bottom Depth (m)	Start	Position		Towing depth (m)	Flowmeter revolution	
				Lat	Long		500µm	330µm
34	8-Nov-14	4824	13.40	5_00.17 N	122_59.94 E	150	10780	10460
35	8-Nov-14	4882	22.40	5_00.02 N	121_59.23 E	135	11040	11020
36	9-Nov-14	3963	03.17	5_24.19 N	121_32.58 E	150	9350	8800
37	9-Nov-14	4490	09.28	4_59.95 N	120_59.35 E	120	12270	10910
38	10-Nov-14	4852	01.05	4_00.06 N	123_04.89 E	130	10520	10320
39	10-Nov-14	4900	17.22	3_59.84 N	122_14.10 E	150	10600	9570
40	10-Nov-14	4941	22.45	3_59.46 N	121_30.48 E	135	11220	10060
41	11-Nov-14	4500	07.02	3_59.94 N	120_29.61 E	150	10530	9380
42	11-Nov-14	3435	15.18	4_00.03 N	119_39.91 E	150	9160	8590
43	11-Nov-14	3435	23.28	4_00.78 N	118_36.67 E	145	8900	7900
44	12-Nov-14	2200	04.10	4_14.90 N	119_11.98 E	150	9500	5060
45	22-Nov-14	3200	17.22	2_30.54 N	125_00.01 E	130	11110	10090
46	23-Nov-14	2550	00.10	3_30.01 N	124_59.91 E	140	10840	10400
47	23-Nov-14	5400	08.20	4_29.09 N	124_59.31 E	145	9400	9260
48	23-Nov-14	4500	16.55	3_30.16 N	124_00.35 E	150	10120	10070
50	24-Nov-14	5230	00.57	2_30.15 N	124_00.31 E	150	10500	10300
51	24-Nov-14	5055	08.43	2_29.90 N	123_00.16 E	150	11060	9220
52	24-Nov-14	5400	18.20	2_30.14 N	122_00.03 E	150	9470	9380
53	25-Nov-14	5485	03.45	2_30.49 N	121_00.81 E	150	8750	8300
54	25-Nov-14	5230	11.35	2_30.23 N	120_00.32 E	150	9420	9320
55	25-Nov-14	4200	20.02	2_29.17 N	119_00.57 E	150	9180	8930
56	26-Nov-14	4218	02.53	1_29.07 N	119_31.02 E	135	10080	9980
57	26-Nov-14	2760	10.25	1_29.58 N	120_31.14 E	150	9600	9400
58	26-Nov-14	3100	19.10	1_30.12 N	121_30.24 E	150	8280	8160
59	27-Nov-14	3427	03.15	1_29.63 N	122_30.13 E	150	9740	9230
60	27-Nov-14	3870.0	10.30	1_29.78 N	123_30.16 E	150	8960	8940
61	27-Nov-14	1700.0	19.55	1_29.56 N	124_29.51 E	115	10540	8380

Table 7. Partial details of Neuston net operation

St. no.	Date	Bottom Depth (m)	Start	Position		Towing depth (m)	Flowmeter revolution
				Lat	Long		
1	25-Oct-14	1168	17:24	10_15.31 N	119_59.98 E	Surface	9920
2	26-Oct-14	1423	01.05	10_14.87N	120_45.09 E	Surface	12990
3	26-Oct-14	986	07.20	10_15.43 N	121_29.96 E	Surface	11230
4	26-Oct-14	3828	13.31	9_59.53 N	121_59.82 E	Surface	13170
5	26-Oct-14	3353	19.47	9_15.85 N	122_12.98 E	Surface	10620
I1	27-Oct-14	5124	00.49	8_44.24 N	122_39.826 E	Surface	11410
6	27-Oct-14	4460	10.22	9_14.98 N	121_30.02 E	Surface	11560
7	27-Oct-14	1630	16.43	9_14.94 N	120_34.94 E	Surface	11650
8	27-Oct-14	1591	23.20	9_15.14 N	119_49.72 E	Surface	11940
9	28-Oct-14	2000	05.15	9_15.01 N	118_59.90 E	Surface	10880
10	28-Oct-14	1020	11.06	8_44.65 N	118_29.57 E	Surface	10540
11	28-Oct-14	2100	16.47	8_15.09 N	118_59.95 E	Surface	11720
12	29-Oct-14	1836	01.52	8_14.92 N	119_59.68 E	Surface	10900
13	29-Oct-14	3700	17.13	8_15.09 N	120_45.05 E	Surface	11870
14	30-Oct-14	4600	01.42	8_13.80 N	121_29.37 E	Surface	10110
I2	30-Oct-14	3400	06.09	8_14.03 N	122_09.52 E	Surface	11680
15	30-Oct-14	4950	12.26	7_44.80 N	121_44.42 E	Surface	10980
16	30-Oct-14	5000	16.05	7_22.53 N	121_30.23 E	Surface	10600
17	30-Oct-14	4594	21.30	7_17.55 N	120_59.51 E	Surface	10640
18	31-Oct-14	4000	06.40	7_09.91 N	120_07.95 E	Surface	11350
19	31-Oct-14	3000	18.55	7_14.40 N	119_00.30 E	Surface	12600
20	1-Nov-14	1240	00.57	6_33.32 N	118_59.13 E	Surface	11720
21	1-Nov-14	3300	06.02	6_21.55 N	119_33.57 E	Surface	10960
22	1-Nov-14	4548	12.23	6_43.51 N	120_08.65 E	Surface	11230
23	1-Nov-14	4500	17.38	6_53.50 N	120_49.92 E	Surface	12190
24	5-Nov-14	360.0	11.07	6_50.11 N	122_29.63 E	Surface	11330
25	5-Nov-14	3092.0	15.45	6_49.65 N	122_59.53 E	Surface	12790
26	5-Nov-14	4546.0	21.13	6_49.93 N	123_29.86 E	Surface	13730
27	6-Nov-14	3978.0	02.22	6_15.22 N	123_44.84 E	Surface	12480
28	6-Nov-14	4198.0	09.00	6_14.32 N	123_00.01 E	Surface	15050
29	6-Nov-14	4100	16.30	5_45.31 N	122_00.40 E	Surface	12720
30	7-Nov-14	4640	01.31	5_44.89 N	123_00.01 E	Surface	13350
31	7-Nov-14	3600	16.50	5_45.02 N	123_59.92 E	Surface	14070
32	7-Nov-14	4774	23.23	5_37.41 N	124_34.16 E	Surface	12910
33	8-Nov-14	4800	05.55	5_00.14 N	123_59.80 E	Surface	12080

St. no.	Date	Bottom Depth (m)	Start	Position		Towing depth (m)	Flowmeter revolution
				Lat	Long		
34	8-Nov-14	4824	14.12	5_00.74 N	122_59.83 E	Surface	14020
35	8-Nov-14	4882	22.05	5_00.06 N	121_59.86 E	Surface	13250
36	9-Nov-14	3963	03.48	5_24.34 N	121_32.11 E	Surface	10800
37	9-Nov-14	4490	08.56	5_00.05 N	120_59.81 E	Surface	14230
38	10-Nov-14	4852	01.37	3_59.59 N	123_04.57 E	Surface	12130
39	10-Nov-14	4900	16.50	3_59.98 N	122_14.89 E	Surface	11900
40	10-Nov-14	4941	23.17	3_59.11 N	121_30.47 E	Surface	13150
41	11-Nov-14	4500	06.31	4_00.10 N	120_29.90 E	Surface	12830
42	11-Nov-14	3435	15.50	3_59.66 N	119_39.88 E	Surface	11320
43	11-Nov-14	3435	22.57	4_00.47 N	118_36.24 E	Surface	11600
44	12-Nov-14	2200	04.42	4_15.10 N	119_11.87 E	Surface	9540
45	22-Nov-14	3200	16.50	2_30.19 N	125_00.13 E	Surface	12070
46	23-Nov-14	2550	00.42	3_30.07 N	124_59.77 E	Surface	14170
47	23-Nov-14	5400	07.58	4_29.18 N	124_59.39 E	Surface	12600
48	23-Nov-14	4500	17.27	3_29.83 N	124_00.45 E	Surface	11420
50	24-Nov-14	5230	00.25	2_30.01 N	123_59.95 E	Surface	14060
51	24-Nov-14	5055	09.15	2_29.94 N	123_00.65 E	Surface	12930
52	24-Nov-14	5400	18.52	2_30.87 N	122_00.63 E	Surface	11560
53	25-Nov-14	5485	03.12	2_29.94 N	121_00.15 E	Surface	14420
54	25-Nov-14	5230	12.07	2_29.78 N	120_01.01 E	Surface	14060
55	25-Nov-14	4200	19.30	2_29.91 N	119_00.31 E	Surface	11250
56	26-Nov-14	4218	03.25	1_29.21 N	119_31.28 E	Surface	12970
57	26-Nov-14	2760	09.53	1_29.91 N	120_30.33 E	Surface	13780
58	26-Nov-14	3100	19.42	1_30.56 N	121_30.51 E	Surface	11660
59	27-Nov-14	3427	02.43	1_30.01 N	122_30.04 E	Surface	14060
60	27-Nov-14	3870.0	11.06	1_28.97 N	123_29.52 E	Surface	14600
61	27-Nov-14	1700.0	19.23	1_29.87 N	124_29.87 E	Surface	12150

