Southeast Asian Fisheries Development Center

Training Department

CRUISE REPORT ON RESEARCH ACTIVITY

M.V.SEAFDEC 2 Cruise No. 5-5/2004

11 September – 15 October 2004

Pelagic Fish Resource Survey, Brunei Darussalam

TD/RP/83

This report is base on preliminary data

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

Southeast Asian Fisheries Development Center
Training Department
PO. BOX 97 Phrasamutchedi
Samut Prakan, 10290
THAILAND
Tel: 662-4256100
Fax: 662-4256110
E-mail: td@seafdec.org

Cruise report on Research Activity

1. Cruise Summary

Vessel name: MV.SEAFDEC2
Cruise no.: 5-5/2004 **Leg no:** -
Duration: 11 September-15 October 2004 (35 days)
Project Title:
Objective: National research survey for Brunei Darussalam
Covered water: Zone 4 Brunei Darussalam waters, South China Sea
Latitude 05°00'.00 N-07°30'.00 N
Longitude 112°20'.00 E-114°20'.00 E
Port of call: Muara, Brunei Darussalam
Main activity: 1. To conduct the pelagic fisheries resources survey in the Zone 4 in Tele Brunei Darussalam waters by using Hydro-Acoustic Equipment (FQ-80) and fish samplings by using the Pelagic Longline and the Automatic-squidjig fishing
2. To conduct the oceanographic survey (using ICTD, Salino-thermo-fluorometer, and others)
3. To collect fish and squid larvae

2. List of researcher and ship staff

Ship personnel

No.	Position	Name
1	Captain	Mr. Tossaporn Sukhapindha
2	Chief engineer	Mr. Veerachai Chettasumon
3	Second officer	Mr. Suren Pruksarat
4	Third officer	Mr. Somphote Vudthipanyo
5	Second engineer	Mr. Komson Sangphuek
6	Third engineer	Mr. Kittinai Sukdit
7	Boatswain	Mr. Vudthirat Vudthipanyo
8	Steerman	Mr. Pradit Kui-prasert
9	Steerman	Mr. Tana Rungjoy
10	Able seaman	Mr. Somkiat Phetrasatien
11	Fitter	Mr. Vallop Phimroom
12	Oiler	Mr. Plew Shodok
13	Oiler	Mr. Boontarin Wara-in
14	Cook	Mr. Saichol Kornnoom
15	Ship's boy	Mr. Somsak Pangkumhuk

SEAFDEC Researchers

No.	Position	Name
16	Chief/Scientist	Mr. Isara Chanrachkij
17	Researcher	Dr. Taweekiet Amornpiyakrit
18	Assist. Researcher/FG.	Mr. Narong Ruangsivakul
19	Assist. Researcher	Mr. Aussawin Buachuay
20	Special Trainee	Mr. Sayan Promjinda
21	Special Trainee/Audio Visual	Ms. Umaporn Paovana
22	Special Trainee	Ms. Kamolwan Pokaeo
23	Assist. Researcher	Ms. Sukanya Obromwan

3. Observation Summary

Oceanographic survey summary

This cruise, the oceanographic instrument consists of Thermo-Salinograph and Fluorometer (TSG), Integrated Conductivity Temperature Depth (ICTD), Larvae net, Bongo net and included Temperature and Depth Recorder. Additionally water transparency was measured by using Sechi disc and Forel scale. The detail of Oceanographic equipment is shown in table 1. The shortly activities summary of each instruments as follows:

Integrated Conductivity Temperature Depth (ICTD)

Fig. 1 Deploying of ICTD

Initially, the oceanographic data were planned to conducted by ICTD-SBE 900 plus which it can be measured conductivity, temperature, salinity, dissolved oxygen, pH, PAR and irradiances. Including, the water samples were collected by SBE 32 CAROUSEL to nutrients determinations using Auto Analyzer. Each station, it was collected at surface (10m.), 30m., 50m., 75m., 100m., 150m., 200m., 250m., 300m., 400m., and 500m, respectively. Then all of them were immediately filtered through 0.2 cm. of filter paper to eradicated of phytoplankton that effected to chlorophyll determination and freeze to analyze at laboratory/TD later.

Unfortunately, during the ICTD operation at st. no. 32, the accidence about a recording data that interrupted and terminated due to a malfunction of the device and the over-heated transformer. Therefore, only fifteen oceanographic stations (st. no. 1-14 and st. no. 32) were carried out using ICTD. The oceanographic data profile is shown in **Appendix I.**

For the rest oceanographic stations, the Niskin bottles were carried out to collected the water sample which it was attached with the line of oceanographic winch and vertically dip with winch speed 1 m/s to collected sea water at surface (10m.), 30m., 50m., 75m., 100m., 150m., 200m., 250m., 300m., and 400m, respectively. Temperature and Depth Recorder (TD), serial No. 231 also was attached with the line of oceanographic winch to collected both of down cast and up cast of temperature and depth data. The temperature profile is shown in **Appendix II.**

Ten oceanographic stations (st. no. 15, 16, 18-21, 27-29 and 32) were carried out using Niskin bottles. However, the samples could not be collected in eight stations (st. no. 17, 22-26, 30 and 31) because the sea condition was poor.

Fig. 2 Collected water sample by using Niskin bottle

Thermo-Salinograph and Fluorometer (TSG)

Thermo-Salinograph and Fluorometer (TSG), it was operated for 24 hrs while the vessel was sailing and far away from the shore for measuring temperature, salinity and fluorescence at sea surface. However, TSG could not be completely operation in this cruise. Because it had some trouble about unable to communicated within with TSG system.

Temperature and Depth Recorder (TD)

This cruise, TD was conducted to collect continuously temperature and depth data of two activities as follows:

Eleven stations (st. no. 15-16, 18-21, 27-31) of water sample collection by Niskin bottle, TD was attached with the line of oceanographic winch and vertically dip with winch speed 1 m/s to collected both of down cast and up cast of temperature and depth data. The temperature profile is shown in **Appendix II**.

Other, twelve stations of pelagic longline operations, TD was attached with the main line of pelagic longline to record continuously temperature data and depth every 2 min. of interval. The temperature profile is shown in **Appendix III**.

The oceanographic stations of TD operations is shown in Table 1.

Larvae net and Bongo net

1) Larvae net (Horizontal direction)

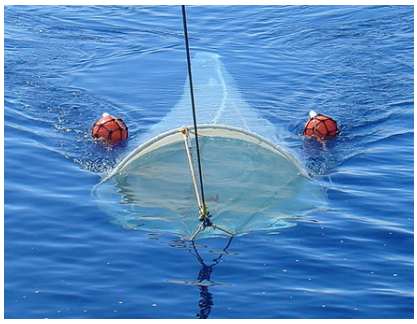


Fig. 3 Larvae net operation

Twenty-four of oceanographic stations, fish larvae were collected using 500 µm of mesh size attached to larvae frame. A flow meter s/no. 178 was attached at the frame to measure the amount of water filtered. Each station, the larvae net was horizontally tow for 30 minutes at se surface (2/3 of larvae net) while the vessel speed 2.0-2.5 knots. The samples were filtered through sieve 125 µm of mesh size and preserved in 10% formalin immediately. However, the larvae net was cancel at st. no. 15, 17, 22-27 because of poorly sea condition.

The oceanographic stations of larvae net operations is shown in Table 2.

2) Bongo net (Oblique direction)

Fig. 4 Bongo net operation

Bongo net was conducted to collected zooplankton and fish larvae. The zooplankton net have 300 µm of mesh size and a flow meter s/no. 2120, both were attached to bongo frame. The fish larvae net have 500 µm of mesh size and a flow meter s/no. 1991 which also attached to bongo frame. The both of flow meter were attached to measure the amount of water filtered.

Each station, the bongo net was oblique tow for 30 minutes while the vessel speed 1.5-2 knots at

the surface – 150 m. of sea depth depend on sea condition in each station. The samples were filtered through sieve 75 and 125 µm of mesh size for zooplankton and fish larvae, respectively and preserved in 10% formalin immediately.

However, the accidence during bongo net operation at st. no. 15 cause the flow meter s/no. 1991 was losing in the sea. Therefore, changing and reattached using a flow meter s/no. 1034 for the next stations.

Additionally, at st. no. 32 where the trial testing of bongo net using 500 µm of mesh size which it was carried out by Brunei Fisheries Department with both of fish larvae and zooplankton.

Totally, the bongo net was conducted in twenty-six oceanographic stations. However, the samples could not be collected at st. no. 17, 23-27 because of sea condition was very poor.

The oceanographic stations of bongo net operations is shown in Table 3.

Transparency

Eighteen oceanographic stations (st. no. 1-13, 18 and 29-32) were conducted by using the Sechi disc and Forel scale to measured the water transparency. However, at st. no. 14-17 and 19-28. There had cloudy and rain cause the water transparency were cancel.

The oceanographic stations of bongo net operations is shown in Table 1.

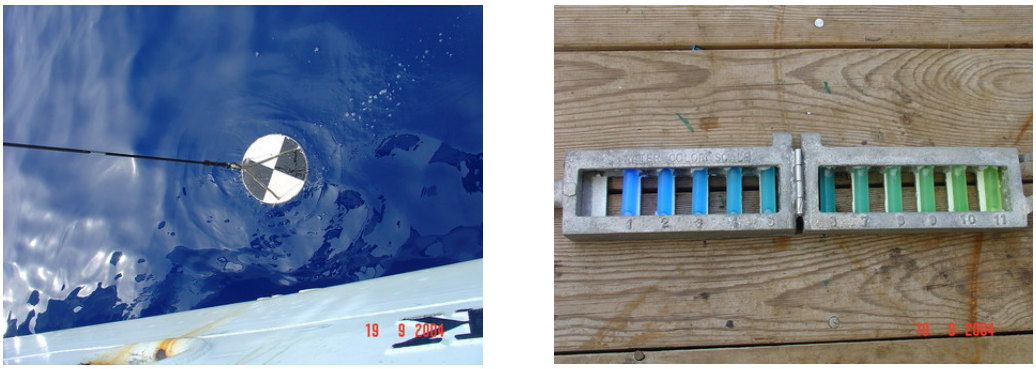


Fig. 5 Sechi disc and Forel scale

Table 1. Partial details of Oceanographic activities cruise no. 5-5/2004 (11 September - 15 October 2004) Brunei Darussalam

St. No.	Date	Time (Local)	Lat	Long	Oceanographic instruments				Transparancy		Bottom Depth(m)	Filename		Remark
					SBE CTD	TSG	TD	Bongo	Sechi disc (m)	Foral scale		SBE CTD	TD	
1	18-Sep-04	1523	05_36.42 N	114_14.48 E	✔	-	✔	✔	24.50	4	865	s2d0501brunei	PLL_st01_1,2	
2	19-Sep-04	0850	05_50.44 N	114_00.47 E	✔	-	-	✔	23.46	4	1250 *	s2d0502brunei		PLL01, SQJ01
3	19-Sep-04	1255	06_04.24 N	113_46.90 E	✔	-	✔	✔	18.65	4	1455*	s2d0503brunei	PLL_st02_1,2	
4	20-Sep-04	0930	06_18.85 N	113_32.39 E	✔	-	-	✔	16.18	4	1455*	s2d0504brunei		PLL02, SQJ02
5	20-Sep-04	1350	06_34.21 N	113_18.01 E	✔	-	✔	✔	17.93	4	2260*	s2d0505brunei	PLL_st03_1,2	
6	21-Sep-04	1003	06_48.22 N	113_04.51 E	✔	-	-	✔	16.22	4	1147*	s2d0506brunei		PLL03, SQJ03
7	21-Sep-04	1410	07_02.56 N	112_50.00 E	✔	-	✔	✔	12.56	3	1385*	s2d0507brunei	PLL_st04_1,2	
8	22-Sep-04	1010	07_14.25 N	112_38.43 E	✔	-	-	✔	28.07	3	1167*	s2d0508brunei		PLL04, SQJ04
9	22-Sep-04	1313	07_05.59 N	112_30.99 E	✔	-	✔	✔	25.58	2	1627*	s2d0509brunei	PLL_st05_1,2,3	
10	23-Sep-04	0936	06_52.92 N	112_43.08 E	✔	-	-	✔	24.94	2	1080*	s2d0510brunei		PLL05, SQJ05
11	23-Sep-04	1336	06_38.70 N	112_57.17 E	✔	-	✔	✔	26.31	3	1110*	s2d0511brunei	PLL_st06_1,2,3	
12	24-Sep-04	0940	06_24.60 N	113_11.17 E	✔	-	-	✔	27.35	2	1580*	s2d0512brunei		PLL06, SQJ06
13	24-Sep-04	1404	06_09.53 N	113_25.80 E	✔	-	✔	✔	12.14	2	2258*	s2d0513brunei	PLL_st07_1,2,3	
14	25-Sep-04	0940	05_55.96 N	113_39.22 E	✔	-	-	✔	-	-	2419*	s2d0514brunei		Weather cond : Dizzle (PLL07,SQJ07)
15	2-Oct-04	1510	05_41.47 N	113_53.55 E	-	-	✔	✔	-	-	2277*	-	nis_st.15 PLL_st11_1,2	Rain
16	2-Oct-04	0951	05_27.02 N	114_07.37 E	-	-	✔	✔	-	-	869	-	nis_st.16	Rain

Remark: * = Bottom depth from navigation map
- = No data recording

Table 1. Continued

St. No.	Date	Time (Local)	Lat	Long	Oceanographic instruments				Transparancy		Bottom Depth(m)	Filename		Remark
					SBE CTD	TSG	TD	Bongo	Sechi disc (m)	Foral scale		SBECTD	TD	
17	-	-	-	-	-	-	-	-	-	-	-	-	-	-
18	3-Oct-04	0913	05_32.64 N	113_45.99 E	-	-	✔	✔	17.24	2	2000*	-	nis_st.18	PLL11, SQJ11
19	3-Oct-04	1248	05_47.01 N	113_31.60 E	-	-	✔	✔	-	-	2368*	-	nis_st.19	Rain
20	4-Oct-04	0729	06_00.66 N	113_17.50 E	-	-	✔	✔	-	-	2258*	-	nis_st.20	PLL12, SQJ12
21	4-Oct-04	1138	06_15.26 N	113_03.46 E	-	-	✔	✔	-	-	1604*	-	nis_st.21	Rain
22	4-Oct-04	1520	06_29.24 N	112_49.02 E	-	-	✔	✔	-	-	1786*	-	PLL_st13_1	PLL13,SQJ13
23	-	-	-	-	-	-	-	-	-	-	-	-	-	cancel
24	-	-	-	-	-	-	-	-	-	-	-	-	-	
25	-	-	-	-	-	-	-	-	-	-	-	-	-	
26	-	-	-	-	-	-	-	-	-	-	-	-	-	
27	1-Oct-04	1530	06_20.29 N	112_41.66 E	-	-	✔	-	-	-	1146*	-	nis_st.27	Rain
28	1-Oct-04	0941	06_05.90 N	112_55.50 E	-	-	✔	✔	-	-	1114*	-	nis_st.28	Rain PLL10, SQJ10
29	30-Sep-04	1356	05_52.15 N	113_10.14 E	-	-	✔	✔	25.12	2	1225*	-	nis_st.29 PLL_st10_1,2	
30	30-Sep-04	0948	05_38.00 N	113_24.40 E	-	-	✔	✔	19.78	2	2248*	-	nis_st.30	PLL09, SQJ09
31	29-Sep-04	1252	05_23.91 N	113_38.29 E	-	-	✔	✔	34.47	3	1786*	-	nis_st.31 PLL_st09_1,2	
32	28-Sep-04	0857	05_09.56 N	113_52.30 E	✔	-	✔	✔	23.77	2	400	s2d0532brunei	PLL_st08_1,2	PLL08, SQJ08

Remark: * = Bottom depth from navigation map
- = No data recording

Table 2. Larvae net: Horizontal direction

St. No.	Date	Start			Finish			Towing speed (knots)	Bottom Depth (m)	No. at flow meter Fish larvae (s/No.178)	Remark
		Time (Brunei)	Latitude	Longitude	Time (Brunei)	Latitude	Longitude				
1	18-Sep-04	1803	05_35.31 N	114_14.56 E	1833	05_35.16 N	114_14.45 E	2.5	865	8,125	
2	19-Sep-04	0941	05_50.06 N	114_00.11 E	1014	05_49.89 N	114_00.04 E	2.5	1250*	10,885	
3	19-Sep-04	1410	06_03.81 N	113_45.68 E	1440	06_03.78 N	113_45.09 E	2.5	1455*	14,072	
4	20-Sep-04	1055	06_19.28 N	113_31.36 E	1127	06_19.53 N	113_31.09 E	2.5	1455*	11,660	
5	20-Sep-04	1514	06_34.84 N	113_17.42 E	1545	06_34.96 N	113_17.13 E	2.5	2260*	10,675	
6	21-Sep-04	1125	06_48.03 N	113_04.08 E	1125	06_48.07 N	113_03.86 E	2.5	1147*	10,410	
7	21-Sep-04	1530	07_02.70 N	112_49.63 E	1559	07_02.83 N	112_49.46 E	2.5	1385*	16,438	
8	22-Sep-04	1127	07_14.46 N	112_37.69 E	1156	07_14.56 N	112_37.38 E	2.5	1167*	8,650	
9	22-Sep-04	1431	07_06.06 N	112_30.06 E	1501	07_06.12 N	112_29.87 E	2.5	1627*	6,740	
10	23-Sep-04	1054	06_53.56 N	112_42.82 E	1124	06_53.90 N	112_42.84 E	2.5	1080*	8,870	
11	23-Sep-04	1505	06_39.82 N	112_57.15 E	1535	06_40.30 N	112_57.10 E	2.5	1110*	8,918	
12	24-Sep-04	1059	06_24.13 N	113_11.82 E	1129	06_24.07 N	113_12.03 E	2.5	1580*	9,530	
13	24-Sep-04	1521	06_09.54 N	113_26.18 E	1552	06_09.49 N	113_26.45 E	2.5	2258*	12,140	
14	25-Sep-04	1054	05_55.59 N	113_39.73 E	1124	05_55.41 N	113_40.02 E	2.5	2419*	9,278	
15	2-Oct-04	1545	05_41.38 N	113_53.94 E	-	-	-	2.5	2277*	-	cancel
16	2-Oct-04	1028	05_27.47 N	114_07.66 E	1058	05_27.74 N	114_08.02 E	2.5	869	8,610	

Remark: * = Bottom depth from navigation map
- = No data recording

Table 2. Continued

St. No.	Date	Start			Finish			Towing speed (knots)	Bottom Depth (m)	No. at flow meter Fish larvae (s/No.178)	Remark
		Time (Brunei)	Latitude	Longitude	Time (Brunei)	Latitude	Longitude				
17	-	-	-	-	-	-	-	-	-	-	cancel
18	3-Oct-04	0950	05_32.58 N	113_46.15 E	1021	05_32.27 N	113_46.43 E	2.5	2000*	8,152	
19	3-Oct-04	1327	05_46.92 N	113_31.65 E	1359	05_47.09 N	113_31.71 E	2.5	2368*	9,392	
20	4-Oct-04	0808	06_00.62 N	113_17.69 E	0838	06_00.58 N	113_17.84 E	2.5	2258*	8,800	
21	4-Oct-04	1214	06_15.28 N	113_03.71 E	1244	06_15.39 N	113_04.03 E	2.5	1604*	8,752	
22	-	-	-	-	-	-	-	-	-	-	cancel
23	-	-	-	-	-	-	-	-	-	-	
24	-	-	-	-	-	-	-	-	-	-	
25	-	-	-	-	-	-	-	-	-	-	
26	-	-	-	-	-	-	-	-	-	-	
27	-	-	-	-	-	-	-	-	-	-	
28	1-Oct-04	1023	06_05.75 N	112_56.01 E	1047	06_05.80 N	112_56.36 E	2.5	1114*	8,260	
29	30-Sep-04	1441	05_52.64 N	113_10.45 E	1512	05_52.85 N	113_10.46 E	2.5	1225*	10,868	
30	30-Sep-04	1028	05_38.08 N	113_24.42 E	1058	05_38.26 N	113_24.16 E	2.5	2248*	9,525	
31	29-Sep-04	1310	05_24.05 N	113_38.30 E	1339	05_24.32 N	113_38.50 E	2.5	1786*	9,464	
32	29-Sep-04	1010	05_10.05 N	113_52.77 E	1045	05_10.61 N	113_53.15 E	2.5	400	9,150	

