Cruise Report

C.S.S. PARIZEAU Cruise 95-034
to Scotian Shelf and Georges Bank

Nov. 24 - Dec. 3, 1995

Local Cruise Designation:	95-034
Vessel:	*C.S.S. Parizeau*
Dates:	24 Nov.-3 Dec. 1995
Area:	Southwest Nova Scotia/Georges Bank
Responsible Agency:	Ocean Sciences Division Scotia-Fundy Region, DFO
Ship's Master:	Capt. W. English

Scientific Personnel:

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1. <u>PURPOSE</u>

The scientific objectives of this cruise were:

1) long term monitoring of the major inflows to the Gulf of Maine, namely the surface inflow from the Scotian Shelf off Cape Sable and the deep inflow of slope water through Northeast Channel,
2) determining the seasonal hydrographic properties along the eastern boundary of the Gulf of Maine, and
3) measuring the hydrographic structure over Truxton Swell and in Jordan Basin (if possible) in order to determine the extent of slope water penetration into Jordan Basin.

The activities planned for the cruise period include:

1) replacement of moorings off Cape Sable (C2) and in Northeast Channel (NECE,NECW),
2) performance of a CTD survey along the eastern boundary of the Gulf of Maine, including Browns Bank, Northeast Channel, Georges Basin and Truxton Swell, and
3) performance of repeated ADCP transects across Northeast Channel over at least one tidal cycle.

2. <u>NATURE OF DATA GATHERED</u>

During this cruise, a total of five current meter moorings and eight guard buoys were recovered at three sites in the Gulf of Maine (C2, NECW, NECE; see Figure 1a and Table 1a). The bottom portion of a sixth current meter mooring (#1188) was also recovered; the float and instrument had been recovered by a fisherman. One guard buoy was also missing from that site; it had been reported adrift off Great South Channel in October, 1995.

In addition, a total of 54 CTD stations (Fig.1b, Table 2) were occupied along:

1) a section from the 50 m isobath off Cape Sable to the outer edge of Browns Bank (Fig.3),
2) two sections across Northeast Channel from Browns to Georges Bank (Figs.4,5),
3) three shorter sections across the mouth of Northeast Channel, in Georges Basin and on Truxton Swell (Figs.6,7,8),
4) a section following the 200 m isobath on the eastern side of the Channel and extended out into the slope water (Fig.9),
5) a section across the outer Scotian Shelf off Shelburne (Fig.10), and
6) at each mooring site.

The quality of the CTD temperature and salinity measurements is quite acceptable (Table 2a), although there were some problems with mismatched time constants for measurements of strongly interleaving water masses. Oxygen samples were drawn from up to 9 depths at each station, providing a reasonable distribution of the dissolved oxygen field. The Beckman and YSI dissolved oxygen sensors both showed a large offsets with respect to the titrated values (Table 2a; Fig.2a-d). After rejection of a significant number of outliers, stable calibrations were obtained by linear regression of uptrace readings against titrated values (Table 2b). Downtraces from both O_2 sensors showed persistent problems: the YSI sensor exhibited occasional noise, spikes, and positive surface layer offsets; the Beckman sensor showed persistent negative surface layer offsets. Therefore it is recommended that the O_2 uptraces rather than downtraces be archived. In addition, roughly 170 oxygen isotope samples were collected throughout the water column at even numbered stations (Fig.1b) for Dr. Robert Houghton of Lamont-Doherty Earth Observatory. Nutrient samples were collected throughout the water column as well at virtually all stations.

Twelve repeated ADCP transects (Table 3) were run over the duration of the cruise along the mooring/CTD line in Northeast Channel (Fig.1b) in order to monitor the inflow/outflow over an M2 tidal cycle. A total of ~32 hrs was devoted to straight-run transects, with an additional 18 hrs spent on the CTD and mooring lines. Only processed (averaged) data were collected over the entire cruise and stored as 5-min averaged data files. During the final transect (#11; Table 3), a test of the ADCP transducer alignment error and amplification factor showed that these values were acceptably small(Table 3a.)

3. PROGRAM SUMMARY

Date	From(UTC)	To(UTC)	Operation
24 Nov.	1000	0522(25)	Depart BIO for C2 site; CTD0,1
25 Nov.	0522	0947	CTD 1-6 on Sect.Ia
	1042	1806	Mooring operations at C2
	1856	0615(26)	CTD7-17 on Sect.Ia,Ib1
26 Nov.	0615	1138(27)	Take shelter in Lobster Bay
27 Nov.	1138	1905	Mooring operations at NECE
	2020	2233	Recovery operations at NECW
	2337	0738(28)	CTD18-25 on Sects.Ib1,Ib2
28 Nov.	0758	1044(29)	Repeated ADCP transects across NEC
29 Nov.	1149	1545	Deployment operations at NECW
	1609	1924	Complete ADCP transect
	2043	0107(30)	CTD27-29 on Sect V
30 Nov.	0107	1156	Take shelter off Seal Island
	1156	1017(1)	CTD30-43 on Sects.III,II,V
1 Dec.	1121	1351	ADCP transect across NEC
	1449	0022(2)	CTD44-50 on Sects.IV,V
2 Dec.	0525	0945	CTD51-54 on Sect.VI
		2030	Arrive BIO