Appendix 6. Genetic study

Table 8. Summaries data of Yellowfin tuna tissue collection

No.	Sampling date	Position		Common name	Sampling method	Weight	Total length	Fork length	Width	Sex	Gonad stage	Fishing by
		Lat.	Long.			(kg)	(cm)	(cm)	(cm)			
1	08-Nov-14	04_59.30 N	123_52.70 E	Yellowfin tuna	Hand line	0.110	18.0	17.2	4.3	M	Unform	Philippines
2	08-Nov-14	04_59.30 N	123_52.70 E	Yellowfin tuna	Hand line	0.105	18.0	16.8	4.1	M	Unform	Philippines
3	08-Nov-14	04_59.30 N	123_52.70 E	Yellowfin tuna	Hand line	0.110	18.0	17.0	4.2	Unform	Unform	Phillipines
4	08-Nov-14	04_59.30 N	123_52.70 E	Yellowfin tuna	Hand line	0.100	18.0	16.2	3.9	M	Unform	Phillipines
5	08-Nov-14	04_59.30 N	123_52.70 E	Yellowfin tuna	Hand line	0.110	19.2	17.0	4.4	Unform	Unform	Phillipines
6	08-Nov-14	04_59.30 N	123_52.70 E	Yellowfin tuna	Hand line	0.110	19.3	16.7	4.2	Unform	Unform	Phillipines
7	08-Nov-14	04_59.30 N	123_52.70 E	Yellowfin tuna	Hand line	0.100	16.0	15.0	3.7	Unform	Unform	Phillipines
8	08-Nov-14	04_59.30 N	123_52.70 E	Yellowfin tuna	Hand line	0.110	18.0	16.5	4.3	Unform	Unform	Phillipines
9	08-Nov-14	04_59.30 N	123_52.70 E	Yellowfin tuna	Hand line	0.100	17.8	16.5	4.2	Unform	Unform	Phillipines
10	08-Nov-14	04_59.30 N	123_52.70 E	Yellowfin tuna	Hand line	0.100	17.8	16.4	4.0	Unform	Unform	Phillipines
11	08-Nov-14	04_59.30 N	123_52.70 E	Yellowfin tuna	Hand line	0.095	17.0	15.5	3.8	Unform	Unform	Phillipines
12	08-Nov-14	05_03.25 N	123_02.11 E	Yellowfin tuna	Hand line	1.250	42.5	39.0	11.0	F	1	Phillipines
13	08-Nov-14	05_03.25 N	123_02.11 E	Yellowfin tuna	Hand line	0.180	20.5	19.0	4.5	F	1	Phillipines
14	08-Nov-14	05_03.25 N	123_02.11 E	Yellowfin tuna	Hand line	0.400	26.0	24.5	6.5	F	1	Phillipines
15	08-Nov-14	05_03.25 N	123_02.11 E	Yellowfin tuna	Hand line	0.320	25.0	23.0	5.0	F	1	Phillipines
16	08-Nov-14	05_03.25 N	123_02.11 E	Yellowfin tuna	Hand line	0.420	27.0	25.0	6.5	F	1	Phillipines
17	08-Nov-14	05_03.25 N	123_02.11 E	Yellowfin tuna	Hand line	0.280	24.5	22.5	5.5	M	1	Phillipines
18	08-Nov-14	05_03.25 N	123_02.11 E	Yellowfin tuna	Hand line	0.260	23.0	22.0	5.5	M	1	Phillipines
19	08-Nov-14	05_03.25 N	123_02.11 E	Yellowfin tuna	Hand line	0.340	26.0	24.0	6.5	F	1	Phillipines
20	08-Nov-14	05_03.25 N	123_02.11 E	Yellowfin tuna	Hand line	0.300	25.0	22.5	6.0	Unform	Unform	Phillipines
21	08-Nov-14	05_03.25 N	123_02.11 E	Yellowfin tuna	Hand line	0.520	29.5	27.5	7.5	F	1	Phillipines
22	08-Nov-14	05_03.25 N	123_02.11 E	Yellowfin tuna	Hand line	0.310	24.5	23.0	6.5	M	1	Phillipines
23	08-Nov-14	05_03.25 N	123_02.11 E	Yellowfin tuna	Hand line	0.600	31.0	28.5	8.0	F	1	Phillipines
24	11-Nov-14	04_02.87 N	121_28.05 E	Yellowfin tuna	Hand line	0.520	30.0	28.0	8.0	F	1	Phillipines
25	11-Nov-14	04_02.87 N	121_28.05 E	Yellowfin tuna	Hand line	0.165	21.0	19.5	5.0	Unform	Unform	Phillipines
26	24-Nov-14	02_29.91N	123_00.22E	Yellowfin tuna	Torling line	1.500	50.0	45.5	12.5	Unform	Unform	Seafdec2
27	26-Nov-14	01_30.79N	120_35.48E	Yellowfin tuna	Hand line	0.600	35.0	31.0	9.0	Unform	Unform	Indonesian
28	26-Nov-14	01_30.79N	120_35.48E	Yellowfin tuna	Hand line	0.750	38.0	34.0	11.0	Unform	Unform	Indonesian
29	26-Nov-14	01_30.79N	120_35.48E	Yellowfin tuna	Hand line	0.750	37.0	33.0	11.0	Unform	Unform	Indonesian
30	26-Nov-14	01_30.79N	120_35.48E	Yellowfin tuna	Hand line	0.600	35.0	31.0	10.0	Unform	Unform	Indonesian

No.	Sampling date	Position		Common name	Sampling method	Weight	Total length	Fork length	Width	Sex	Gonad stage	Fishing by
		Lat.	Long.			(kg)	(cm)	(cm)	(cm)			
31	26-Nov-14	01_30.79N	120_35.48E	Yellowfin tuna	Hand line	0.650	35.0	32.0	10.0	Unform	Unform	Indonesian
32	26-Nov-14	01_30.79N	120_35.48E	Yellowfin tuna	Hand line	0.220	25.0	22.0	6.5	Unform	Unform	Indonesian
33	26-Nov-14	01_30.79N	120_35.48E	Yellowfin tuna	Hand line	0.500	33.0	29.0	9.0	Unform	Unform	Indonesian
34	26-Nov-14	01_30.79N	120_35.48E	Yellowfin tuna	Hand line	0.800	37.0	33.0	11.0	Unform	Unform	Indonesian
35	26-Nov-14	01_30.79N	120_35.48E	Yellowfin tuna	Hand line	0.700	37.0	34.0	11.0	Unform	Unform	Indonesian
36	26-Nov-14	01_30.79N	120_35.48E	Yellowfin tuna	Hand line	0.550	33.0	30.0	9.0	Unform	Unform	Indonesian
37	26-Nov-14	01_30.79N	120_35.48E	Yellowfin tuna	Hand line	0.350	30.0	27.0	8.0	Unform	Unform	Indonesian

Table 9 summaries data of Skipjack tuna tissue collection

No.	Sampling date	Position		Common name	Sampling method	Weight	Total length	Fork length	Width	Sex	Gonad stage	Fishing by
		Lat.	Long.			(kg)	(cm)	(cm)	(cm)			
1	08-Nov-14	05_03.25 N	123_02.11 E	Skipjack tuna	Hand line	1.600	49.0	46.0	10.5	M	1	Phillipines
2	09-Nov-14	05_03.25 N	123_02.11 E	Skipjack tuna	Hand line	0.480	28.0	26.0	6.5	M	1	Phillipines
3	10-Nov-14	05_03.25 N	123_02.11 E	Skipjack tuna	Hand line	0.500	27.5	26.0	6.5	M	1	Phillipines
4	11-Nov-14	05_03.25 N	123_02.11 E	Skipjack tuna	Hand line	0.460	28.0	27.5	7.0	M	1	Phillipines
5	12-Nov-14	05_03.25 N	123_02.11 E	Skipjack tuna	Hand line	0.580	29.5	28.0	7.0	M	1	Phillipines
6	13-Nov-14	05_03.25 N	123_02.11 E	Skipjack tuna	Hand line	0.440	27.0	26.5	6.0	M	1	Phillipines
7	14-Nov-14	05_03.25 N	123_02.11 E	Skipjack tuna	Hand line	0.480	27.0	26.0	6.5	M	1	Phillipines
8	15-Nov-14	05_03.25 N	123_02.11 E	Skipjack tuna	Hand line	0.440	27.0	25.5	6.5	F	1	Phillipines
9	16-Nov-14	05_03.25 N	123_02.11 E	Skipjack tuna	Hand line	0.480	28.0	26.5	6.5	M	1	Phillipines
10	17-Nov-14	05_03.25 N	123_02.11 E	Skipjack tuna	Hand line	0.430	27.0	26.5	6.5	F	1	Phillipines
11	18-Nov-14	05_03.25 N	123_02.11 E	Skipjack tuna	Hand line	0.400	26.5	26.0	6.0	F	1	Phillipines
12	19-Nov-14	05_03.25 N	123_02.11 E	Skipjack tuna	Hand line	0.480	27.5	26.5	7.0	M	1	Phillipines
13	20-Nov-14	05_03.25 N	123_02.11 E	Skipjack tuna	Hand line	0.300	24.0	23.0	5.5	F	1	Phillipines
14	21-Nov-14	05_03.25 N	123_02.11 E	Skipjack tuna	Hand line	0.440	26.5	25.0	6.5	F	1	Philippines
15	26-Nov-14	01_30.79N	120_35.48E	Skipjack tuna	Hand line	0.200	24.0	23.0	6.0	Unform	Unform	Indonesian
16	26-Nov-14	01_30.79N	120_35.48E	Skipjack tuna	Hand line	0.250	26.0	25.0	7.0	Unform	Unform	Indonesian
17	26-Nov-14	01_30.79N	120_35.48E	Skipjack tuna	Hand line	0.190	24.0	22.0	7.0	Unform	Unform	Indonesian
18	26-Nov-14	01_30.79N	120_35.48E	Skipjack tuna	Hand line	0.550	32.0	30.0	10.0	F	1	Indonesian
19	26-Nov-14	01_30.79N	120_35.48E	Skipjack tuna	Hand line	0.290	37.0	26.0	8.0	Unform	Unform	Indonesian