Remark: * = Bottom depth from navigation map
- = No data recording

Table 3. Bongo net: Oblique direction

St. No.	Date	Start			Finish			Towing depth (m)	Towing speed (knots)	Bottom Depth (m)	No. at flow meter		Remark
		Time (Brunei)	Latitude	Longitude	Time (Brunei)	Latitude	Longitude				Fish larvae (s/No.1991)	Zooplankton (s/No.2120)	
1	18-Sep-04	1724	05_35.65 N	114_14.80 E	1759	05_35.28 N	114_14.64 E	0-150	2	865	11,400	11,820	
2	19-Sep-04	1020	05_49.76 N	114_00.07 E	1050	05_49.82 N	113_59.65 E	0-150	2	1250*	11,610	13,058	
3	19-Sep-04	1333	06_04.09 N	113_46.30 E	1403	06_03.87 N	113_45.80 E	0-107	2	1455*	12,890	14,440	
4	20-Sep-04	1020	06_19.03 N	113_31.76 E	1051	06_19.17 N	113_31.45 E	0-110	2	1455*	12,320	11,640	
5	20-Sep-04	1437	06_34.48 N	113_17.7 E	1512	06_34.86 N	113_17.44 E	0-125	2	2260*	9,238	11,060	
6	21-Sep-04	1050	06_48.09 N	113_04.25 E	1120	06_48.16 N	113_04.03 E	0-145	2	1147*	11,138	11,942	
7	21-Sep-04	1455	07_02.63 N	112_49.77 E	1525	07_02.66 N	112_49.58 E	0-135	2	1385*	11,154	11,714	
8	22-Sep-04	1051	07_14.10 N	112_38.07 E	1122	07_14.39 N	112_37.60 E	0-155	2	1167*	13,650	12,530	
9	22-Sep-04	1356	07_05.76 N	112_30.56 E	1427	07_05.96 N	112_30.06 E	0-135	2	1627*	10,972	11,172	
10	23-Sep-04	1017	06_53.12 N	112_42.95 E	1049	06_53.54 N	112_42.88 E	0-142	2	1080*	10,820	11,228	
11	23-Sep-04	1416	06_39.19 N	112_57.24 E	1451	06_39.56 N	112_57.21 E	0-135	2	1110*	12,884	12,590	
12	24-Sep-04	1023	06_24.32 N	113_11.46 E	1054	06_24.21 N	113_11.66 E	0-151	2	1580*	10,678	10,604	
13	24-Sep-04	1446	06_09.65 N	113_25.93 E	1516	06_09.48 N	113_26.15 E	0-125	2	2258*	12,328	11,832	
14	25-Sep-04	1019	05_55.88 N	113_39.41 E	1049	05_55.70 N	113_39.64 E	0-140	1.5	2419*	12,590	15,532	
15	2-Oct-04	1511	05_41.44 N	113_53.55 E	1541	05_41.37 N	113_53.89 E	0-155	2	2277*	13,392	8,730	
16	2-Oct-04	0954	05_26.08 N	114_07.34 E	1024	05_27.40 N	114_07.64 E	0-135	2	869	11,190	15,650	

Remark: * = Bottom depth from navigation map
- = No data recording

Table 3. Continued

St. No.	Date	Start			Finish			Towing depth (m)	Towing speed (knots)	Bottom Depth (m)	No. at flow meter		Remark
		Time (Brunei)	Latitude	Longitude	Time (Brunei)	Latitude	Longitude				Fish larvae (s/No.1991)	Zooplankton (s/No.2120)	
17	-	-	-	-	-	-	-	-	-	-	-	-	cancel
18	3-Oct-04	0915	05_32.61 N	113_46.03 E	0945	05_32.65 N	113_46.18 E	0-155	2	2000*	11,130	14,110	
19	3-Oct-04	1251	05_47.04 N	113_31.56 E	1321	05_46.90 N	113_31.62 E	0-122	2	2368*	14,389	8,640	St.16,18,19,20,21,22
20	4-Oct-04	0734	06_00.63 N	113_17.47 E	0804	06_00.63 N	113_17.67 E	0-140	2	2,258	10,980	4,405	Fish Larvae = S/No.2120
21	4-Oct-04	1139	06_15.25 N	113_03.50 E	1210	06_15.27 N	113_03.72 E	0-148	2	1604*	10,860	3,100	Zooplankton = S/No.1034
22	4-Oct-04	1528	06_29.46 N	112_49.05 E	1559	06_29.81 N	112_49.37 E	0-140	2	1786*	11,260	6,650	
23	-	-	-	-	-	-	-	-	-	-	-	-	cancel
24	-	-	-	-	-	-	-	-	-	-	-	-	
25	-		-	-	-	-	-	-	-	-	-	-	
26	-	-	-	-	-	-	-	-	-	-	-	-	
27	-	-	-	-	-	-	-	-	-	-	-	-	
28	1-Oct-04	0941	06_05.92 N	112_55.55 E	1018	06_05.72 N	112_56.01 E	0-115	2	1114*	12,792	12,234	
29	30-Sep-04	1402	05_52.10 N	113_10.15 E	1432	05_52.32 N	113_10.16 E	0-102	2	1225*	13,295	15,932	
30	30-Sep-04	0952	05_38.03 N	113_24.51 E	1022	05_38.21 N	113_24.42 E	0-132	2	2248*	13,018	14,758	
31	29-Sep-04	1347	05_24.36 N	113_38.57 E	1418	05_24.64 N	113_38.66 E	0-130	2	1786*	11,958	13,098	
32	29-Sep-04	0928	05_09.81 N	113_52.51 E	1005	05_10.08 N	113_52.82 E	0-150	2	400	12,245	12,535	mesh size=500μm.

Remark: * = Bottom depth from navigation map
- = No data recording

Hydro-Acoustic survey summary

The Scientific Echo Sounder (Model FQ-80)

The pelagic marine resources survey in the Brunei Darussalam Waters has been carried out in collaboration with the Brunei Darussalam fisheries officers (Marine Resource Research and Development Section, MRMD Division, Fisheries Department) by M.V. SEAFDEC 2 during September 18 to October 2, 2004.

The survey was conducted by various kinds of fishing gears namely; Pelagic longline and Automatic squid jigging machine, Oceanographic equipments namely; ICTD and TD and Hydro-acoustic method by using a scientific echo sounder model FQ-80.

The FQ-80 was operated during the period of September 18-25 (Cruise 1, Fig. 1[6]) and September 28 to October 2 (Cruise 2, Fig. 2[7]), 2004. The first cruise has been successfully made for 15 tracks (16 stations) due to calm sea conditions with the maximum survey speed of 10 knots. However, for the second cruise, since weather condition was extremely severe and an announcement from the Marine Department of Brunei not to enter the restricted area (for an exercise of missile firing) during October 5-6, the survey has not been successfully made. There were only 12 survey tracks were made and remained 5 tracks un-surveyed (stations 22 to 27). The maximum survey speed was only 6 knots.

The echo views, area of the operations and the SV values (the strength of the returning pulse) along the survey track are shown as images respectively on each page of the report in Microsoft Word Document format. While the SV values can be found in the GIS folders which contain the SV values in Microsoft Excel format. All of the recorded data and pre-analyzed results are compiled and saved in the CD ROMs.

Problems, suggestions and notes

1) Most of the echo views obtained in the first cruise which have been aggregate-calculated by the analyzer unit show continued results without any interference caused by waves or air bubbles (shown by the black vertical lines) due to calm sea condition and weather. The maximum survey speed could reach up to 10 knots. However, for the second cruise, interruptions caused by the waves, air bubbles and ship pitching can be mostly observed on the echo views. This can further affect the internal errors on the data analysis.

2) Since the ship's speed can affect the quality of the results, therefore, an optimal survey speed is suggested at around 8 knots or not excessive than 10 knots for a calm sea condition. Nevertheless, unwanted conditions such as a rough sea condition or time limitation may occur, time allocation is required. This information is useful for the next survey plan to determine the ship's speed and the distance between the stations.

3) The obtained SV values (also for SV values) do not particularly represent the biomass assessment results. They only show the strength of the returning pulse. Therefore, further analysis to elaborate is necessary and a fish sampling (or other kinds of the targets) in the survey area must be made to confirm the findings.

4) Please note that the obtained data may not be able to open properly or executed due to some software requirements and a copyright made by the Furuno Co., Ltd. This may require a particular device to activate the program.

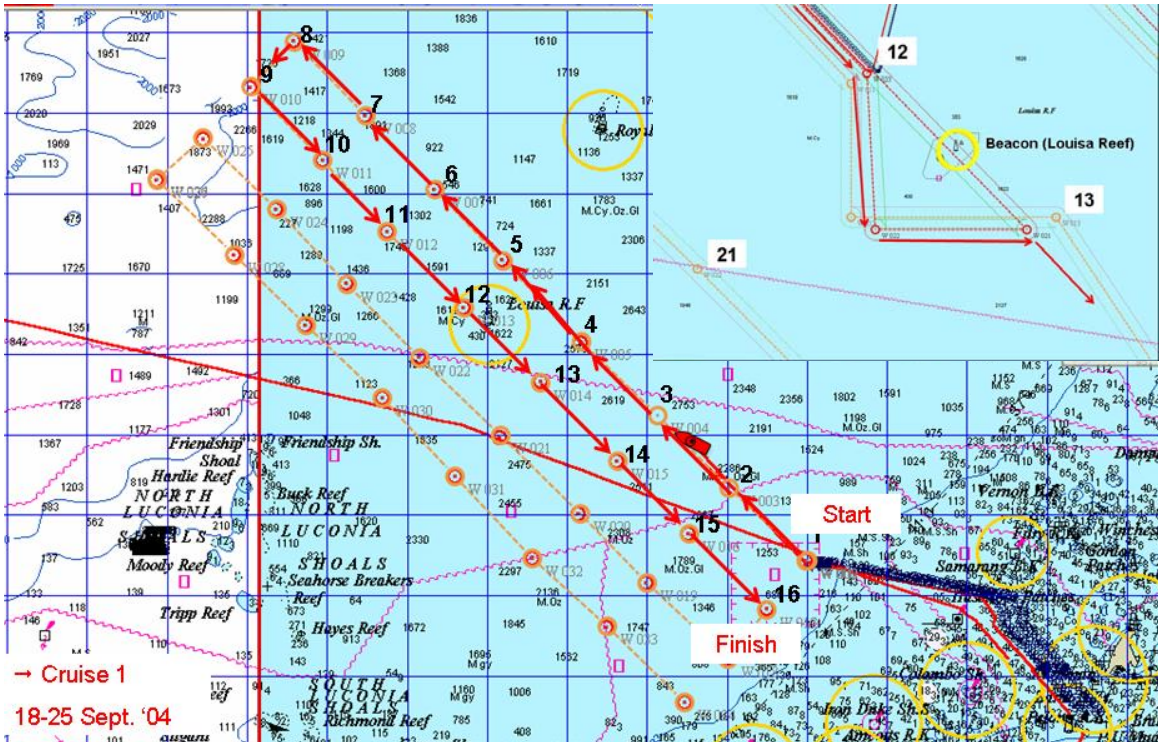


Fig. 6 A chart showing the survey tracks for the hydro-acoustic survey (Scientific Echo Sounder model FQ-80) Off Brunei Darussalam Waters by M.V. SEAFDEC 2 during September 18-25, 2004 (Cruise 1 of 2). The bold numbers and red arrows indicate the stations and the survey tracks respectively (16 stations and 15 tracks in total). A zigzag track was made from station 12 to station 13 (See inset) to avoid a reef area marked by the yellow circle. The tracks were plotted by MaxSea Marine Software, v. 10.3.1.10, MaxSea Inc. USA.

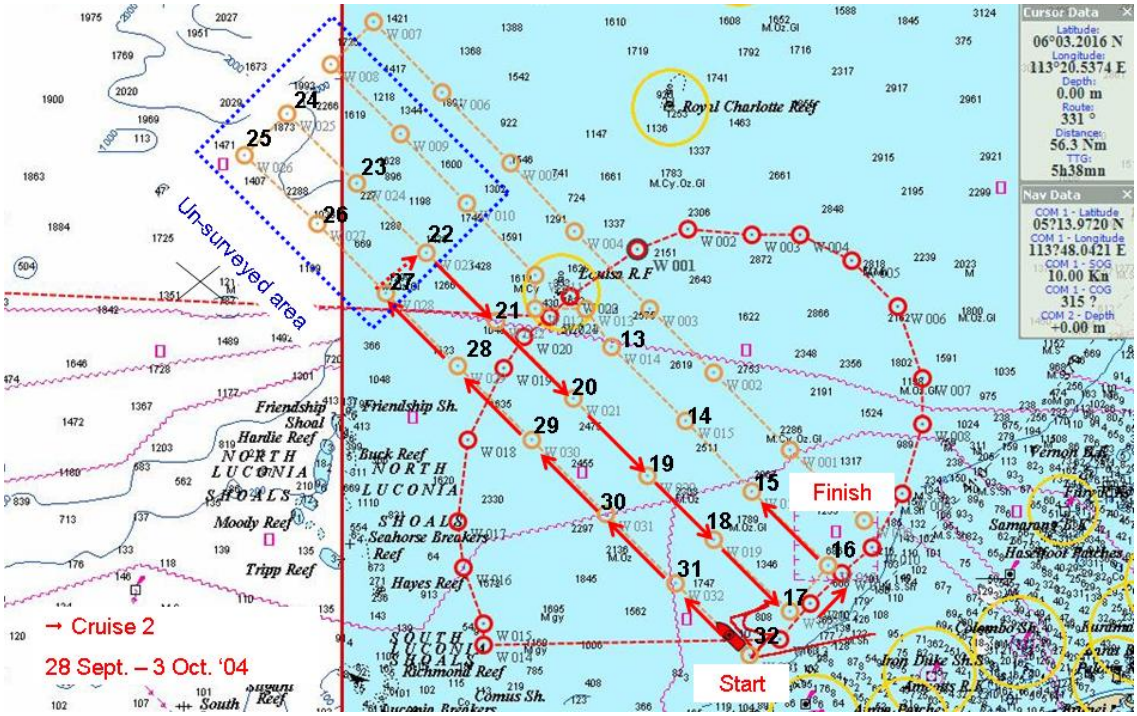


Fig. 7 A chart showing the survey tracks (made in reverse order) for the hydro-acoustic survey Off Brunei Darussalam Waters by M.V. SEAFDEC 2 during September 28 to October 2, 2004 (Cruise 2 of 2). The bold numbers and red arrows indicate the stations and the survey tracks respectively (14 stations and 12 tracks in total). A semi-circle indicates the restricted area announced by the Department of Marine, Brunei Darussalam for an exercise of the missile firing during October 5-6, 2004. The un-surveyed area is marked by the dotted rectangular due to the severe sea conditions.

Fishing survey summary

In this survey, fish sampling survey had used 2 kinds of fishing gear were Pelagic Longline and the Automatic-squidjig fishing.

Pelagic Longline

This survey was operated pelagic longline 13 stations. The maximum catch was 7 pieces about 84.94 kg. at operation no. 4 (station no. 8). The partial detail of pelagic longline survey is shown in Table 4.

Fig. 8 Pelagic longline operation: shooting

Automatic-squidjig fishing

This survey was operated Automatic-squidjig 13 stations. The maximum catch was 25 pieces about 8.145 kg. at operation no. 5 (station no. 10). The partial detail of automatic-squidjig survey is shown in Table 5.

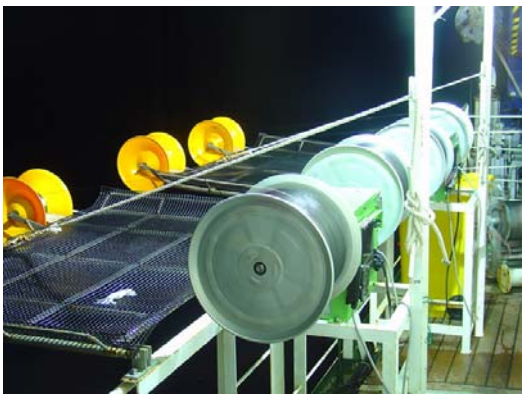


Fig. 9 Squid jigging operation

Fig. 10 Purpleback flying squid

Table 4. Partial details of Pelagic longline fishing survey activities cruise no. 5-5/2004 (11 September - 15 October 2004) Brunei Darussalam

Survey Station No.	Operation No.		Shooting		Hauling		No. of hooks/ basket	Total hook number	Immersion Time	Depth of hook (m)	Total catch	
			Start	Finish	Start	Finish					No. (pcs.)	Weight (kg)
2	1	Date	18/9/2004	18/9/2004	19/9/2004	19/9/2004	12	520	9 hrs 26 min	60-120	1	Lost during hauling up
		Time	2052	2240	0555	0830						
		Latitude	05°50'.8 N	05°58'.7 N	05°58'.2 N	05°50'.8 N						
		Longitude	114°00'.1 E	113°53'.3 E	113°53'.9 E	113°59'.7 E						
4	2	Date	19/9/2004	19/9/2004	20/9/2004	20/9/2004	6&13	508	12 hrs 46 min	50-70	4	20.30
		Time	1752	2004	0602	0920						
		Latitude	06°18'.7 N	06°06'.4 N	06°07'.6N	06°18'.6 N						
		Longitude	113°32'.2 E	113°30'.1 E	113°29'.6 E	113°32'.1 E						
6	3	Date	20/9/2004	20/9/2004	21/9/2004	21/9/2004	10	505	12 hrs 34 min	70-120	6	22.30
		Time	1802	2001	0555	0913						
		Latitude	06°48'.4 N	06°42'.2 N	06°50'.9 N	06°46'.4 N						
		Longitude	113°04.2 E	112°54'.1 E	113°03'.9 E	112°55'.7 E						
8	4	Date	21/9/2004	21/9/2004	22/9/2004	22/9/2004	10	502	11 hrs 53 min	125	7	84.94
		Time	1802	1951	0555	0857						
		Latitude	07°14'.4 N	07°25'.5 N	07°18'.2 N	07°26'.62 N						
		Longitude	112°38.2 E	112°41'.8 E	112°32'.7 E	112°35'.36 E						
10	5	Date	22/9/2004	22/9/2004	23/9/2004	23/9/2004	14	500	12 hrs 13 min	80-120	5	7.70
		Time	1747	1934	0600	0845						
		Latitude	06°53'.3 N	06°44'.3 N	06°47'.4 N	06°58'.5 N						
		Longitude	112°42.04 E	112°35.34 E	112°37'.6 E	112°38'.6 E						
12	6	Date	23/9/2004	23/9/2004	24/9/2004	24/9/2004	8	500	12 hrs 41 min	50-120	1	2.60
		Time	1802	1956	0603	0920						
		Latitude	06°24'.5 N	06°36'.8 N	06°37'.1 N	06°27'.1 N						
		Longitude	113°10.8 E	113°14.2 E	113°14'.6 E	113°12'.3 E						

Table 4. cont.

