

# Survey Cruise Report



**Cruise no:** M/V SEAFDEC2 No.29-2/2008

**Period:** 4 June – 5 July 2008 (31 days)

**Area:** Waters of Brunei Darussalam

**Port of call:** Muara port, Brunei Darussalam

**Objective:** **Main Activity for Research Survey are as follows:**

1. Oceanography: ICTD, IKMT, Bongo net, Neuston net, Thermosalinograph with Fluorometer (TSG-Fluorometer), Current indicator and others weather information.
2. Demersal fish resources in zone 3 will be collected using the bottom beam trawl and bottom otter board trawl.
3. Acoustic survey by FQ 80
4. Whale observation during cruising.

**Numbers of fishing gears are as follows:**

1. Trawl : 36 stations
2. Acoustic survey : 20 stations
3. Oceanographic survey : 56 stations

**List of personals on board:****Ship personals**

No.	Name	Position
1	Mr. Tossaporn Sukhapindha	Captain
2	Mr. Veerachai Chettasumon	Chief engineer
3	Mr. Suren Pruksarat	Second officer
4	Mr. Somphote Vudthipanyo	Third officer
5	Mr. Komson Sangphuek	Second engineer
6	Mr. Nuttapon Chaitanavisut	Third Engineer
7	Mr. Aussawin Buachuay	Fishing Assistant
8	Mr. Vudthirat Vudthipanyo	Boatswain
9	Mr. Pradit Kui-prasert	Steerman
10	Mr. Tana Rungjoy	"
11	Mr. Jaroon Po-U	"
12	Mr. Plew Shodok	Oiler
13	Mr. Boontarin Wara-in	"
14	Mr. Watchara Panasri	"
15	Mr. Saichol Kornnoom	Cook
16	Mr. Somsak Phangkumhuk	Ship's boy

**Researchers from SEAFDEC/TD**

No.	Name	Responsibility	Contact address	Period of duty
1	Mr. Sayan Promjinda <sup>1</sup>	Chief scientist	sayan@seafdec.org	4 June–1 July
2	Mr. Narong Ruangsivakul <sup>1</sup>	Fishing gear Technologist	narong@seafdec.org	8 June-1 July
3	Mr. Nakaret Yasook <sup>1</sup>	Fishing gear Technologist	nakaret@seafdec.org	8 June-5 July
4	Mr. Phochan Manomayitthikan <sup>1</sup>	Researcher	phochan@seafdec.org	8 June-1 July
5	Mr. Ritthirong Prommas <sup>1</sup>	Fisheries Oceanographer	ritthirong@seafdec.org	8 June-1 July

### Research from Brunei Darussalam

No.	Name	Activity	Position and contacted	Period of duty
1	PP MATZAINI HAJI JUNA	Hydroacoustic survey/searching	Fisheries officer	9 – 13, 15-19 and 21-28 June
2	SS ELVIRO CINCO	Hydroacoustic survey/searching	Expert on gear technology	9 – 13 ,21-28 June
3	SFA HAJI AJI	Oceanography survey	Senior fisheries assistant	9 – 13, 15-19 and 21-28 June
4	N NORAZMI	Oceanography survey	Fisherman	9 – 13 ,21-28 June
5	JFA HAJI RAMLEE	Plankton survey	Junior fisheries assistant	9 – 13 , 15-19 June
6	PTK AHMAD PUTIH	Plankton survey	Fisherman	9 – 13 ,21-28 June
7	N HATRAL KAMAL	Plankton survey	Fisherman	9 – 13, 15-19 and 21-28 June
8	HP ABD HAMID HAJI ZAININ	Fishing trail using otter board trawl net	Head of Fisherman	9 – 13 , 15-19 June
9	N TALIP HJ OMAR	Fishing trail using otter board trawl net	Fisherman	9 – 13, 15-19 and 21-28 June
10	KAPTAN MOHAMMAD	Deck operation	Captain	9 – 13 June
11	S HARUN	Deck operation	Vessel officer	9 – 13, 15-19 and 21-28 June
12	HAJI EMRAN HAJI OSMAN (MAS)	Deck operation	Licensing officer	9 – 13 June
13	SS SYAH	Hydroacoustic survey/searching	Expert on coral	15-19 June
14	SFA MATSALLEH	Oceanography survey	Senior fisheries assistant	15-19, 21-28 June
15	HP ABD HAMID HAJI ZAININ	Fishing trial using beam trawl net	Head of Fisherman	15-19 June
16	VSO BIDIN SURU	Deck operation	Vessel senior officer	15-19, 21-28 June
17	JTT1 ROSLAN HAJI LAMIT	Engine room operation	Engineer	15-19, 21-28 June

No.	Name	Activity	Position and contacted	Period of duty
18	MOHD NAZRIN MD IDRIS (MAS)	Engine room operation	Licensing officer	15-19 June
19	ADI SHAH ABD HAMID (MAS)	Engine room operation	Licensing officer	21 – 28 June

## I. Area of Survey

The survey was conducted within the EEZ of Brunei. Numbers of planned survey station are 38 stations cover with continental slope (Zone 3) and deep sea (Zone 4) as follow:

1) Continental slope in Zone 3. Sea depth is from 100 to 550 m. There were 18 survey stations (A1-A18) oceanographic survey, 18 bottom trawl operation for demersal resources survey on the first session and 18 bottom beam trawl operations on the second session are planned to conduct. Period of the first session is from 9 to 13 June 2008 and in the second session on 15-19 June 2008.

2) In the deep sea zone (Zone 4), 20 survey stations are planned to conduct the oceanographic and Hydro acoustic survey, IKMT were conducted during the third session. Sea depth is different from 800 m to 2,600 m, Period of the third session is carried out from 21 to 28 June 2009.

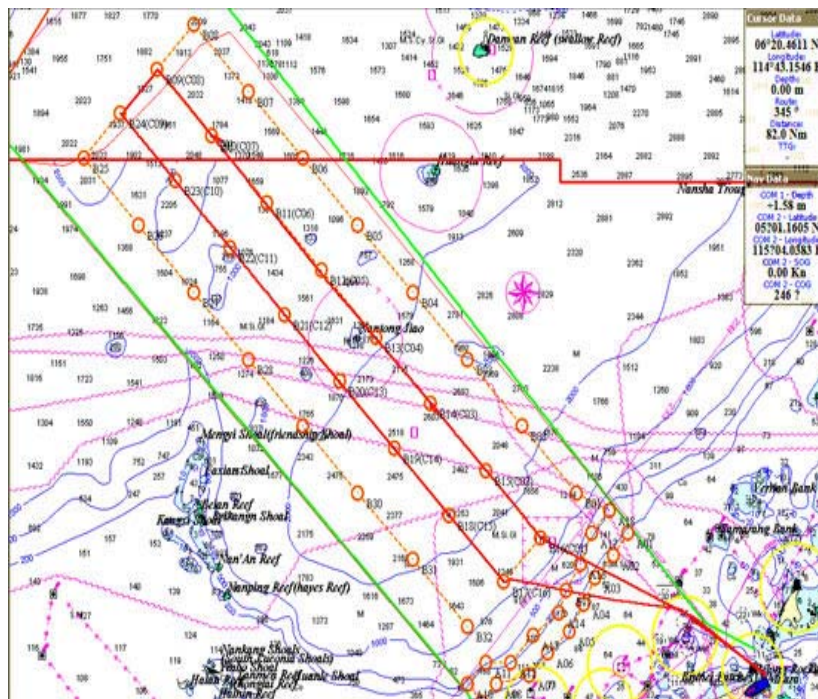


Figure 1. Survey station in zone 3 and zone 4.

## II. Survey summary

The mission of Cruise No.29-2/2008, The National Research Survey in the EEZ of Brunei, has been accomplished with 37 survey stations. The stations are divided into 28 Oceanographic surveys, 9 operations for fishing survey by bottom trawl and 11 operations for beam trawl operations. The topographic survey was carried out between station A1 to A18 before the fishing operation for observe the sea bottom. Hydro-acoustic survey by FQ80 was conducted in the third session for 19 operations (planned to 20 stations) due to the rough sea condition. The survey has been split into 3 sessions. At the first and second session the oceanographic survey and demersal deep sea resource survey were conducted. Bottom otter board and Beam trawl fishing has been carried out. Acoustic, oceanographic survey and IKMT has been conducted on the third session. Details of activities are appeared into each part of activities, i.e. oceanographic survey and fisheries resources survey. Daily activity of survey is appeared in the table of research activities (Appendix I).

### First session (9 - 13 June 2008)

There are 10 oceanographic survey stations and 9 bottom trawl fishing operations have been conducted on the first session from 9 to 13 June 2008. The oceanographic survey was done in odd number stations and in station no.18.

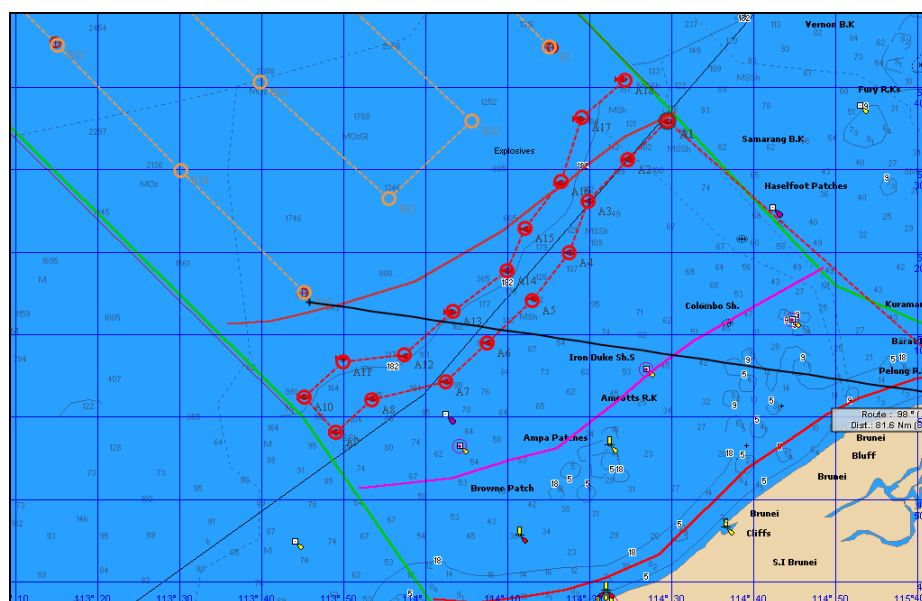


Figure 2. Survey station in zone 3 for session1-2.

## Second session (15 – 18 June 2008)

The second survey is started from 15 to 18 June 2008 in zone 3, which same station in first session. Oceanographic survey was conducted in even number stations, except some stations had been conducted during the first session. There are 8 oceanographic stations and 11 beam trawl operations have been carried out in the second session.

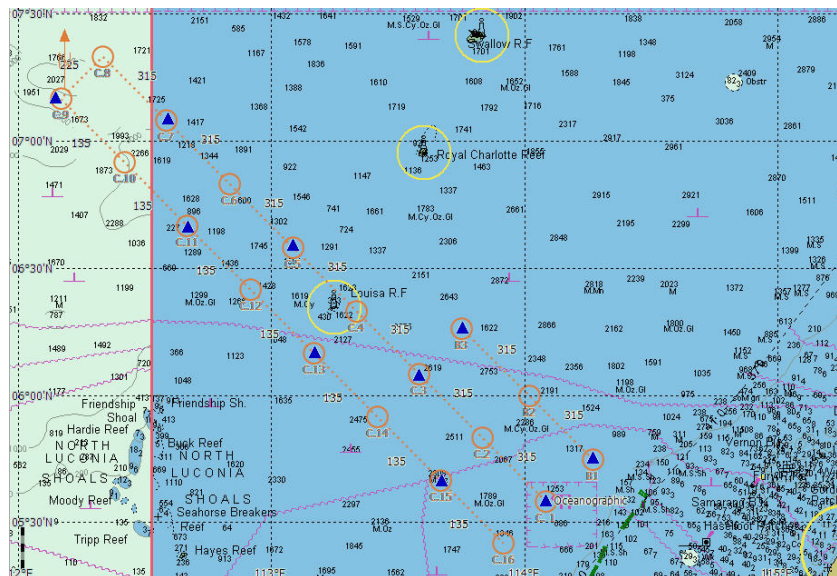


Figure 3. Survey station in zone 4 for session 3.

## Third session (21 – 28 June 2008)

This session is conducted from 21 to 28 June 2008 in the deep sea zone of Brunei water (Zone 4), however, the rough sea condition in the early session was affected to the schedule after 2 stations of oceanographic survey and Hydro-Acoustic survey by FQ-80 from station B1 to B3 were conducted during 21-22 June 2008. After 22 June 2008 the survey was cancelled and M/V SEAFDEC 2 was preceded back to Muara fishing port and rearranged the schedule to continue the survey from 24 to 27 June 2008. There are 8 oceanographic stations and IKMT operations were conducted in the odd number stations. Sixteen stations for Hydro-acoustic survey have been carried out in the third session. Sea depth during the survey ranged from 883 to 2,620 m.

### III. Oceanographic survey

A survey was carried out during 8 and 28 June 2008 on board M/V SEAFDEC 2 with 28 stations were conduct in the Waters of Brunei Darussalam (Fig. 4). Partial details and environmental conditions of each station are in table 1 and 2. The following are materials and method of the oceanographic survey.