No.	Sampling date	Position		Common name	Sampling method	Weight	Total length	Fork length	Width	Sex	Gonad stage	Fishing by
		Lat.	Long.			(kg)	(cm)	(cm)	(cm)			
20	26-Nov-14	01_30.79N	120_35.48E	Skipjack tuna	Hand line	0.200	25.0	23.0	7.0	Unform	Unform	Indonesian
21	26-Nov-14	01_30.79N	120_35.48E	Skipjack tuna	Hand line	0.230	26.0	24.0	6.5	Unform	Unform	Indonesian
22	26-Nov-14	01_30.79N	120_35.48E	Skipjack tuna	Hand line	0.200	25.0	23.0	6.5	Unform	Unform	Indonesian
23	26-Nov-14	01_30.79N	120_35.48E	Skipjack tuna	Hand line	0.210	25.0	23.0	7.0	Unform	Unform	Indonesian
24	26-Nov-14	01_30.79N	120_35.48E	Skipjack tuna	Hand line	0.250	26.0	24.0	7.0	Unform	Unform	Indonesian
25	26-Nov-14	01_30.79N	120_35.48E	Skipjack tuna	Hand line	0.260	26.0	24.0	6.0	Unform	Unform	Indonesian
26	26-Nov-14	01_30.79N	120_35.48E	Skipjack tuna	Hand line	0.510	32.0	30.0	8.5	Unform	Unform	Indonesian
27	26-Nov-14	01_30.79N	120_35.48E	Skipjack tuna	Hand line	0.920	40.0	37.0	11.0	F	1	Indonesian
28	26-Nov-14	01_30.79N	120_35.48E	Skipjack tuna	Hand line	0.210	26.0	24.0	6.5	Unform	Unform	Indonesian
29	26-Nov-14	01_30.79N	120_35.48E	Skipjack tuna	Hand line	0.240	25.0	24.0	7.0	Unform	Unform	Indonesian
30	26-Nov-14	01_30.79N	120_35.48E	Skipjack tuna	Hand line	0.440	32.0	30.0	8.0	Unform	Unform	Indonesian
31	26-Nov-14	01_30.79N	120_35.48E	Skipjack tuna	Hand line	0.200	26.0	24.0	6.0	Unform	Unform	Indonesian
32	26-Nov-14	01_30.79N	120_35.48E	Skipjack tuna	Hand line	0.220	25.0	23.0	6.0	Unform	Unform	Indonesian
33	26-Nov-14	01_30.79N	120_35.48E	Skipjack tuna	Hand line	0.520	34.0	32.0	8.0	Unform	Unform	Indonesian
34	26-Nov-14	01_30.79N	120_35.48E	Skipjack tuna	Hand line	0.210	24.0	23.0	6.0	Unform	Unform	Indonesian
35	26-Nov-14	01_30.79N	120_35.48E	Skipjack tuna	Hand line	0.240	25.0	23.0	6.0	Unform	Unform	Indonesian
36	26-Nov-14	01_30.79N	120_35.48E	Skipjack tuna	Hand line	0.200	25.0	23.0	6.0	Unform	Unform	Indonesian
37	26-Nov-14	01_30.79N	120_35.48E	Skipjack tuna	Hand line	0.230	25.0	23.0	6.0	Unform	Unform	Indonesian
38	26-Nov-14	01_30.79N	120_35.48E	Skipjack tuna	Hand line	0.260	27.0	25.0	7.0	Unform	Unform	Indonesian
39	26-Nov-14	01_30.79N	120_35.48E	Skipjack tuna	Hand line	0.350	30.0	28	7.5	Unform	Unform	Indonesian
40	26-Nov-14	01_30.79N	120_35.48E	Skipjack tuna	Hand line	0.230	25.0	24	6	Unform	Unform	Indonesian
41	26-Nov-14	01_30.79N	120_35.48E	Skipjack tuna	Hand line	0.200	24.0	24	5.5	Unform	Unform	Indonesian
42	26-Nov-14	01_30.79N	120_35.48E	Skipjack tuna	Hand line	0.240	26.0	24	6	Unform	Unform	Indonesian
43	26-Nov-14	01_30.79N	120_35.48E	Skipjack tuna	Hand line	0.170	24.0	23	5.5	Unform	Unform	Indonesian
44	26-Nov-14	01_30.79N	120_35.48E	Skipjack tuna	Hand line	0.170	24.0	23	5.5	Unform	Unform	Indonesian
45	26-Nov-14	01_30.79N	120_35.48E	Skipjack tuna	Hand line	0.230	26.0	24	6	Unform	Unform	Indonesian

Table 10. Summaries data of other species tissue collection

No.	Sampling date	Position		Common name	Sampling method	Weight	Total length	Fork length	Width	Sex	Gonad stage	Fishing by
		Lat.	Long.			(kg)	(cm)	(cm)	(cm)			
1	29-Oct-14	08_17.10 N	119_56.30 E	Sickle promfet	P- longline	2.600	56.0	-	21.0	Male	1	SEAFDEC 2
2	31-Oct-14	07_12.04 N	120_06.51 E	Pelagic string ray	P-longline	5.000	40.0	-	56.0	Female	Unidentify	SEAFDEC 2
3	31-Oct-14	07_12.04 N	120_06.51 E	Pelagic string ray	P-longline	3.200	39.0	-	49.0	Male	Unidentify	SEAFDEC 2
4	7-Nov-14	05_40.14 N	123_05.20 E	Pelagic string ray	P-longline	2.800	34.0	-	46.0	Male	Unidentify	SEAFDEC 2
5	7-Nov-14	05_40.14 N	123_05.20 E	Blue shark	P-longline	45.000	220.0	-	30.0	Female	Unidentify	SEAFDEC 2
6	7-Nov-14	05_40.14 N	123_05.20 E	swordfish	P-longline	6.000	148.0	-	16.0	Male	1	SEAFDEC 2
7	08-Nov-14	04_59.30 N	123_52.70 E	Frigate tuna	Hand line	0.110	18.8	17.7	4.0	Unform	Unform	Philippines
8	08-Nov-14	04_59.30 N	123_52.70 E	Frigate tuna	Hand line	0.100	17.0	16.2	3.3	Unform	Unform	Philippines
9	08-Nov-14	04_59.30 N	123_52.70 E	Frigate tuna	Hand line	0.105	18.4	17.5	3.9	Unform	Unform	Philippines
10	08-Nov-14	04_59.30 N	123_52.70 E	Frigate tuna	Hand line	0.090	15.0	14.6	3.0	Unform	Unform	Philippines
11	08-Nov-14	04_59.30 N	123_52.70 E	Frigate tuna	Hand line	0.095	16.7	15.8	3.7	Unform	Unform	Philippines
12	08-Nov-14	04_59.30 N	123_52.70 E	Frigate tuna	Hand line	0.090	16.7	15.9	3.4	Unform	Unform	Philippines
13	08-Nov-14	04_59.30 N	123_52.70 E	Frigate tuna	Hand line	0.095	17.0	15.9	3.2	Unform	Unform	Philippines
14	08-Nov-14	04_59.30 N	123_52.70 E	Frigate tuna	Hand line	0.100	17.6	16.6	3.8	Unform	Unform	Philippines
15	08-Nov-14	04_59.30 N	123_52.70 E	Frigate tuna	Hand line	0.100	17.4	16.5	3.6	Unform	Unform	Philippines
16	08-Nov-14	05_03.25 N	123_02.11 E	Rainbow	Hand line	0.460	33.0	28.0	7.5	Female	1	Philippines
17	08-Nov-14	05_03.25 N	123_02.11 E	Rainbow	Hand line	0.380	31.0	26.5	6.5	Male	1	Philippines
18	08-Nov-14	05_03.25 N	123_02.11 E	Bigeye scad	Hand line	0.160	20.0	18.0	5.5	Male	3	Philippines
19	08-Nov-14	05_03.25 N	123_02.11 E	Round scad	Hand line	0.300	27.0	25.0	5.0	Male	3	Philippines
20	08-Nov-14	05_03.25 N	123_02.11 E	Round scad	Hand line	0.280	27.0	25.0	5.0	Male	3	Philippines
21	08-Nov-14	05_03.25 N	123_02.11 E	Round scad	Hand line	0.320	27.0	25.0	5.0	Female	3	Philippines
22	08-Nov-14	05_03.25 N	123_02.11 E	Round scad	Hand line	0.300	27.5	25.5	5.0	Female	3	Philippines
23	08-Nov-14	05_03.25 N	123_02.11 E	Round scad	Hand line	0.360	29.0	27.0	5.5	Male	3	Philippines
24	08-Nov-14	05_03.25 N	123_02.11 E	Frigate tuna	Hand line	0.320	26.0	25.0	5.5	Male	1	Philippines
25	11-Nov-14	04_02.87 N	121_28.05 E	Greater amberjack	Hand line	0.380	27.5	25.0	8.0	Male	1	Philippines
26	11-Nov-14	04_02.87 N	121_28.05 E	Dolphinfish	Hand line	1.100	57.5	49.0	10.0	Female	4	Philippines
27	11-Nov-14	04_02.87 N	121_28.05 E	Dolphinfish	Hand line	0.780	44.5	37.5	9.0	Female	2	Philippines
28	26-Nov-14	01_30.79N	120_35.48E	Frigate tuna	Hand line	0.250	26.0	25.0	6.0	Male	1	Indonesian
29	26-Nov-14	01_30.79N	120_35.48E	Frigate tuna	Hand line	0.200	24.0	23.0	5.0	Female	1	Indonesian
30	26-Nov-14	01_30.79N	120_35.48E	Frigate tuna	Hand line	0.180	24.0	23.0	5.0	Female	1	Indonesian
31	26-Nov-14	01_30.79N	120_35.48E	Frigate tuna	Hand line	0.200	24.0	23.0	6.0	Female	1	Indonesian

No.	Sampling date	Position		Common name	Sampling method	Weight	Total length	Fork length	Width	Sex	Gonad stage	Fishing by
		Lat.	Long.			(kg)	(cm)	(cm)	(cm)			
32	26-Nov-14	01_30.79N	120_35.48E	Frigate tuna	Hand line	0.180	23.0	22.0	5.0	Unform	Unform	Indonesian
33	26-Nov-14	01_30.79N	120_35.48E	Frigate tuna	Hand line	0.210	26.0	24.0	6.0	Male	1	Indonesian
34	26-Nov-14	01_30.79N	120_35.48E	Frigate tuna	Hand line	0.250	26.0	24.0	6.0	Male	1	Indonesian
35	26-Nov-14	01_30.79N	120_35.48E	Frigate tuna	Hand line	0.180	26.0	24.0	6.0	Male	1	Indonesian
36	26-Nov-14	01_30.79N	120_35.48E	Frigate tuna	Hand line	0.210	26.0	24.0	6.0	Unform	Unform	Indonesian
37	26-Nov-14	01_30.79N	120_35.48E	Frigate tuna	Hand line	0.200	24.0	23.0	5.5	Female	1	Indonesian
38	26-Nov-14	01_30.79N	120_35.48E	Frigate tuna	Hand line	0.200	24.0	23	5.0	Female	1	Indonesian
39	26-Nov-14	01_30.79N	120_35.48E	Frigate tuna	Hand line	0.250	26.0	24	6	Male	1	Indonesian
40	26-Nov-14	01_30.79N	120_35.48E	Frigate tuna	Hand line	0.170	24.0	22	5	Unform	1	Indonesian
41	26-Nov-14	01_30.79N	120_35.48E	Frigate tuna	Hand line	0.250	25.0	24	5.5	Female	1	Indonesian
42	26-Nov-14	01_30.79N	120_35.48E	Frigate tuna	Hand line	0.200	25.0	23	5.5	Unform	Unform	Indonesian
43	26-Nov-14	01_30.79N	120_35.48E	Bullet tuna	Hand line	0.170	24.0	23	5	Male	1	Indonesian
44	26-Nov-14	01_30.79N	120_35.48E	Bullet tuna	Hand line	0.150	22.0	21	4.5	Male	1	Indonesian
45	26-Nov-14	01_30.79N	120_35.48E	Bullet tuna	Hand line	0.190	24.0	23	5	Female	1	Indonesian
46	26-Nov-14	01_30.79N	120_35.48E	Bullet tuna	Hand line	0.150	23.0	22	4.5	Female	1	Indonesian
47	26-Nov-14	01_30.79N	120_35.48E	Bullet tuna	Hand line	0.180	24.0	23	5	Male	3	Indonesian
48	26-Nov-14	01_30.79N	120_35.48E	Bullet tuna	Hand line	0.140	22.0	21	4.5	Female	1	Indonesian
49	26-Nov-14	01_30.79N	120_35.48E	Bullet tuna	Hand line	0.140	23.0	22	5	Male	1	Indonesian
50	26-Nov-14	01_30.79N	120_35.48E	Bullet tuna	Hand line	0.170	25.0	24	5	Male	1	Indonesian
51	26-Nov-14	01_30.79N	120_35.48E	Kawakawa	Hand line	0.260	26.0	25	7	Unform	Unform	Indonesian
52	26-Nov-14	01_30.79N	120_35.48E	Frigate tuna	Hand line	0.450	31.0	29	9	Male	2	Indonesian