Survey Station No.	Operation No.		Shooting		Hauling		No. of hooks/ basket	Total hook number	Immersion Time	Depth of hook (m)	Total catch	
			Start	Finish	Start	Finish					No. (pcs.)	Weight (kg)
14	7	Date	24/9/2004	24/9/2004	25/9/2004	25/9/2004	11	452	12 hrs 35 min	60-80	3	56.70
		Time	1808	1956	0610	0904						
		Latitude	05_55.8 N	05_44.5 N	05_43.9 N	05_52.2 N						
		Longitude	113_39.2 E	113_39.0 E	113_39.1 E	113_38.9 E						
32	8	Date	28/9/2004	28/9/2004	29/9/2004	29/9/2004	11	398	11 hrs 4 min	90-100	4	2.98
		Time	1904	2046	0600	0818						
		Latitude	05°09'.9 N	05°17'.0 N	05°17'.8 N	05°14'.2 N						
		Longitude	113°53'.4 E	113°48'.2 E	113°51'.1 E	113°56'.2 E						
30	9	Date	29/9/2004	29/9/2004	30/9/2004	30/9/2004	11	452	12 hrs 5 min	85-100	3	6.80
		Time	1802	1929	0607	0854						
		Latitude	05°38'.0 N	05°37'.3 N	05°37'.2 N	05°37'.0 N						
		Longitude	113°24'.1 E	113°34'.8 E	113°25'.0 E	113°33'.9 E						
28	10	Date	30/9/2004	30/9/2004	1/10/2004	1/10/2004	10	477	12 hrs 14 min	90-140	5	14.80
		Time	1758	1950	0614	0906						
		Latitude	06°06'.2 N	06°06'.0 N	06°06'.2 N	06°07'.8 N						
		Longitude	112°55'.8 E	113°07'.0 E	113°07'.5 E	112°58'.4 E						
18	11	Date	2/10/2004	2/10/2004	3/10/2004	3/10/2004	9	497	12hrs 5 min	90-140	6	23.10
		Time	1805	2007	0600	0830						
		Latitude	05°34'.6 N	05° 46'.1 N	05°45'.6 N	05°36'.9 N						
		Longitude	113°47'.4 E	113°50'.0 E	113°52'.4 E	113°51'.8 E						
20	12	Date	3/10/2004	3/10/2004	4/10/2004	4/10/2004	9	45	12 hrs 30 min	Line shooter was trouble and stop operation	1	2.10
		Time	1800	1836	0630	0657						
		Latitude	06°01'.1 N	06°02'.4 N	06°05'.0 N	06°05'.1 N						
		Longitude	113°17'.9 E	113°19'.3 E	113°17'.6 E	113°17'.4 E						
22	13	Date	4/10/2004	4/10/2004	5/10/2004	5/10/2004	9	300	12 hrs 38 min	-	9	28.30
		Time	1808	1946	0630	0820						
		Latitude	06°29'.6 N	06°32'.7 N	06°35'.3 N	06°32'.8 N						
		Longitude	112°49'.2 E	112°41'.9 E	112°47'.5 E	112°54'.9 E						

Table 5. Partial details of Automatic-squidjig fishing survey activities cruise no. 5-5/2004 (11 September - 15 October 2004) Brunei Darussalam

Station No.	Operation No.		Luring		Jigging		Total no. of Jig	Total jigging time	Total catch	
			Start	Finish	Start	Finish			No. (pcs.)	Weight (kg)
2	1	Date	18/9/2004	19/9/2004	18/9/2004	19/9/2004	80	1 hr 30 min	2	0.115
		Time	2305	0035	2330	0035				
		Latitude			05°58'.2 N	05°56'.0 N				
		Longitude			113°53'.0 E	113°52'.0 E				
4	2	Date	19/9/2004	20/9/2004	19/9/2004	20/9/2004	40	3 hrs 5 min	2	0.280
		Time	2007	0015	2110	0015				
		Latitude			06°05'.8 N	06°05'.0 N				
		Longitude			113°29'.1 E	113°25'.0 E				
6	3	Date	20/9/2004	20/9/2004	20/9/2004	20/9/2004	80	2 hrs	6	0.942
		Time	2055	2353	2154	2353				
		Latitude			06°48'.0 N	06°48'.2 N				
		Longitude			113°00'.4 E	112°59'.4 E				
8	4	Date	21/9/2004	22/9/2004	21/9/2004	22/9/2004	80	2 hrs	11	1.050
		Time	2100	0000	2158	0000				
		Latitude			07°15'.1 N	07°15'.2 N				
		Longitude			112°35'.9 E	112°33'.6 E				
10	5	Date	22/9/2004	23/9/2004	22/9/2004	23/9/2004	80	3 hrs 25 min	25	8.145
		Time	1935	0000	2035	0000				
		Latitude			06°44'.4 N	06°44'.8 N				
		Longitude			112°35'.5 E	112°37'.0 E				
12	6	Date	23/9/2004	24/9/2004	23/9/2004	24/9/2004	80	3 hrs 15 min	1	0.360
		Time	2001	0015	2100	0015				
		Latitude			06°37'.1 N	06°36'.9 N				
		Longitude			113°14'.6 E	113°14'.5 E				

Table 5. cont.

Station No.	Operation No.		Luring		Jigging		Total no. of Jig	Total jigging time	Total catch	
			Start	Finish	Start	Finish			No. (pcs.)	Weight (kg)
14	7	Date	24/9/2004	25/9/2004	24/9/2004	25/9/2004	80	3 hrs	12	2.660
		Time	1959	0000	2100	0000				
		Latitude			05°43'.5 N	05°43'.0 N				
		Longitude			113°39'.6 E	113°39'.0 E				
32	8	Date	28/9/2004	29/9/2004	28/9/2004	29/9/2004	80	2 hrs 10 min	3	0.190
		Time	2050	0000	2150	0000				
		Latitude			05°17'.6 N	05°18'.3 N				
		Longitude			113°49'.5 E	113°51'.7 E				
30	9	Date	29/9/2004	30/9/2004	29/9/2004	30/9/2004	80	3 hrs	2	0.260
		Time	1939	0000	2055	0000				
		Latitude			05°36'.6 N	05°35'.0 N				
		Longitude			113°34'.8 E	113°35'.0 E				
28	10	Date	30/9/2004	1/10/2004	30/9/2004	1/10/2004	80	3 hrs	7	0.360
		Time	2000	0000	2100	0000				
		Latitude			06°06'.4 N	06°06'.5 N				
		Longitude			113°07'.5 E	113°07'.7 E				
18	11	Date	2/10/2004	3/10/2004	2/10/2004	3/10/2004	80	2 hrs 50 min	6	1.170
		Time	2010	0000	2110	0000				
		Latitude			05°46'.2 N	05°46'.3 N				
		Longitude			113°51'.5 E	113°54'.4 E				
20	12	Date	3/10/2004	4/10/2004	3/10/2004	4/10/2004	100	4 hrs 20 min	5	0.310
		Time	1900	0000	1940	0000				
		Latitude			06°02'.8 N	06°03'.4 N				
		Longitude			113°19'.9 E	113°20'.4 E				
22	13	Date	4/10/2004	4/10/2004	4/10/2004	4/10/2004	70	2 hrs	2	0.400
		Time	2000	2300	2100	2300				
		Latitude			06°32'.8 N	06°34'.7 N				
		Longitude			112°50'.0 E	112°45'.0 E				

Fig. 11 Cruise track map of cruise no. 5-5/2004 (11 September - 15 October 2004) Brunei Darussalam

Fig. 12 Cruise track map of cruise no. 5-5/2004 (11 September - 15 October 2004) Brunei Darussalam: survey area

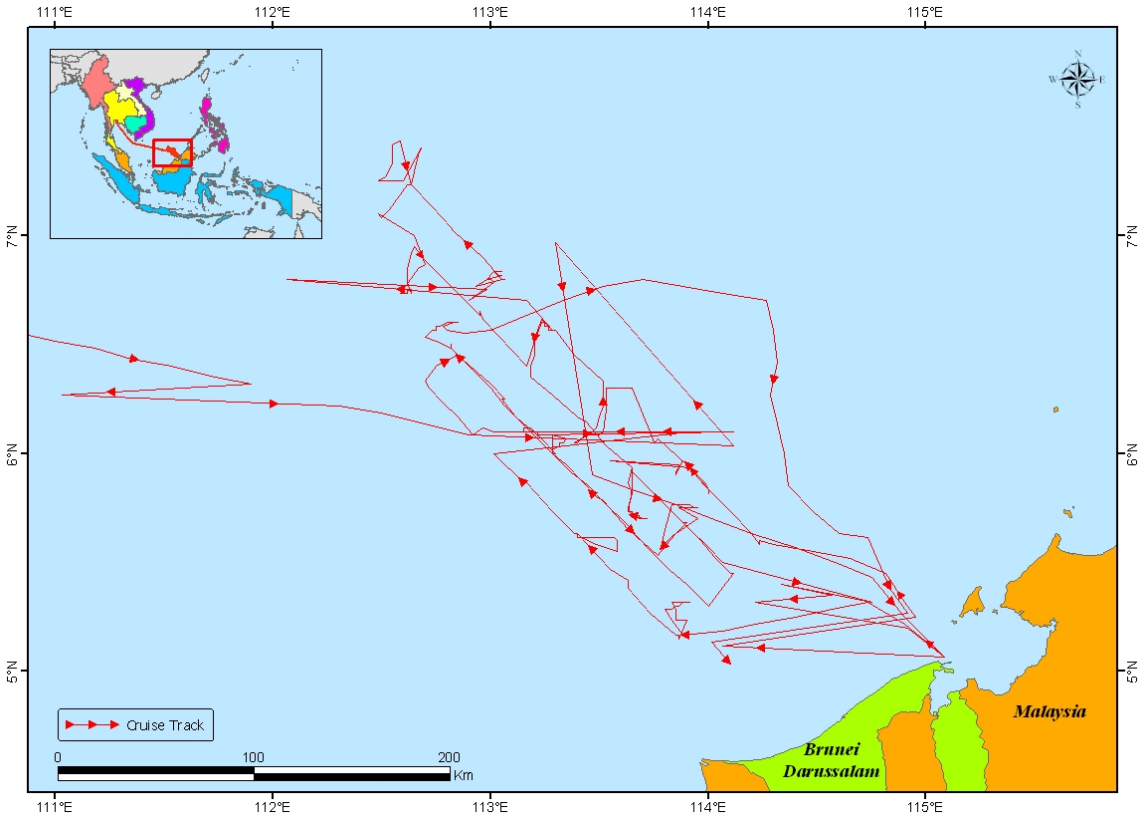


Fig. 13 Oceanographic survey stations of cruise no. 5-5/2004 (11 September - 15 October 2004) Brunei Darussalam

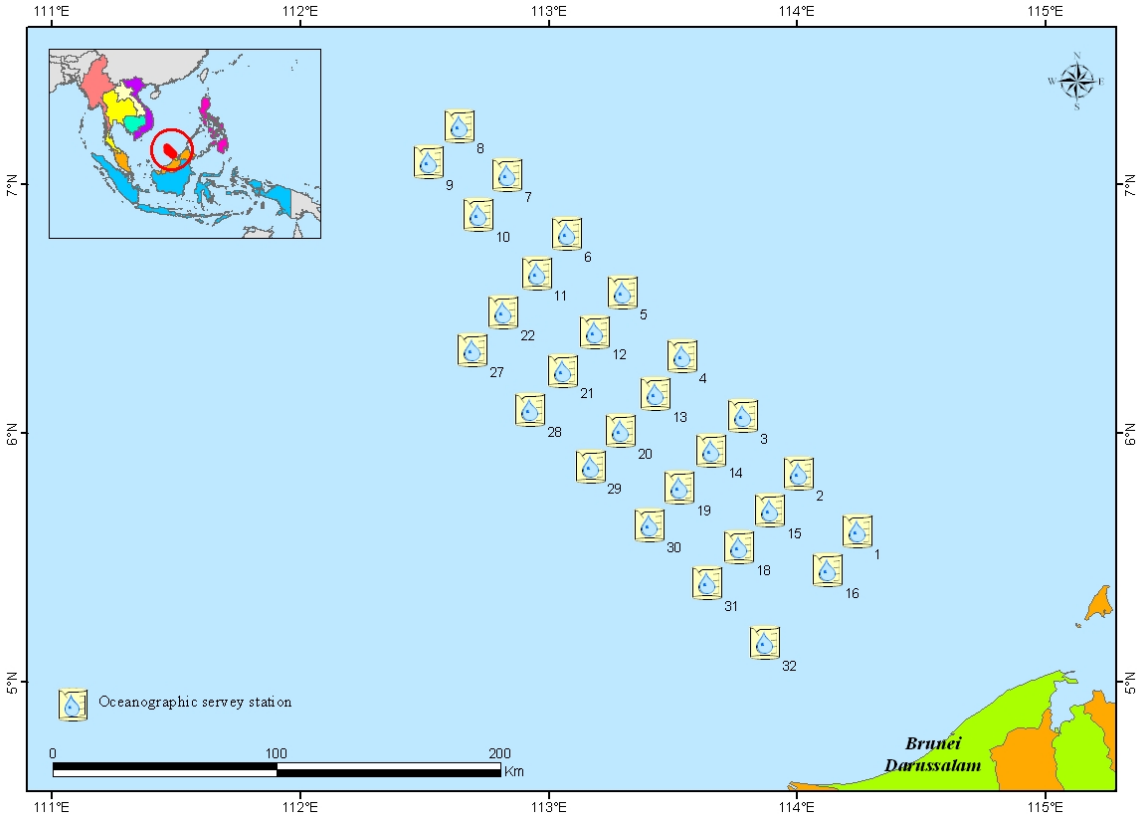


Fig. 14 Larvae net survey stations of cruise no. 5-5/2004 (11 September - 15 October 2004) Brunei Darussalam

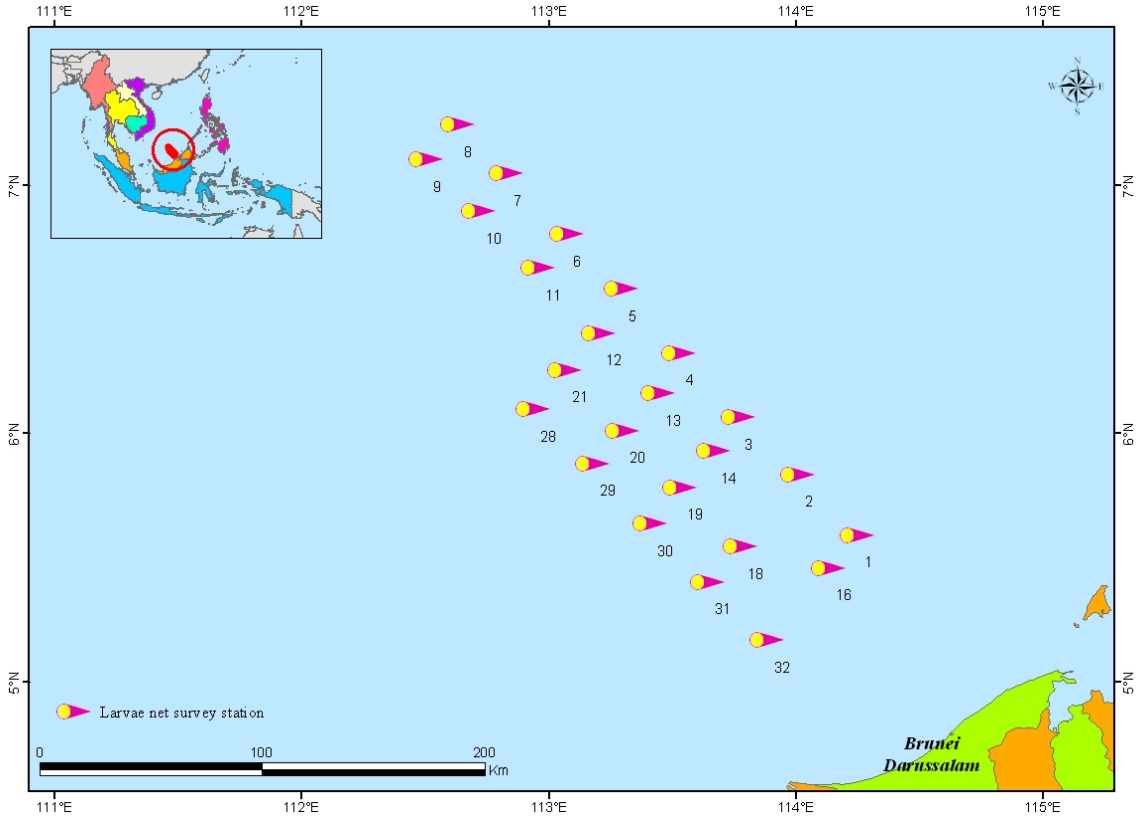


Fig. 15 Bongo net survey stations of cruise no. 5-5/2004 (11 September - 15 October 2004) Brunei Darussalam

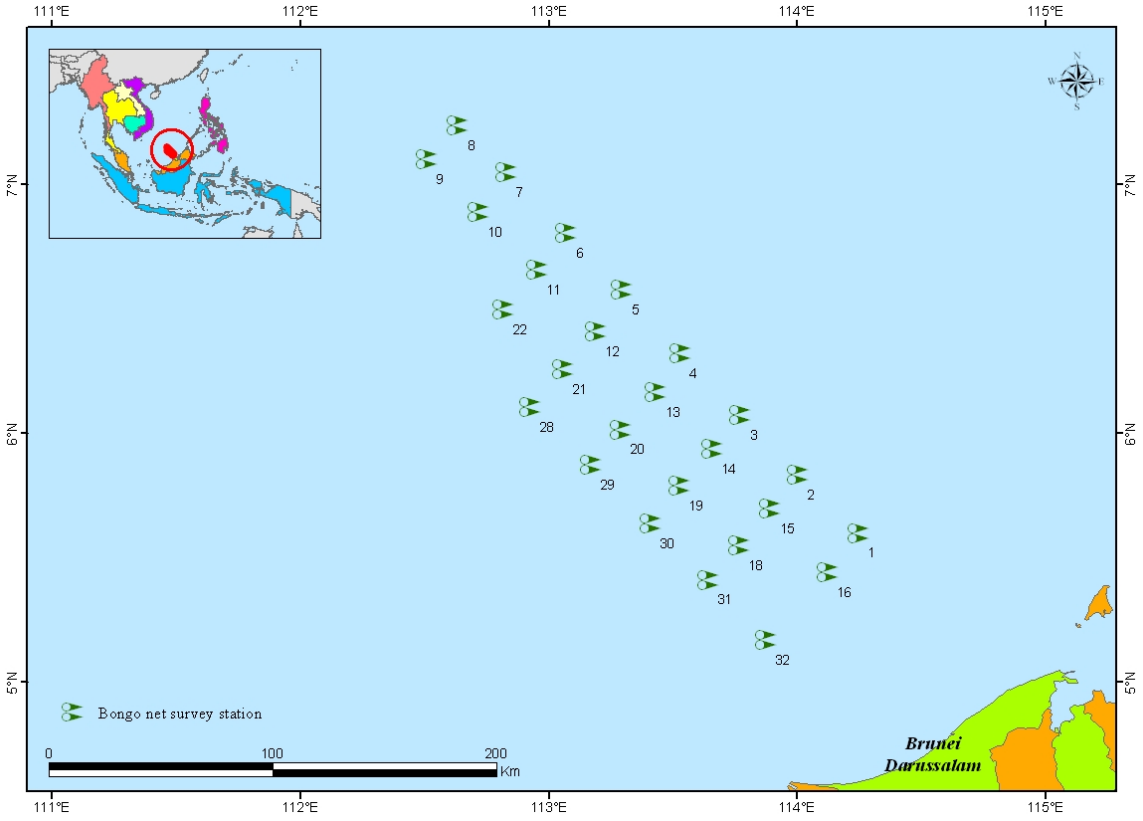


Fig. 16 Pelagic longline survey stations of cruise no. 5-5/2004 (11 September - 15 October 2004) Brunei Darussalam