4. MOORING OPERATIONS

The recovery of five instrument moorings and one partial mooring at three sites (C2,NECE, and NECW; Table 1a, Appendix B) was completed without incident. Using differential GPS positioning with AGCNAV and transponding with the release, it was possible to locate and retrieve all of the moorings quickly. The partial mooring (#1188 at NECWA) consisted of just backup buoyancy (BUB) and the release; the upper portion of the mooring had been returned by a fisherman in September. The wire lead above the BUB appears to have been hit with something sharp and parted. Otherwise, all the returning moorings were in excellent shape. There were minor amounts of hairy growth on the instruments at the 20 and 50m levels, but the conductivity cells and rotors were clean. There were no obvious instrument malfunctions; each had the expected number of words in memory.

One of the original nine guard buoys was missing from the NECW site. Those that returned showed the normal signs of wear after a 5-6 month deployment. The bottom chain had some pitting and corrosion, especially at the welds of the individual links. Also, some of the bushings installed on the shackles under the buoys in June showed significant wear and several on NECE and NECW buoys had begun to allow minor amounts of wear (1/8") between the shackle pin and the hoop under the buoy. The recovery operation itself was hampered by the tangling of the bottom chain on the NECE moorings only. The resulting large clump at the base of these moorings had to be lifted separately with the crane. Also, on those moorings which didn't tangle, it was found that the 1 1/2" chain at the very bottom would not pass through the block in the A-frame and had to be lifted separately.

The placement of the new moorings (Table 1, Appendix A) was relatively straightforward. Using the DGPS positions from previous deployments, it was possible to relocate the moorings in those precise locations with the help of AGCNAV. The sound speed correction for the ELAC sounder on the bridge was:

true depth = .97533*sounding + 5m (keel depth).

The only mishap during deployment was the parting of a swivel under the float on the NECE mooring (#1210, Table 1) which caused the upper current meter and SeaCat to fall a sort distance to the deck. The swivel was apparently missing a retention clip, but should have been dead weight tested (to 1000 lbs.) before use.

Two new types of guard buoy moorings were deployed at each site, along with one of conventional style (see Appendix A). The standard type ("A") uses oval rings, each of which must be welded, to connect the various types of tackle (e.g. chain, nylon braid). New type "B" replaces the rings with connecting links which do not require welding; type "C" uses rings, but replaces the bottom chain assembly with nylon braid, supported by two small trawl floats to keep it from chafing on the anchor. The new guard buoy reflectors also featured rounded edges, rather than the previous pointed corners. Attempts to measure any differences in range between the new and old reflectors were frustrated by highly variable seastate conditions, but it appeared that both types were able to achieve a 5 nm range in moderate-to-high seas. At the start of the trip, when the seastate was low, the old reflectors at C2 were detected at a range of 12-13 nm.

Problems:

(1) In future, all swivels must strength tested (to at least 1000 lbs) prior to use in the

moorings.

(2) *A new means of mounting the bottom pressure gauges in the anchor should be investigated. The present method involving taping the lanyard to the release casing is clumsy and slightly dangerous.*

(3) *The positions of moorings in the AGCNAV waypoint file should be designated by mooing number (e.g. 1188), not the site name (e.g. NECWA).*

(4) *To facilitate the recovery of three guard buoys at a time, three empty barrels should be brought along in future to hold the tackle.*

5. HYDROGRAPHIC MEASUREMENTS

Hydrographic and chemical measurements were made at a total of 54 stations (Table 2) using a Seabird 9/11 Plus system, equipped with either a Beckman (CTD15-17,26-54) or a SBE 23Y Yellow Springs Instruments (YSI;CTD1-12,18-25) dissolved oxygen sensor. A second YSI sensor was substituted for CTD13,14, but it gave no good data and was replaced with the Beckman sensor at CTD15. The data were logged on a 33 Mhz 486 PC and post-processed between stations using SEABIRD's software. Once processed, the data were transferred to the VAX over the network for final tape backup to EXABYTE.

The performance of both O_2 sensors was less than satisfactory. The downtraces from the YSI probe began to show noise, spikes and unrealistic positive surface layer (<30m) offsets at CTD11 and 12, which continued to a lesser extent at CTD18-25. The downtraces from the Beckman sensor consistently showed unreasonably low values in the surface layer. However, both sensors appeared to recover to realistic values in the surface layer on the uptraces. This resulted in the acceptable calibrations (Table 2b; see Section 5b below) derived by comparing the uptrace observations to the titrations.

5a. Processing

The processing and data transfer to the VAX was initiated by a single command at the end of the station. This command, called PROCESS, starts a batch job that sequentially passes the data through a number of programs. Most were from SEABIRD's SEASOFT package. A few were custom written at BIO. The following is a summary of the processing procedure:

(1) Convert raw frequency data to binary pressure, temperature and conductivity using SEABIRD's DATCNV program.

(2) Split the file into the up and down traces using SEABIRD's SPLIT program.