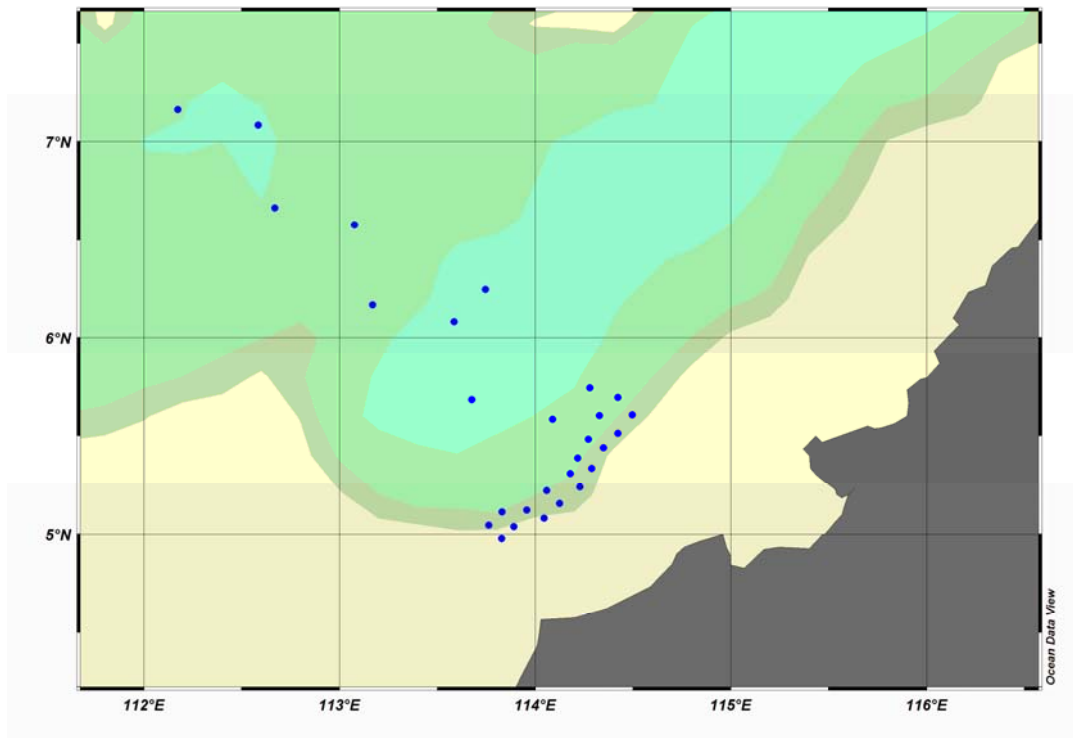


Figure 4. Map of the oceanographic survey stations.

#### 3.1 Physical and chemical character of water

Physical and chemical character of vertical profile including salinity, temperature, depth, dissolved oxygen, pH and PAR/Irradiation were measuring using SeaBird 911 iCTD (Fig. 5 and 6).

M/V SEAFDEC 2, iCTD systems equipped with three main sensors for conductivity, temperature and depth and three auxiliary sensors for Dissolved Oxygen (D.O.), pH and PAR/Irradiation. The iCTD as deployed from sea surface to maximum depth approximately 400 m with velocity 0.5-0.8 m/s and retrieved to surface at a similar speed. All iCTD data were average into every 1 meter interval. Data in station were divided into down cast and up cast.



Figure 5 Operating CTD in laboratory.



Figure 6 Lowering CTD.

During retrieving iCTD, Carousel water sample (Niskin Bottles) which is a part of iCTD system was used for collecting water samples from standard depth (table 3 for several studies).

TSG – Fluorometer were operated along the cruise track of M/V SEAFDEC 2. The system was designed to pump water from approximately 5 meters below the sea surface continuously for measuring salinity, temperature and fluorescence chlorophyll-a (Fig.7). The data were average every 6 second. Partial details of operating summary show in table 1.

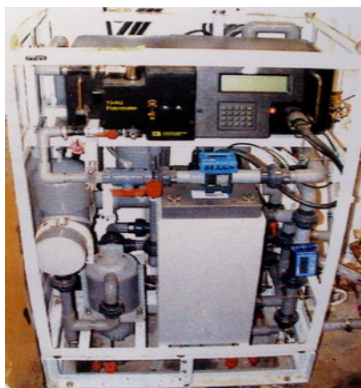


Figure 7. TSG-Fluorometer.

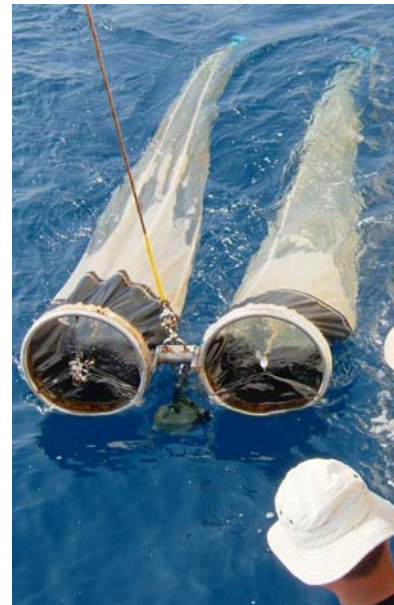


Figure 8 Towing Bongo net.

### 3.2 Nutrient

Sea water samples from Niskin bottles were filtrated through Whatman GF/C (1.2  $\mu\text{m}$ ) filter paper and subsampling to transport tubes. For nitrite plus nitrate and



phosphate samples were stored in the freezer at -40 °C. For silicate samples were stored in dark and room temperature. Samples will be analyzed at SEAFDEC/Training Department chemical laboratory.

### 3.3 Zooplankton and Fish larvae

The 45 cm diameter bongo frames were attached with zooplankton and larval fish net with mesh size of 330  $\mu\text{m}$  and 521  $\mu\text{m}$ , respectively. A flow meter was attached at the aperture of net to measure the water volume passing through the net. Zooplankton net and fish larvae net were attached with TSK flow meters no. 7021 and 7035 respectively.

The TSK flow meters were calibrated before and after the survey period which calibration factor show in table 4 and 5.

Bongo net was oblique tow with ship speed approximately 1-2 knots. Angle of towing cable was maintained at 45°. Towing depth was observed using Net SONDE (depth meter). Partial details of Bongo net operation show in table 3 (Fig.8).

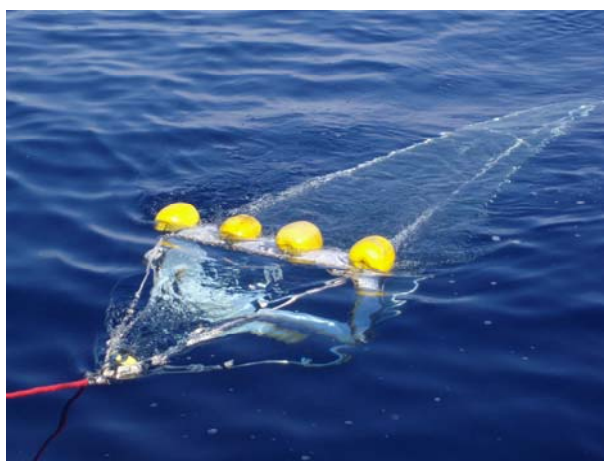


Figure 9. Rectangular-mouthed Neuston net.

### 3.4 Fish Juvenile

The operations on rectangular- mouthed Neuston net (Fig.9) with mesh size of upper part 1,000  $\mu\text{m}$  and lower part 600  $\mu\text{m}$  was conducted for the fish juveniles collection at the surface layer with towing speed between 3-4 knots and approximated towing time of 15 minute.

It is advisory to include a neuston net tow due to the larvae of several species of commercially important pelagic fishes is known to occur in the surface layer. Partial details of Neuston net operation are in table 3. The rectangular-mouthed

Neuston net was attached with Hydro-Bios flow meters, calibration factor show in table 4 and 5.

### 3.5 Preliminary analysis of oceanographic parameters

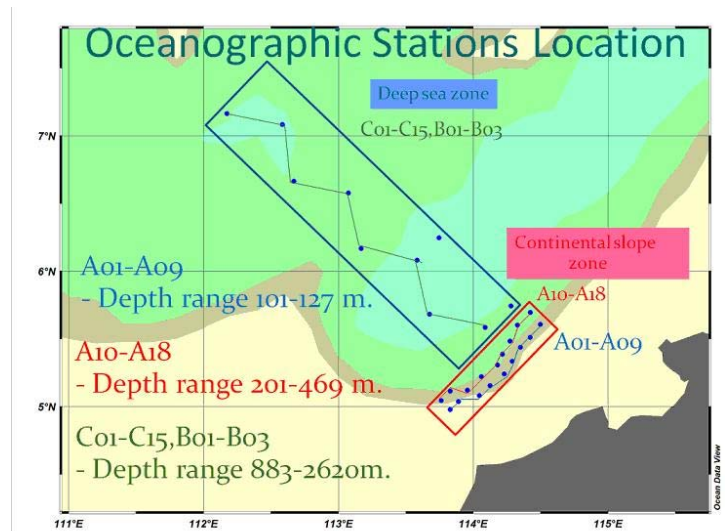
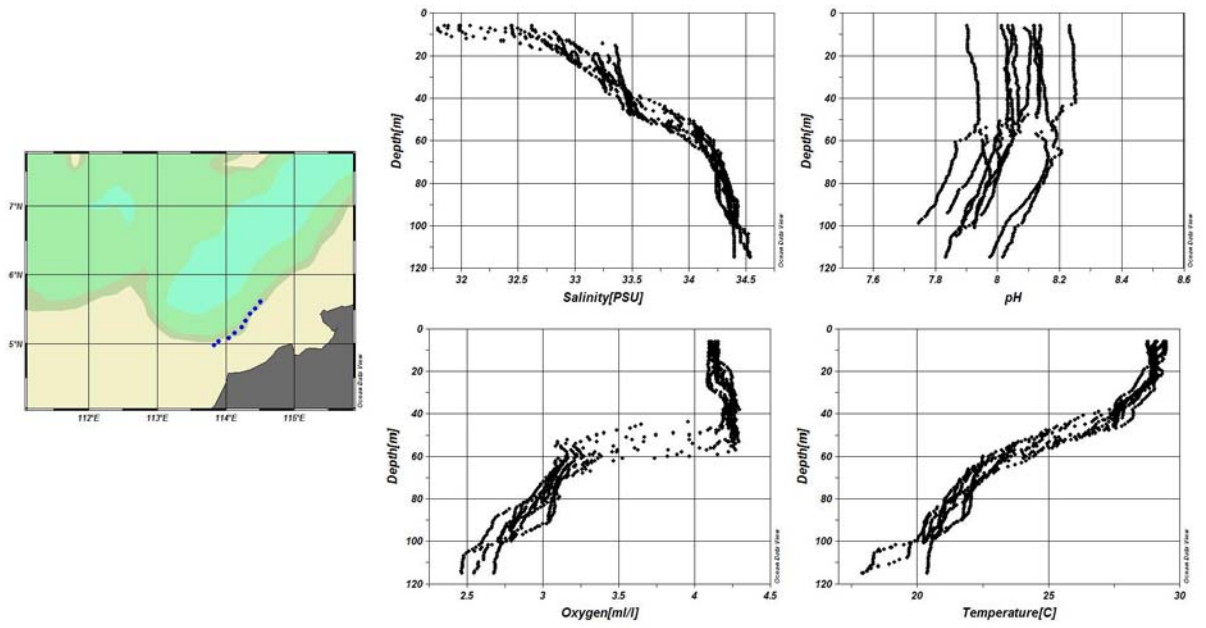
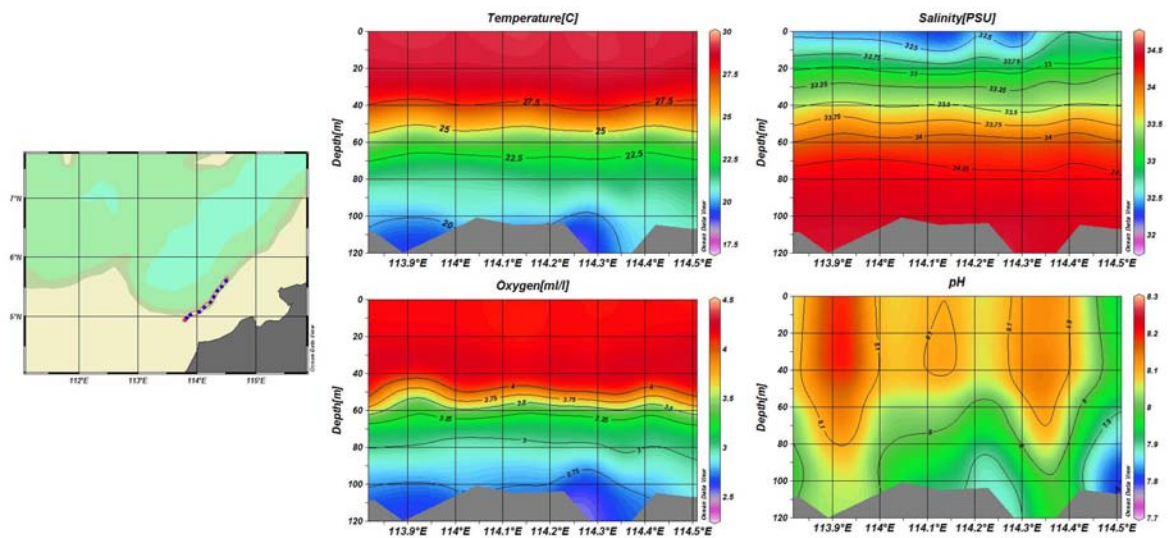


Figure 10. Station map of Continental slope zone and Deep sea zone.