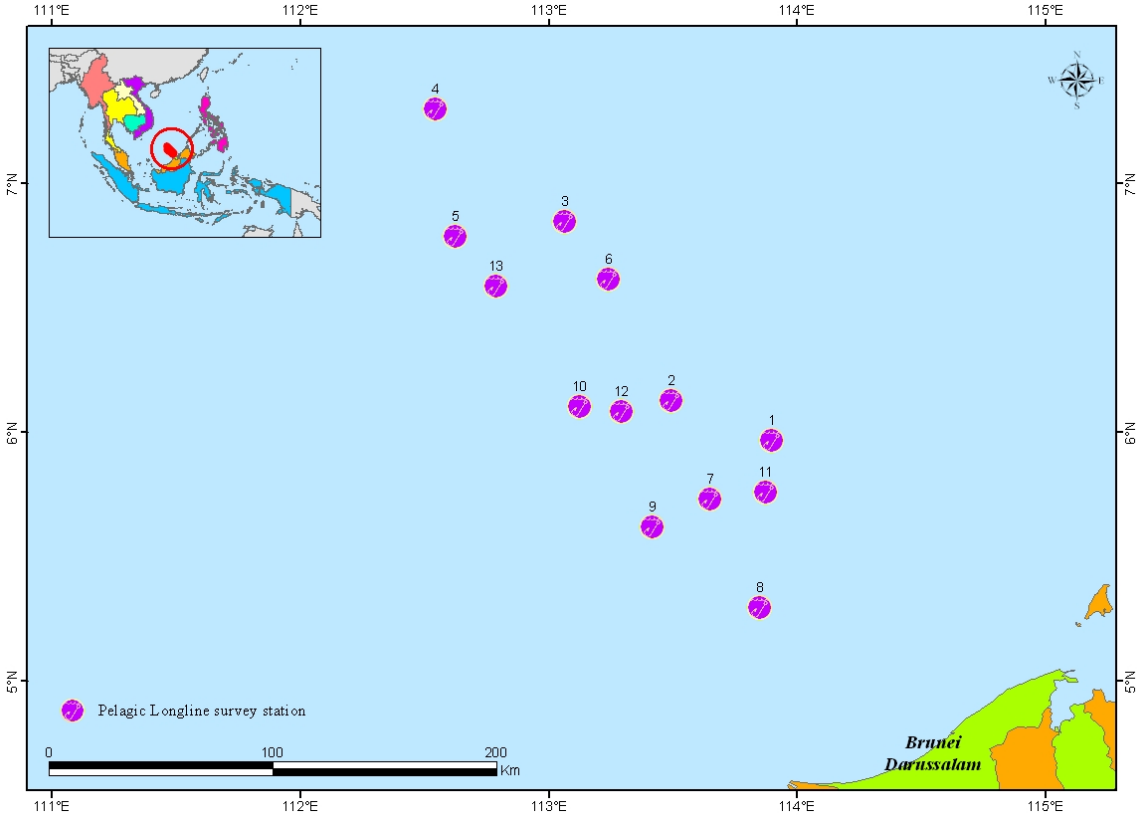
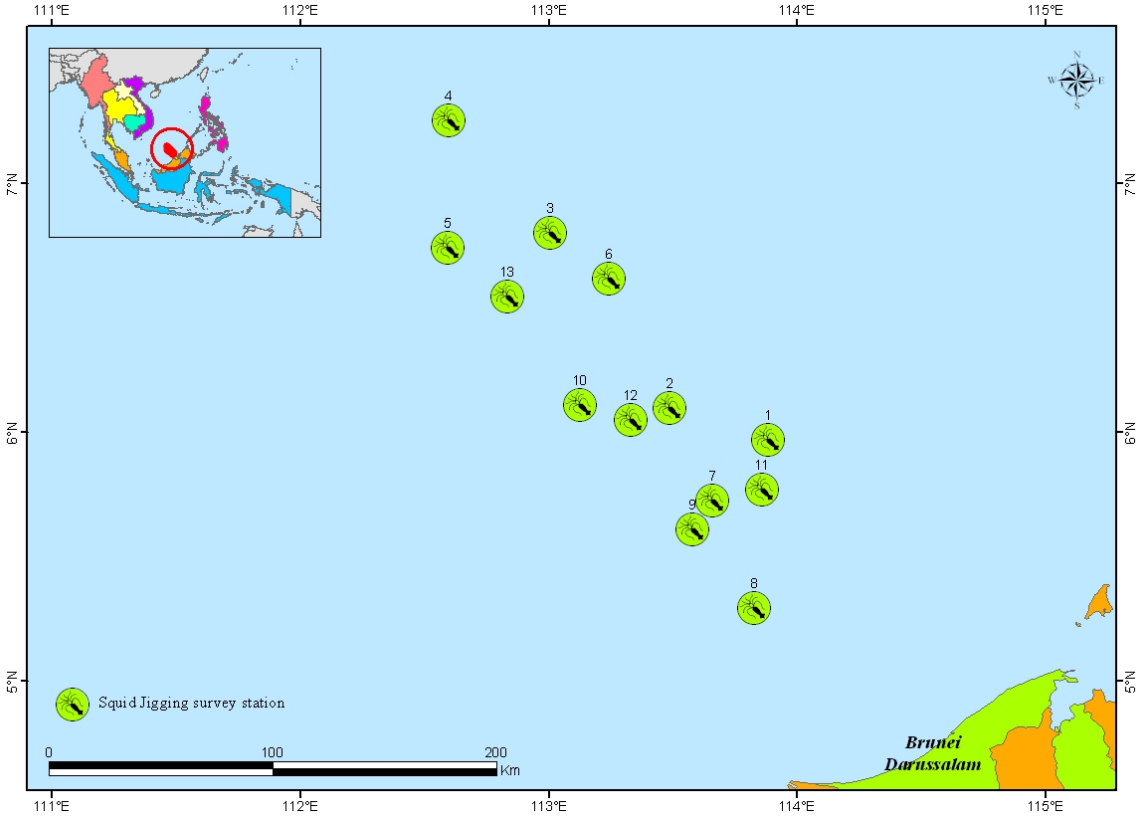


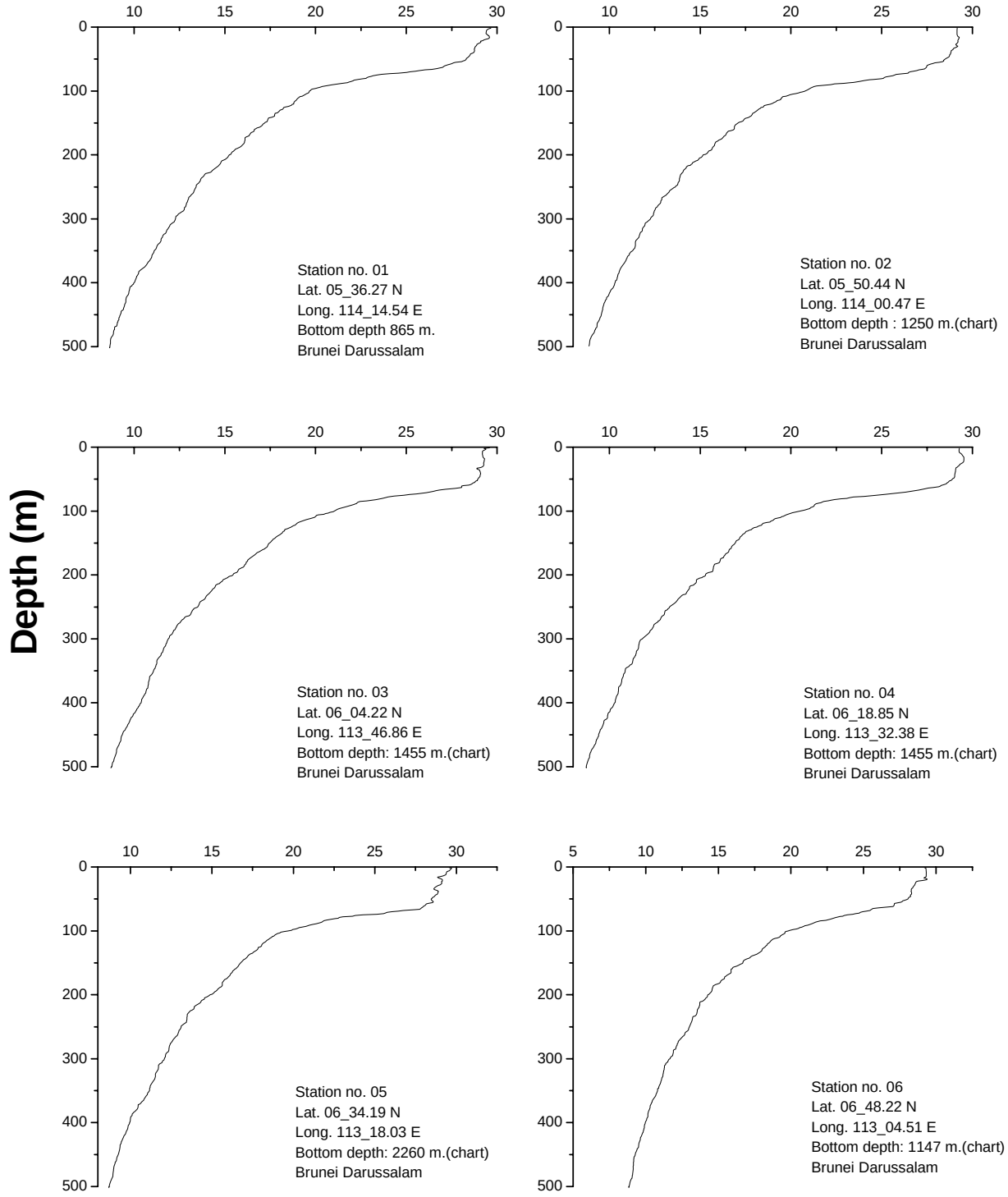
Fig. 17 Squid jigging survey stations of cruise no. 5-5/2004 (11 September - 15 October 2004) Brunei Darussalam



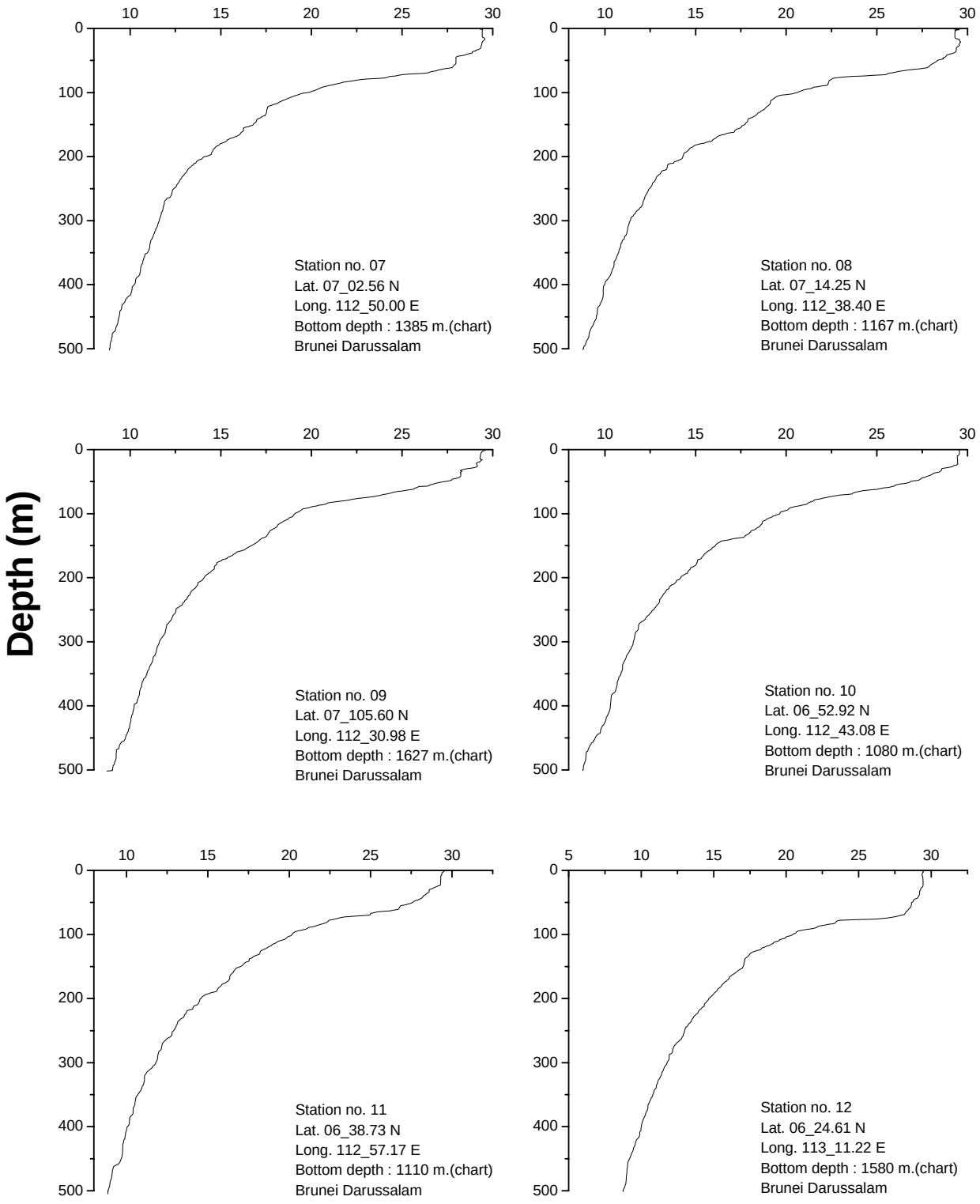
Appendix I

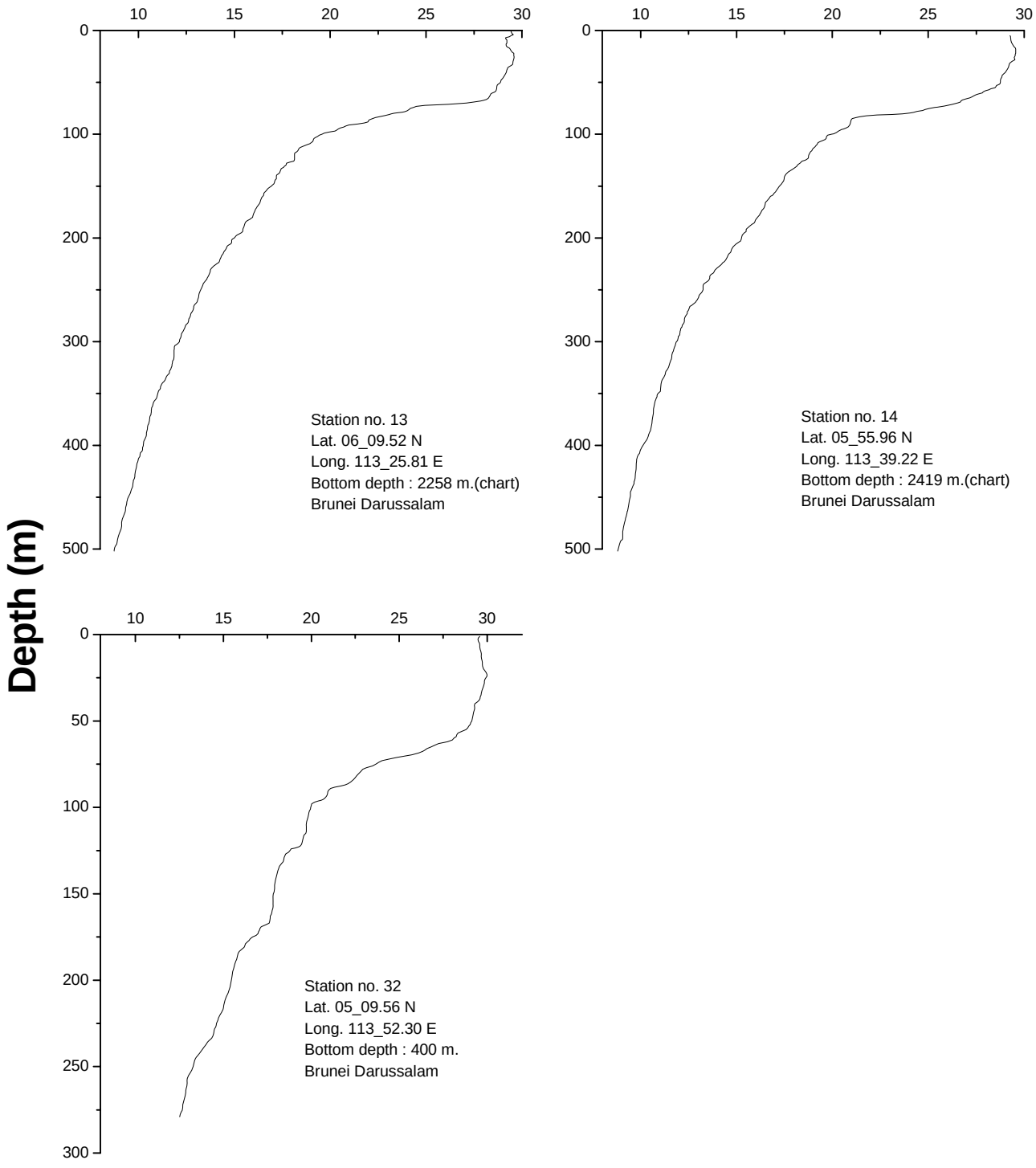
The Oceanographic data profile by Sea-Bird's 911 plus CTD

Temperature (^{o}C)

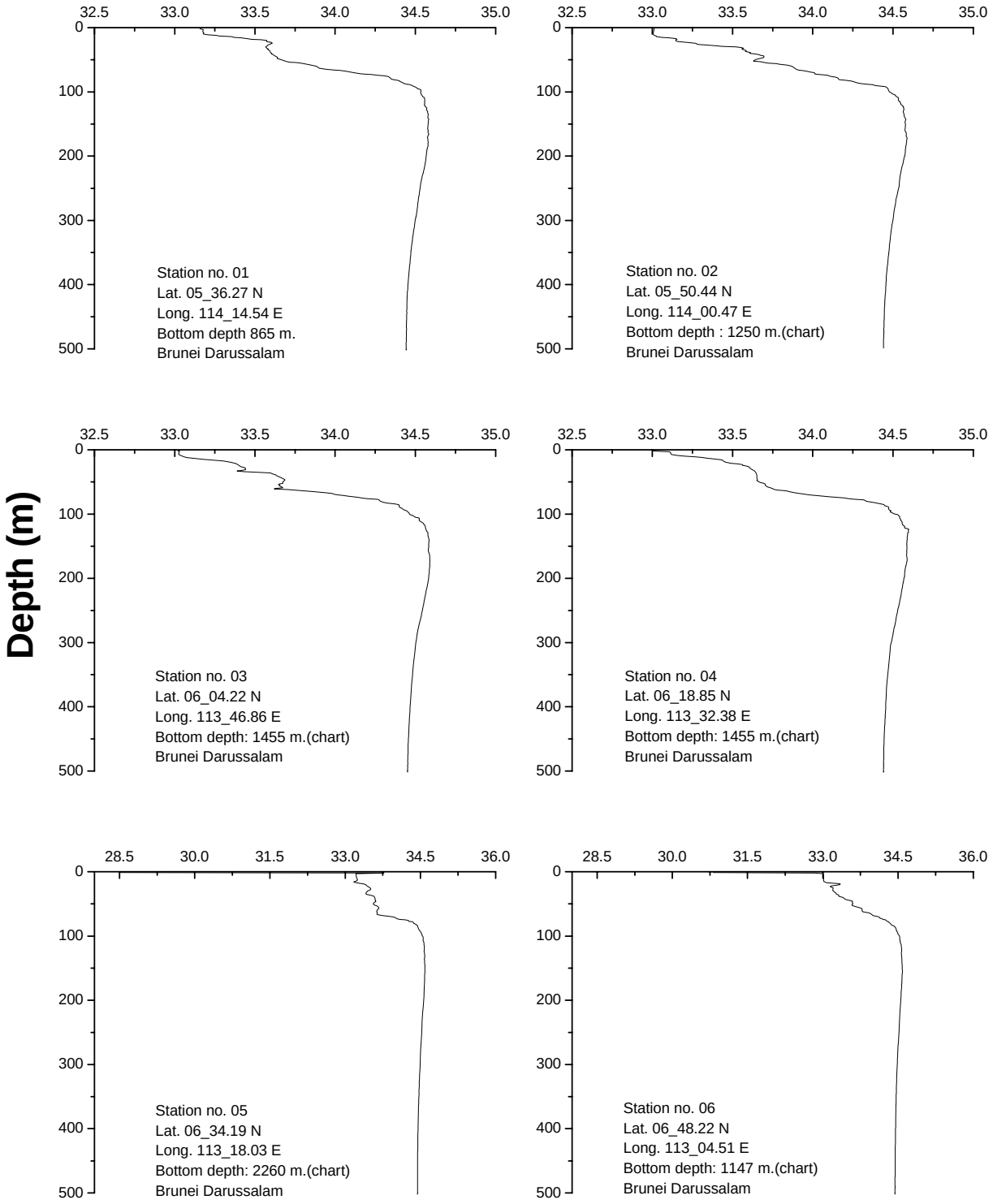


Temperature (^{o}C)