(3) Check downcast for and mark any 'wild' data points with SEABIRD's WILDEDIT program.

(4) Filter downcast conductivity and temperature using SEABIRD's FILTER program. This is a low pass filter and we used a time constant of 0.045 seconds for conductivity and 0.15 seconds for temperature.

(5) Mark downcast scans where the CTD is moving less than the minimum velocity of 0.10 m/s using SEABIRD's LOOPEDIT program.

(6) Align downcast pressure, temperature and conductivity using SEABIRD's ALIGNCTD program by advancing the conductivity signal by 0.01 sec.

(7) Apply the thermal mass correction for the conductivity cell using SEABIRD's CELLTM program.
(8) Bin average downcast data to 1.0 m intervals using SEABIRD's BINAVG program.
(9) Compute downcast salinity, potential density (Sigma-θ), potential temperature, dissolved oxygen, and depth using SEABIRD's DERIVE program.
(10) Convert the down cast from binary to ASCII using SEABIRD's TRANS program.
(11) Convert downcast to ODF format using PCS program SEAODF.
(12) Create IGOSS message using PCS program ODF_IGOS.
(13) Prepare batch and command files to transfer the data to the VAX and create the input for SEABIRD's ROSSUM program using our customized MAKEFILE program.
(14) Check for bottles, then use ROSSUM to create the rosette summary file.
(15) Convert the resulting .BTL file to a format suitable for ingestion into Quattro PRO (.QAT file) using our customized QPROBTL program.
(16) Use the command file from step (12) to perform the FTP transfer of the raw binary and processed data to the VAX.
(17) Copy Quattro, downcast, and ODF files to appropriate directories and clean up.

Plots and status info displayed by the SEASAVE program during the acquisition are discarded when the program terminates. The post-processing plotting was not included in the batch job because SEABIRD's SEAPLOT program requires interactive operator attention.

5b. Calibration

At the base of each CTD cast two rosette bottles were tripped, one of which carried a pair of digital thermometers. Salinity samples were drawn from each of the two bottles and analyzed onboard with an Guildline AutoSal salinometer. The comparison of these standards against the SeaBird CTD (Table 2a below) shows that, after the removal of several obvious outliers, the offset in temperature is negligible, but that for salinity is significantly different from zero. Nevertheless, the standard deviations about the offsets are small, so the calibrations for both T and S are considered generally acceptable. However, some problems with mismatch of the SeaBird sensor time constants were evident from apparent density inversions which occurred in regions of exceptionally high vertical gradients of T and S, such as the interleaving zone at the mouth of Northeast Channel (see Figs.8,9 below). Removal of these features requires reprocessing with iterative adjustment of the sensors' individual time constants, which has not yet been undertaken. Away from these frontal regions, the accuracies implied by Table 2a are assumed to apply.

In addition, dissolved oxygen samples were collected from rosette bottles tripped over the entire water column and analyzed on board with the automated titration unit borrowed from Marine Chemistry. Comparisons between the both Beckman and YSI measurements and bottle samples revealed that both sensors have significant offsets with respect to the titrated values (Table 2a). The overall mean differences between uptrace sensor readings and titrated values suggests that the Beckman sensor was somewhat more stable than the YSI on this cruise. However, part of the observed variance may be due to titration errors, since titrated replicate samples showed a standard deviation of 0.46 ml/l. In order to provide the best O_2 calibrations, significant outliers (based on replicate statistics) were excluded from the linear regression analysis of titrated on uptrace sensor values. Thus, the effective calibrations for the two sensors (Table 2b; Figs.2a-d) indicate high correlation and low standard error for both YSI and Beckman instruments.

Problems:

(1) *An attempt should be made to minimize the density inversions in the interleaving regions by iterative adjustment of the sensor temperature and conductivity time constants.*

(2) *Because of problems with noise and surface layer offsets in the downtraces for both YSI and Beckman* O_2 *sensors, it is recommended that the dissolved oxygen uptraces, rather than downtraces, be archived.*

5c. Sections

CTD sections I-VI (Figs. 3-10) depict hydrographic conditions, 1) along the eastern boundary of the Gulf of Maine, 2) across the sill in Northeast Channel, 3) down the western flank of Browns Bank, 4) along Truxton Swell, 5) across the mouth of Northeast Channel, 6) along the 200 m isobath on the eastern side of the Channel, and 7) across the outer Scotian Shelf off Shelburne, respectively. Section Ia (Fig.3) shows a sharp demarcation in surface water properties at CTD10-11, where the surface salinity rises by roughly 0.5 in the offshore direction. Below the surface layer there is evidence for intrusion of warmer, saltier waters at CTD7-9, probably supplied by the eastward current along the northern flank of Browns Bank. At the outermost stations (CTD11,12), the presence of slope water is evident along the edge of Northeast Channel.