Oceanographic stations were separated to continental slope zone and deep sea zone (Fig.10). The continental slope zone including 18 stations (A01 to A18). The bottom sediment in this zone is normally muddy. Station no. A01 to A09 are shallow area, the sea bottom depths were range between 101-127 m. Station no. Sea depth of survey station number A10 to A18 were range between 201 and 469 m. The deep sea area were conducted 10 oceanographic stations, there are B01, B03, C01, C03, C05, C07, C09, C11, C13 and C15. The bottom depths were range between 883-2,620 m. Oceanographic data from iCTD present in vertical profile, transect profile and horizontal profile (Fig. 11, 12, 13, 14).

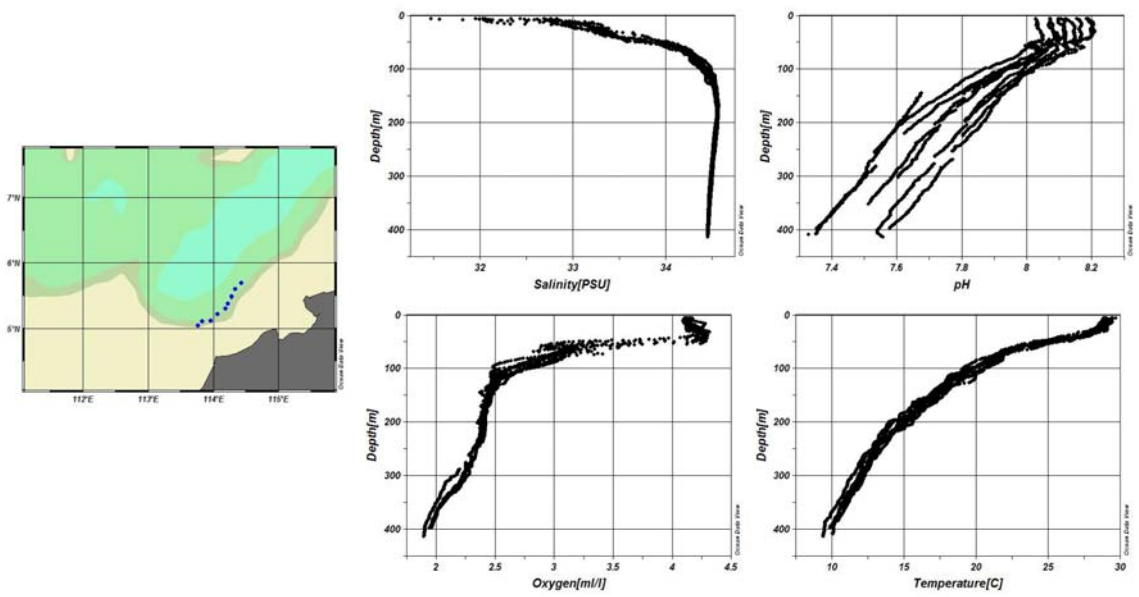


(a)

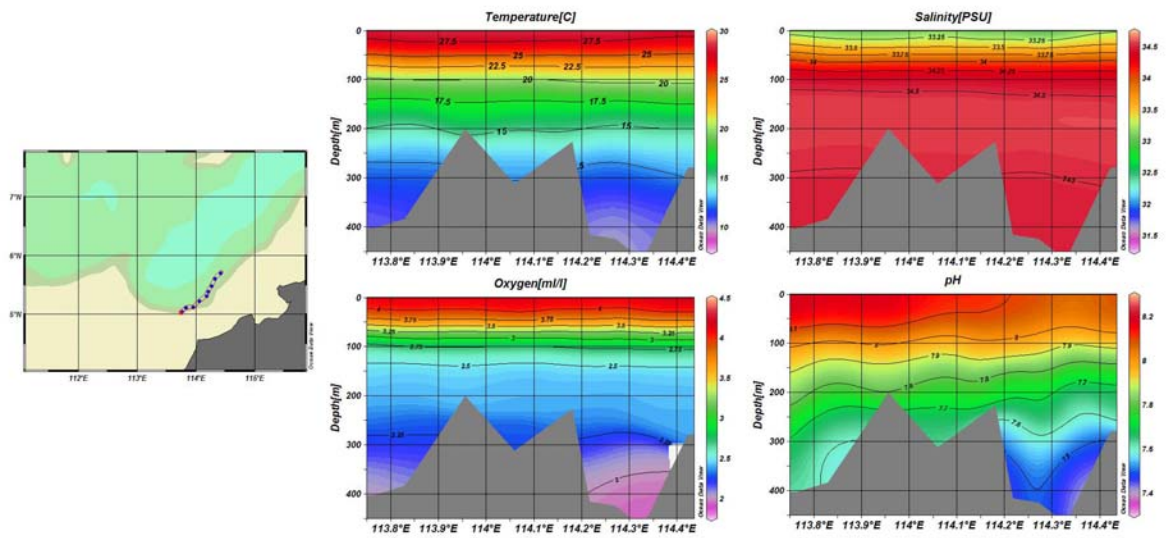


(b)

Figure 11. (a) Vertical profile and (b) and transect profile of temperature ( $^{\circ}$ C), salinity (psu), Oxygen (ml/l) and pH of oceanographic stations A01-A09.

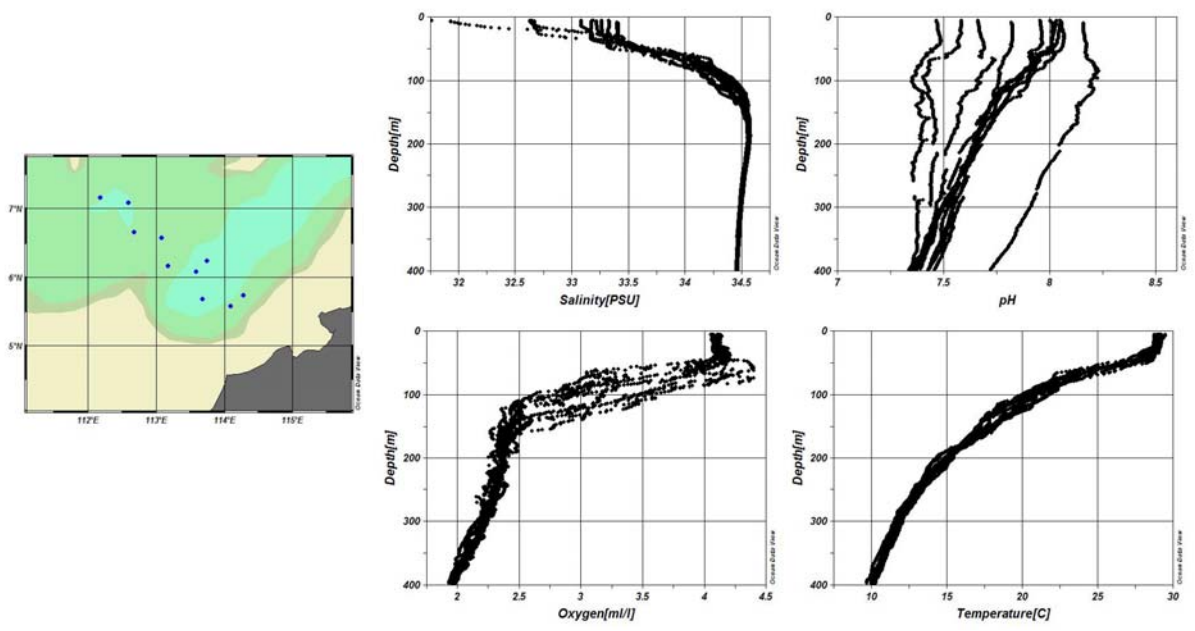


(a)

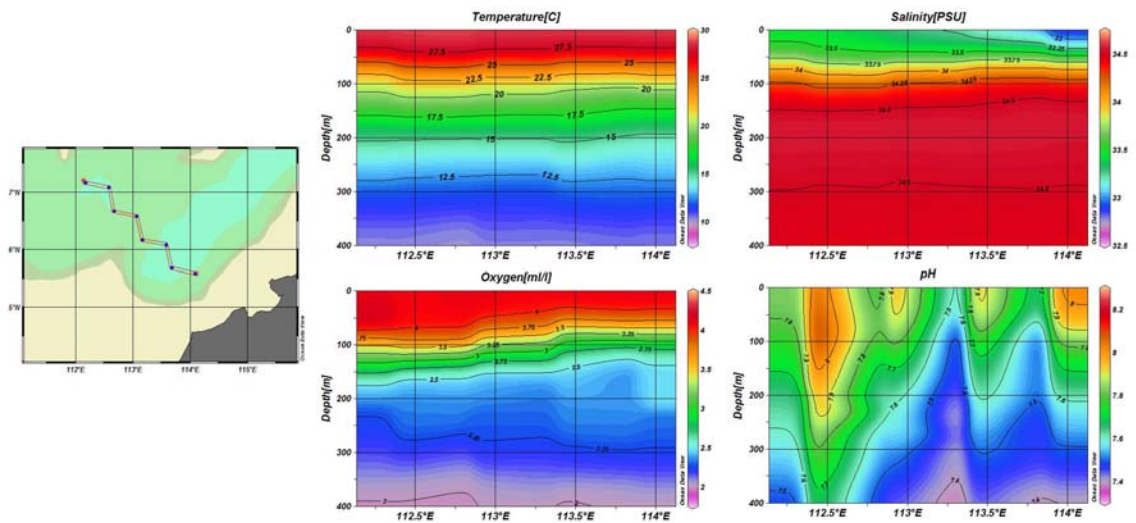


(b)

Figure 12. (a) Vertical profile and (b) and transect profile of temperature ( $^{\circ}\text{C}$ ), salinity (psu), Oxygen (ml/l) and pH of oceanographic stations A10-A18.



(a)



(b)

Figure 13. (a) Vertical profile and (b) and transect profile of temperature ( $^{\circ}\text{C}$ ), salinity (psu), Oxygen (ml/l) and pH of oceanographic stations B01, B03, C01, C03, C05, C07, C09, C11, C13 and C15.

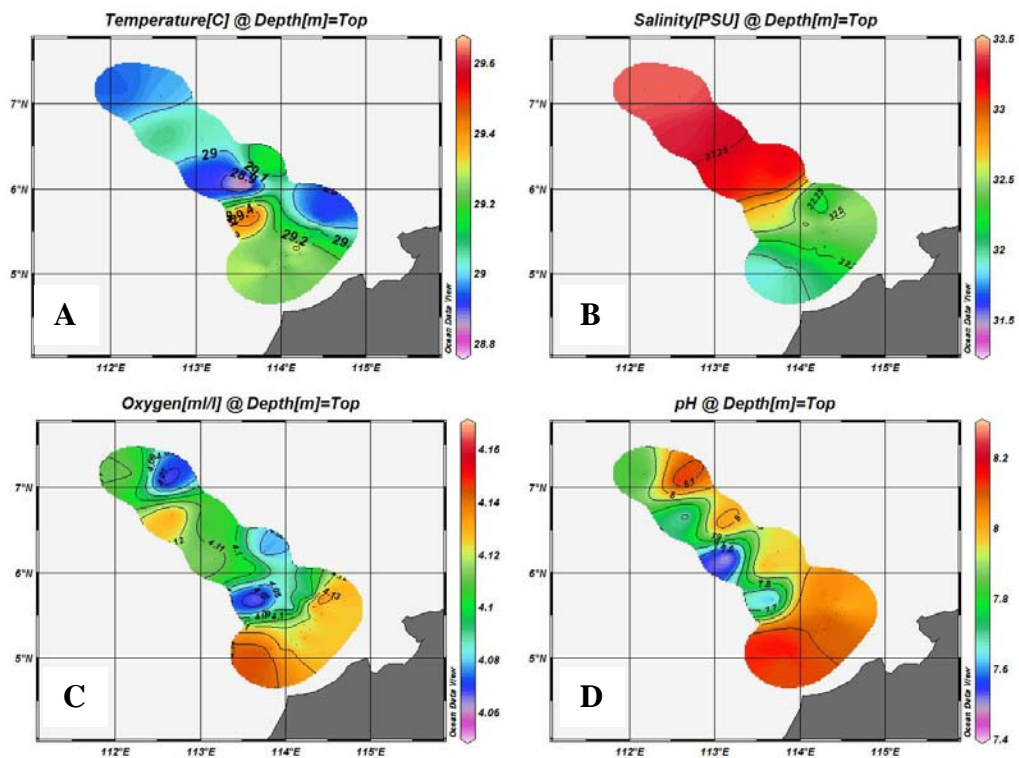


Figure 14. Horizontal profile of A: Temperature ( $^{\circ}\text{C}$ ); B: Salinity (PSU);  
C: Dissolved oxygen (ml/l); D: Surface salinity (psu).

## IV. Fishery resources survey

Two categories of fishing gear, i.e. bottom otter board and beam trawl were operated in the present survey. On the first session, the bottom trawl was used for investigate the resources abundance and species composition of the demersal resources in the continental slope in zone 3 of Brunei Waters at depth from 100 to 160 m. The second session, the bottom beam trawl survey were target on the deep sea shrimp at the same survey stations with the first session.