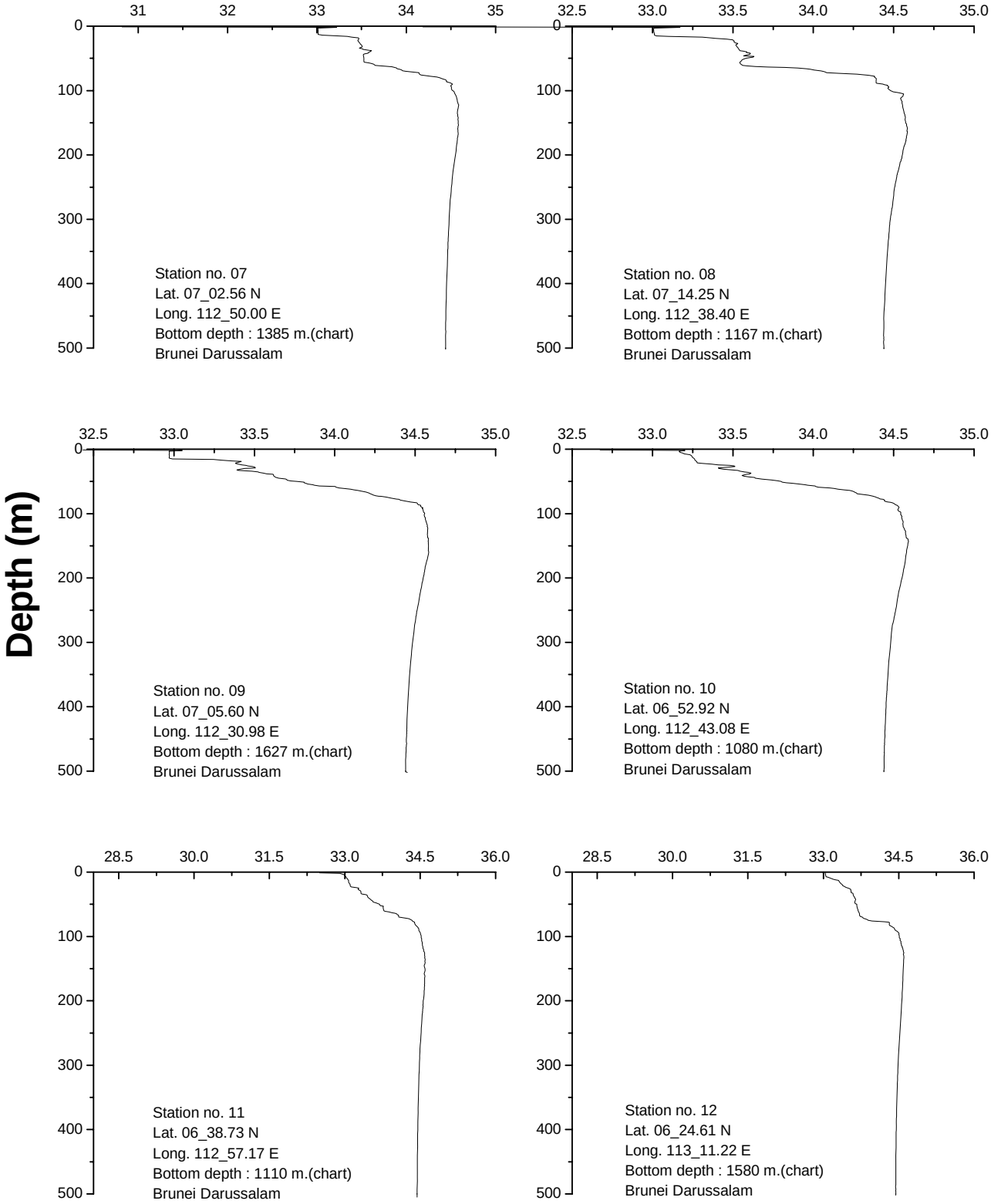



Temperature (°C)
Depth (m)
10
15
20
25
30
0
100
200
300
400
500
Station no. 13
Lat. 06_09.52 N
Long. 113_25.81 E
Bottom depth : 2258 m.(chart)
Brunei Darussalam
Station no. 14
Lat. 05_55.96 N
Long. 113_39.22 E
Bottom depth : 2419 m.(chart)
Brunei Darussalam
0
50
100
150
200
250
300
Station no. 32
Lat. 05_09.56 N
Long. 113_52.30 E
Bottom depth : 400 m.
Brunei Darussalam

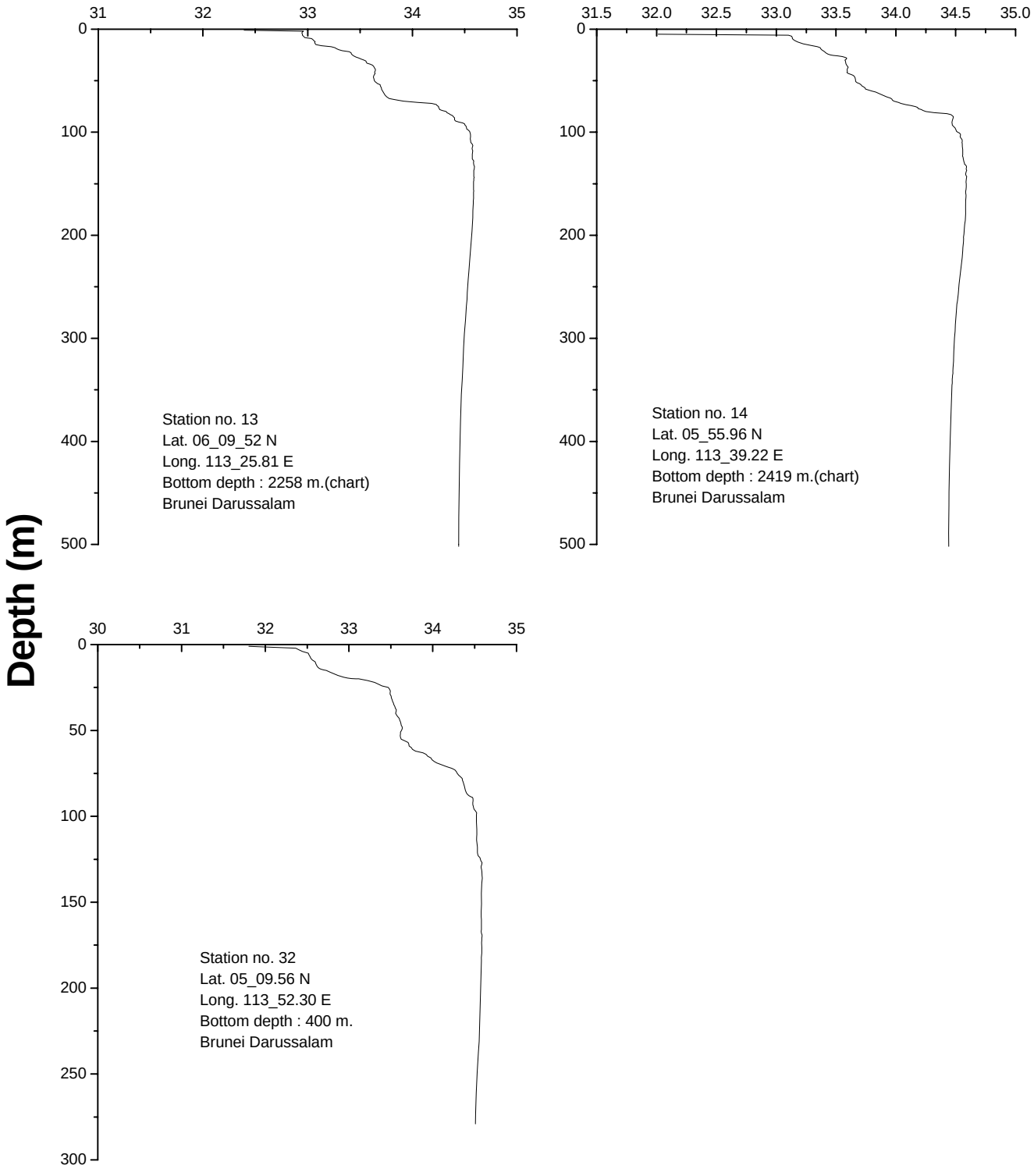
Salinity (PSU)



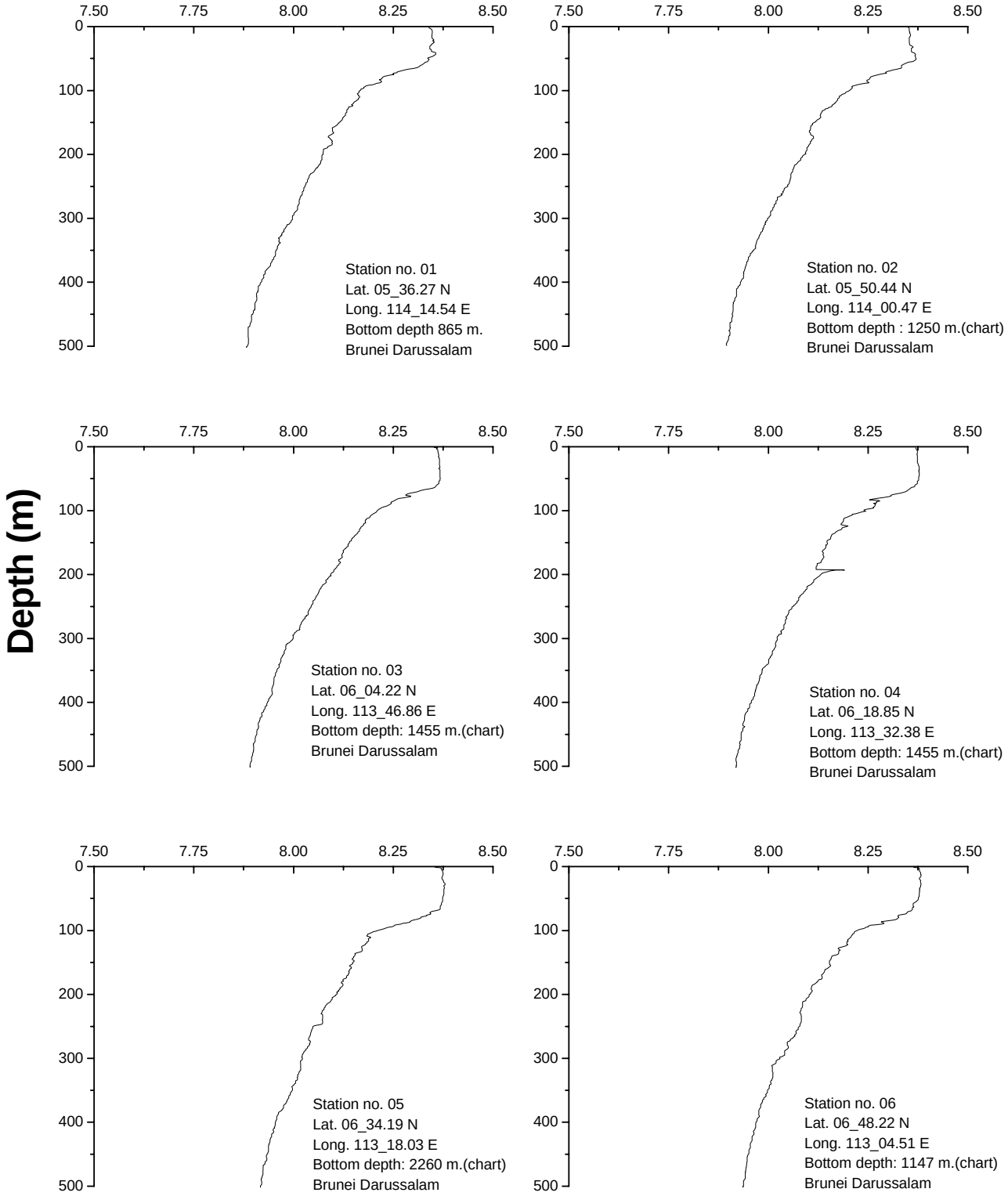
Salinity (PSU)



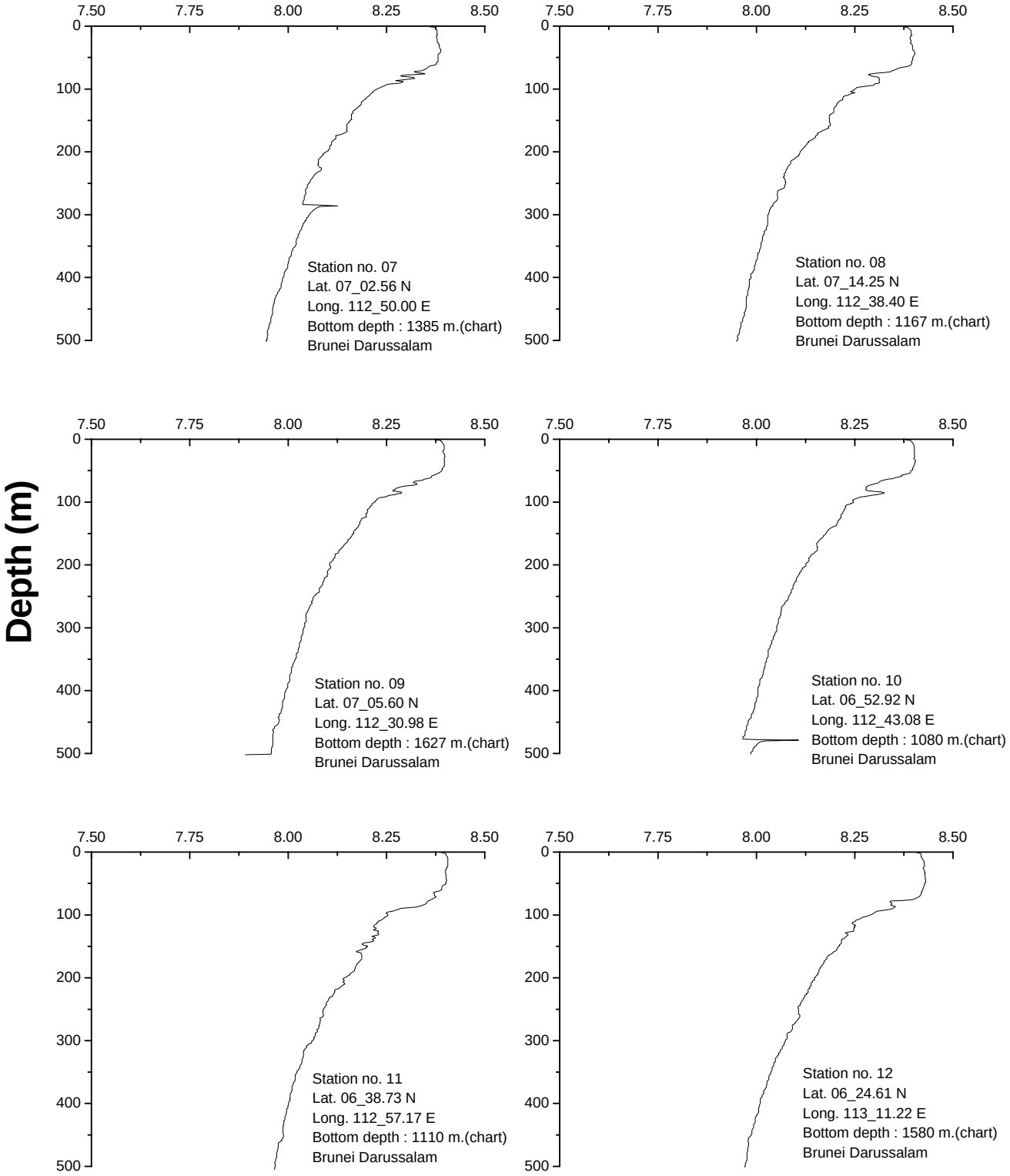
Salinity (PSU)



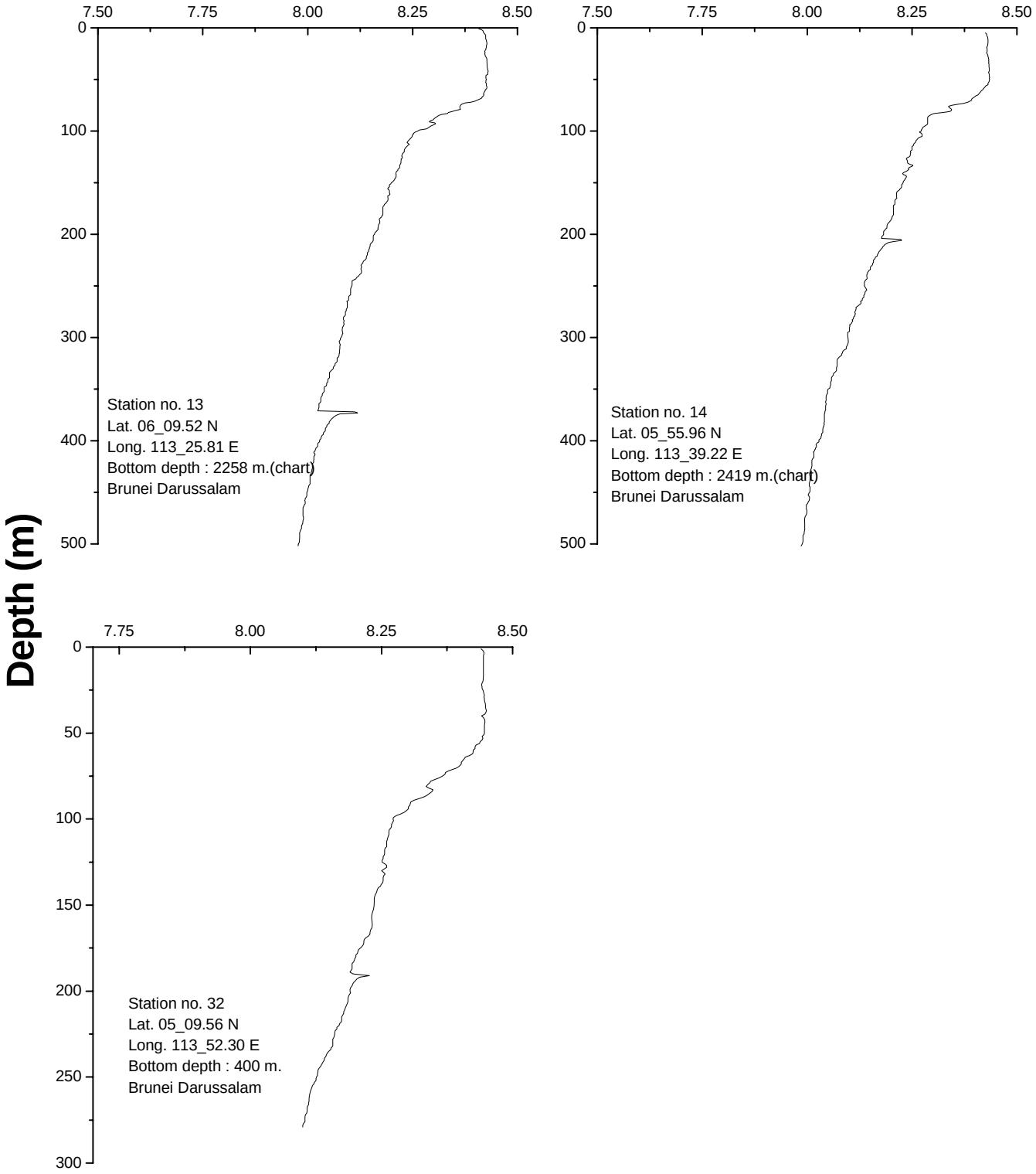
pH


Depth (m)
7.50
7.75
8.00
8.25
8.50
0
100
200
300
400
500
Station no. 01
Lat. 05_36.27 N
Long. 114_14.54 E
Bottom depth 865 m.
Brunei Darussalam
Station no. 02
Lat. 05_50.44 N
Long. 114_00.47 E
Bottom depth : 1250 m.(chart)
Brunei Darussalam
Station no. 03
Lat. 06_04.22 N
Long. 113_46.86 E
Bottom depth: 1455 m.(chart)
Brunei Darussalam
Station no. 04
Lat. 06_18.85 N
Long. 113_32.38 E
Bottom depth: 1455 m.(chart)
Brunei Darussalam
Station no. 05
Lat. 06_34.19 N
Long. 113_18.03 E
Bottom depth: 2260 m.(chart)
Brunei Darussalam
Station no. 06
Lat. 06_48.22 N
Long. 113_04.51 E
Bottom depth: 1147 m.(chart)
Brunei Darussalam