Two versions of Section Ib were run in Northeast Channel along the mooring/ADCP line. The first (Section Ib1; CTD13-17) was occupied just prior to the first large storm of the cruise on 26 Nov.; the second (Section Ib2; CTD18-25) was occupied just after the storm had passed. The water mass structure on Section Ib1 (Fig.4; section completed with CTD 18-19) was dramatically different from that on Section Ib2 (Fig.5). Before the storm (Fig.4), warm (>14°C), salty (>35) slope water was found on the eastern side of the Channel, pressed against the flank of Browns Bank. After the storm (Fig.5), however, most of the slope water was missing, and that remaining had shifted to the centre of the Channel (CTD21). These changes are clearly seen by comparing the T,S properties on the two sections (Fig.4d vs. 5d).

A qualitative explanation for this phenomenon may be found in the numerical model results of Greenberg, *et al.* (1995), which indicate that the effect of strong NE winds on 26 Nov. would be strong onshore Ekman transport compensated by deep seaward transport in Northeast Channel. Moreover, the model's seaward transport appears to be associated with a cross-channel component toward Georges Bank at the mooring line section. Thus it is plausible that the warm salty slope water was pushed across and out of Northeast Channel by the wind-driven transport, but such an hypothesis clearly requires further testing.

Section II (Fig.6) shows properties similar to those found on Section Ib2, but not Section Ib1. This is consistent with the notion that the replacement water on Section Ib2 comes from the onshore region. Salinities in excess of 35.0 are found at depth in Georges Basin (CTD38,39), but temperatures near the 200m isobath barely exceed 11°C.

Section III (Fig.7) along Truxton Swell depicts the transition from well-mixed waters off SW Nova Scotia to the well-layered structure in the central Gulf of Maine. The freshest water is found in the east (CTD30,31), isolated by a fairly sharp tidal front between CTD31 and 32.

Distinct evidence for a slope water intrusion is found at CTD33, where the salinity just reaches 35.0 near the bottom and warm temperatures (>9.5°C) persist throughout the water column. Further west, the cold intermediate layer is found at CTD36,37, where salinities do not exceed 34.5.

Section IV (Fig.8), across the mouth of Northeast Channel to Georges Bank, shows strong interleaving between coastal and Gulf Stream (T>16°C, S>35.5) water masses on the eastern side off Browns Bank. The latter is most probably the source region for the slope water intrusion found on Section Ib1 (Fig.4), where its properties had already been diluted by mixing with shelf waters. On the other side, the well-mixed waters found on Georges Bank (e.g. CTD44) are considerably more saline than those off SW Nova Scotia or on Browns Bank.

Section V (Fig.9) extends from the offshore region through the eastern side of Northeast Channel to Truxton Swell, roughly along the 200m isobath. All stations on this line were occupied after the passage of the major storm and its attendant changes on 26 Nov. The offshore region is characterized by a strong front at the mouth of the Channel and interleaving of water masses. Within the Channel and through Georges Basin, the continuity of waters with salinity >35.0 suggests that a major intrusion of slope water has occurred in recent months, in spite of occasional countervailing transports. Evidence for this event will be sought from the current meter data.

Finally, Section VI (Fig.10) shows that the properties near the Scotian Shelf break off Shelburne differ from those off Northeast Channel (T<12°C in deep water), but that the surface waters on the shelf are similar to those found off SW Nova Scotia. In particular, the near-surface temperatures and salinities at CTD53,54 are very close to those at CTD2-9. This suggests that: 1) these two water masses have a common origin, and 2) the warmer, saltier waters found on the outer half of Browns Bank come from the Gulf of Maine or offshore. The fate of the freshwater on this section is still an open question.

References:

Greenberg, D.A., J.W. Loder, Y. Shen, and D.R. Lynch. 1995. Spatial and temporal structure of the barotropic response of the Scotian Shelf and Gulf of Maine to surface wind stress. *J. Geophys. Res.*, submitted.

6. ADCP TRANSECTS

The RDI ADCP was run continuously over the cruise in the bottom track mode. The velocity measurements were made in 100 4-m bins below the transducer depth (4.9 m). In the standard acquisition mode, 10-ping ensembles were averaged over 5 minutes to create processed profiles of velocity, beam intensity, etc. The RDI system appeared to work well over the cruise.

Eleven primary transects (Table 3) formed the repeated ADCP section across the Channel, including CTD Sections Ib1 and Ib2 and the transits during mooring operations. On these transects, only the averaged processed data were collected. A total of 32 hrs was devoted to straight-run transects, with an additional 18 hrs spent on the CTD and mooring lines (transects

1-3). Some of the transects (9,10) were incomplete due to operational constraints. The transects in Table 3 show indications of strong vertical shear in the water column and will form the basis for the removal of the semidiurnal tidal signal from the records. They also showed layers of high backscatter extending from Georges Bank out into Northeast Channel at bank depths (C.Hannah, pers. comm.). These features ought to be investigated in future.

A calibration of the transducer alignment and amplification factor was conducted shortly after leaving BIO, on the straight run down to SW Nova Scotia. The results (Table 3a) show that both these quantities are negligibly different from their design values of 0 deg. and 1.00, respectively.

Acknowledgements:

We are greatly indebted to the officers and crew of the *C.S.S. Parizeau* for their skilled assistance and friendly cooperation, which was vital to the success of this mission. We also thank the Department of Oceanography at Dalhousie University for their encouragement of student participation in our field work. The help is greatly appreciated.