### 4.1 Bottom trawl survey

Nine bottom trawl fishing operations were carried out during the first session. Two survey stations (A1-A18, and A1-A2) from the total of nine stations had trawled less than 30 minutes due to the trouble of the otter board stuck in the muddy bottom of those stations and the otter board were overlie at station A1-A2. After finish hauling, the ground rope was found broken and took time about one day to repaired and the survey was carried out on the next days.

### 4.1.1 Material and method

The bottom trawl of M/V SEAFDEC 2 is 2 seams trawl. Ground rope is 40.12 m with length and head rope of 32.56 m length. Net body is 66.37 m length. Ground rope is suitable for soft bottom. Cod end part is 40 mm double mesh size made by polyethylene PE 700d/30. Net opening is about 4-10 m height and 10-20 m wing spread. Net is spread by rectangular iron otter board 1,400 mm length and 2,200 mm height. Sweep line is 30 m length with upper and lower net pendant 50 m. Trawling speed is 3.0-3.5 knot with the trawling time of 30 minute per operation.

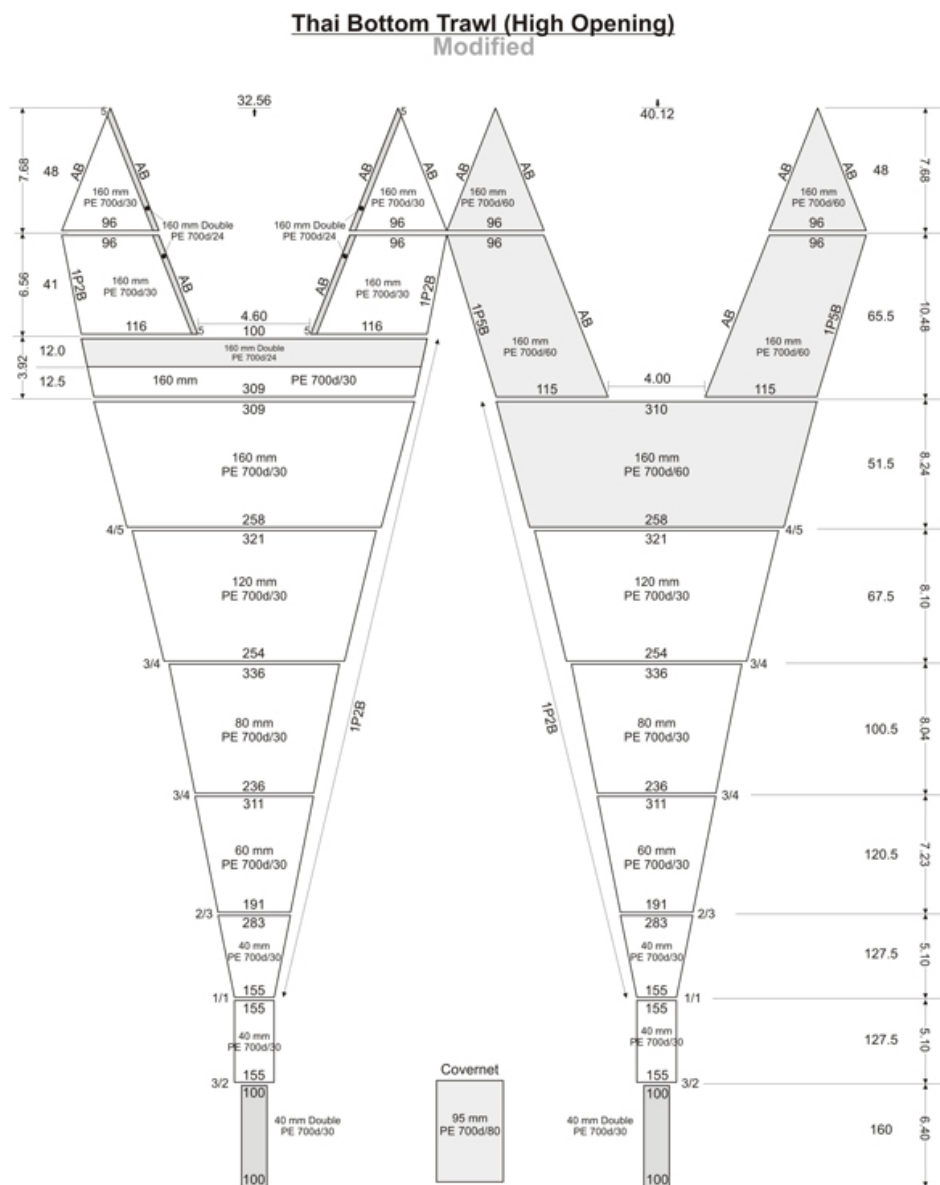


Figure 15. Construction of bottom trawl net.

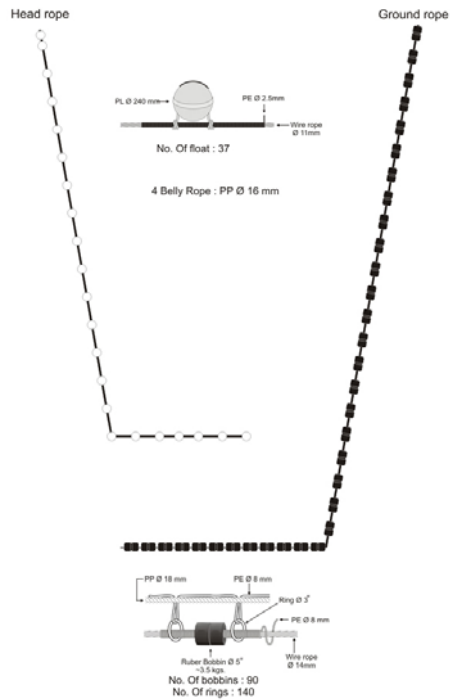


Figure 16. Construction of the head rope and ground rope.

#### 4.1.2 Area of bottom trawl operation

Bottom trawl were carried out in the continental slope of zone 3, Brunei Waters. Sea depth was range from 100 to 160 m. The survey was carried out at the smooth sea bottom stations only (A1, A3, A4, A5, A6, A8 and A9). From station A 10 to A 18 which the sea depth was range between 200-470 m the bottom trawl could not operated due to the limited of warp wire length.



Figure 17. Fishing area of Bottom trawl.



### 4.1.3 Results of the bottom trawl survey

Total catches from 9 trawl fishing operations of about 242 towing minutes was 372.91 kg and CPUE was 106.54 kg/hrs. Highest catches was found at the operation number 7 of station no A8 with the total catches of 85.1 kg and CPUE of 170.2 kg/hrs followed by station A3 of the last operation with the total catches of 81.76 kg and CPUE 163.52 kg/hrs. The details of species composition, size composition and distribution of catches will be report by DOF/Brunei.

Table 1. Bottom trawl fishing data summary

Op. No	Ship speed (kt)	Towing time	Sea depth (m)	Warp length (m)	Net Opening (m)	Wing Spread (m)	Total catch in weight( kg )	CPUE (Kg/hr)
1	2	10	105-115	450	3.8	17.1	-	-
2	3	22	110	400	-	-	-	-
3	3.3	30	111	360	4.1	-	61.77	123.54
4	3.2	30	121	400	4.5	-	38.98	77.96
5	3.2	30	102	350	4.4	15.2-15.6	66.1	132.2
6	3.7	30	109-158	400	4-6	14-15.6	5.48	10.96
7	3.7	30	118-162	550	4	16.1-16.3	85.1	170.2
8	3.7	30	122-124	450	3.4	15.6	33.72	67.44
9	3.7	30	107-109	450	3.4	17.3	81.76	163.52

### 4.2 Beam trawl survey

The beam trawl and net design using in the present survey was modified from the fishing gears in the North and Northeastern of the European Waters. The fishing gear had been developed to suit for M/V SEAFDEC 2 and other research vessels to operate in the deep sea area of the Southeast Asian Region particularly for sampling the deep sea shrimps and demersal fishes.

Head rope and ground ropes are made from Z-twist polyethylene rope with the diameter 14 mm and 12 mm. Length of head rope is 4 m and ground rope is 7.43 m. The square part made from polyethylene net twine size 380d/18 and mesh size of 38 mm. Baiting and belly part are composed from polyethylene net with twine size of 380d/18 and 380d/18 with mesh size 38 mm. The cod end part made from

polyethylene net twine size 380d/15 with mesh size 25 mm. The cover net at the cod end made from polyethylene net twine size 700d/30 and mesh size 60 mm.



Figure 18. Beam design

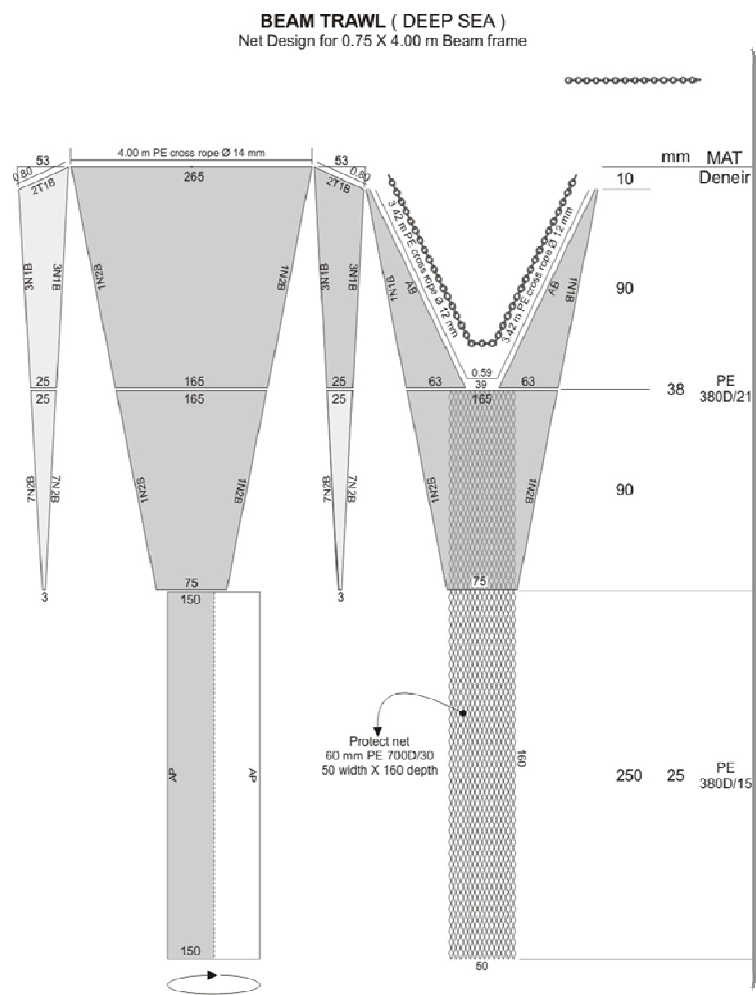


Figure 19. Net construction of deep sea beam trawl (4 m beam).



Figure 20. Trawl net construction.

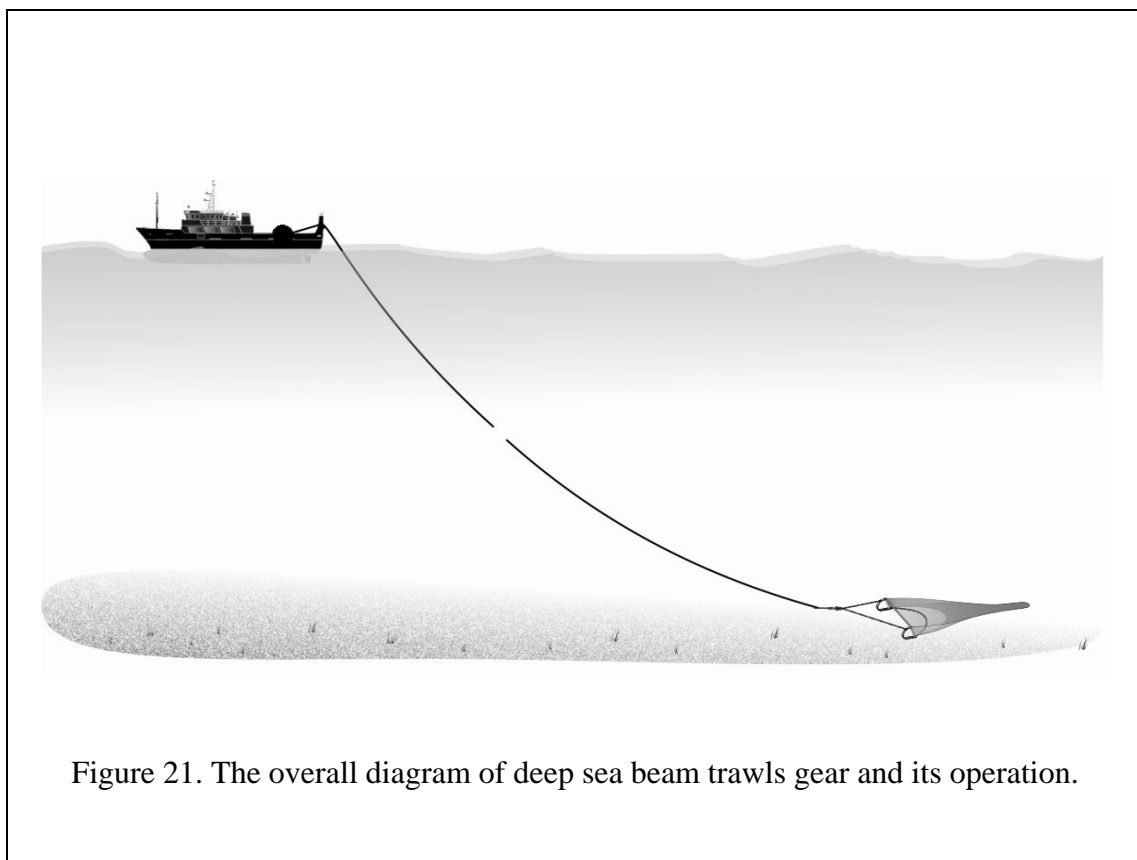


Figure 21. The overall diagram of deep sea beam trawls gear and its operation.