Table11. FADs survey in SSS. **Appendix 7. FADs Inventory**

Iventory of FADs in Sulu and Sulawesi Seas

Cruise 47-3/2014 , 22 October - 28 November 2014

No.	Date	Station	Time	Location								Type of FADs	Remark
				Lat				Long					
1	26-Oct-14	3	0740	#	15	20	N	121	29	30	E	AFADs/Foam	
2	26-Oct-14	3	1036	#	10	96	N	121	38	11	E	AFADs/Plastic drur	distance 0.43 nm/ 190◦
3	26-Oct-14	3	1034	9	10	96	N	121	38	11	E	AFADs/Plastic drur	distance 1.54 nm/ 025◦
4	26-Oct-14	4-5	1644	9	40	97	N	122	06	28	E	AFADs/Foam	
5	26-Oct-14	4-5	1652	9	38	20	N	122	06	70	E	AFADs/Foam	
6	26-Oct-14	4-5	1700	9	37	40	N	122	07	70	E	AFADs steel drum	
7	26-Oct-14	4-5	1709	9	35	50	N	122	06	90	E	AFADs/Foam	
8	26-Oct-14	4-5	1712	9	33	79	N	122	05	90	E	AFADs/Foam	
9	26-Oct-14	4-5	1718	9	32	04	N	122	08	36	E	AFADs/unidentified	
10	26-Oct-14	4-5	1730	9	29	00	N	122	07	90	E	AFADs/unidentified	3 fishing boat
11	26-Oct-14	4-5	1810	9	25	10	N	122	11	60	E	AFADs/unidentified	3 fishing boat
12	26-Oct-14	4-5	1835	9	21	03	N	122	12	99	E	AFADs/unidentified	4 fishing boat
13	27-Oct-14	I1-6	0635	9	00	43	N	122	02	63	E	AFADs steel drum	
14	28-Oct-14	9-10	0834	9	02	16	N	118	47	92	E	AFADs steel drum	colour : orenge
15	28-Oct-14	10-11	1548	8	23	20	N	118	51	70	E	AFADs steel drum	
16	29-Oct-14	I2	0611	8	16	27	N	122	09	17	E	AFADs steel drum	
17	29-Oct-14	I2	1616	8	14	90	N	122	09	95	E	AFADs /bamboo	distance 1.8 nm/ 180◦
18	29-Oct-14	I2-15	0930	8	04	97	N	122	01	52	E	AFADs /bamboo	
19	29-Oct-14	I2-15	0940	8	03	57	N	122	00	36	E	AFADs /bamboo	distance 2.0 nm/ 240◦
20	29-Oct-14	I2-15	1125	7	48	36	N	121	88	00	E	AFADs /bamboo	
21	29-Oct-14	15-16	1507	7	30	30	N	121	36	50	E	AFADs steel drum	colour: white
Leg 2													
22	5-Nov-14	24	1017	6	49	58	N	122	26	99	E	AFADs /bamboo	
23	5-Nov-14	24	1020	6	49	95	N	122	28	59	E	AFADs /bamboo	
24	5-Nov-14	24	1022	6	48	42	N	122	29	28	E	AFADs /bamboo	
25	5-Nov-14	24	1025	6	50	28	N	122	30	53	E	AFADs /bamboo	
26	5-Nov-14	24-25	1310	6	50	62	N	122	33	74	E	AFADs steel drum	
27	5-Nov-14	24-25	1330	6	49	28	N	122	37	90	E	AFADs steel drum	
28	5-Nov-14	24-25	1330	6	51	84	N	122	37	30	E	AFADs steel drum	
29	5-Nov-14	24-25	1500	6	50	93	N	122	53	14	E	AFADs steel drum	
30	5-Nov-14	24-25	1510	6	47	48	N	122	55	67	E	AFADs steel drum	
31	5-Nov-14	24-25	1515	6	48	87	N	122	57	21	E	AFADs steel drum	
32	5-Nov-14	24-25	1535	6	51	11	N	122	58	02	E	AFADs steel drum	
33	5-Nov-14	24-25	1540	6	51	38	N	123	01	62	E	AFADs steel drum	
34	5-Nov-14	24-25	1750	6	51	29	N	123	01	86	E	AFADs steel drum	
35	5-Nov-14	24-25	1755	6	52	38	N	123	03	33	E	AFADs steel drum	
36	6-Nov-14	27-28	0600	6	14	98	N	123	26	73	E	AFADs steel drum	distance 0.1 nm/ 000◦
37	6-Nov-14	27-28	0640	6	14	99	N	123	19	31	E	AFADs steel drum	distance 0.5 nm/ 000◦
38	6-Nov-14	27-28	0705	6	14	98	N	123	14	74	E	AFADs steel drum	distance 0.1 nm/ 000◦
39	6-Nov-14	27-28	0705	6	14	98	N	123	14	74	E	AFADs steel drum	distance 1.8 nm/ 000◦
40	6-Nov-14	27-28	0725	6	17	79	N	123	09	21	E	AFADs steel drum	
41	6-Nov-14	27-28	0727	6	14	93	N	123	10	15	E	AFADs steel drum	
42	6-Nov-14	27-28	0738	6	17	00	N	123	04	70	E	AFADs steel drum	with fishing boat
43	6-Nov-14	27-28	0739	6	13	42	N	123	06	77	E	AFADs steel drum	with fishing boat
44	6-Nov-14	27-28	1135	6	08	82	N	122	48	45	E	AFADs steel drum	with fishing boat
45	6-Nov-14	27-28	1150	6	05	63	N	122	46	75	E	AFADs steel drum	with fishing boat
46	6-Nov-14	27-28	1525	5	47	74	N	122	10	04	E	AFADs steel drum	with fishing boat
47	6-Nov-14	27-28	1530	5	50	58	N	122	07	56	E	AFADs steel drum	

No.	Date	Station	Time	Location								Type of FADs	Remark
				Lat				Long					
48	6-Nov-14	27-28	1550	5	46	82	N	122	05	50	E	AFADs steel drum	
49	6-Nov-14	27-28	1625	5	46	29	N	121	57	93	E	AFADs steel drum	with fishing boat
50	7-Nov-14	30-31	1200	5	45	83	N	123	11	29	E	AFADs steel drum	distance 1.7 nm/ 130◦
51	7-Nov-14	30-31	1200	5	42	70	N	123	11	93	E	AFADs steel drum	distance 2.9 nm/ 160◦
52	7-Nov-14	30-31	1220	5	46	47	N	123	16	37	E	AFADs steel drum	distance 2.9 nm/ 040◦
53	7-Nov-14	30-31	1242	5	47	47	N	123	17	97	E	AFADs steel drum	distance 2.5 nm/ 010◦
54	7-Nov-14	30-31	1250	5	46	26	N	123	20	68	E	AFADs steel drum	distance 1.9 nm/ 050◦
55	7-Nov-14	30-31	1250	5	43	45	N	123	22	02	E	AFADs steel drum	distance 2.9 nm/ 125◦
56	7-Nov-14	30-31	1310	5	42	72	N	123	23	60	E	AFADs steel drum	distance 2.3 nm/ 185◦
57	7-Nov-14	30-31	1330	5	45	95	N	123	27	12	E	AFADs steel drum	distance 1.1 nm/ 010◦
58	7-Nov-14	30-31	1418	5	44	80	N	123	32	99	E	AFADs steel drum	distance 1.3 nm/ 100◦
59	7-Nov-14	30-31	1427	5	44	35	N	123	36	25	E	AFADs steel drum	distance 1.4 nm/ 130◦
60	7-Nov-14	30-31	1440	5	46	08	N	123	37	74	E	AFADs steel drum	distance 1.3 nm/ 010◦
61	7-Nov-14	30-31	1455	5	45	70	N	123	40	83	E	AFADs steel drum	distance 1.2 nm/ 030◦
62	7-Nov-14	30-31	1520	5	45	76	N	123	15	18	E	AFADs steel drum	
63	7-Nov-14	30-31	1556	5	45	19	N	123	23	55	E	AFADs steel drum	
64	7-Nov-14	30-31	1607	5	44	62	N	123	54	31	E	AFADs steel drum	
65	7-Nov-14	30-31	1612	5	44	76	N	123	54	66	E	AFADs steel drum	
66	7-Nov-14	30-31	1630	5	44	54	N	123	54	87	E	AFADs steel drum	
67*	8-Nov-14	33	0607	5	01	56	N	123	59	47	E	AFADs steel drum	collect the sample *
68	8-Nov-14	33-34	0839	4	59	17	N	123	52	91	E	AFADs steel drum	
69	8-Nov-14	33-34	0925	5	00	02	N	123	49	42	E	AFADs steel drum	
70	8-Nov-14	33-34	0935	5	03	99	N	123	47	11	E	AFADs steel drum	
71	8-Nov-14	33-34	0956	4	57	77	N	123	44	83	E	AFADs steel drum	
72	8-Nov-14	33-34	0948	5	02	59	N	123	40	42	E	AFADs steel drum	
73	8-Nov-14	33-34	1005	5	01	76	N	123	39	62	E	AFADs steel drum	
74	8-Nov-14	33-34	1020	4	58	82	N	123	35	10	E	AFADs steel drum	
75	8-Nov-14	33-34	1046	5	00	36	N	123	32	73	E	AFADs steel drum	
76	8-Nov-14	33-34	1103	5	02	14	N	123	27	82	E	AFADs steel drum	
77	8-Nov-14	33-34	1110	4	58	81	N	123	27	42	E	AFADs steel drum	
78	8-Nov-14	33-34	1115	4	58	64	N	123	24	76	E	AFADs steel drum	
79	8-Nov-14	33-34	1118	4	56	96	N	123	25	88	E	AFADs steel drum	
80	8-Nov-14	33-34	1118	4	56	30	N	123	24	13	E	AFADs steel drum	
81	8-Nov-14	33-34	1148	4	59	23	N	123	19	89	E	AFADs steel drum	
82	8-Nov-14	33-34	1153	5	00	62	N	123	18	89	E	AFADs steel drum	
83	8-Nov-14	33-34	1225	4	59	76	N	123	13	28	E	AFADs steel drum	distance 0.8 nm/ 255◦
84	8-Nov-14	33-34	1231	4	57	83	N	123	10	90	E	AFADs steel drum	distance 2.8 nm/ 221◦
85	8-Nov-14	33-34	1247	4	58	20	N	123	08	59	E	AFADs steel drum	distance 1.9 nm/ 205◦
86*	8-Nov-14	33-34	1630	5	03	09	N	123	02	11	E	AFADs steel drum	collect the sample *
87	8-Nov-14	34-35	1655	4	58	54	N	122	50	11	E	AFADs steel drum	
88	8-Nov-14	34-35	1700	4	56	78	N	122	55	45	E	AFADs steel drum	
89	8-Nov-14	34-35	1725	5	00	84	N	122	55	15	E	AFADs steel drum	
90	8-Nov-14	34-35	1725	4	58	27	N	122	47	02	E	AFADs steel drum	
91	8-Nov-14	34-35	1725	4	57	13	N	122	49	81	E	AFADs steel drum	
92	8-Nov-14	34-35	1730	4	58	74	N	122	47	62	E	AFADs steel drum	
93	8-Nov-14	34-35	1810	4	59	98	N	122	43	20	E	AFADs steel drum	
94	9-Nov-14	36-37	0530	5	22	17	N	121	31	22	E	AFADs steel drum	
95	9-Nov-14	36-37	0545	5	22	50	N	121	28	96	E	AFADs steel drum	
96	9-Nov-14	36-37	0552	5	19	17	N	121	27	54	E	AFADs steel drum	