TABLE 1. Moorings Deployed During *Parizeau* Cruise 95034
24 Nov.-3 Dec. 1995

Mooring No.	Site (Depth,m)	N. Lat. W. Long.	Deployment Time(Z),Date	Instrument (Depth,m)
1205	C2A	43°02.57'	1722,Nov.24	RCM7127(27)
	(115)	65°46.74'		
1206	C2	43°02.74'	1806,Nov.24	RCM3569(45)
	(105)	65°46.95'		RCM5001(95)
				TG821(105)
1207	NECWA	42°07.48'	1343,Nov.29	RCM7131(23)
	(211)	66°00.66'		
1208	NECW	42°07.63'	1427,Nov.29	RCM7137(49)
	(212)	66°00.72'		RCM6401(100)
				RCM6407(150)
				RCM7124(192)
				TG1271(212)
1209	NECEA	42°17.78'	1808,Nov.27	SCAT359(23)
	(212)	65°50.44'		RCM4208(24)
1210	NECE	42°17.77'	1905,Nov.27	SCAT365(49)
	(213)	65°50.69'		RCM9607(50)
				RCM7651(101)
				RCM8697(151)
				RCM5359(193)
				TG334(213)

TABLE 1a. Moorings Recovered During *Parizeau* Cruise 95034
24 Nov.-3 Dec. 1995

Mooring No.	Site (Depth,m)	N. Lat. W. Long.	Recovery Time(Z),Date	Instrument (Depth,m)	Comments
1192	C2A	43°02.58'	1112,Nov.24	RCM7650(26)	hairy growth
	(114)	65°46.76'			rotor free
1193	C2	43°02.73'	1144,Nov.24	RCM7134(49)	rotor free
	(109)	65°47.04'		RCM2663(99)	" "
				TG109(109)	clean
1188	NECWA	42°07.60'	2020,Nov.27	RCM4600(26)	missing;
	(214)	66°00.73'			recovered
					earlier
1189	NECW	42°07.72'	2035,Nov.27	RCM9355(53)	rotor free
	(216)	66°00.69'		RCM4998(104)	" "
				RCM5358(154)	" "
				RCM6404(196)	" "
				TG336(216)	clean
1190	NECEA	42°17.75'	1213,Nov.27	RCM7138(23)	hairy growth;
	(211)	65°50.39'			rotor free
1191	NECE	42°17.92'	1128,Nov.27	RCM7592(51)	rotor free
	(214)	65°50.94'		RCM7122(102)	" "
				RCM3300(152)	" "
				RCM4406(194)	" "
				TG343(214)	clean

TABLE 2. CTD Stations During Parizeau 95034, 24 Nov.-3 Dec. 1995

Stn. No.	N.LAT.	W.LONG.	Sound. (m)	Date	Year Day	Time [UTC]
0	44.690	63.642	62	Nov 24 1995	328	15:06:25
1	44.400	63.466	86	Nov 24 1995		19:19:04
2	43.248	65.740	40	Nov 25 1995	329	05:35:01
3	43.165	65.743	44	Nov 25 1995		06:43:32
4	43.085	65.745	86	Nov 25 1995		07:41:00
5	43.000	65.749	126	Nov 25 1995		08:51:18
6	43.033	65.778	102	Nov 25 1995		09:39:23
7	42.919	65.753	137	Nov 25 1995		19:07:08
8	42.835	65.757	92	Nov 25 1995		20:09:39
9	42.751	65.757	97	Nov 25 1995		21:09:11
10	42.671	65.747	81	Nov 25 1995		22:01:12
11	42.585	65.745	83	Nov 25 1995		22:53:48
12	42.499	65.751	81	Nov 25 1995		23:46:08
13	42.426	65.752	87	Nov 26 1995	330	01:03:09
14	42.338	65.796	172	Nov 26 1995		02:04:33
15	42.268	65.864	218	Nov 26 1995		03:38:38
16	42.202	65.933	218	Nov 26 1995		04:48:28
17	42.135	65.994	222	Nov 26 1995		06:03:40
18	42.060	66.079	88	Nov 27 1995	331	23:46:17
19	42.000	66.138	85	Nov 28 1995	332	00:42:13
20	42.132	65.994	215	Nov 28 1995		02:17:00
21	42.200	65.932	221	Nov 28 1995		03:26:08
22	42.267	65.867	223	Nov 28 1995		04:27:53
23	42.284	65.859	220	Nov 28 1995		05:15:56
24	42.332	65.793	159	Nov 28 1995		06:25:04
25	42.425	65.750	90	Nov 28 1995		07:29:04
26	42.117	66.014	193	Nov 29 1995	333	15:33:31
27	42.191	65.702	222	Nov 29 1995		20:54:20
28	42.176	65.500	104	Nov 29 1995		23:15:52
29	42.090	65.511	727	Nov 30 1995	334	00:41:02
30	43.279	66.437	59	Nov 30 1995		12:01:36
31	43.216	66.647	104	Nov 30 1995		13:23:56
32	43.170	66.865	159	Nov 30 1995		14:45:50
33	43.135	67.102	177	Nov 30 1995		16:01:56
34	43.168	67.317	184	Nov 30 1995		17:18:17
35	43.121	67.554	174	Nov 30 1995		18:46:08
36	43.001	67.738	165	Nov 30 1995		20:18:26
37	42.926	67.998	155	Nov 30 1995		21:45:22
38	42.507	66.961	314	Dec 01 1995	335	02:27:06