#### 4.2.1 Beam trawl fishing operations

Eleven fishing operations were conducted during the second session. Beam trawl fishing trials were conducted only in the daytime as the shrimp species always bury themselves under the muddy. Therefore, daytime operations are the most appropriate period for fishing trial. Towing time of the first and second operations was 30 minute and the towing time of about 60 minute was set for operation 3 to 11. Sea depth of those 11 operations was range between 100 and 374 m. The towing line

was released 1.5 to 2.5 times of the sea depth. The towing speed was reduced to between 1.5 and 2 knots at the rock and/or coral bottom to reduce the damage of the trawl net.

#### 4.2.2 Area of beam trawl operation

Bottom beam trawl were carried out on the continental slope of zone 3. Sea depth was range from 100 m to 1374 m. The survey was carried out on the smooth sea bottom which the sea depth not more than 200 m at station A1, A3, A4, A5, A6, A7, A8, A9, A11, A12 and A14.

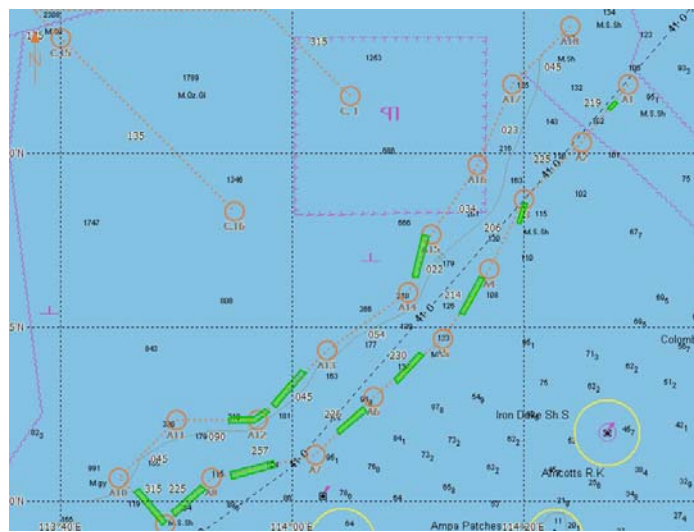


Figure 22. Fishing tracks of bottom beam trawl.



Figure 23. Fishing trials of Beam Trawl on M/V SEAFDEC2.



Figure 24. Catches from beam trawl operation.

#### 4.2.3 Results of beam trawl survey

Total catches from 11 beam trawl fishing operations of about 3,592 tows minutes was 58.68 kg and CPUE was 5.94 kg/hrs. Highest catches was found at the operation number 11 of station A14 with the total catches of 12.02 kg followed by station A5 of the 4th operation with the total catches of 12.01 kg. Flatfish and shrimp were dominant in the catches from beam trawl. The maximum number of shrimp specimens was found at station A14 (4.0 kg). The details of species composition, size composition and distribution of catches will be report by DOF/Brunei.

Table 2. Beam trawl fishing data summary

Op. No	Ship speed (kt)	Towing time	Sea depth (m)	Warp length ( m )	Total catch in weight( kg )	CPUE (Kg/hr)
1	2.2	30	110	250	1.43	2.86
2	2.5	30	127	270	3.6	7.2
3	2.5	60	111	250	6.4	6.4
4	2.6	60	121	280	12.01	12.01
5	2.4	60	100	220	4.39	4.39
6	2.5	60	100-110	250	1.8	1.8
7	2.3	60	110-118	250	5.33	5.33
8	2.4	60	109-160	350	5.23	5.23
9	2.5	60	215-202	450	2.54	2.54
10	2.8	60	216-238	540	3.93	3.93
11	2.5	60	276-374	700	12.02	12.02





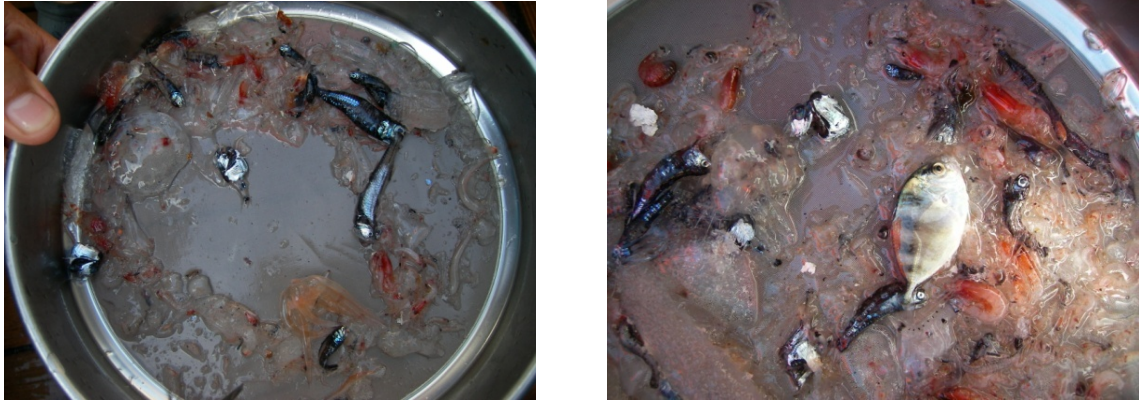


Figure 29. Active organism live in day time at depth 380 and 400 m.



Figure 30. Active organism live in night time at depth 400 m.

#### 4.4 Hydro Acoustic Survey

Hydro acoustic survey was conducted in 2<sup>nd</sup> and 3<sup>rd</sup> leg on June 15 – 22, 2008, using the scientific echosounder model Furuno FQ-80 onboard M/V SEAFDEC2. Total survey tracks are 16 tracks, 6 tracks in 2<sup>nd</sup> leg and 10 tracks in 3<sup>rd</sup> leg (Fig. 31). The data of backscattering were recorded and backup to DVD disc. There was some problem about the operating system during surveying in leg 2. The analyzer unit for recording and pre-analyze (computer notebook, Toshiba), so the 2<sup>nd</sup> leg could survey from Station A1 – A7. After solving the problem surveying could continue in the 3<sup>rd</sup> leg. See survey logsheet for more information.



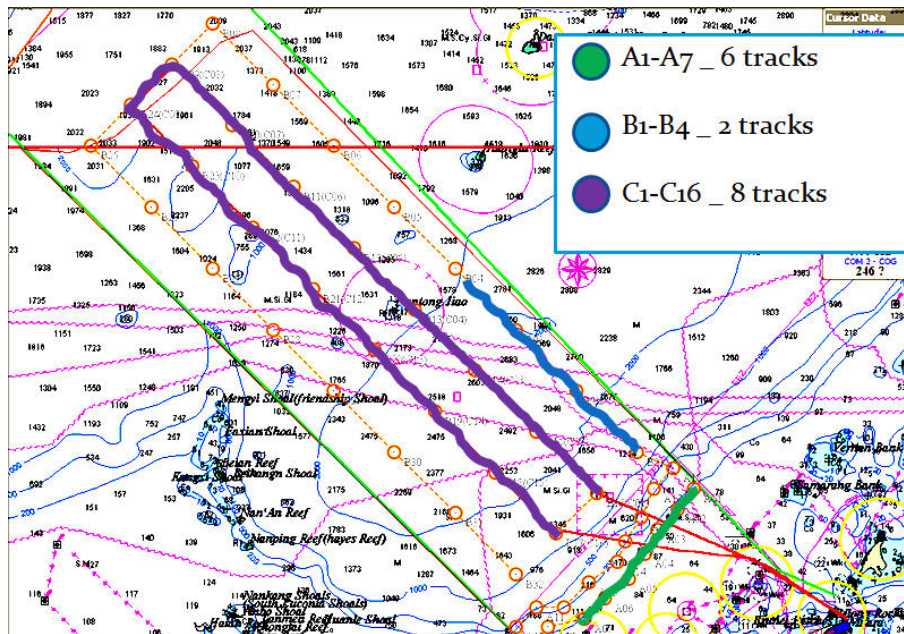


Figure 31. Track survey of Hydro-acoustic.

#### 4.5 Sea Floor Topographic Survey

The sea floor topography survey in Brunei Waters used the SDAC program onboard M/V SEAFDEC 2. The SDAC program can record information data from every electronic equipment that connect to PC such as ship speed, ship course, ship position, wind speed and direction, water depth, etc. The SDAC time interval for recording during the present survey was set at every 10 second. However, the SDAC program is not stable and often stops working. The acoustic signal blocked by the thick of active organism in deep scattering layer was the other problem, so the depth data could not record. And also, the maximum depth of echosounder onboard M/V SEAFDEC 2 is 800 meter, then the data from the deeper area was lost. The images of sea floor created by surfer program were shown in figure 32 and 33.

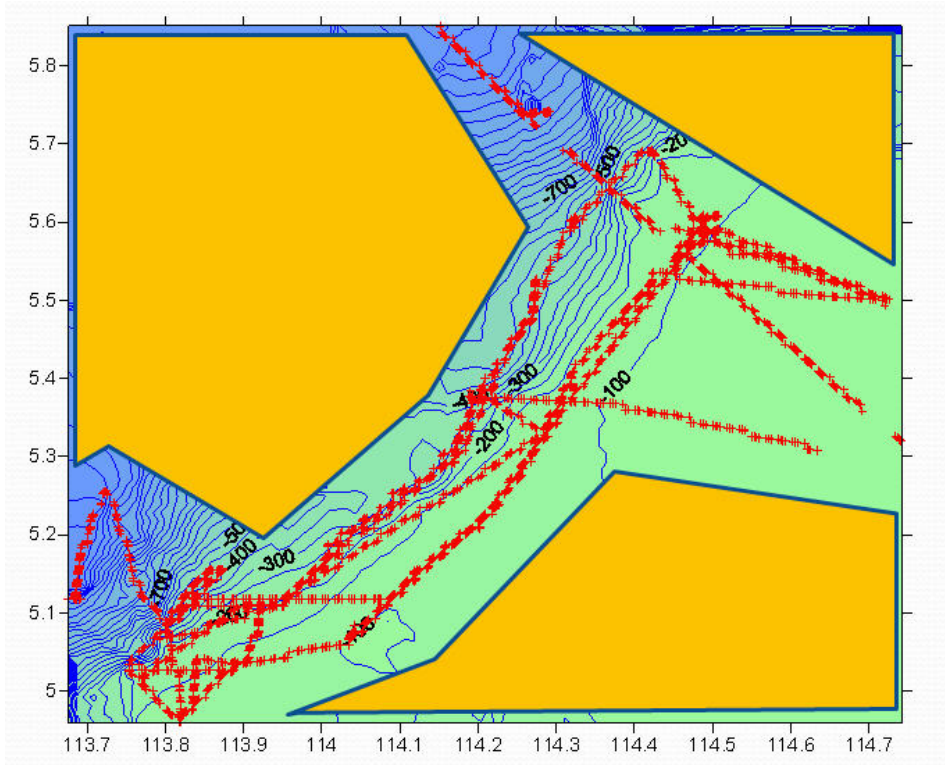


Figure 32. Track of vessel for topographic survey.

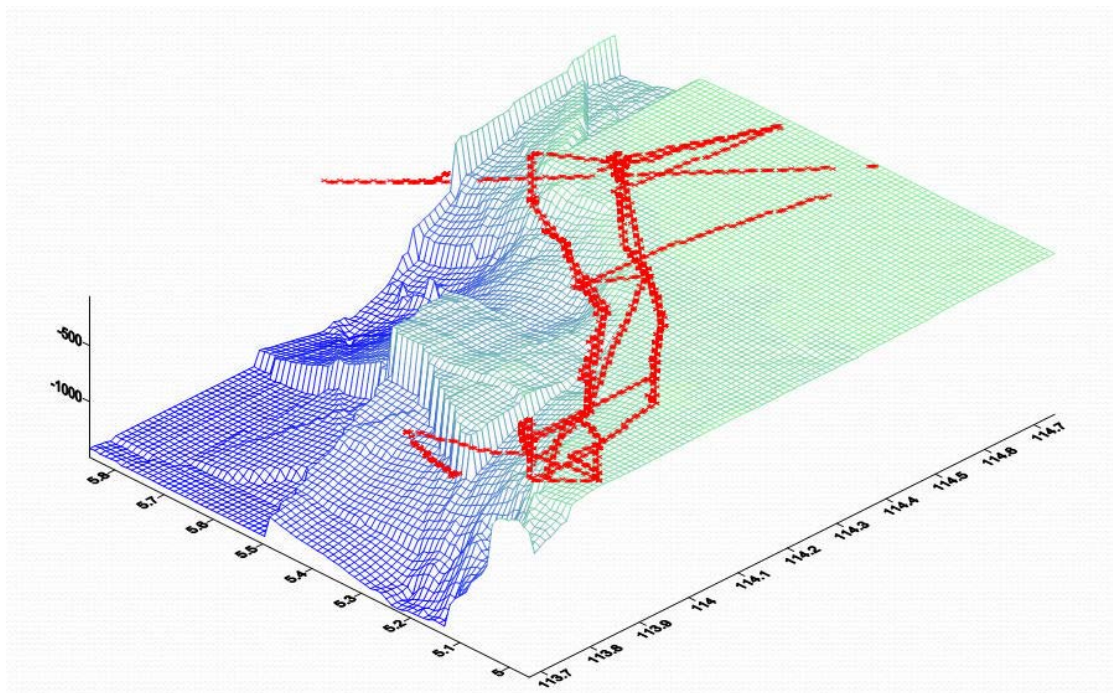


Figure 33. See floor topographic.