No.	Date	Station	Time	Location								Type of FADs	Remark
				Lat				Long					
97	9-Nov-14	36-37	0604	5	18	94	N	121	24	70	E	AFADs steel drum	
98	9-Nov-14	36-37	0605	5	16	65	N	121	26	58	E	AFADs steel drum	
99	9-Nov-14	36-37	0605	5	19	50	N	121	24	29	E	AFADs steel drum	
100	9-Nov-14	36-37	0633	5	16	03	N	121	20	46	E	AFADs steel drum	
101	9-Nov-14	36-37	0640	5	12	69	N	121	20	28	E	AFADs steel drum	
102	9-Nov-14	36-37	0649	5	12	73	N	121	20	30	E	AFADs steel drum	
103	9-Nov-14	36-37	0651	5	13	38	N	121	16	41	E	AFADs steel drum	
104	9-Nov-14	36-37	0701	5	11	07	N	121	16	74	E	AFADs steel drum	
105	9-Nov-14	36-37	0715	5	04	42	N	121	13	39	E	AFADs steel drum	
106	9-Nov-14	36-37	0747	5	05	78	N	121	10	08	E	AFADs steel drum	
107	9-Nov-14	36-37	0753	5	03	71	N	121	09	60	E	AFADs steel drum	
108	9-Nov-14	36-37	0821	5	01	69	N	121	04	01	E	AFADs steel drum	with fishing boat
109	9-Nov-14	36-37	0827	5	03	41	N	121	02	04	E	AFADs steel drum	
110	9-Nov-14	36-37	0840	5	02	38	N	121	00	00	E	AFADs steel drum	
111	9-Nov-14	36-37	0844	4	59	53	N	121	00	21	E	AFADs steel drum	
112	9-Nov-14	36-37	0846	5	00	77	N	121	57	53	E	AFADs steel drum	
113	9-Nov-14	37-38	1228	4	54	58	N	121	09	94	E	AFADs steel drum	distance 1.6 nm/ 135◦
114	9-Nov-14	37-38	1309	4	50	83	N	121	14	35	E	AFADs steel drum	distance 2.0 nm/ 196◦
115	9-Nov-14	37-38	1320	4	51	54	N	121	17	14	E	AFADs steel drum	distance 0.6 nm/ 132◦
116	9-Nov-14	37-38	1328	4	48	95	N	121	18	04	E	AFADs steel drum	distance 2.4 nm/ 180◦
117	9-Nov-14	37-38	1345	4	49	60	N	121	22	43	E	AFADs steel drum	distance 1.8 nm/ 107◦
118	9-Nov-14	37-38	1346	4	49	16	N	121	23	45	E	AFADs steel drum	distance 2.2 nm/ 106◦
119	9-Nov-14	37-38	1416	4	45	72	N	121	25	38	E	AFADs steel drum	distance 2.1 nm/ 180◦
120	9-Nov-14	37-38	1421	4	46	89	N	121	27	22	E	AFADs steel drum	distance 1.3 nm/ 118◦
121	9-Nov-14	37-38	1442	4	43	52	N	121	30	78	E	AFADs steel drum	distance 2.8 nm/ 148◦
122	9-Nov-14	37-38	1447	4	46	80	N	121	30	44	E	AFADs steel drum	distance 1.2 nm/ 180◦
123	9-Nov-14	37-38	1448	4	45	66	N	121	30	97	E	AFADs steel drum	distance 0.7 nm/ 076◦
124	9-Nov-14	37-38	1449	4	44	67	N	121	31	94	E	AFADs steel drum	distance 1.7 nm/ 119◦
125	9-Nov-14	37-38	1530	4	41	51	N	121	36	15	E	AFADs steel drum	
126	9-Nov-14	37-38	1540	4	42	58	N	121	39	99	E	AFADs steel drum	
127	9-Nov-14	37-38	1620	4	38	59	N	121	42	97	E	AFADs steel drum	with fishing boat
128	9-Nov-14	37-38	1643	4	37	57	N	121	46	88	E	AFADs steel drum	
129	9-Nov-14	37-38	1643	4	35	60	N	121	47	64	E	AFADs steel drum	with fishing boat
130	9-Nov-14	37-38	1655	4	36	84	N	121	49	29	E	AFADs steel drum	colour: white / red
131	9-Nov-14	37-38	1655	4	35	02	N	121	50	14	E	AFADs steel drum	colour: Orange / white
132	9-Nov-14	37-38	1710	4	35	02	N	121	52	04	E	AFADs steel drum	colour: Orange / white
133	9-Nov-14	37-38	1736	4	31	80	N	121	53	67	E	AFADs steel drum	colour: Orange / white
134	10-Nov-14	38-39	1313	3	59	51	N	122	57	35	E	AFADs steel drum	colour: Orange / white
135	10-Nov-14	38-39	1314	4	00	35	N	122	57	40	E	AFADs steel drum	colour: Orange / white
136	10-Nov-14	38-39	1315	3	59	00	N	122	56	61	E	AFADs steel drum	colour: Orange / white
137	10-Nov-14	38-39	1337	4	00	83	N	122	53	85	E	AFADs steel drum	colour: Orange / white
138	10-Nov-14	38-39	1339	3	58	91	N	122	50	30	E	AFADs steel drum	colour: Orange / white
139	10-Nov-14	38-39	1351	4	01	19	N	122	47	94	E	AFADs steel drum	colour: Orange / white
140	10-Nov-14	38-39	1408	4	02	20	N	122	45	21	E	AFADs steel drum	colour: Orange / white
141	10-Nov-14	38-39	1423	4	01	47	N	122	42	75	E	AFADs steel drum	colour: Orange / white
142	10-Nov-14	38-39	1434	3	58	21	N	122	41	41	E	AFADs steel drum	colour: Orange / white
143	10-Nov-14	38-39	1454	4	01	46	N	122	35	75	E	AFADs steel drum	colour: yellow / green
144	10-Nov-14	38-39	1456	3	58	59	N	122	36	20	E	AFADs steel drum	colour: Orange / white
145	10-Nov-14	38-39	1513	3	59	54	N	122	33	89	E	AFADs steel drum	colour: Orange / white

No.	Date	Station	Time	Location								Type of FADs	Remark
				Lat				Long					
146	10-Nov-14	38-39	1513	4	01	34	N	122	35	71	E	AFADs steel drum	
147	10-Nov-14	38-39	1523	4	01	43	N	122	30	78	E	AFADs steel drum	
148	10-Nov-14	38-39	1525	4	02	95	N	122	29	20	E	AFADs steel drum	
149	10-Nov-14	38-39	1535	4	00	59	N	122	30	14	E	AFADs steel drum	colour: Orange
150	10-Nov-14	38-39	1540	3	58	88	N	122	28	59	E	AFADs steel drum	colour: Orange
151	10-Nov-14	38-39	1540	3	58	67	N	122	27	62	E	AFADs steel drum	
152	10-Nov-14	38-39	1552	4	00	45	N	122	27	15	E	AFADs steel drum	colour: Orange
153	10-Nov-14	38-39	1557	3	50	04	N	122	26	03	E	AFADs steel drum	colour: Green
154	10-Nov-14	38-39	1605	3	59	15	N	122	23	54	E	AFADs steel drum	
155	10-Nov-14	38-39	1605	3	59	22	N	122	23	06	E	AFADs steel drum	colour: Green
156	10-Nov-14	38-39	1610	3	58	03	N	122	21	50	E	AFADs steel drum	
157	10-Nov-14	38-39	1620	4	00	04	N	122	20	70	E	AFADs steel drum	colour: Green
158	10-Nov-14	38-39	1622	4	01	38	N	122	18	81	E	AFADs steel drum	colour: Green
159	11-Nov-14	40-41	0520	3	59	69	N	120	41	60	E	AFADs steel drum	colour: Orange / yellow
160	11-Nov-14	40-41	0613	4	00	16	N	120	31	06	E	AFADs steel drum	colour: Orange / yellow
161	11-Nov-14	40-41	0615	4	00	90	N	120	31	01	E	AFADs steel drum	colour: Orange / yellow
162	11-Nov-14	40-41	0615	3	59	06	N	120	29	56	E	AFADs steel drum	colour: Orange / yellow
163*	11-Nov-14	41	0625	4	02	87	N	121	28	05	E	AFADs steel drum	collect the sample *
164	11-Nov-14	41-42	1110	3	58	31	N	120	23	75	E	AFADs steel drum	colour: Orange
165	11-Nov-14	41-42	1130	3	59	94	N	120	19	45	E	AFADs steel drum	colour: Orange / Red
166	11-Nov-14	41-42	1140	3	59	78	N	120	17	41	E	AFADs steel drum	colour: Orange / Red
167	11-Nov-14	41-42	1236	3	59	47	N	120	08	39	E	AFADs steel drum	colour: Yellow /Green
168	11-Nov-14	41-42	1245	3	59	03	N	120	05	09	E	AFADs steel drum	colour: Yellow /Green
169	11-Nov-14	41-42	1248	3	01	24	N	120	05	24	E	AFADs steel drum	colour: Yellow /Green
170	11-Nov-14	41-42	1310	3	59	53	N	120	01	13	E	AFADs steel drum	colour: Yellow /Green
171	11-Nov-14	41-42	1330	3	59	11	N	119	57	95	E	AFADs steel drum	colour: Yellow /Green
172	11-Nov-14	41-42	1410	3	59	04	N	119	50	05	E	AFADs steel drum	colour: Orange
173	11-Nov-14	41-42	1426	3	37	49	N	119	47	13	E	AFADs steel drum	colour: Orange
174	11-Nov-14	41-42	1427	3	01	12	N	119	46	10	E	AFADs steel drum	colour: Orange
175	11-Nov-14	41-42	1431	3	59	12	N	119	46	72	E	AFADs steel drum	colour: Orange
Leave Sandakan for Bitung													
176	18-Nov-14		0545	3	55	22	N	121	25	62	E	AFADs steel drum	distance 0.3 nm/ 200◦ / Yellow
177	18-Nov-14		0546	3	55	05	N	121	25	80	E	AFADs steel drum	distance 0.3 nm/ 080◦/ Yellow
178	18-Nov-14		0550	3	50	68	N	121	26	61	E	AFADs steel drum	distance 1.5 nm/ 180◦/ Yellow
179	18-Nov-14		0551	3	50	61	N	121	26	74	E	AFADs steel drum	distance 1.5 nm/ 175◦/ Yellow
180	18-Nov-14		0552	3	50	39	N	121	27	10	E	AFADs steel drum	distance 1.5 nm/ 090◦/ Yellow
181	18-Nov-14		0555	3	50	16	N	121	27	68	E	AFADs steel drum	distance 1.5 nm/ 010◦/ Yellow
182	18-Nov-14		0559	3	49	94	N	121	28	05	E	AFADs steel drum	distance 2.0 nm/ 160◦/ Yellow
183	18-Nov-14		0609	3	53	09	N	121	25	35	E	AFADs steel drum	distance 2.0 nm/ 130◦/ Yellow
184	18-Nov-14		0622	3	53	27	N	121	29	17	E	AFADs steel drum	
185	18-Nov-14		0624	3	49	62	N	121	28	71	E	AFADs steel drum	
186	18-Nov-14		0635	3	50	86	N	121	32	66	E	AFADs steel drum	
187	18-Nov-14		0636	3	49	93	N	121	31	38	E	AFADs steel drum	
188	18-Nov-14		0641	3	51	47	N	121	31	28	E	AFADs steel drum	colour: white
189	18-Nov-14		0642	3	51	98	N	121	32	26	E	AFADs steel drum	Purse seine fishing boat
190	18-Nov-14		0643	3	49	69	N	121	31	39	E	AFADs steel drum	colour: Orange / white
191	18-Nov-14		0650	3	47	30	N	121	32	59	E	AFADs steel drum	Purse seine fishing boat
192	18-Nov-14		0656	3	50	10	N	121	33	81	E	AFADs steel drum	colour: white / green
193	18-Nov-14		0659	3	50	71	N	121	36	99	E	AFADs steel drum	Purse seine fishing boat