39	42.592	66.777	222	Dec 01 1995		03:52:38
40	42.708	66.612	164	Dec 01 1995		05:13:02
41	42.803	66.434	91	Dec 01 1995		06:24:42
42	42.511	66.181	213	Dec 01 1995		08:40:51
43	42.426	65.980	215	Dec 01 1995		10:06:19
44	41.807	66.129	84	Dec 01 1995		14:56:41
45	41.823	65.913	110	Dec 01 1995		16:06:47
46	41.854	65.684	734	Dec 01 1995		17:39:41
47	41.942	65.607	725	Dec 01 1995		19:19:24
48	42.010	65.558	810	Dec 01 1995		20:47:11
49	42.042	65.417	1041	Dec 01 1995		22:31:29
50	41.984	65.317	1658	Dec 02 1995	336	00:02:18
51	42.608	64.226	915	Dec 02 1995		05:40:43
52	42.678	64.293	234	Dec 02 1995		06:58:34
53	42.751	64.363	118	Dec 02 1995		08:13:40
54	42.893	64.501	105	Dec 02 1995		09:38:51

TABLE 2a. Temperature and Salinity Calibration Results for *Parizeau* 95034

QUANTITY	NO. SAMPLES	MEAN DIFF.	STD. DEV.
Salinity:			
CTD-AutoSal.	106	-0.021	0.006
Temperature:			
CTD-Thermometers	30	-0.004	0.005
Dissolved Oxygen:			
YSI-Titration(1-12)	69	0.76	0.14
Beckman-Titration(15-17)	24	-0.74	0.48
YSI-Titration(18-25)	66	0.02	0.50
Beckman-Titration(15-17)	237	-0.72	0.29

TABLE 2b. Dissolved Oxygen Regression Results for *Parizeau* 95034
Y = aX+b (Y=titration, X=sensor)

SENSOR	NO. SAMPLES	$a \pm \delta a$	b(ml/l)	$\pm\delta Y$(ml/l)	r^2
YSI(1-12)	69	0.8684±0.0177	0.1154	±0.107	0.97
Beckman(15-17)	24	0.8707±0.2560	1.105 0	±0.655	0.34
YSI(18-25)	90	1.0810±0.0735	-0.4390	±0.499	0.77
Beckman(26-54)	237	1.1780±0.0230	-0.0349	±0.257	0.92

TABLE 3 Primary ADCP Transects During *Parizeau* 95-034

NO.	DATE (m-d)	STRT (UTC)	END (UTC)	FROM (Lat./Long.)	TO (Lat./Long.)	COMMENTS
1	11-26	00:51	06:15	42°26'/65°45'	42°08'/65°59'	CTD13-17
2	11-27	19:05	00:35	42°18'/65°51'	42°00'/66°08'	mooring,CTD18-19
3	11-28	00:50	07:20	42°00'/66°08'	42°26'/65°44'	CTD20-25
4	11-	07:58	11:42	42°25'/65°45'	41°59'/66°08'	
5	11-	11:42	15:00	41°59'/66°08'	42°26'/65°45'	
6	11-	15:00	21:26	42°26'/65°45'	42°00'/66°08'	
7	11-	21:34	01:58	42°00'/66°08'	42°26'/65°45'	
8	11-29	02:09	07:44	42°26'/65°45'	42°00'/66°08'	
9	11-	08:18	10:44	42°00'/66°08'	42°10'/65°59'	partial
10	11-	16:09	19:24	42°08'/66°01'	42°26'/65°45'	partial
11	11-	11:21	13:51	42°26'/65°45'	42°00'/66°08'	

TABLE 3a. Straight Run RDI Calibrations for *Parizeau 95-034*

DATE: 1 December, 1995

TIME	MISALIGNMENT ANGLE (deg.)	AMPLIFICATION FACTOR (-)
12:32:26	-0.332	0.981
12:37:12	-1.825	1.005
12:42:13	0.252	1.003
12:47:13	-4.532	1.012
12:52:14	1.392	1.002
12:57:14	-3.100	1.000
13:02:15	-0.190	1.001
AVERAGE	-1.175	1.000

FIGURE CAPTIONS:

Figure 1 a) Mooring sites, and b) CTD positions and ADCP transects for *C.S.S. Parizeau* Cruise 95-034, 24 Nov.-3 Dec. 1995

Figure 2 Calibration data for the (a,c) YSI and (b,d) Beckman dissolved oxygen sensors. Titrated values from rosette bottle samples are plotted against uptrace values from the sensors at the same depth. Bold lines through the points are linear regressions of titrated on sensor values (Table 2b). Dashed and dotted lines represent calibrations from data other than those plotted.