Table 1. Partial detail of oceanographic stations

St. no.	Date	Start	Finish	Lat (N)		Long (E)		Bot. (m)	SBE CTD	TSG	Bongo net (m)	Sechi disc (m)	Forel scale
				Degree	Libda	Degree	Libda						
A01	10-Jun-08	06:20	07:24	5	36.3	114	29.7	107	s2d29A01,s2u29A01	-	97.0	-	-
A02	15-Jun-08	18:37	19:13	5	30.6	114	25.3	105.0	s2d29A02,s2u29A02	20080615_stA2-A04	60.0	-	-
A03	10-Jun-08	09:10	09:55	5	20.2	114	20.9	127	s2d29A03,s2u29A03	-	70.0	24.67	4
A04	16-Jun-08	05:59	06:45	5	20.5	114	17.4	115	s2d29A04,s2u29A04	20080616_stA04-A06	75.0	-	-
A05	11-Jun-08	12:00	12:43	5	14.4	114	13.7	104	s2d29A05,s2u29A05	-	60.0	29.00	7
A06	16-Jun-08	08:57	09:25	5	9.2	114	7.5	103	s2d29A06,s2u29A06	20080616_stA06-A08	65.0	24.11	5
A07	11-Jun-08	14:27	15:15	5	4.9	114	2.8	99	s2d29A07,s2u29A07	20080611_stA07-A09	60.0	17.82	7
A08	16-Jun-08	11:48	12:30	5	2.2	113	53.4	120	s2d29A08,s2u29A08	20080616_stA08-A10	65.0	18.84	5
A09	11-Jun-08	16:58	17:42	4	58.6	113	49.7	109	s2d29A09,s2u29A09	20080611_stA09-A11	60.0	7.88	10
A10	16-Jun-08	13:28	14:25	5	2.7	113	45.7	404	s2d29A10,s2u29A10	20080616_stA10-A12	100.0	13.42	9
A11	12-Jun-08	05:56	07:00	5	6.8	113	50.0	385	s2d29A11,s2u29A11	20080612_stA11-A13	120.0	-	-
A12	16-Jun-08	15:30	16:16	5	7.2	113	57.3	201	s2d29A12,s2u29A12	20080616_stA12-A14	75.0	23.56	9
A13	12-Jun-08	08:35	09:38	5	13.2	114	3.5	313	s2d29A13,s2u29A13	-	90.0	17.12	8
A14	16-Jun-08	17:45	18:30	5	18.4	114	10.8	234	s2d29A14,s2u29A14	20080616_stA14-A16	70.0	-	-
A15	10-Jun-08	11:25	12:27	5	23.4	114	13.2	416	s2d29A15,s2u29A15	-	115.0	26.08	4
A16	17-Jun-08	6:00	6:56	5	28.9	114	16.3	425	s2d29A16,s2u29A16	20080617_st16-BeamA01-A02	80.0	-	-
A17	10-Jun-08	13:55	14:53	5	36	114	19.7	469	s2d29A17,s2u29A17	-	115.0	26.41	3
A18	10-Jun-08	15:44	16:36	5	41.6	114	25.3	280	s2d29A18,s2u29A18	-	80.0	27.57	4

Table 1. Partial detail of oceanographic stations (cont')

St. no.	Date	Start	Finish	Lat (N)		Long (E)		Bot. (m)	SBE CTD	TSG	Bongo net (m)	Secchi disc (m)	Forel scale
				Degree	Libda	Degree	Libda						
B01	21-Jun-08	17:22	20:15	5	44.5	114	16.7	1208	s2d29B01,s2u29B01	20080621_port to B01	53.0	-	-
B03	22-Jun-08	06:08	08:45	6	14.7	113	44.7	>2000	s2d29B03,s2u29B03	20080621_B01 to B03, 20080621_B01 to B03 cont	70.0	-	-
C01	24-Jun-08	15:20	18:00	5	35	114	5.3	1310	s2d29C01,s2u29C01	20080624_Port to C01	100.0	19.94	6
C03	25-Jun-08	06:01	08:25	6	4.8	113	35	2620	s2d29C03,s2u29C03	20080624_C01 to C03	100.0	-	-
C05	25-Jun-08	13:18	15:51	6	34.6	113	4.4	1534	s2d29C05,s2u29C05	20080625_C03 to C05	90.0	24.03	4
C07	26-Jun-08	5:53	8:12	7	4.9	112	35.3	>2000	s2d29C07,s2u29C07,s 2u29C07-2	20082625_C05 to C07	95.0	-	-
C09	26-Jun-08	12:13	14:34	7	9.7	112	10.3	2046	s2d29C09,s2u29C09	20080626_C07 to C09	90.0	31.06	2
C11	26-Jun-08	19:05	21:15	6	39.7	112	40.2	883	s2d29C11,s2u29C11	20080626_C09 to C11	100.0	-	-
C13	27-Jun-08	05:57	08:23	6	9.9	113	10.1	1764	s2d29C13,s2u29C13	20080626_C11 to C13	100.0	-	-
C15	27-Jun-08	12:57	15:40	5	40	113	40.6	2277	s2d29C15,s2u29C15	20080627_C13 to C15	92.0	-	-
										20080627_C15 to C17 to Port			

Table 2. Environmental condition during oceanographic survey

St. no.	Wind		Air					Water	Current					
	Spd. (knt)	Dir.	Temp (c )	Press.	Humidity	Weather	Sea stage		Surface		50m.		100m.	
								Temp ( c )	Spd.(Knt)	Dir	Spd.(Knt)	Dir	Spd.(Knt)	Dir
A01	13	180	26.7	1013.0	92	2/4	smooth	28.8	0.6	062	0.7	051	0.7	030
A02	4	0	30.1	1011.5	78	1/2	smooth	30.4	0.3	077	0.2	78	-	-
A03	9	60	28.5	1014.8	78	2/4	smooth	28.7	1.2	060	0.8	062	0.6	018
A04	10	180	27.2	1013.0	84	4/4	slight	29.5	0.5	038	0.3	010	-	-
A05	2	80	31.1	1013.0	62	1/4	smooth	29.5	0.6	094	0.2	090	0.6	016
A06	10	180	29.2	1013.0	66	3/4	slight	29.4	0.3	000	0.4	074	-	-
A07	2	40	31.5	1011.5	61	1/4	smooth	29.8	0.3	087	0.2	128	0.2	103
A08	10	180	31.2	1012.5	66	3/4	slight	29.6	0.4	039	0.2	028	0.0	000
A09	5	60	31.9	1011.0	63	2/4	smooth	30.5	0.5	043	0.3	077	0.0	097
A10	2	200	30.3	1013.0	61	3/4	smooth	30.1	0.3	199	0.2	171	0.3	058
A11	5	100	28.7	1013.0	78	2/4	smooth	29.1	0.4	88	0.2	60	0.4	062
A12	2	190	31.3	1011.0	61	3/4	smooth	29.8	0.2	001	0.1	075	0.1	300
A13	5	5	30.4	1014.5	78	2/4	smooth	29.4	0.3	059	0.2	055	0.5	055
A14	5	210	30.2	1011.0	85	3/4	smooth	29.8	0.1	255	0.0	327	0.2	232
A15	4	140	29.3	1013.0	78	2/4	smooth	29.2	0.7	067	0.7	065	0.7	068
A16	8	130	28.2	1011.0	84	2/4	smooth	29.4	0.1	353	0.1	329	0.2	290
A17	2	280	29.4	1012.0	76	2/4	smooth	29.4	0.6	063	0.6	062	0.5	051
A18	2	130	29.6	1011.0	72	2/4	smooth	29.3	0.6	046	0.9	059	0.4	035
B01	14	240	26.5	1011.0	92	4/4	moderate	29.0	0.0	000	0.5	296	0.4	348
B03	10	220	28.7	1011.0	78	4/4	moderate	29.2	0.0	000	0.9	305	0.8	307
C01	10	250	30.9	1010.5	79	3/4	slight	29.2	0.0	000	0.5	237	0.4	338
C03	4	250	28.8	1013.0	78	1/4	slight	28.8	0.0	000	0.4	081	0.2	023
C05	10	230	31.5	1013.0	73	1/4	slight	29.2	0.0	000	0.1	332	0.6	022
C07	4	270	28.4	1013.0	99	1/4	slight	29.0	0.0	000	0.4	042	0.3	289
C09	4	250	31.5	1013.0	72	1/4	slight	29.7	0.0	000	0.3	078	0.5	061
C11	4	270	30.2	1012.5	78	1/4	smooth	29.6	0.0	000	0.2	157	0.3	230
C13	4	240	29.3	1013.0	85	1/4	smooth	30.0	0.0	000	0.4	291	0.5	046
C15	4	140	30.3	1012.5	78	3/4	smooth	30.4	0.0	000	0.3	191	0.5	147

Table 3. Partial detail of Bongo net, Neuston net and Niskin water sampler

St.No.	Bongo net						Neuston net				Niskin bottle (depth, m)
	Towing depth (m)	Start Time	Towing period (min)	Towing spd. (knt.)	Flowmeter rev.		Start Time	Towing period (min)	Towing spd. (knt.)	Flow Meter rev.	
					Fish larvae	Zooplankton					
A01	97.0	06:53	31	1.2	8548	9580	-	-	-	-	100,75,50,30,0
A02	60.0	1.5	19	1.5	6340	6485	-	-	-	-	100,70,50,30,20,10,0
A03	70.0	09:10	30	1.4	9830	9865	-	-	-	-	115,100,75,50,30,20,10,0
A04	75.0	05:59	29	1.8	9790	9785	-	-	-	-	115,100,75,50,20,10,0
A05	60.0	12:00	30	2.0	8390	8278	-	-	-	-	95,75,50,30,24,10,0
A06	65.0	08:57	28	1.3	6383	6482	-	-	-	-	105,75,50,30,20,10,0
A07	60.0	14:27	28	1.5	9246	9508	-	-	-	-	95,75,50,30,20,10,0
A08	65.0	11:48	30	1.0	7752	7610	-	-	-	-	115,100,75,50,30,20,10,0
A09	60.0	16:58	27	1.6	8895	8285	-	-	-	-	100,75,50,30,20,10,0
A10	100.0	13:28	30	1.2	9160	9270	-	-	-	-	400,300,250,200,150,130,100,75,50,30,10,0
A11	120.0	06:28	32	0.8	7032	7253	-	-	-	-	343.5,300,250,200,150,125,100,75,50,30,10,0
A12	75.0	15:30	25	2.0	7445	7225	-	-	-	-	195,150,125,100,75,50,30,20,10,0
A13	90.0	08:35	30	2.0	8755	8842	-	-	-	-	304,250,200,150,125,100,75,50,30,20,10,0
A14	70.0	17:45	27	1.5	8360	8190	-	-	-	-	227,200,150,100,75,50,30,20,10,0
A15	115.0	11:25	30	2.0	8890	7925	-	-	-	-	400,300,250,200,150,125,100,75,50,30,10,0
A16	80.0	06:26	30	1.7	9345	9050	-	-	-	-	416,300,250,200,150,125,100,75,50,30,10,0
A17	115.0	13:55	29	1.3	8065	8080	-	-	-	-	411,300,250,200,150,125,100,75,50,30,10,0
A18	80.0	15:44	30	2.0	8040	8050	-	-	-	-	270,250,200,150,125,100,75,50,30,10,0
B01	53.0	17:22	20	2.0	13495	12495	17:51	21	3.9	3806	338,300,250,200,150,125,100,75,50,30,10,0
B03	70.0	06:45	30	1.5	10710	10770	07:20	16	3.2	3417	400,300,200,150,125,100,75,50,30,10,0
C01	100.0	15:20	38	1.6	10340	10370	15:59	15	3.0	4664	400,291,250,200,150,125,100,75,50,30,10,0
C03	100.0	06:34	29	1.7	10635	10670	07:05	15	3.0	4027	400,300,250,200,150,125,100,75,50,30,10,0
C05	90.0	13:18	32	1.5	10460	10480	13:53	14	2.8	3698	400,300,250,200,150,125,100,75,50,30,10,0
C07	95.0	06:29	30	1.8	10200	10300	07:02	20	3.4	5920	400,300,250,200,150,125,100,75,50,30,10,0
C09	90.0	12:13	27	1.9	9753	9703	12:42	14	2.9	4055	400,300,250,200,150,125,100,75,50,30,10,0
C11	100.0	19:05	32	1.6	9715	9625	-	-	-	-	400,300,250,200,150,125,100,75,50,30,10,0
C13	100.0	06:23	30	1.7	9323	7653	06:55	15	3.0	4623	400,300,250,200,150,125,100,75,50,30,10,0
C15	92.0	12:57	28	1.7	9450	9280	13:27	16	3.0	4193	400,300,250,200,150,125,100,75,50,30,10,0