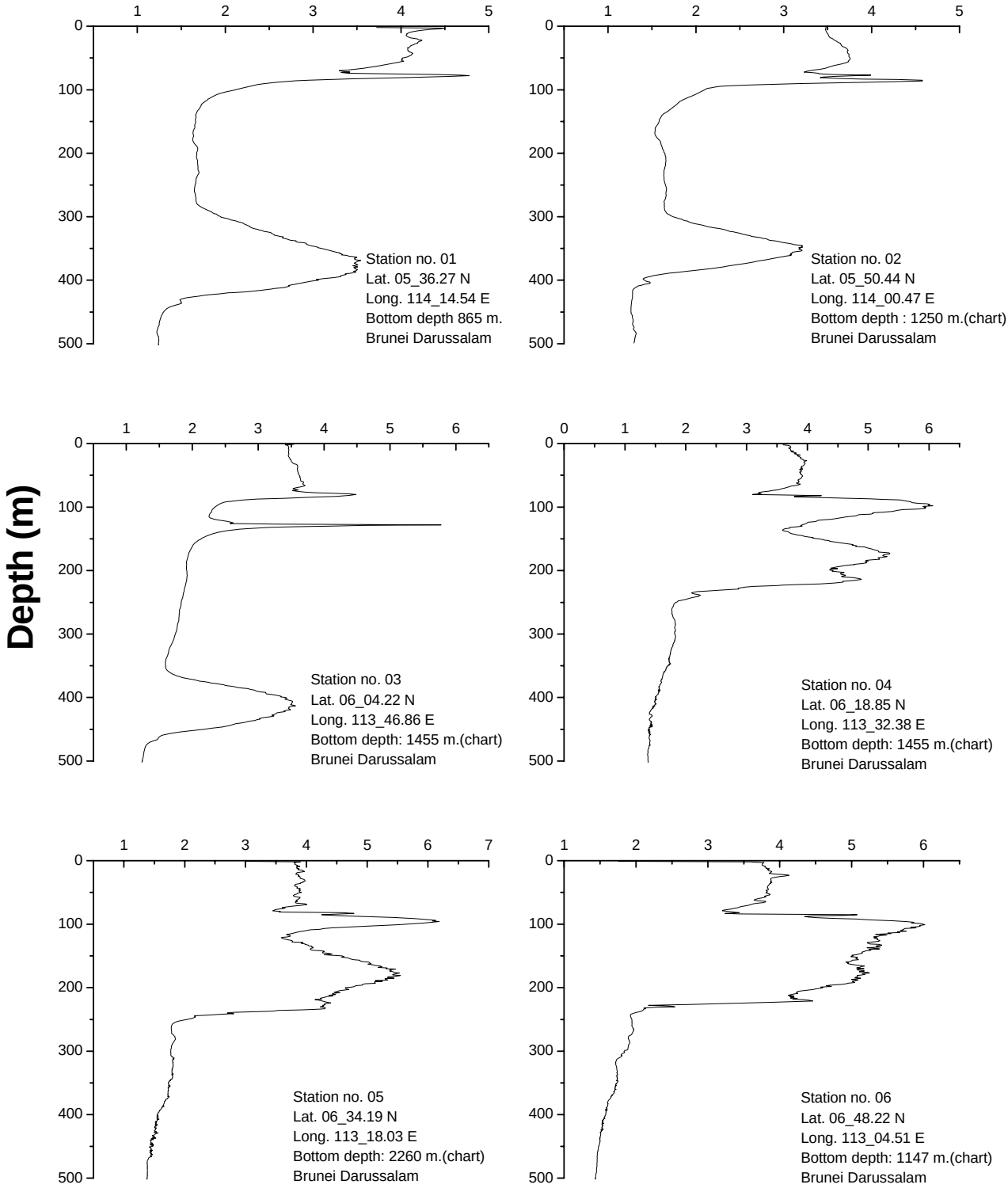
pH


Depth (m)
7.50
7.75
8.00
8.25
8.50
0
100
200
300
400
500
Station no. 07
Lat. 07_02.56 N
Long. 112_50.00 E
Bottom depth : 1385 m.(chart)
Brunei Darussalam
Station no. 08
Lat. 07_14.25 N
Long. 112_38.40 E
Bottom depth : 1167 m.(chart)
Brunei Darussalam
Station no. 09
Lat. 07_05.60 N
Long. 112_30.98 E
Bottom depth : 1627 m.(chart)
Brunei Darussalam
Station no. 10
Lat. 06_52.92 N
Long. 112_43.08 E
Bottom depth : 1080 m.(chart)
Brunei Darussalam
Station no. 11
Lat. 06_38.73 N
Long. 112_57.17 E
Bottom depth : 1110 m.(chart)
Brunei Darussalam
Station no. 12
Lat. 06_24.61 N
Long. 113_11.22 E
Bottom depth : 1580 m.(chart)
Brunei Darussalam

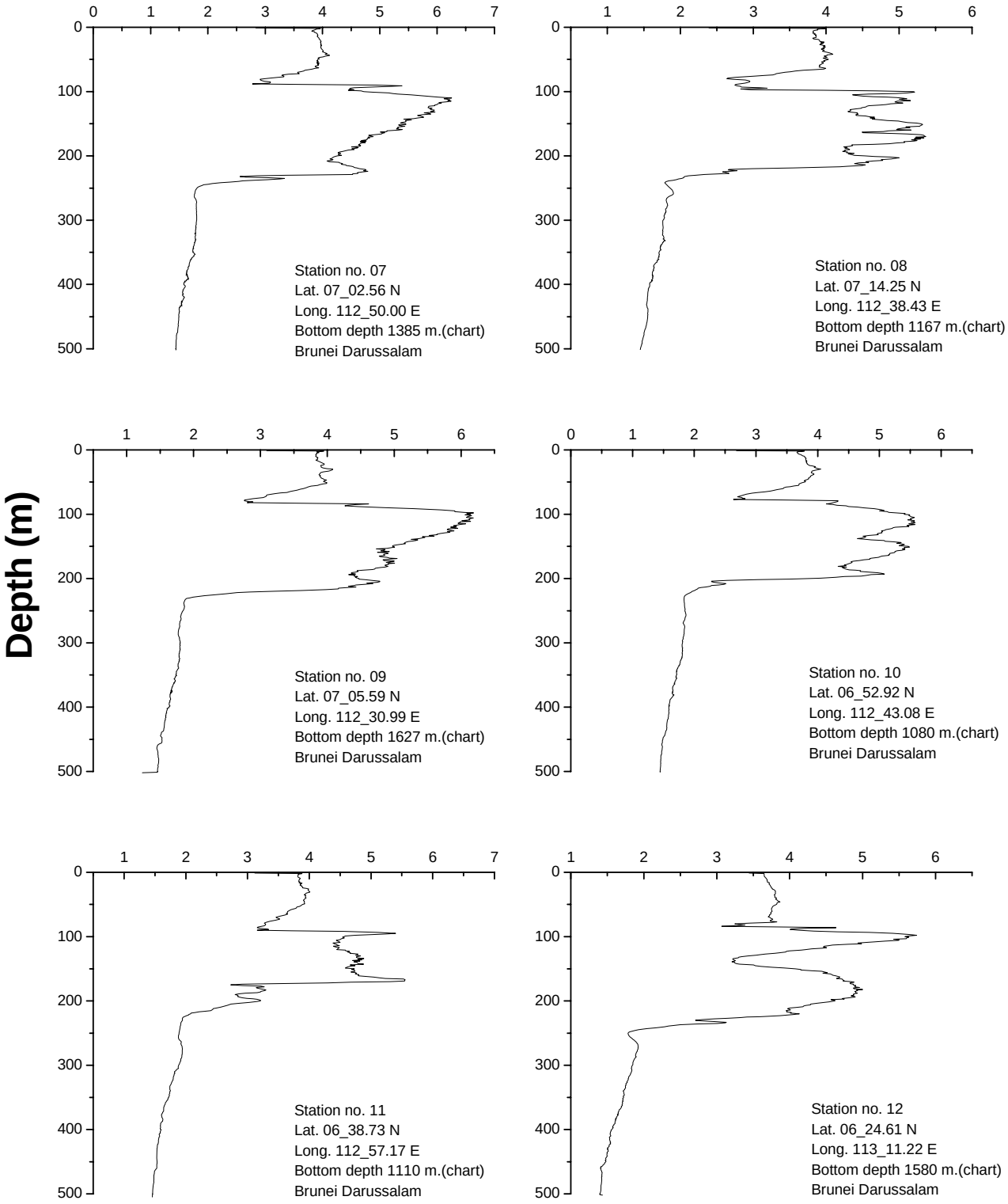
pH


Depth (m)
7.50
7.75
8.00
8.25
8.50
0
100
200
300
400
500
Station no. 13
Lat. 06_09.52 N
Long. 113_25.81 E
Bottom depth : 2258 m.(chart)
Brunei Darussalam
Station no. 14
Lat. 05_55.96 N
Long. 113_39.22 E
Bottom depth : 2419 m.(chart)
Brunei Darussalam
7.75
8.00
8.25
8.50
0
50
100
150
200
250
300
Station no. 32
Lat. 05_09.56 N
Long. 113_52.30 E
Bottom depth : 400 m.
Brunei Darussalam

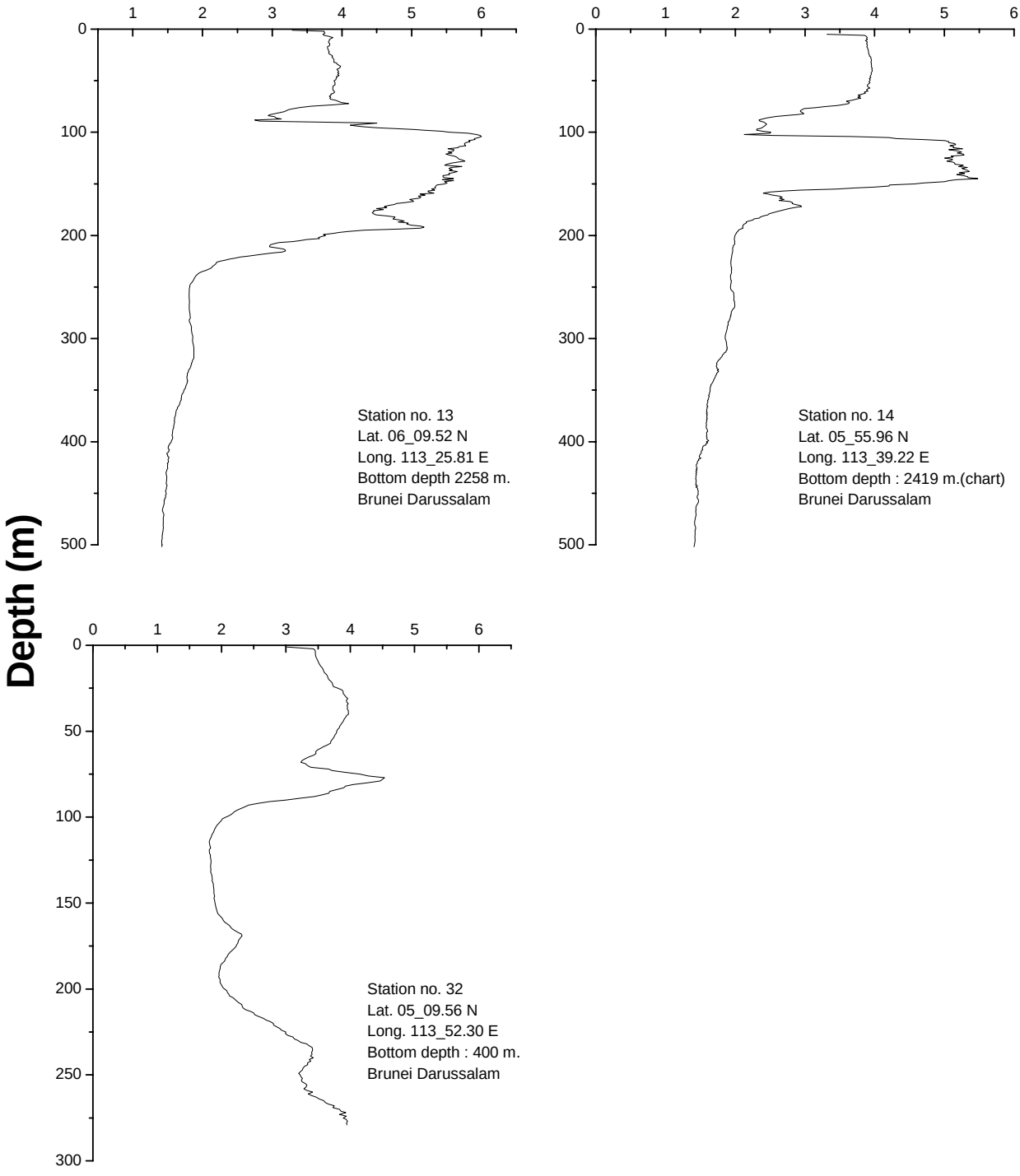
Oxygen (ml/l)


Depth (m)
Station no. 01
Lat. 05_36.27 N
Long. 114_14.54 E
Bottom depth 865 m.
Brunei Darussalam
Station no. 02
Lat. 05_50.44 N
Long. 114_00.47 E
Bottom depth : 1250 m.(chart)
Brunei Darussalam
Station no. 03
Lat. 06_04.22 N
Long. 113_46.86 E
Bottom depth: 1455 m.(chart)
Brunei Darussalam
Station no. 04
Lat. 06_18.85 N
Long. 113_32.38 E
Bottom depth: 1455 m.(chart)
Brunei Darussalam
Station no. 05
Lat. 06_34.19 N
Long. 113_18.03 E
Bottom depth: 2260 m.(chart)
Brunei Darussalam
Station no. 06
Lat. 06_48.22 N
Long. 113_04.51 E
Bottom depth: 1147 m.(chart)
Brunei Darussalam

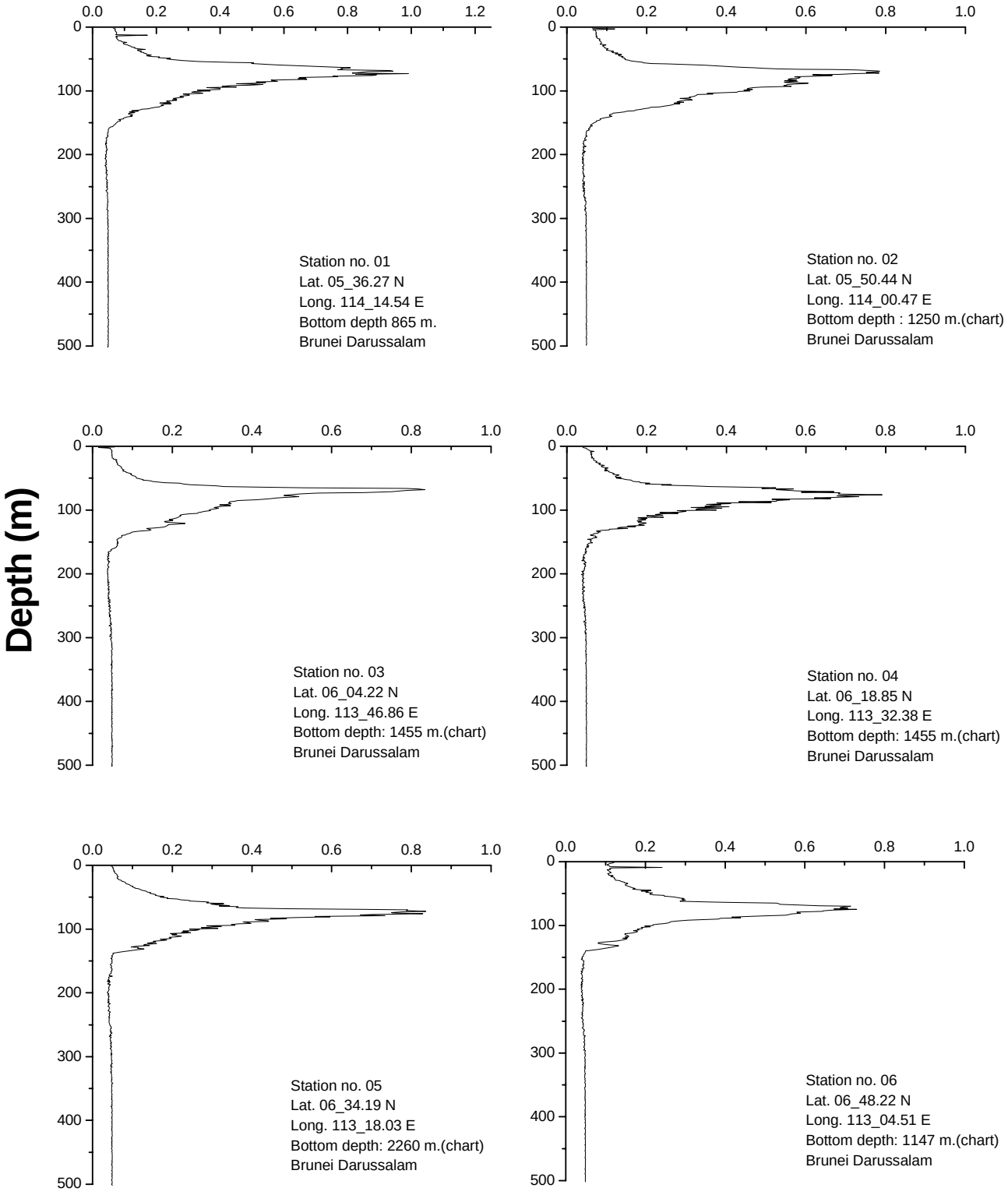
Oxygen (ml/l)


Depth (m)
Station no. 07
Lat. 07_02.56 N
Long. 112_50.00 E
Bottom depth 1385 m.(chart)
Brunei Darussalam
Station no. 08
Lat. 07_14.25 N
Long. 112_38.43 E
Bottom depth 1167 m.(chart)
Brunei Darussalam
Station no. 09
Lat. 07_05.59 N
Long. 112_30.99 E
Bottom depth 1627 m.(chart)
Brunei Darussalam
Station no. 10
Lat. 06_52.92 N
Long. 112_43.08 E
Bottom depth 1080 m.(chart)
Brunei Darussalam
Station no. 11
Lat. 06_38.73 N
Long. 112_57.17 E
Bottom depth 1110 m.(chart)
Brunei Darussalam
Station no. 12
Lat. 06_24.61 N
Long. 113_11.22 E
Bottom depth 1580 m.(chart)
Brunei Darussalam

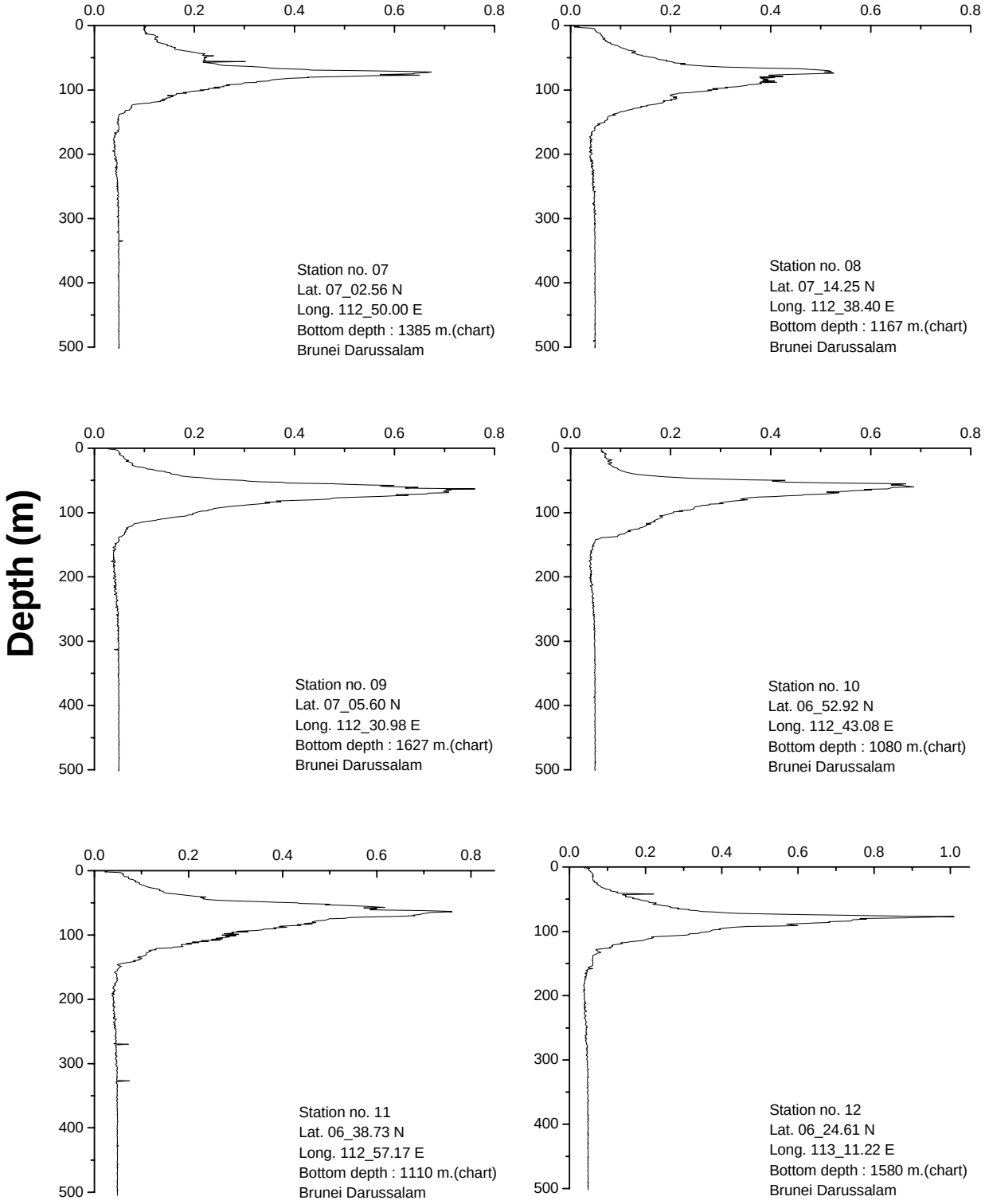
Oxygen (ml/l)