Figure 3 Hydrographic section Ia (CTD2-13) from Cape Sable to the offshore edge of Browns Bank.
(a) temperature,
(b) salinity,
(c) sigma-θ, and
(d) temperature vs. salinity.
(e) station map

Figure 4 Hydrographic section Ib (CTD13-19) across Northeast Channel at the mooring line.
(a) temperature,
(b) salinity,
(c) sigma-θ, and
(d) temperature vs. salinity.
(e) station map

Figure 5 Hydrographic section Ib (CTD18-25) across Northeast Channel at the mooring line.
(a) temperature,
(b) salinity,
(c) sigma-θ, and
(d) temperature vs. salinity.
(e) station map

Figure 6 Hydrographic section II (CTD38-41) on the western flank of Browns Bank.
(a) temperature,
(b) salinity,
(c) sigma-θ, and
(d) temperature vs. salinity.
(e) station map

Figure 7 Hydrographic section III (CTD30-37) along Truxton Swell.
(a) temperature,

(b) salinity,
(c) sigma-θ, and
(d) temperature vs. salinity.
(e) station map

Figure 8 Hydrographic section IV (CTD27,29,44-48) across the mouth of Northeast Channel and Northeast Peak.
(a) temperature,
(b) salinity,
(c) sigma-θ, and
(d) temperature vs. salinity.
(e) station map

Figure 9 Hydrographic section V (CTD33,39,43,42,23,27,29,49-50) along the slope water inflow axis from Truxton Swell to the slope water, roughly along the 200m isobath.
(a) temperature,
(b) salinity,
(c) sigma-θ, and
(g) temperature vs. salinity.
(e) station map

Figure 10 Hydrographic section VI (CTD51-54) across the Scotian Shelf break off Shelburne.
(a) temperature,
(b) salinity,
(c) sigma-θ, and
(d) temperature vs. salinity.
(e) station map