Table 4 Partial detail of flow meter calibration before the survey

**Research vessel name:** M.V.SEAFFDEC2      **Recorded by:** Phochan  
**Cruise:** 29-2/2008      **Area:** Brunei Darussalam waters  
**Date:** 9-Jun-08      **Time:** 5:40      **Wire-out length(m):** 46      **m.**  
**Latitude** 5°47.3N      **Longitude** 113°54.1      **Wind speed (m/s):** 2      **Current speed (m/s):** 1.2 (50 m)

Times	Wire Angle	Distance	time	Flowmeter						Remark	
				Neuston				Zooplankton	Larval fish		
				Hydro-Bios <sup>1</sup>	Hydro-Bios <sup>1</sup>	G.O.Envirn. <sup>1</sup>	G.O.Envirn. <sup>1</sup>	TSK <sup>2</sup>	TSK <sup>2</sup>		
				No tape	Yellow tape	20399	20383	7021	7035		
(°)	(m)	(s)									
1	0	46	150	start	27118	30968	881241	574019	0	0	
				finish	27478	31309	884926	577789	279	388	
				Rev1.	180	170.5	1842.5	1885	279	388	
2	0	46	153	start	27478	31309	884926	577789	0	0	
				finish	27822	31653	888458	581418	325	311	
				Rev2.	172	172	1766	1814.5	325	311	
3	0	46	210	start	27822	31653	888458	581418	0	0	
				finish	28221	32015	892452	585549	280	211	
				Rev3.	199.5	181	1997	2065.5	280	211	
4	0	46	175	start	28221	32015	892452	585549	0	0	
				finish	28588	32386	896227	589403	349	343	
				Rev4.	183.5	185.5	1887.5	1927	349	343	
5	0	46	101	start	28588	32386	896227	589403	0	0	
				finish	28959	32745	899820	593100	330	325	
				Rev5.	185.5	179.5	1796.5	1848.5	330	325	
6	0	46	138	start	28959	32745	899820	593100	0	0	
				finish	29323	33112	903493	596848	331	341	
				Rev6.	182	183.5	1836.5	1874	331	341	
<b>Calibrate factor(m/r)</b>					0.25083012	0.25771788	0.024845341	0.024221321	0.146811772	0.14917046	
<b>Remark</b> <sup>2</sup> = flow meters will count revolution only upcast <sup>1</sup> = flow meters will count revolution both downcast and upcast (When calculate Rev. will divide 2)											

Table 5 Partial detail of flow meter calibration after the survey

Research vessel name:				M.V.SEAFFDEC2		Recorded by:		Ritthirong Prommas			
Cruise:		29-2/2008		Area:		Brunei Darussalam waters					
Date:		27 June 08		Time:		14:18		Wire-out length(m):		50	m.
Latitude		5°40.9N		Longitude		113°40.6E		Wind speed (m/s): 2		Current speed (m/s): 0.1 (50 m)	
Times	Wire Angle	Distance	time	Flowmeter						Remark	
				Neuston				Zooplankton	Larval fish		
	Hydro-Bios <sup>1</sup>	Hydro-Bios <sup>1</sup>	G.O.Envirion. <sup>1</sup>	G.O.Envirion. <sup>1</sup>	TSK <sup>2</sup>	TSK <sup>2</sup>					
	No tape	Yellow tape	20399	20383	7021	7035					
1	20	46.98	120	start	67727	33137	903384	596450	0	0	
				finish	68138	33563	907254	600255	480	452	
				Rev1.	205.5	213	1935	1902.5	480	452	
2	24	45.68	119	start	68138	33563	907254	600255	480	452	
				finish	68571	33985	911425	604005	922	984	
				Rev2.	216.5	211	2085.5	1875	442	532	
3	23	46.03	98	start	68571	33985	911425	604005	922	984	
				finish	68978	34370	915305	608234	1350	1321	
				Rev3.	203.5	192.5	1940	2114.5	428	337	
4	23	46.03	220	start	68978	34370	915305	608234	1350	1321	
				finish	69523	34881	919213	611152	1885	1833	
				Rev4.	272.5	255.5	1954	1459	535	512	
5	24	45.68	98	start	69523	34881	919213	611152	1885	1833	
				finish	69941	35295	923380	615154	2303	2250	
				Rev5.	209	207	2083.5	2001	418	417	
				finish							
				Rev6.							
Calibrate factor(m/r)					0.21065598	0.21540121	0.023078189	0.025040564	0.100817965	0.10516739	
Remark					<sup>1</sup> = flow meters will count revolution both downcast and upcast (When calculate Rev. will divide 2)						
					<sup>2</sup> = flow meters will count revolution only upcast						



## Appendix I

### Research activities of M/V SEAFDEC2

#### Cruise 29-2/2008: Fisheries resources survey in Brunei Darussalam Waters

#### Session I: 9 to 13 June 2008

Date	Time	Activities	Remark
<b>8 June 08</b>	1315	Alongside M/VTenggiri, Fish Landing Complex, Muara port, Brunei Darussalam	
	1330-1530	Transfer some of fishing gear to M/V Tenggiri And prepared the Bottom otter trawl	
<b>9 June 08</b>	0900-1700	Researcher of DOF Brunei 12 persons embarked on board M/VSEAFDEC 2	
	2320-2400	Bunkering at BSM's Jetty	
<b>10 June 08</b>	0005	Leaved to research survey station A1	
	0540	Arrived station A1	
	0544-0614	Calibrated Flow meter, depth 76 m	L05°35'.80N λ114°29'.50E
	0620-0631	iCTD operation 1, at station A1.depth 107 m	L05°36'.30N λ114°29'.70E
	0653-0724	Bongo net operation 1, depth 107 m	L05°36'.70N λ114°30'.40E
	0740-0820	Topographic survey from station.A1 to A2.	
	0820-0905	Topographic survey from station.A2 to A3.	
	0910-0940	Bongo net operation 2 at station A3, depth 127 m	L05°26'.00N λ114°20'.30E
	0942-0955	iCTD operation 2, depth 127 m	L05°20'.20N λ114°20'.90E
	1005-1050	Topographic survey from station.A3 to A4.	
	10501120	Topographic survey from station.A4 to A15.	
	1125-1155	Bongo net operation 3 at station A15, depth 417 m	L05°23'.00N λ114°12'.30E
	1200-1227	iCTD operation 3, depth 400 m	L05°23'.40N λ114°13'.20E
	1235-1312	Topographic survey from station.A15 to A16.	
	1312-1353	Topographic survey from station.A16 to A17.	
	1355-1424	Bongo net operation 4 at station A17, depth 535 m	L05°36'.01N λ114°19'.20E
	1425-1453	iCTD operation 4, depth 469 m	L05°36'.00N λ114°19'.70E
	1500-1542	Topographic survey from station.A17 to A18.	
	1544-1611	Bongo net operation 5 at station A18, depth 343 m	L05°41'.50N λ114°24'.90E
	1614-1630	iCTD operation 5, depth 278 m	L05°41'.60N λ114°25'.30E
<b>11 June 08</b>	0615-0645	Shooting Bottom trawl operation 1at station A1 ( A1-A18), depth 105-115m	L05°35'.50N λ114°29'.50E – L05°36'.30N λ114°28'.80E
	0655-0740	Hauling Bottom trawl op.1	L05°36'.60N λ114°28'.80E – L05°36'.80N λ114°29'.40E
	0952-1025	Shooting Bottom trawl operation 2at station A1 ( A1-A2), depth 109-110 m	L05°34'.90N λ114°28'.20E – L05°34'.30N λ114°27'.80E

Date	Time	Activities	Remark
11 June 08	0842-0925	Hauling Bottom trawl op.2	L05°33'.50N λ114°27'.30E – L05°33'.50N λ114°27'.90E
	1113-1157	Topographic survey from station.A4 to A5	
	1200-1230	Bongo net operation 6 at station A5, depth 106 m	L05°14'.00N λ114°13'.20E
	1231-1243	iCTD operation 6, depth 104 m	L05°14'.40N λ114°13'.70E
	1253-1340	Topographic survey from station.A5 to A6.	
	1340-1425	Topographic survey from station.A6 to A7.	
	1427-1455	Bongo net operation 7 at station A7, depth 99 m	L05°04'.00N λ114°02'.10E
	1501-1515	iCTD operation 7, depth 100 m	L05°04'.90N λ114°02'.80E
	1525-1620	Topographic survey from station.A7 to A8.	
	1620-1655	Topographic survey from station.A8 to A9.	
	1658-1725	Bongo net operation 8 at station A9, depth 100 m	L04°57'.90N λ113°49'.10E
	1729-1742	iCTD operation 8, depth 109 m	L04°58'.60N λ113°49'.70E
	1750-1822	Topographic survey from station.A9 to A10.	
	1822-1859	Topographic survey from station.A10 to A11.	
12 June 08	0556-0625	iCTD operation 9, at station A.11depth 385 m	L05°06'.80N λ113°50'.00E
	0628-0700	Bongo net operation 9, depth 330 m	L05°06'.80N λ113°50'.20E
	0708-0746	Topographic survey from station.A11 to A12.	
	0746-0830	Topographic survey from station.A12 to A13.	
	0835-0905	Bongo net operation 10 at station A13, depth 310 m	L05°13'.10N λ114°03'.20E
	0910-0938	iCTD operation 10, depth 310 m	L05°13'.20N λ114°03'.50E
	0945-1030	Topographic survey from station.A13 to A14.	
	1030-1100	Topographic survey from station.A14 to A15.	
	1209-1227	Shooting Bottom trawl operation 3.at station A4 ( A4-A5), depth 111 m	L05°19'.60N λ114°17'.10E – L05°18'.70N λ114°16'.50E
	1258-1320	Hauling Bottom trawl op.3	L05°17'.00N λ114°15'.60E – L05°17'.00N λ114°15'.60E
	1432-1445	Shooting Bottom trawl operation 4. at station A5 ( A5-A6), depth 118 m	L05°12'.60N λ114°11'.60E – L05°12'.10N λ114°11'.00E
	1515-1540	Hauling Bottom trawl op.4	L05°11'.20N λ114°09'.80E – L05°10'.90N λ114°09'.60E
	1651-1710	Shooting Bottom trawl operation 5. at station A6 ( A6-A7), depth 102 m	L05°08'.80N λ114°06'.90E – L05°08'.00N λ114°06'.40E
	1740-1806	Hauling Bottom trawl op.5	L05°07'.10N λ114°05'.10E – L05°07'.10N λ114°04'.70E

Date	Time	Activities	Remark
13 June 08	0602-0624	Shooting Bottom trawl operation 6.at station A9 ( A9-A8), depth 158 m	L04°58'.50N λ113°49'.80E – L04°59'.70N λ113°50'.20E
	0654-0725	Hauling Bottom trawl op.6	L05°01'.60N λ113°49'.80E – L05°02'.60N λ113°50'.60E
	0745-0806	Shooting Bottom trawl operation 7. at station A8 ( A8-A7), depth 118 – 160 m	L05°02'.20N λ113°53'.60E – L05°03'.10N λ113°54'.60E
	0837-0910	Hauling Bottom trawl op.7	L05°04'.90N λ113°55'.00E – L05°05'.90N λ113°55'.10E
	1130-1152	Shooting Bottom trawl operation 8. at station A4 ( A4-A3), depth 122 m	L05°20'.60N λ114°17'.50E – L05°22'.00N λ114°18'.20E
	1222-1253	Hauling Bottom trawl op.8	L05°23'.60N λ114°19'.00E – L05°24'.30N λ114°19'.10E
	1346-1406	Shooting Bottom trawl operation 9. at station A3 ( A3-A1), depth 107 - 109 m	L05°28'.70N λ114°23'.10E – L05°28'.90N λ114°24'.00E
	1436-1517	Hauling Bottom trawl op.9	L05°31'.20N λ114°25'.20E – L05°32'.10N λ114°25'.60E
2015	Arrived Muara fishing port		
14 June 08	0800-1030	Fishing gear preparation for Bottom Beam trawl	

Oceanographic survey 10 operations,  
Bottom trawl 9 operations

### Session II: 15 to 18 June 2008

Date	Time	Activities	Remark
15 June 08	0800-0850	All researcher embark on board	
	0900	Leave Muara port for survey station	
	1005-1310	Calibrated the FQ – 80, depth 33 m	L05°07'.10N λ115°02'.00E
	1745-1830	Acoustic survey from station A1 to A2	
	1837-1856	Bongo net operation 11 at station A2, depth 105 m	L05°30'.50N λ114°25'.20E
	1900-1913	iCTD operation 11, depth 105 m	L05°30'.60N λ114°25'.30E
	1920-2010	Acoustic survey from station.A2 to A3	
	2010-2100	Acoustic survey from station.A3 to A4	
16 June 08	0559-0613	iCTD operation 12, at station A4,depth 114 m	L05°20'.00N λ114°17'.30E
	0616-0645	Bongo net operation 12, depth 122 m	L05°20'.50N λ114°17'.40E