Depth (m)
Station no. 13
Lat. 06_09.52 N
Long. 113_25.81 E
Bottom depth 2258 m.
Brunei Darussalam
Station no. 14
Lat. 05_55.96 N
Long. 113_39.22 E
Bottom depth : 2419 m.(chart)
Brunei Darussalam
Station no. 32
Lat. 05_09.56 N
Long. 113_52.30 E
Bottom depth : 400 m.
Brunei Darussalam

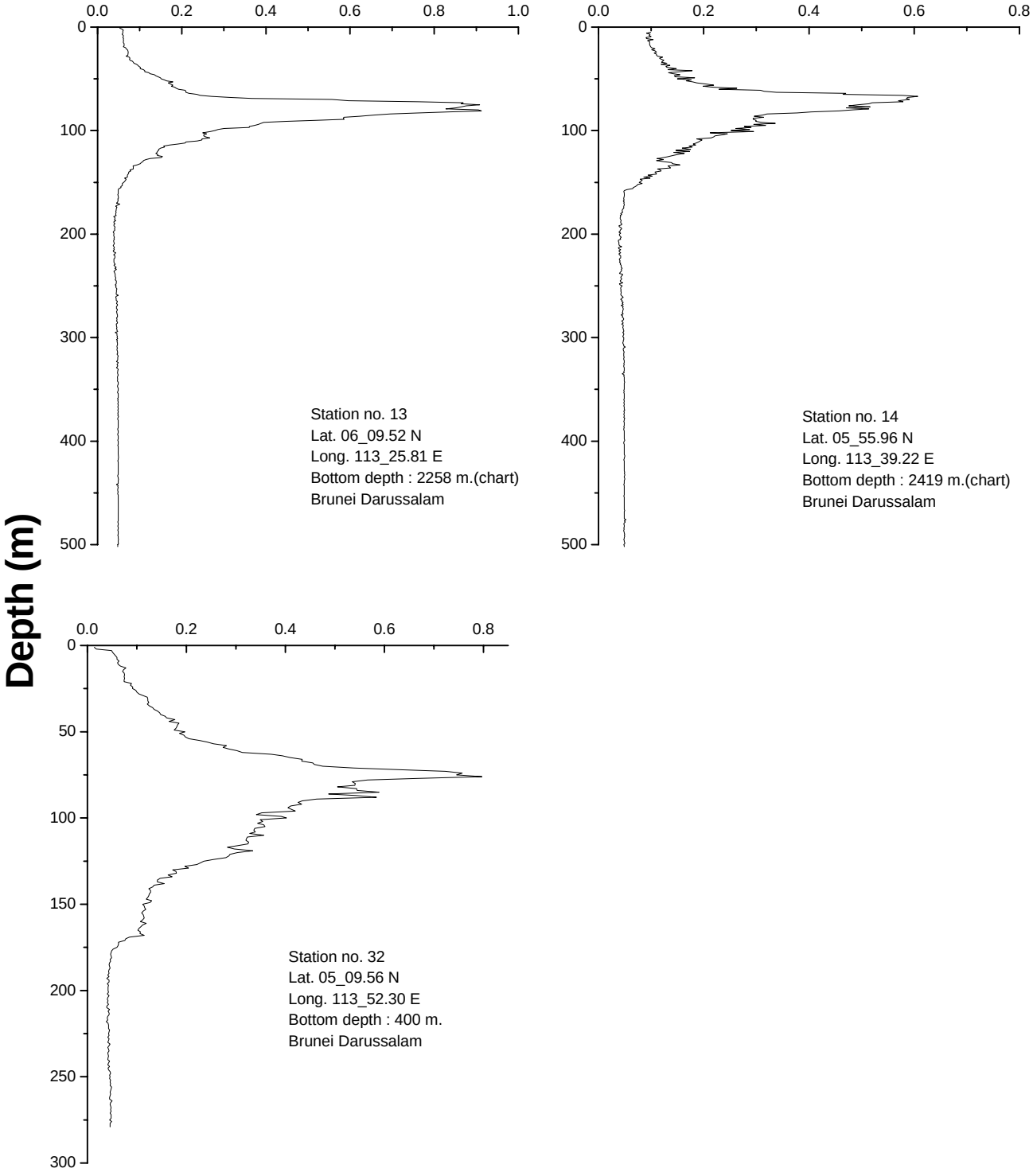
Fluorescence



Fluorescence

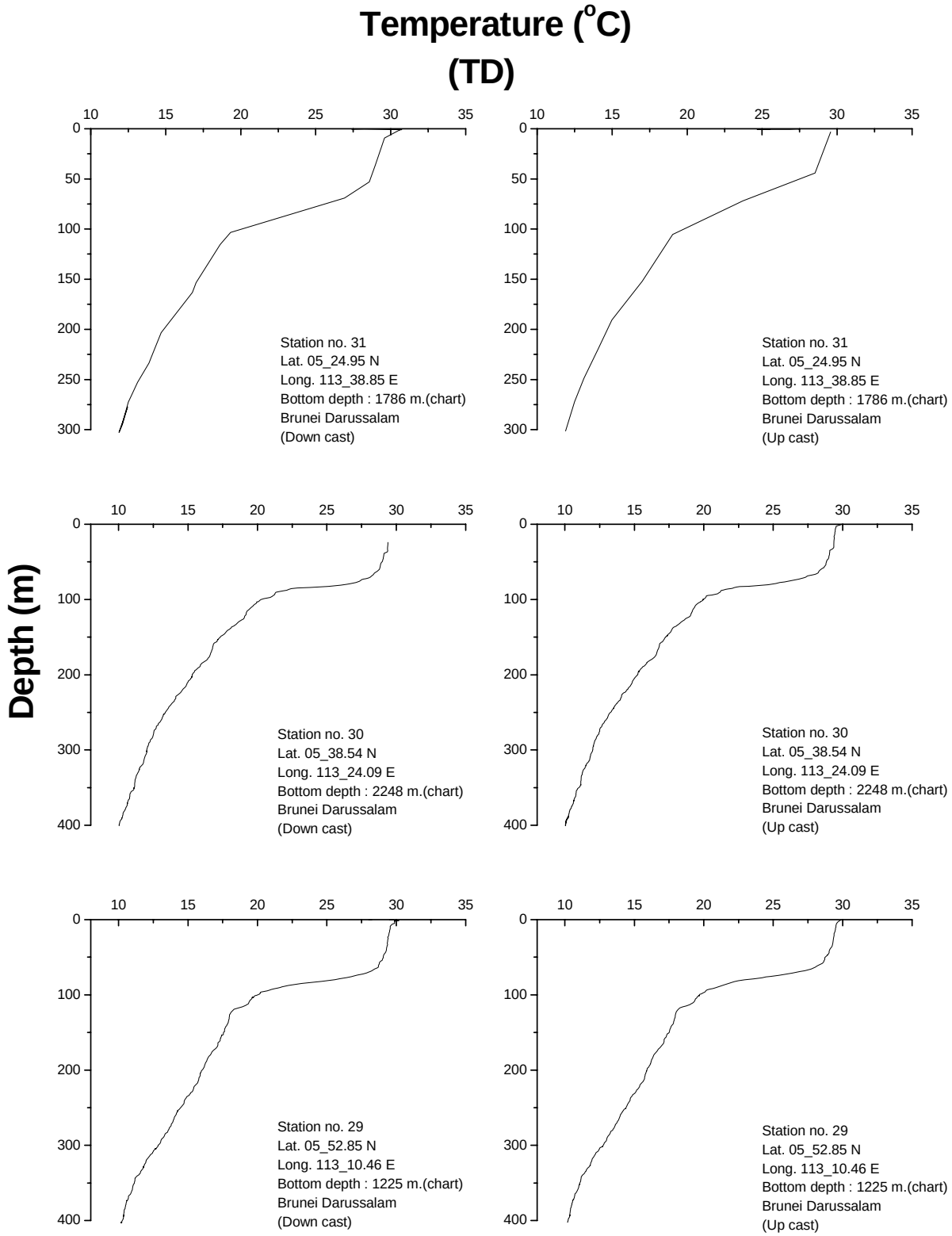


Fluorescence

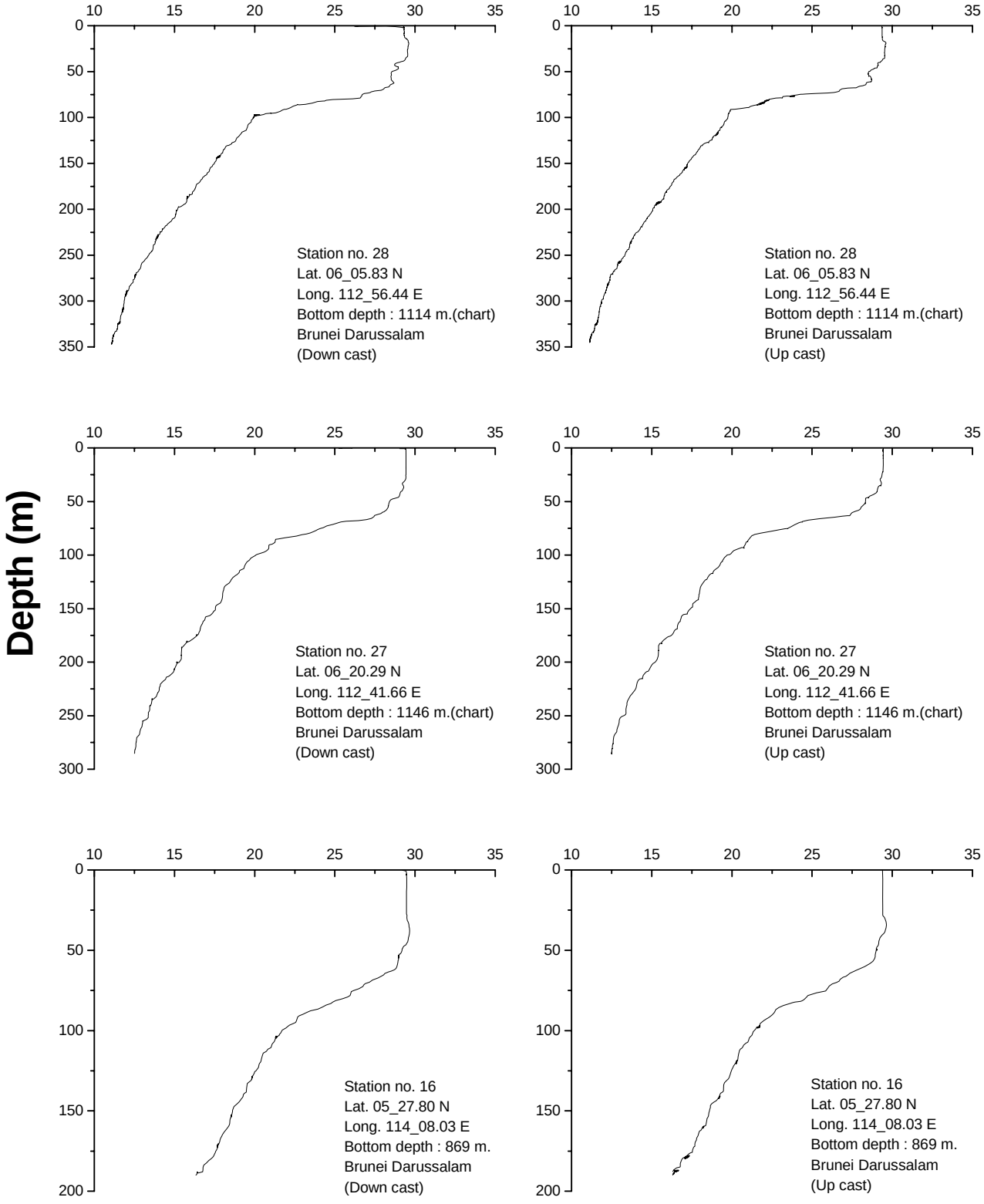


Appendix II

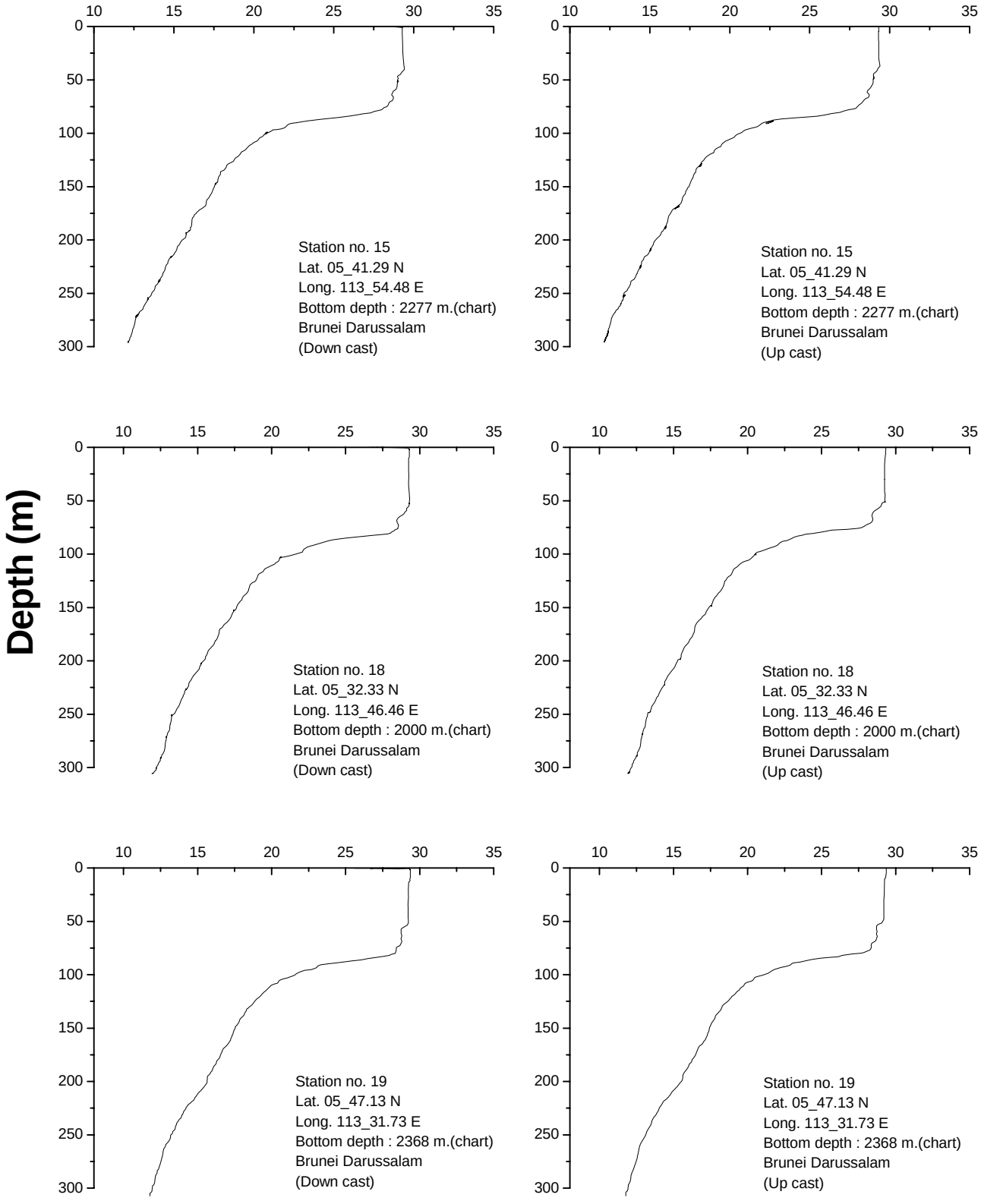
Temperature profile by Temperature and Depth Recorder



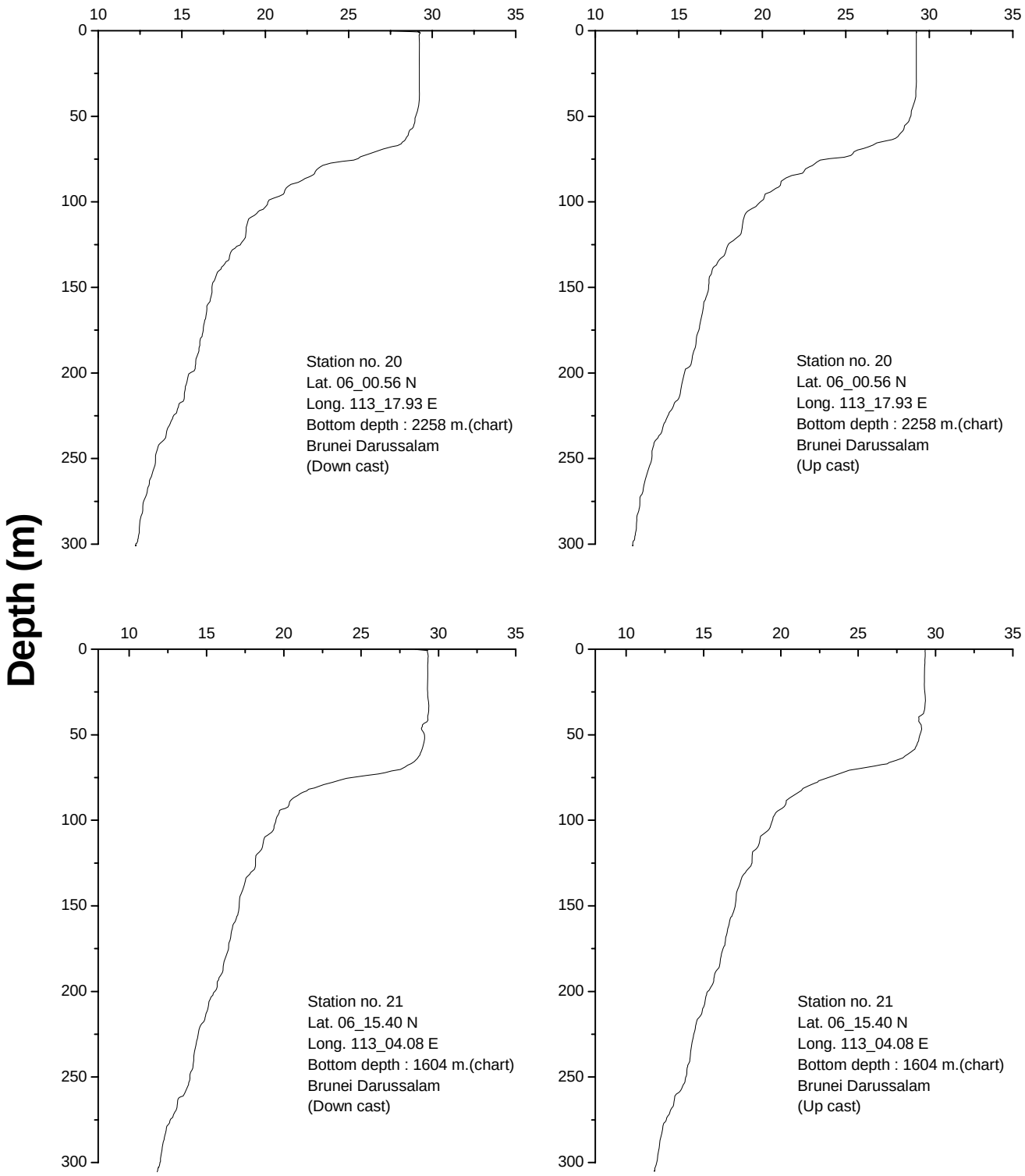
Temperature (^{o}C)
(TD)



Temperature (^{o}C)
(TD)



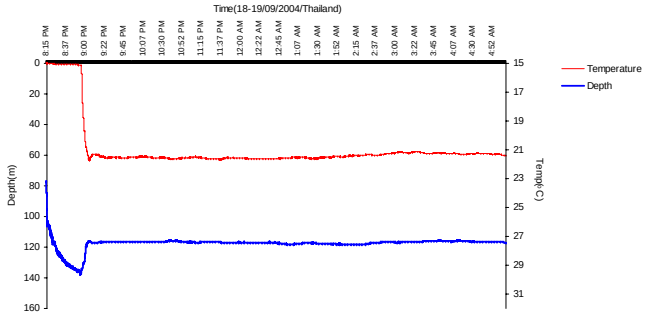
Temperature (^{o}C)
(TD)