No.	Date	Station	Time	Location								Type of FADs	Remark
				Lat				Long					
194	18-Nov-14		0700	3	49	10	N	121	34	62	E	AFADs steel drum	colour: Red / white
195	18-Nov-14		0707	3	47	60	N	121	35	72	E	AFADs steel drum	colour: Red / white No.38
196	18-Nov-14		0715	3	45	67	N	121	35	97	E	AFADs steel drum	
197	18-Nov-14		0720	3	48	48	N	121	38	32	E	AFADs steel drum	Purse seine fishing boat
198	18-Nov-14		0728	3	46	45	N	121	38	23	E	AFADs steel drum	colour: Red / white
199	18-Nov-14		0740	3	43	93	N	121	42	11	E	AFADs steel drum	Purse seine fishing boat
200	18-Nov-14		0740	3	44	27	N	121	40	30	E	AFADs steel drum	colour: Red / white
201	18-Nov-14		0743	3	43	79	N	121	39	40	E	AFADs steel drum	colour: Red / white
202	18-Nov-14		0750	3	46	03	N	121	42	56	E	AFADs steel drum	colour: Red / white
203	18-Nov-14		0800	3	43	49	N	121	43	22	E	AFADs steel drum	colour: Red / white (NHO 99)
204	18-Nov-14		0812	3	44	04	N	121	46	09	E	AFADs steel drum	colour: Red / white
205	18-Nov-14		0818	3	39	83	N	121	45	35	E	AFADs steel drum	colour: Red / white
206	18-Nov-14		0830	3	41	36	N	121	47	46	E	AFADs steel drum	colour: Red / white
207	18-Nov-14		0835	3	38	16	N	121	49	65	E	AFADs steel drum	Purse seine fishing boat
208	18-Nov-14		0900	3	39	64	N	121	52	30	E	AFADs steel drum	colour: Red / white
209	18-Nov-14		0923	3	35	12	N	121	55	81	E	AFADs steel drum	colour: Red / white
210	18-Nov-14		0930	3	38	94	N	121	55	56	E	AFADs steel drum	colour: Red / white
211	18-Nov-14		0940	3	35	54	N	121	58	88	E	AFADs steel drum	colour: Red / white
212	18-Nov-14		0942	3	38	35	N	121	59	17	E	AFADs steel drum	colour: Red / white / fishing boat
213	18-Nov-14		1005	3	34	81	N	121	01	45	E	AFADs steel drum	colour: Red / white
214	18-Nov-14		1010	3	26	88	N	122	02	41	E	AFADs steel drum	colour: Red / white
215	18-Nov-14		1011	3	31	70	N	122	04	55	E	AFADs steel drum	colour: Red / white
216	18-Nov-14		1020	3	28	44	N	122	05	41	E	AFADs steel drum	colour: Red / white
217	18-Nov-14		1031	3	31	68	N	122	07	25	E	AFADs steel drum	colour: Red / white
218	18-Nov-14		1035	3	28	47	N	122	05	27	E	AFADs steel drum	colour: Red / white
219	18-Nov-14		1047	3	27	81	N	122	08	27	E	AFADs steel drum	colour: Red / white
220	18-Nov-14		1049	3	32	09	N	122	10	46	E	AFADs steel drum	colour: Red / white
221	18-Nov-14		1100	3	29	73	N	122	11	21	E	AFADs steel drum	colour: Red / white
222	18-Nov-14		1105	3	28	00	N	122	13	37	E	AFADs steel drum	colour: Red / white / fishing boat
223	18-Nov-14		1108	3	26	49	N	122	10	77	E	AFADs steel drum	colour: Red / white
224	18-Nov-14		1113	3	25	68	N	122	12	60	E	AFADs steel drum	colour: Red / white
225	18-Nov-14		1116	3	31	69	N	122	13	35	E	AFADs steel drum	colour: Red / white
226	18-Nov-14		1120	3	26	24	N	122	15	17	E	AFADs steel drum	colour: Red / white
227	18-Nov-14		1140	3	27	98	N	122	18	50	E	AFADs steel drum	colour: Red / white / fishing boat
228	18-Nov-14		1147	3	22	65	N	122	16	54	E	AFADs steel drum	colour: Red / white
229	18-Nov-14		1647	2	59	16	N	123	00	91	E	AFADs steel drum	floating hut
230	19-Nov-14		0700	1	41	05	N	125	14	55	E	AFADs/ stylefoam	colour: Yellow / fishing boat
231	19-Nov-14		0747	1	32	85	N	125	18	45	E	AFADs/ stylefoam	colour: Yellow
Leg 3													
232	22-Nov-14	B- 45	1621	2	27	17	N	125	01	06	E	AFADs steel drum	colour: white
233	22-Nov-14	B- 45	1621	2	28	70	N	124	56	94	E	AFADs steel drum	floating hut
234	22-Nov-14	B- 45	1622	2	31	65	N	124	59	66	E	AFADs steel drum	floating hut
235	24-Nov-14	50-51	0621	2	28	45	N	123	19	54	E	AFADs steel drum	floating hut
236	24-Nov-14	50-51	0621	2	27	81	N	123	20	17	E	AFADs steel drum	floating hut
237	24-Nov-14	50-51	0622	2	31	64	N	123	19	35	E	AFADs steel drum	floating hut
238	24-Nov-14	50-51	0820	2	28	62	N	123	01	63	E	AFADs steel drum	floating hut
239*	24-Nov-14	50-51	0820	2	30	23	N	122	59	76	E	AFADs steel drum	floating hut *EK-60/fish sampling
240	24-Nov-14	51-52	1257	2	30	87	N	122	51	61	E	AFADs steel drum	colour: Blue
241	24-Nov-14	51-52	1310	2	30	51	N	122	49	54	E	AFADs /Bamboo	
242	24-Nov-14	51-52	1315	2	29	46	N	122	48	47	E	AFADs steel drum	colour: white