Date	Time	Activities	Remark
16 June 08	0700-0755	Acoustic survey from station.A4 to A5	
	0755-0853	Acoustic survey from station.A5 to A6	
	0857-0925	Bongo net operation 13 at station A6, depth 102 m	L05°08'.80N λ114°07'.20E
	1037-1145	Acoustic survey from station.A7 to A8	
	1148-1248	Bongo net operation 14 at station A8, depth 119 m	L05°01'.80N λ113°53'.20E
	1220-1230	iCTD operation 14, depth 120 m	L05°02'.20N λ113°53'.40E
	1235	Proceed to station A 10.	FQ-80 was malfunction
	1328-1358	Bongo net operation 15 at station A10, depth 404 m	L05°01'.90N λ113°45'.30E
	1400-1425	iCTD operation 15, depth 404 m	L05°02'.70N λ113°45'.70E
	1530-1555	Bongo net operation 16 at station A12, depth 193 m	L05°06'.80N λ113°57'.00E
	1558-1616	iCTD operation 16, depth 201 m	L05°07'.20N λ113°57'.30E
	1745-1812	Bongo net operation 17 at station A14, depth 240 m	L05°17'.90N λ114°10'.30E
	1814-1830	iCTD operation 17, depth 234 m	L05°18'.40N λ114°10'.80E
17 June 08	0600-0623	iCTD operation 18, at station A 16,depth 425 m	L05°28'.90N λ114°16'.30E
	0626-0656	Bongo net operation 18, depth 411 m	L05°29'.30N λ114°16'.40E
	0805	Arrived station A1 for Beam trawl fishing operation	
	0815-0825	Shooting Beam trawl operation 1, at station A1 ( A1-A2), depth 110 m	L05°34'.50N λ114°28'.00E – L05°34'.30N λ114°27'.80E
	0847-0935	Hauling Beam trawl operation 1.	L05°33'.80N λ114°27'.40E – L05°33'.40N λ114°27'.40E
	1050-1056	Shooting Beam trawl operation 2, at station A3 ( A3-A4), depth 127 m	L05°25'.70N λ114°20'.10E – L05°25'.40N λ114°19'.90E
	1126-1140	Hauling Beam trawl operation 2.	L05°24'.40N λ114°19'.60E – L05°24'.00N λ114°19'.60E
	1215-1220	Shooting Beam trawl operation 3, at station A4 ( A4-A5), depth 111 m	L05°19'.30N λ114°16'.30E – L05°19'.00N λ114°16'.60E
	1320-1340	Hauling Beam trawl operation 3.	L05°17'.00N λ114°14'.90E – L05°16'.10N λ114°14'.70E
	1418-1425	Shooting Beam trawl operation 4, at station A5 ( A5-A6), depth 121 m	L05°12'.60N λ114°11'.20E – L05°12'.50N λ114°10'.70E
	1525-1540	Hauling Beam trawl operation 4.	L05°10'.70N λ114°09'.00E – L05°10'.30N λ114°08'.90E
	1600-1610	Shooting Beam trawl operation 5, at station A6 ( A6-A7), depth 100 m	L05°08'.00N λ114°06'.30E – L05°07'.80N λ114°06'.00E
	1710-1725	Hauling Beam trawl operation 5.	L05°06'.20N λ114°04'.40E – L05°06'.00N λ114°04'.00E

Date	Time	Activities	Remark
18 June 08	0520-0528	Shooting Beam trawl operation 6, at station A7 ( A7-A8), depth 106 m	L05°03'.20N λ113°58'.40E – L05°03'.20N λ113°58'.40E
	0740-0745	Shooting Beam trawl operation 7, at station A8 ( A8-A9), depth 118 m	L05°01'.10N λ113°52'.30E – L05°00'.80N λ113°52'.00E
	0845-0858	Hauling Beam trawl operation 7.	L04°59'.80N λ113°49'.70E – L04°58'.90N λ113°49'.70E
	0915-0930	Shooting Beam trawl operation 8, at station A9 ( A9-A10), depth 109 - 170 m	L04°58'.00N λ113°48'.90E – L04°58'.50N λ113°48'.50E
	1030-1100	Hauling Beam trawl operation 6.	L05°00'.40N λ113°46'.80E – L05°01'.00N λ113°46'.50E
	1202-1213	Shooting Beam trawl operation 9, at station A11 ( A11-A12), depth 215 m	L05°06'.90N λ113°54'.50E – L05°06'.90N λ113°54'.90E
	1313-1337	Hauling Beam trawl operation 9.	L05°07'.00N λ113°57'.20E – L05°07'.70N λ113°57'.90E
	1345-1358	Shooting Beam trawl operation 10, at station A12 ( A12-A13), depth 220-250 m	L05°08'.20N λ113°58'.40E – L05°08'.70N λ113°58'.90E
	1458-1517	Hauling Beam trawl operation 10.	L05°10'.60N λ114°00'.80E – L05°11'.40N λ114°00'.80E
	1628-1642	Shooting Beam trawl operation 11, at station A14 ( A14-A15), depth 276-374 m	L05°19'.20N λ114°10'.60E – L05°19'.90N λ114°10'.90E
	1742-1813	Hauling Beam trawl operation 10.	L05°22'.20N λ114°11'.90E – L05°23'.00N λ114°11'.40E
			Proceeded to Muara fishing port
19 June 08	0005	Arrive Muara fishing port	

Oceanographic survey 8 operations,  
Bottom Beam trawl 11 operations

### Session III: 21 to 28 June 2008

Date	Time	Activities	Remark
<b>21 June 08</b>	0800	All of Brunei researchers embark onboard M/VSEAFDEC 2	
	0850	Leave Mura port for bunkering	
	0920-1010	Loaded the fuel 18,000 liters	
	1015	Leave Muara for Survey stations	
	1715	Arrived station B.1 start Oceanographic survey	
	1722-1742	Bongo net operation 19 at station B.1, depth 1,208 m	L05°44'.80N λ114°15'.10E
	1751-1812	Neuston net op.1, depth 1,164 m	L05°44'.20N λ114°16'.30E
	1815-1852	iCTD operation 19, depth 1,144 m	L05°44'.50N λ114°16'.70E
	1915-1925	Start shooting IKMT operation 1 at station B1, Depth 1,196 mm	L05°44'.90N λ114°15'.20E – L05°45'.30N λ114°14'.90E
	1955-2015	Hauling IKMT operation 1.	L05°46'.40N λ114°13'.80E – L05°46'.90N λ114°13'.20E
	2015-2224	Acoustic survey FQ-80 from station B1 – B2	
	2224-2400	Acoustic survey FQ-80 from station B2 – B3	
	<b>22 June 08</b>	0608-0640	iCTD operation 20 at station B3. depth > 2,000 m
0645-0715		Bongo net operation 20 , depth >2,000 m	L06°14'.80N λ113°45'.20E
0720-0736		Neuston net op.2, depth > 2,000 m	L06°13'.90N λ113°45'.80E
0743-0756		Shooting IKMT operation 2 at station B3, Depth >2,000 mm	L06°13'.60N λ113°06'.00E – L06°14'.20N λ113°45'.60E
0826-0845		Hauling IKMT operation 2.	L06°15'.40N λ113°44'.70E – L06°16'.00N λ113°44'.10E
1015		Proceeded to Muara fishing port	It can not to operated the oceanographic due to the rough sea condition
<b>24 June 08</b>	0800	All of Brunei researcher embark onboard M/Vseafdec2	
	0820	Leaved Muara fishing port for survey station	
	1518	Arrived station C.1 start oceanographic survey	
	1520-1558	Bongo net operation 21 at station C1(B16) depth 1,332 m	L05°34'.90N λ114°05'.10E
	1559-1614	Neuston net op.3, depth 1,324 m	L05°34'.80N λ114°05'.20E
	1615-1645	iCTD operation 21, depth 1,310 m	L05°35'.00N λ114°05'.30E
	1648-1702	Start shooting IKMT operation 3 at station B1, Depth 1,317 mm	L05°35'.10N λ114°05'.50E – L05°35'.20N λ114°04'.90E
	1732-1748	Hauling IKMT operation 3.	L05°35'.50N λ114°03'.70E – L05°37'.20N λ114°02'.90E

Date	Time	Activities	Remark
24 June 08	1748-2000	Acoustic survey FQ-80 from station C1 – C2	
	2000-2247	Acoustic survey FQ-80 from station C2 – C3	
25 June 08	0601-0630	iCTD operation 22,at station C3(B14) depth 2,620 m	L06°04'.80N λ113°35'.00E
	0634-0703	Bongo net operation 22,depth 2,620 m	L06°34'.60N λ113°35'.20E
	0705-0720	Neuston net op.4, depth 2,620 m	L06°04'.40N λ113°34'.80E
	0722-0739	Start shooting IKMT operation 4 at station C3(B14), Depth > 2,000 m	L06°04'.40N λ113°35'.00E – L06°35'.20N λ113°34'.90E
	0809-0825	Hauling IKMT operation 3.	L06°06'.10N λ113°34'.00E – L06°06'.70N λ113°33'.50E
	0825-1315	Acoustic survey FQ-80 from station C3 – C5	
	1318-1350	Bongo net operation 23,at station C5(B12) depth 1,529 m	L06°34'.90N λ113°04'.20E
	1353-1407	Neuston net op.5, depth 1,540 m	L06°34'.60N λ113°04'.40E
	1410-1440	iCTD operation 23,depth 1,534 m	L06°34'.60N λ113°04'.40E
	1444-1459	Start shooting IKMT operation 5 at station C5(B12), Depth 1,527 m	L06°34'.70N λ113°04'.60E – L06°35'.30N λ113°03'.90E
	1529-1551	Hauling IKMT operation 5.	L06°36'.30N λ113°02'.90E – L06°37'.10N λ113°02'.10E
	1551-2035	Acoustic survey FQ-80 from station C5 – C7	
26 June 08	0535-0625	iCTD operation 24,at station C7(B10) depth >2,000m	L07°04'.90N λ112°35'.10E
	0629-0659	Bongo net operation 24,depth >2,000m	L07°04'.80N λ112°35'.30E
	0702-0722	Neuston net op.6, depth >2,000 m	L07°04'.90N λ112°35'.50E
	0724-0735	Start shooting IKMT operation 6 at station C7(B10), Depth > 2,000 m	L07°04'.60N λ112°36'.00E – L07°04'.80N λ112°35'.50E
	0805-0812	Hauling IKMT operation6.	L07°05'.80N λ112°34'.40E – L07°06'.10N λ112°34'.10E
	0812-1209	Acoustic survey FQ-80 from station C7 – C9	
	1213-1240	Bongo net operation 24,at station C9(B24) depth 2,046 m	L07°09'.80N λ112°10'.20E
	1242-1256	Neuston net op.7, depth 2,046 m	L07°09'.80N λ112°10'.20E
	1259-1326	iCTD operation 24,depth 2,046 m	L07°09'.70N λ112°10'.30E
	1332-1347	Start shooting IKMT operation 7 at station C9(B24), Depth 2,046 m	L07°09'.80N λ112°10'.20E – L07°09'.20N λ112°10'.90E
	1417-1434	Hauling IKMT operation 5.	L07°08'.10N λ112°12'.10E – L07°07'.60N λ112°12'.70E
	1434-1900	Acoustic survey FQ-80 from station C5 – C7	

Date	Time	Activities	Remark
<b>26 June 08</b>	1905-1937	Bongo net operation 26,at station C11(B22) depth 893 m	L06°39'.80N λ112°40'.10E
	1940-2005	iCTD operation 26,depth 883 m	L06°39'.70N λ112°40'.20E
	2012-2027	Start shooting IKMT operation 8 at station C11(B22), Depth 887 m	L06°39'.90N λ112°40'.50E – L06°39'.10N λ112°40'.90E
	2057-2115	Hauling IKMT operation 8.	L06°38'.10N λ112°42'.10E – L06°37'.40N λ112°42'.70E
	2115-0145	Acoustic survey FQ-80 from station C11 – C13	
<b>27 June 08</b>	0557-0620	iCTD operation 27,at station C13(B20) depth 1,764m	L06°09'.90N λ113°10'.10E
	0623-0653	Bongo net operation 27,depth 1,764 m	L06°09'.80N λ113°10'.10E
	0655-0710	Neuston net op.8, depth 1,782 m	L06°09'.70N λ113°09'.90E
	0717-0734	Start shooting IKMT operation 9 at station C13(B20), Depth 1,769 m	L06°04'.40N λ113°35'.00E – L06°35'.20N λ113°34'.90E
	0809-0825	Hauling IKMT operation 3.	L06°09'.90N λ113°10'.00E – L06°09'.00N λ113°10'.90E
	0825-1255	Acoustic survey FQ-80 from station C13 – C15	
	1257-1325	Bongo net operation 28,at station C15(B18) depth 2,277 m	L05°40'.90N λ113°40'.10E
	1327-1343	Neuston net op.9, depth 2,277 m	L05°40'.50N λ113°40'.70E
	1345-1418	iCTD operation 28,depth 2,277 m	L05°40'.90N λ113°40'.60E
	1422-1440	Calibrated Flow meter	L05°41'.50N λ113°40'.40E
	1443-1500	Start shooting IKMT operation 10 at station C15(B18),Depth 2,277 m	L05°41'.90N λ113°40'.50E – L05°40'.90N λ113°40'.30E
	1530-1540	Hauling IKMT operation 10.	L05°39'.40N λ113°40'.80E – L05°38'.50N λ113°41'.80E
	1540-1755	Acoustic survey FQ-80 from station C15 – C16	
	1755	Proceeded to Muara fishing port	
<b>28 June 08</b>	0125	Arrived Muara Fishing port	
	0130	All researcher disembark on board	