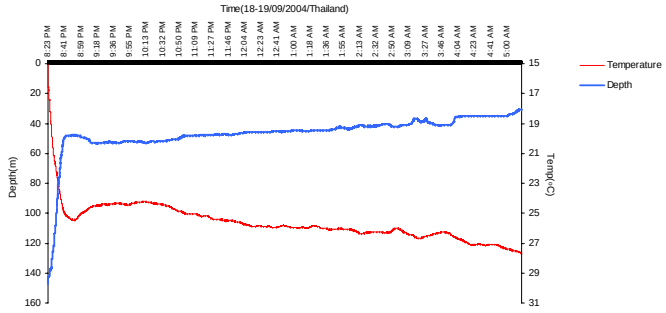
Appendix III

Temperature profile by Temperature and Depth Recorder for Pelagic longline operation

PLL 01 Start: Lat. 05_50.80 N Long. 114_00.10 E
Finish: Lat. 05_58.70 N Long. 113_53.30 E

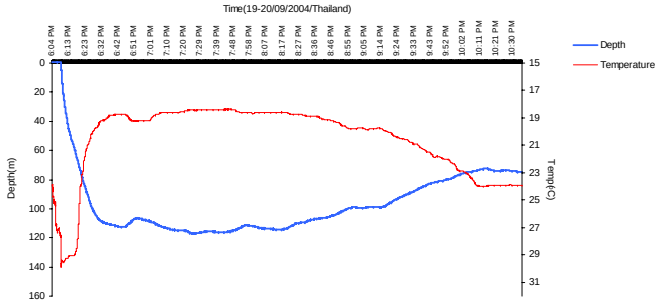


No. hook/basket 12 Serial TD number 231
Hook no. 6

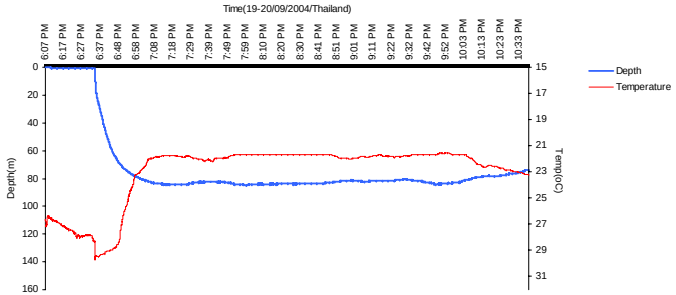


No. hook/basket 12 Serial TD number 232
Hook no. 1

PLL 02 Start: Lat. 06_18.70 N Long. 113_32.20 E
Finish: Lat. 06_06.40 N Long. 113_30.10 E

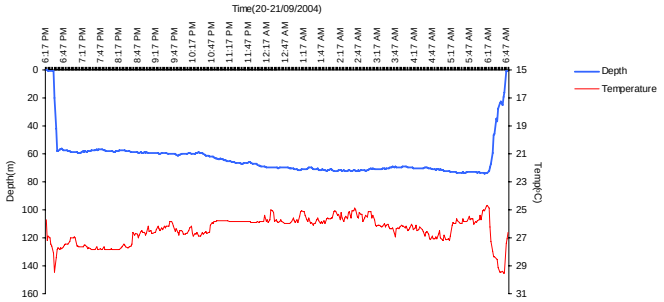


No. hook/basket 6 and 13 Serial TD number 232
Hook no. 6

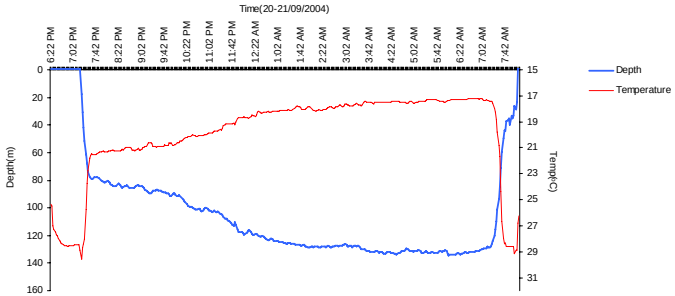


No. hook/basket 6 and 13 Serial TD number 231
Hook no. 3

PLL 03 Start: Lat. 06_48.40 N Long. 113_04.20 E
Finish: Lat. 06_42.20 N Long. 112_54.10 E

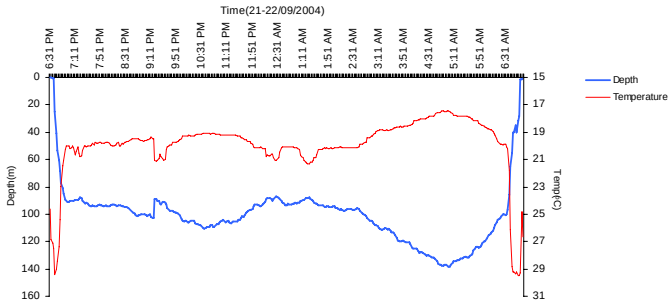


No. hook/basket 10 Serial TD number 231
Hook no. 1

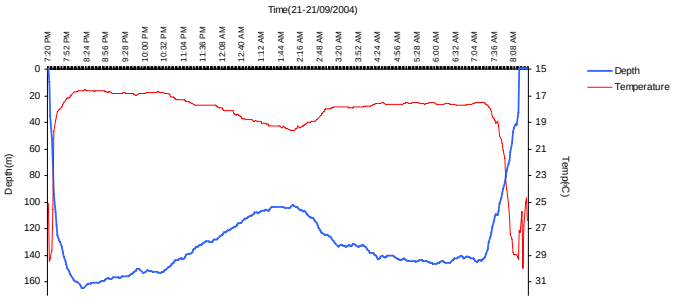


No. hook/basket 10 Serial TD number 232
Hook no. 5

PLL 04 Start: Lat. 07_14.40 N Long. 112_38.20 E
Finish: Lat. 07_25.50 N Long. 112_41.80 E

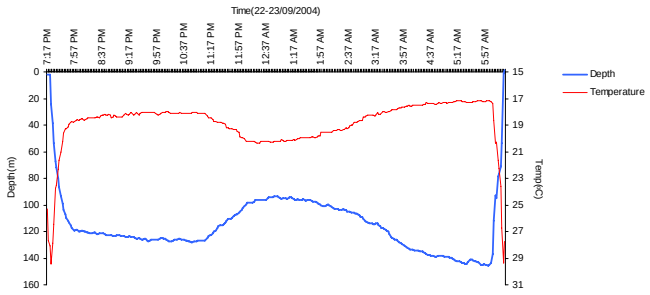


No. hook/basket 10 Serial TD number 231
Hook no. 6

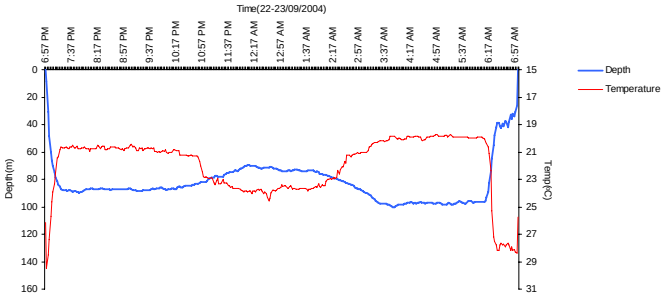


No. hook/basket 10 Serial TD number 232
Hook no. 5

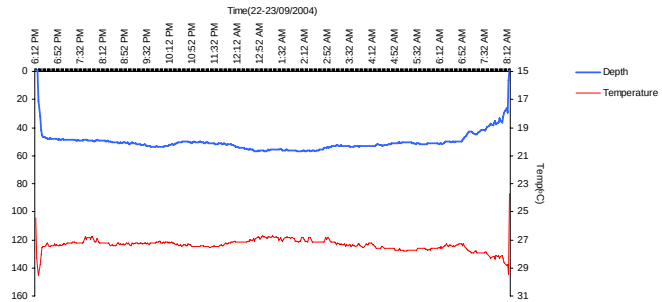
PLL 05 Start: Lat. 06_53.30 N Long. 112_42.04 E
Finish: Lat. 06_44.30 N Long. 112_35.34 E



No. hook/basket 10 and 14 Serial TD number 234
Hook no. 1

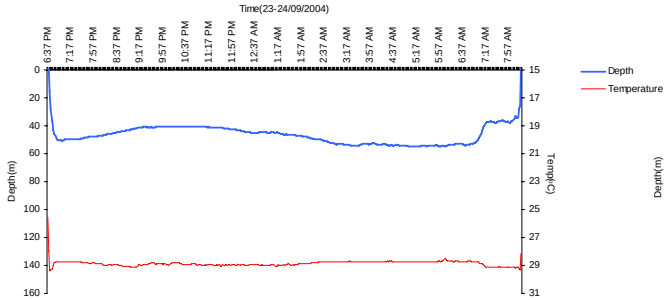


No. hook/basket 10 and 14 Serial TD number 233
Hook no. 5

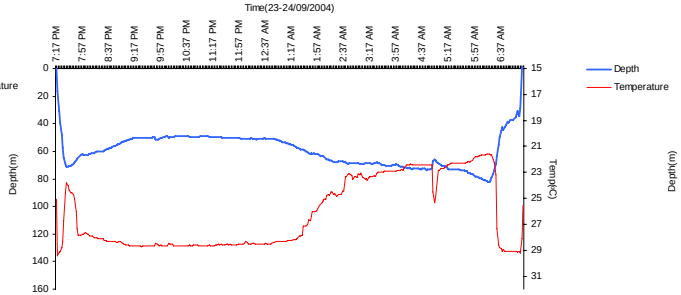


No. hook/basket 10 and 14 Serial TD number 232
Hook no. 7

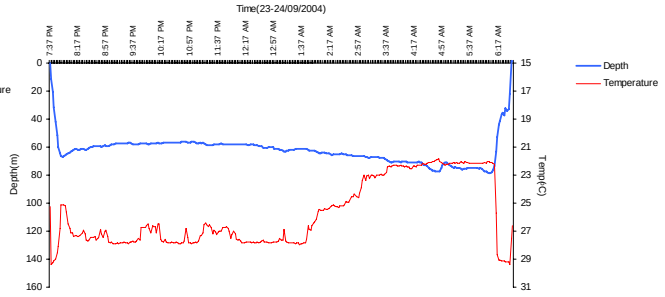
PLL 06 Start: Lat. 06_24.50 N Long. 113_10.80 E
Finish: Lat. 06_36.80 N Long. 113_14.20 E



No. hook/basket 8 Serial TD number 232
Hook no. 1

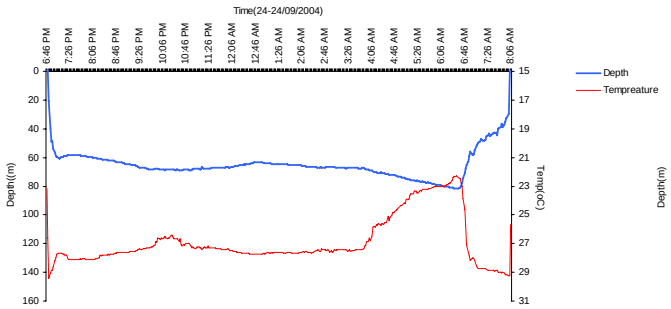


No. hook/basket 8 Serial TD number 233
Hook no. 4

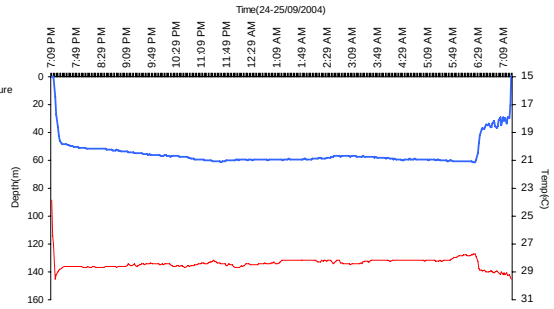


No. hook/basket 8 Serial TD number 234
Hook no. 5

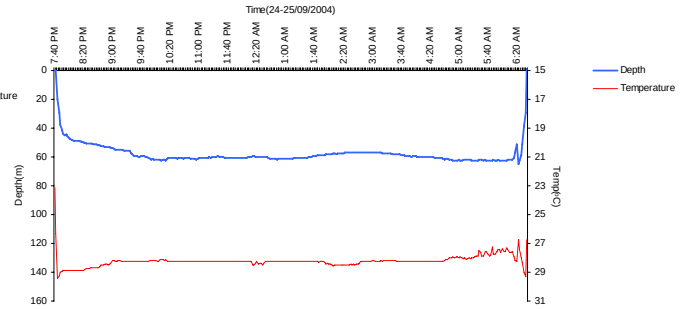
PLL 07 Start: Lat. 05_55.80 N Long. 113_39.20 E
Finish: Lat. 05_44.50 N Long. 113_39.00 E



No. hook/basket 11 Serial TD number 232
Hook no. 11

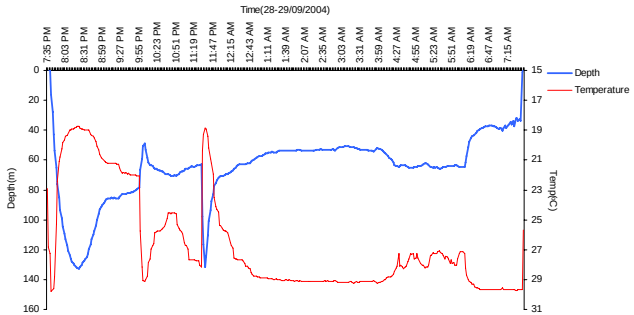


No. hook/basket 11 Serial TD number 233
Hook no. 11

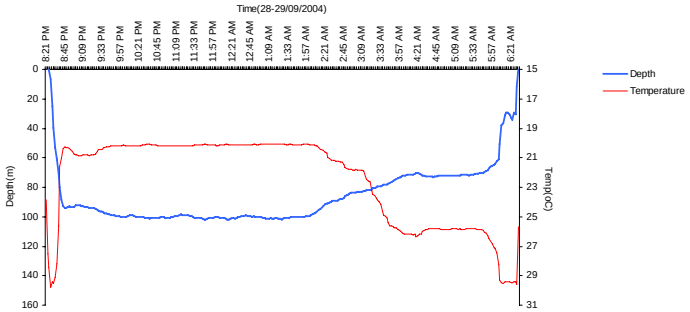


No. hook/basket 11 Serial TD number 234
Hook no. 6

PLL 08 Start: Lat. 05_09.90 N Long. 113_53.40 E
Finish: Lat. 05_17.00 N Long. 113_48.20 E

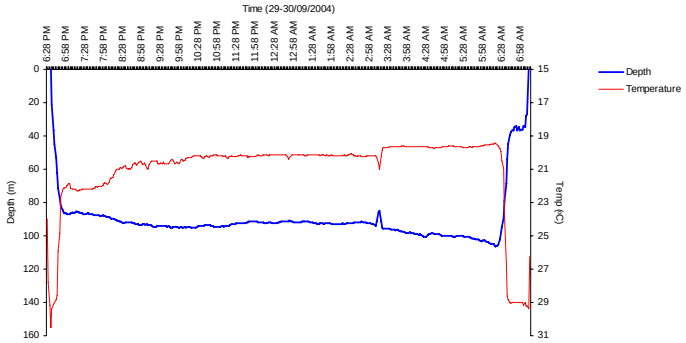


No. hook/basket 11 Serial TD number 232
Hook no. 6

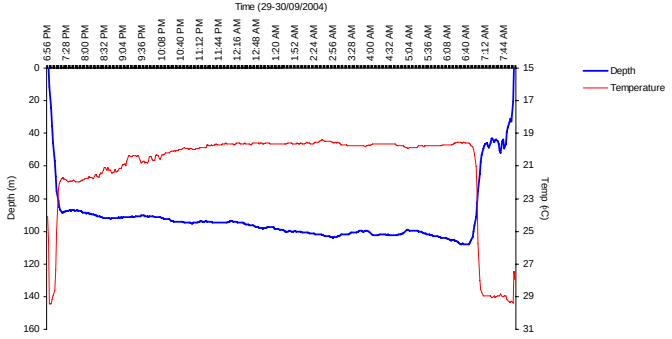


No. hook/basket 11 Serial TD number 233
Hook no. 6

PLL 09 Start: Lat. 05_38.00 N Long. 113_24.10 E
Finish: Lat. 05_37.30 N Long. 113_34.80 E

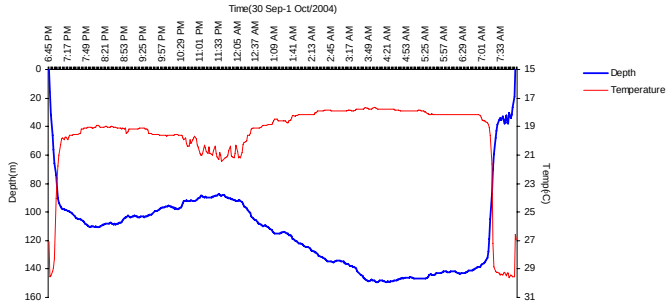


No. hook/basket 11 Serial TD number 232
Hook no. 6

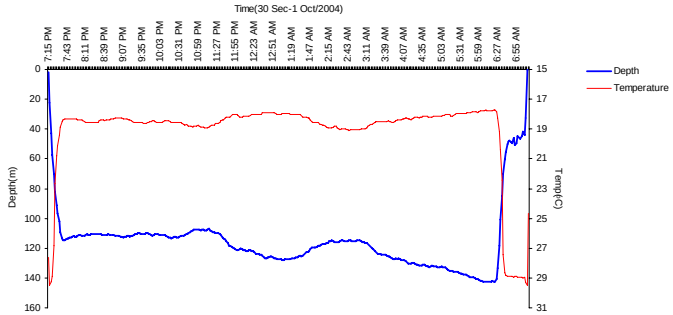


No. hook/basket 11 Serial TD number 233
Hook no. 7

PLL 10 Start: Lat. 06_06.20 N Long. 112_55.80 E
Finish: Lat. 06_06.00 N Long. 113_07.00 E

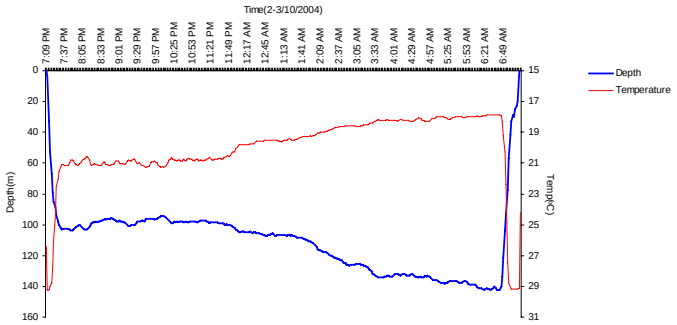


No. hook/basket 11 Serial TD number 233
Hook no. 6

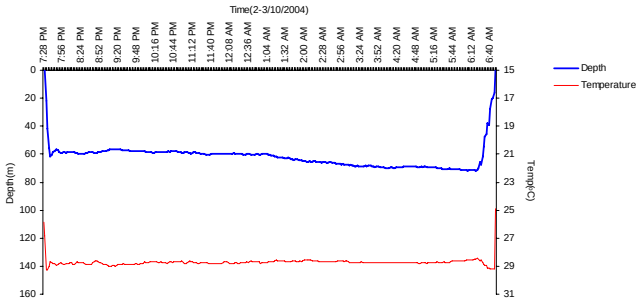


No. hook/basket 11 Serial TD number 234
Hook no. 6

PLL 11 Start: Lat. 05_34.60 N Long. 113_47.40 E
Finish: Lat. 05_46.10 N Long. 113_50.00 E

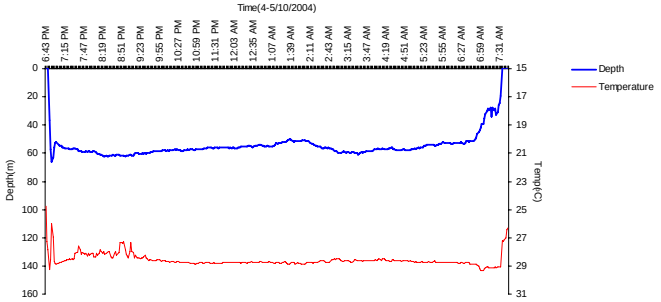


No. hook/basket 9 Serial TD number 233
Hook no. 5



No. hook/basket 9 Serial TD number 232
Hook no. 9

PLL 13 Start: Lat. 06_29.60 N Long. 112_49.20 E
Finish: Lat. 06_32.70 N Long. 112_41.90 E



No. hook/basket 9 Serial TD number 232
Hook no. 1