No.	Date	Station	Time	Location								Type of FADs	Remark
				Lat				Long					
243	24-Nov-14	51-52	1335	2	28	77	N	122	44	53	E	AFADs steel drum	colour: white
244	24-Nov-14	51-52	1338	2	27	99	N	122	42	64	E	AFADs steel drum	colour: Red / white
245	24-Nov-14	51-52	1350	2	32	73	N	122	41	38	E	AFADs steel drum	colour: blue/white / fishing boat
246	24-Nov-14	51-52	1420	2	28	22	N	122	37	39	E	AFADs steel drum	colour: blue
247	24-Nov-14	51-52	1735	2	30	05	N	122	06	36	E	AFADs steel drum	colour: blue
248	26-Nov-14	56-57	0705	1	28	80	N	119	57	89	E	AFADs steel drum	colour: blue
249	26-Nov-14	56-57	0715	1	31	87	N	120	00	67	E	AFADs steel drum	colour: blue
250	26-Nov-14	56-57	0802	1	27	43	N	120	07	08	E	AFADs steel drum	floating hut
251	26-Nov-14	56-57	0810	1	29	95	N	120	10	68	E	AFADs steel drum	fishing boat
252	26-Nov-14	57-58	1155	1	31	06	N	120	33	76	E	AFADs /stylefoam	colour: white / fishing boat
253*	26-Nov-14	57-58	1205	1	31	43	N	120	34	74	E	AFADs /stylefoam	colour: yellow / fishing boat*
													EK-60 / fish sampling
254	26-Nov-14	57-58	1518	1	28	02	N	120	42	17	E	AFADs /Bamboo	
255	26-Nov-14	57-58	1525	1	31	81	N	120	43	24	E	AFADs /Bamboo	
256	26-Nov-14	57-58	1535	1	30	30	N	120	45	75	E	AFADs /Bamboo	with stylefoam
257	26-Nov-14	57-58	1555	1	32	23	N	120	50	13	E	AFADs /Bamboo	with stylefoam
258	27-Nov-14	59-60	0545	1	29	68	N	122	41	98	E	AFADs steel drum	colour: blue/white
259	27-Nov-14	59-60	0630	1	29	31	N	122	50	17	E	AFADs steel drum	colour: red
260	27-Nov-14	59-60	0633	1	31	03	N	122	52	63	E	AFADs steel drum	Ring net fishing boat
261	27-Nov-14	59-60	0710	1	30	16	N	122	57	19	E	AFADs steel drum	colour: Red
262	27-Nov-14	59-60	0743	1	28	42	N	123	02	47	E	AFADs steel drum	
263	27-Nov-14	59-60	0753	1	27	28	N	123	04	67	E	AFADs steel drum	
264	27-Nov-14	59-60	0830	1	27	45	N	123	11	81	E	AFADs steel drum	
265	27-Nov-14	59-60	0835	1	31	77	N	123	10	92	E	AFADs steel drum	
266	27-Nov-14	59-60	0840	1	30	96	N	123	12	26	E	AFADs steel drum	
267	27-Nov-14	59-60	0840	1	30	54	N	123	13	94	E	AFADs steel drum	
268	27-Nov-14	59-60	0900	1	27	82	N	123	14	96	E	AFADs steel drum	
269	27-Nov-14	59-60	0931	1	31	32	N	123	30	64	E	AFADs steel drum	
270	27-Nov-14	59-60	0931	1	28	00	N	123	22	36	E	AFADs steel drum	
271	27-Nov-14	59-60	1010	1	30	36	N	123	29	68	E	AFADs steel drum	colour: Yellow
272	27-Nov-14	59-60	1010	1	31	22	N	123	29	37	E	AFADs steel drum	colour: Blue/white
273	27-Nov-14	59-60	1015	1	29	07	N	123	29	49	E	AFADs steel drum	colour: Yellow
274	27-Nov-14	59-60	1343	1	30	31	N	123	29	70	E	AFADs steel drum	colour: Orenge
275	27-Nov-14	59-60	1343	1	31	17	N	123	29	29	E	AFADs steel drum	colour: Orenge
276	27-Nov-14	60-61	1415	1	29	94	N	123	35	39	E	AFADs steel drum	colour: Red/white
277	27-Nov-14	60-61	1433	1	31	85	N	123	40	14	E	AFADs steel drum	colour: Red
278	27-Nov-14	60-61	1445	1	29	43	N	123	42	75	E	AFADs steel drum	with small house
279	27-Nov-14	60-61	1506	1	29	56	N	123	47	73	E	AFADs steel drum	colour: white / small house
280	27-Nov-14	60-61	1638	1	30	54	N	124	03	01	E	AFADs steel drum	
281	27-Nov-14	60-61	1638	1	31	52	N	124	01	73	E	AFADs steel drum	colour: Red
282	27-Nov-14	60-61	1645	1	27	14	N	124	02	97	E	AFADs steel drum	
283	27-Nov-14	60-61	1652	1	31	18	N	124	05	95	E	AFADs steel drum	
284	27-Nov-14	60-61	1656	1	29	60	N	124	07	51	E	AFADs steel drum	
285	27-Nov-14	60-61	1700	1	31	5	N	124	05	44	E	AFADs steel drum	
286	27-Nov-14	60-61	1715	1	27	67	N	124	10	74	E	AFADs steel drum	
287	27-Nov-14	60-61	1716	1	28	74	N	124	10	92	E	AFADs steel drum	

Appendix 8.

Table 12. FQ80 Log book

LEG 1														
ID	1275	From	Puerto Princesa Port											
Date	25-Oct-14	Lat	9	48	0	N	Long	119	0	0	E	Course	65	degree
Strat Time	10:50	To	St.1									Speed	10.7	knt
Finish Time	17:25	Lat	10	15	0	N	Long	119	0	0	E	Sea State	slide	
ID	1276	From	St.1											
Date	25-Oct-14	Lat	10	15	28	N	Long	120	0	11	E	Course	90	degree
Strat Time	20:10	To	St.2									Speed	10	knt
Finish Time	0:30	Lat	10	15	47	N	Long	120	44	99	E	Sea State	slide	
ID	1277	From	St.2											
Date	26-Oct-14	Lat	10	15	42	N	Long	120	45	15	E	Course	90	degree
Strat Time	3:00	To	St.3									Speed	10.4	knt
Finish Time	7:15	Lat	10	15	47	N	Long	121	29	90	E	Sea State	slide	
ID	1278	From	St.3											
Date	26-Oct-14	Lat	10	15	41	N	Long	121	30	0	E	Course	117	degree
Strat Time	9:45	To	St.4									Speed	10	knt
Finish Time	12:55	Lat	9	59	98	N	Long	122	0	0	E	Sea State	slide	
ID	1279	From	St.4											
Date	26-Oct-14	Lat	9	59	60	N	Long	121	59	85	E	Course	162	degree
Strat Time	15:00	To	St.5									Speed	11	knt
Finish Time	19:00	Lat	9	16	38	N	Long	122	14	54	E	Sea State	slide	
ID	1280	From	St.5											
Date	26-Oct-14	Lat	9	14	31	N	Long	122	15	32	E	Course	140	degree
Strat Time	21:15	To	St.i1									Speed	11	knt
Finish Time	0:45	Lat	8	44	38	N	Long	122	40	2	E	Sea State	slide	
ID	1281	From	St.i1											
Date	27-Oct-14	Lat	8	44	45	N	Long	122	39	12	E	Course	293	degree
Strat Time	3:05	To	St.6									Speed	11	knt
Finish Time	9:50	Lat	9	14	92	N	Long	121	30	20	E	Sea State	slide	
ID	1282	From	St.6											
Date	27-Oct-14	Lat	9	14	90	N	Long	121	29	95	E	Course	270	degree
Strat Time	12:00	To	St.7									Speed	11	knt
Finish Time	16:45	Lat	9	15	5	N	Long	120	35	23	E	Sea State	slide	
ID	1283	From	St.7											
Date	27-Oct-14	Lat	9	15	17	N	Long	120	33	44	E	Course	270	degree
Strat Time	18:55	To	St.8									Speed	11	knt
Finish Time	22:40	Lat	9	15	4	N	Long	119	50	16	E	Sea State	slide	
ID	1284	From	St.8											
Date	28-Oct-14	Lat	9	15	1	N	Long	119	49	84	E	Course	270	degree
Strat Time	1:00	To	St.9									Speed	11	knt
Finish Time	5:05	Lat	9	14	98	N	Long	119	0	22	E	Sea State	slide	
ID	1285	From	St.9											
Date	28-Oct-14	Lat	9	12	87	N	Long	118	57	89	E	Course	224.5	degree
Strat Time	7:25	To	St.10									Speed	12	knt
Finish Time	10:30	Lat	8	45	0	N	Long	118	30	2	E	Sea State	slide	
ID	1286	From	St.10											
Date	28-Oct-14	Lat	8	14	90	N	Long	118	30	21	E	Course	127	degree
Strat Time	13:00	To	St.11									Speed	11	knt
Finish Time	16:45	Lat	8	14	23	N	Long	118	59	90	E	Sea State	slide	

ID	1287	From	St.11											
Date	28-Oct-14	Lat	8	44	52	N	Long	119	0	16	E	Course	90	degree
Strat Time	19:30	To	St.12									Speed	10.5	knt
Finish Time	1:10	Lat	8	15	11	N	Long	120	0	3	E	Sea State	slide	
ID	1288	From	St.12											
Date	29-Oct-14	Lat	8	14	99	N	Long	120	0	4	E	Course	90	degree
Strat Time	13:10	To	St.13									Speed	11	knt
Finish Time	17:05	Lat	8	15	23	N	Long	120	44	93	E	Sea State	slide	
ID	1289	From	St.13											
Date	29-Oct-14	Lat	8	14	98	N	Long	120	45	87	E	Course	90	degree
Strat Time	19:30	To	St.14									Speed	10.5	knt
Finish Time	23:25	Lat	8	14	95	N	Long	121	19	95	E	Sea State	slide	
ID	1290	From	St.14											
Date	30-Oct-14	Lat	8	14	95	N	Long	121	30	14	E	Course	90	degree
Strat Time	2:20	To	St.i2									Speed	11	knt
Finish Time	6:05	Lat	8	15	0	N	Long	122	9	82	E	Sea State	slide	
ID	1292	From	St.i2											
Date	30-Oct-14	Lat	8	13	38	N	Long	122	8	70	E	Course	270	degree
Strat Time	8:30	To	St.15									Speed	11	knt
Finish Time	11:45	Lat	7	45	0	N	Long	121	44	94	E	Sea State	moderate	
ID	1293	From	St.15											
Date	30-Oct-14	Lat	7	43	3	N	Long	121	43	62	E	Course	213	degree
Strat Time	14:00	To	St.16									Speed	12	knt
Finish Time	16:00	Lat	7	22	64	N	Long	121	30	15	E	Sea State	slide	
ID	1294	From	St.16											
Date	30-Oct-14	Lat	7	22	34	N	Long	121	28	89	E	Course	258	degree
Strat Time	18:17	To	St.17									Speed	11	knt
Finish Time	20:50	Lat	7	17	52	N	Long	121	0	13	E	Sea State	slide	
ID	1295	From	St.17											
Date	30-Oct-14	Lat	7	17	42	N	Long	120	58	56	E	Course	268	degree
Strat Time	23:10	To	St.18									Speed	10	knt
Finish Time	3:50	Lat	7	15	18	N	Long	120	4	81	E	Sea State	slide	
ID	1296	From	St.18											
Date	31-Oct-14	Lat	7	15	30	N	Long	120	6	0	E	Course	270	degree
Strat Time	13:00	To	St.19									Speed	11	knt
Finish Time	18:50	Lat	7	14	99	N	Long	119	0	95	E	Sea State	slide	
ID	1297	From	St.19											
Date	31-Oct-14	Lat	7	13	29	N	Long	118	59	93	E	Course	189	degree
Strat Time	20:55	To	St.20									Speed	11	knt
Finish Time	0:20	Lat	6	33	48	N	Long	118	53	17	E	Sea State	slide	
ID	1298	From	St.20											
Date	1-Nov-14	Lat	6	33	30	N	Long	118	53	81	E	Course	106	degree
Strat Time	2:20	To	St.21									Speed	11	knt
Finish Time	5:55	Lat	6	21	72	N	Long	119	33	55	E	Sea State	slide	
ID	1299	From	St.21											
Date	1-Nov-14	Lat	6	21	76	N	Long	119	33	74	E	Course	58	degree
Strat Time	8:05	To	St.22									Speed	11	knt
Finish Time	11:45	Lat	6	43	23	N	Long	120	8	44	E	Sea State	slide	
ID	1300	From	St.22											
Date	1-Nov-14	Lat	6	43	35	N	Long	120	8	96	E	Course	76	degree
Strat Time	13:45	To	St.23									Speed	11	knt
Finish Time	17:30	Lat	6	53	53	N	Long	120	49	74	E	Sea State	slide	

LEG 2														
ID	130101	From	ST24											
Date	5-Nov-14	Lat	6	49	98	N	Long	122	30	18	E	Course	90	degree
Strat Time	12:55	To	ST25									Speed	10.6	knt
Finish Time	15:40	Lat	6	49	99	N	Long	122	59	94	E	Sea State	slide	
ID	1302	From	ST25											
Date	5-Nov-14	Lat	6	49	97	N	Long	122	59	78	E	Course	90	degree
Strat Time	17:45	To	ST26									Speed	10	knt
Finish Time	20:35	Lat	6	49	93	N	Long	123	30	0	E	Sea State	calm	
ID	1303	From	ST26											
Date	5-Nov-14	Lat	6	50	3	N	Long	123	44	94	E	Course	156	degree
Strat Time	22:40	To	ST27									Speed	11.2	knt
Finish Time	2:20	Lat	6	15	11	N	Long	123	44	93	E	Sea State	calm	
ID	1304	From	ST27											
Date	6-Nov-14	Lat	6	15	29	N	Long	123	44	94	E	Course	270	degree
Strat Time	4:25	To	ST28									Speed	10.8	knt
Finish Time	8:20	Lat	6	14	98	N	Long	123	0	20	E	Sea State	calm	
ID	1305	From	ST28											
Date	6-Nov-14	Lat	6	14	96	N	Long	122	59	94	E	Course	243	degree
Strat Time	10:30	To	ST29									Speed	10.5	knt
Finish Time	16:25	Lat	5	45	33	N	Long	122	0	71	E	Sea State	slide	
ID	1306	From	ST29											
Date	6-Nov-14	Lat	5	44	56	N	Long	122	0	32	E	Course	90	degree
Strat Time	18:30	To	ST30									Speed	11	knt
Finish Time	0:50	Lat	5	44	96	N	Long	122	59	95	E	Sea State	slide	
ID	1307	From	ST30											
Date	7-Nov-14	Lat	5	45	2	N	Long	123	8	60	E	Course	90	degree
Strat Time	11:55	To	ST31									Speed	11	knt
Finish Time	16:43	Lat	5	44	99	N	Long	123	59	80	E	Sea State	calm	
ID	1308	From	ST31											
Date	7-Nov-14	Lat	4	44	95	N	Long	123	59	96	E	Course	103	degree
Strat Time	19:25	To	ST32									Speed	11	knt
Finish Time	22:43	Lat	5	36	70	N	Long	124	34	96	E	Sea State	slide	
ID	1309	From	ST32											
Date	8-Nov-14	Lat	5	36	88	N	Long	124	34	47	E	Course	224	degree
Strat Time	0:13	To	ST33									Speed	11	knt
Finish Time	5:45	Lat	5	0	18	N	Long	124	0	16	E	Sea State	slide	
ID	1310	From	ST33											
Date	8-Nov-14	Lat	5	0	8	N	Long	123	59	40	E	Course	270	degree
Strat Time	8:15	To	ST34									Speed	12	knt
Finish Time	13:37	Lat	5	0	7	N	Long	123	0	5	E	Sea State	slide	
ID	1311	From	ST34											
Date	8-Nov-14	Lat	5	0	34	N	Long	122	59	95	E	Course	270	degree
Strat Time	16:50	To	ST35									Speed	11.7	knt
Finish Time	21:57	Lat	4	59	58	N	Long	122	0	20	E	Sea State	slide	
ID	1312	From	ST35											
Date	9-Nov-14	Lat	5	0	29	N	Long	121	59	20	E	Course	311	degree
Strat Time	0:05	To	ST36									Speed	11	knt
Finish Time	3:21	Lat	4	24	5	N	Long	121	32	57	E	Sea State	slide	
ID	1313	From	ST36											
Date	9-Nov-14	Lat	5	23	20	N	Long	121	31	14	E	Course	233	degree
Strat Time	5:30	To	ST37									Speed	10.6	knt
Finish Time	9:40	Lat	5	0	7	N	Long	121	0	7	E	Sea State	calm	

ID	1314-1317	From	ST37												
Date	9-Nov-14	Lat	5	0	7	N	Long	120	59	82	E	Course	115	degree
Strat Time	11:30	To	ST38									Speed	10.6	knt
Finish Time	1:37	Lat	3	59	64	N	Long	123	4	92	E	Sea State	calm	
ID	1318	From	ST38											
Date	10-Nov-14	Lat	4	0	2	N	Long	123	3	67	E	Course	270	degree
Strat Time	12:37	To	ST39									Speed	11.4	knt
Finish Time	16:45	Lat	4	0	0	N	Long	122	15	29	E	Sea State	calm	
ID	1319	From	ST39											
Date	10-Nov-14	Lat	3	59	81	N	Long	122	13	14	E	Course	270	degree
Strat Time	18:50	To	ST40									Speed	11	knt
Finish Time	22:40	Lat	3	59	99	N	Long	121	30	13	E	Sea State	slide	
ID	1320	From	ST40											
Date	11-Nov-14	Lat	3	59	83	N	Long	121	29	99	E	Course	270	degree
Strat Time	0:57	To	ST41									Speed	10.5	knt
Finish Time	6:25	Lat	4	0	13	N	Long	120	29	1	E	Sea State	slide	
ID	1321	From	ST41											
Date	11-Nov-14	Lat	3	59	95	N	Long	120	29	29	E	Course	270	degree
Strat Time	10:45	To	ST42									Speed	10.4	knt
Finish Time	15:13	Lat	3	59	96	N	Long	119	40	14	E	Sea State	calm	
ID	1322	From	ST42											
Date	11-Nov-14	Lat	3	59	93	N	Long	119	38	86	E	Course	270	degree
Strat Time	17:17	To	ST43									Speed	11.8	knt
Finish Time	22:45	Lat	3	59	88	N	Long	118	36	79	E	Sea State	calm	
ID	1323	From	ST43											
Date	12-Nov-14	Lat	4	0	4	N	Long	118	37	90	E	Course	73, 61	degree
Strat Time	0:55	To	ST44									Speed	11.8	knt
Finish Time	4:04	Lat	4	14	96	N	Long	119	11	92	E	Sea State	calm	

LEG 3

ID	1326	From	ST45											
Date	22-Nov-14	Lat	2	31	67	N	Long	124	59	68	E	Course	0	degree
Strat Time	18:50	To	ST46									Speed	11.6	knt
Finish Time	0:05	Lat	3	29	89	N	Long	125	0	0	E	Sea State	calm	
ID	1327	From	ST46											
Date	23-Nov-14	Lat	3	29	98	N	Long	124	59	93	E	Course	0	degree
Strat Time	2:07	To	ST47									Speed	11.3	knt
Finish Time	7:45	Lat	4	29	95	N	Long	124	59	95	E	Sea State	calm	
ID	1328	From	ST47											
Date	23-Nov-14	Lat	4	26	77	N	Long	124	56	65	E	Course	225	degree
Strat Time	9:50	To	ST48									Speed	12.6	knt
Finish Time	16:50	Lat	3	30	12	N	Long	124	0	14	E	Sea State	calm	
ID	1329	From	ST48											
Date	23-Nov-14	Lat	3	29	85	N	Long	124	0	35	E	Course	180	degree
Strat Time	18:45	To	ST50									Speed	10.3	knt
Finish Time	0:20	Lat	2	29	93	N	Long	123	59	97	E	Sea State	calm	
ID	1330	From	ST50											
Date	24-Nov-14	Lat	2	30	12	N	Long	124	0	31	E	Course	243	degree
Strat Time	2:29	To	ST51									Speed	10.5	knt
Finish Time	8:35	Lat	2	29	99	N	Long	123	0	23	E	Sea State	slide	
ID	1331	From	ST51											
Date	24-Nov-14	Lat	2	29	98	N	Long	123	0	14	E	Course	270	degree
Strat Time	12:10	To	ST52									Speed	10	knt
Finish Time	18:15	Lat	2	29	99	N	Long	122	0	9	E	Sea State	slide	

ID	1332	From	ST52											
Date	24-Nov-14	Lat	2	32	48	N	Long	122	1	87	E	Course	270	degree
Strat Time	20:41	To	ST53									Speed	9.3	knt
Finish Time	3:06	Lat	2	30	1	N	Long	121	0	1	E	Sea State	slide	
ID	1333	From	ST53											
Date	25-Nov-14	Lat	2	30	6	N	Long	121	0	10	E	Course	270	degree
Strat Time	5:40	To	ST54									Speed	9.8	knt
Finish Time	11:30	Lat	2	30	3	N	Long	120	0	3	E	Sea State	calm	
ID	1334	From	ST54											
Date	25-Nov-14	Lat	2	30	2	N	Long	120	0	5	E	Course	270	degree
Strat Time	13:37	To	ST55									Speed	10.6	knt
Finish Time	19:25	Lat	2	29	94	N	Long	119	0	41	E	Sea State	calm	
ID	1335	From	ST55											
Date	25-Nov-14	Lat	2	26	22	N	Long	119	1	64	E	Course	153	degree
Strat Time	21:50	To	ST56									Speed	13	knt
Finish Time	2:45	Lat	1	29	98	N	Long	120	30	0	E	Sea State	calm	
ID	1336	From	ST56											
Date	26-Nov-14	Lat	1	29	93	N	Long	119	33	58	E	Course	90	degree
Strat Time	5:20	To	ST57									Speed	11.7	knt
Finish Time	9:47	Lat	1	29	99	N	Long	120	30	0	E	Sea State	calm	
ID	1338, 1340	From	ST57											
Date	26-Nov-14	Lat	1	32	8	N	Long	120	35	54	E	Course	90	degree
Strat Time	14:37	To	ST58									Speed	12.9	knt
Finish Time	19:05	Lat	1	29	99	N	Long	121	29	99	E	Sea State	slide	
ID	1341	From	ST58											
Date	26-Nov-14	Lat	1	29	96	N	Long	121	31	27	E	Course	90	degree
Strat Time	21:19	To	ST59									Speed	10.3	knt
Finish Time	2:37	Lat	1	29	94	N	Long	122	29	94	E	Sea State	slide	
ID	1342	From	ST59											
Date	27-Nov-14	Lat	1	30	1	N	Long	122	30	7	E	Course	90	degree
Strat Time	4:50	To	ST60									Speed	11.3	knt
Finish Time	10:25	Lat	1	29	95	N	Long	123	30	1	E	Sea State	calm	
ID	1343	From	ST60											
Date	27-Nov-14	Lat	1	29	70	N	Long	123	29	91	E	Course	90	degree
Strat Time	13:50	To	ST61									Speed	10.5	knt
Finish Time	19:17	Lat	1	29	96	N	Long	124	29	88	E	Sea State	calm	