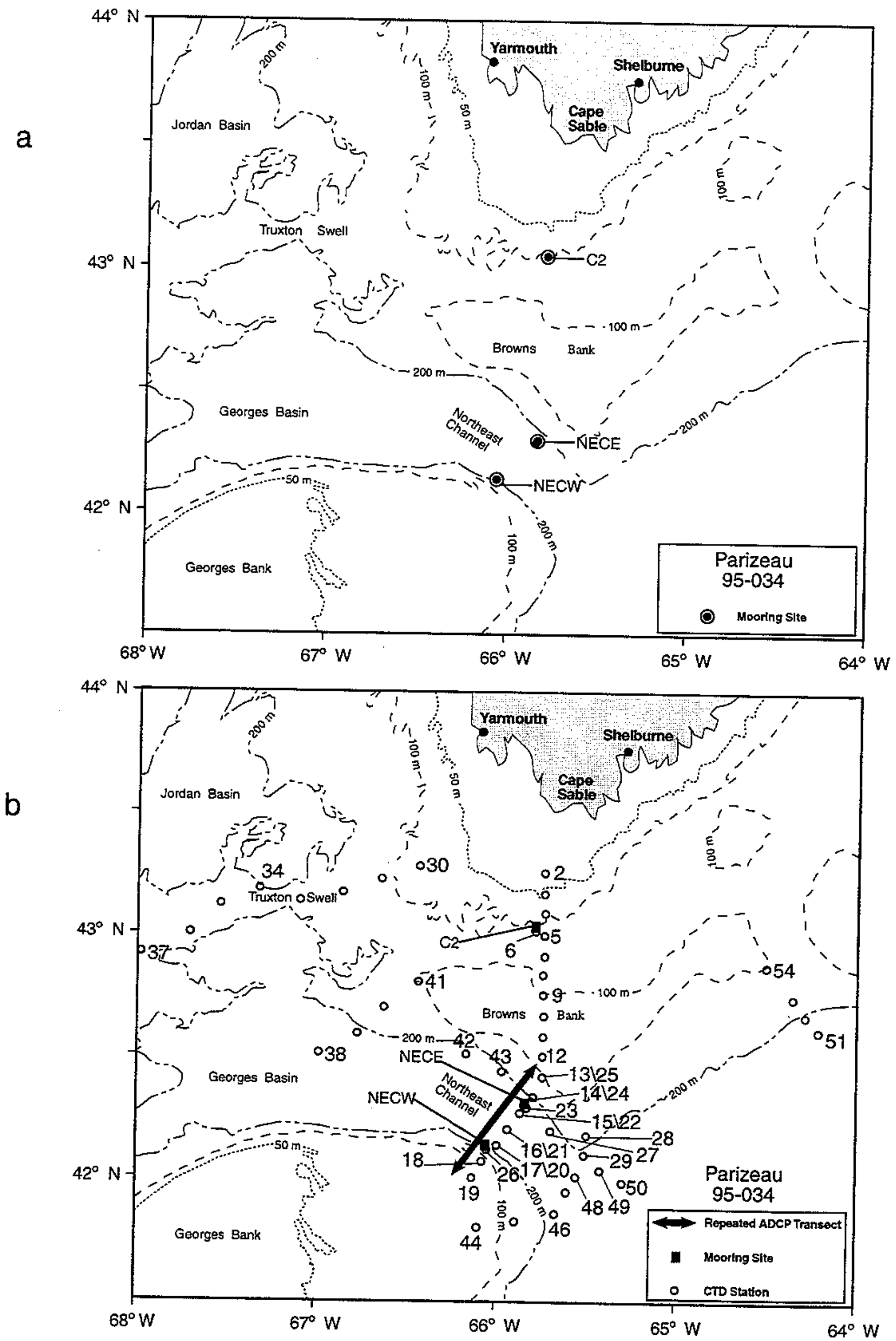


Fig. 1. a) Mooring sites, and b) CTD positions and ADCP transects for *C.S.S. Parizeau* Cruise 95-034, 24 Nov.-3 Dec. 1995.

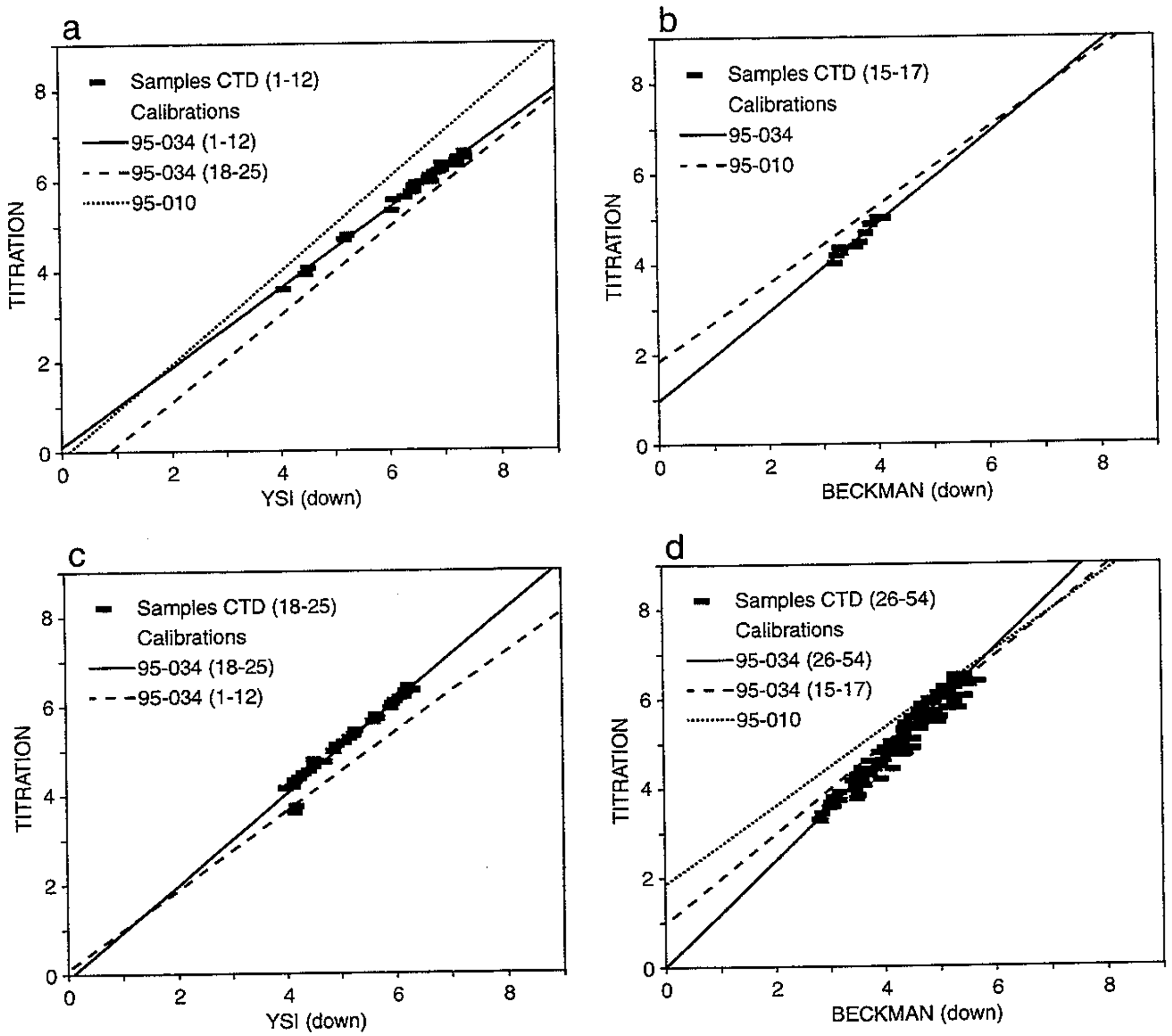


Fig. 2. Calibration data for (a,c) YSI and (b,d) Beckman dissolved oxygen sensors. Titrated values from rosette bottle samples are plotted against uptrace values from the sensors at the same depth. Bold lines through the points are linear regressions of titrated on sensor values (Table 2b). Dashed and dotted lines represent calibrations from data other than those plotted.

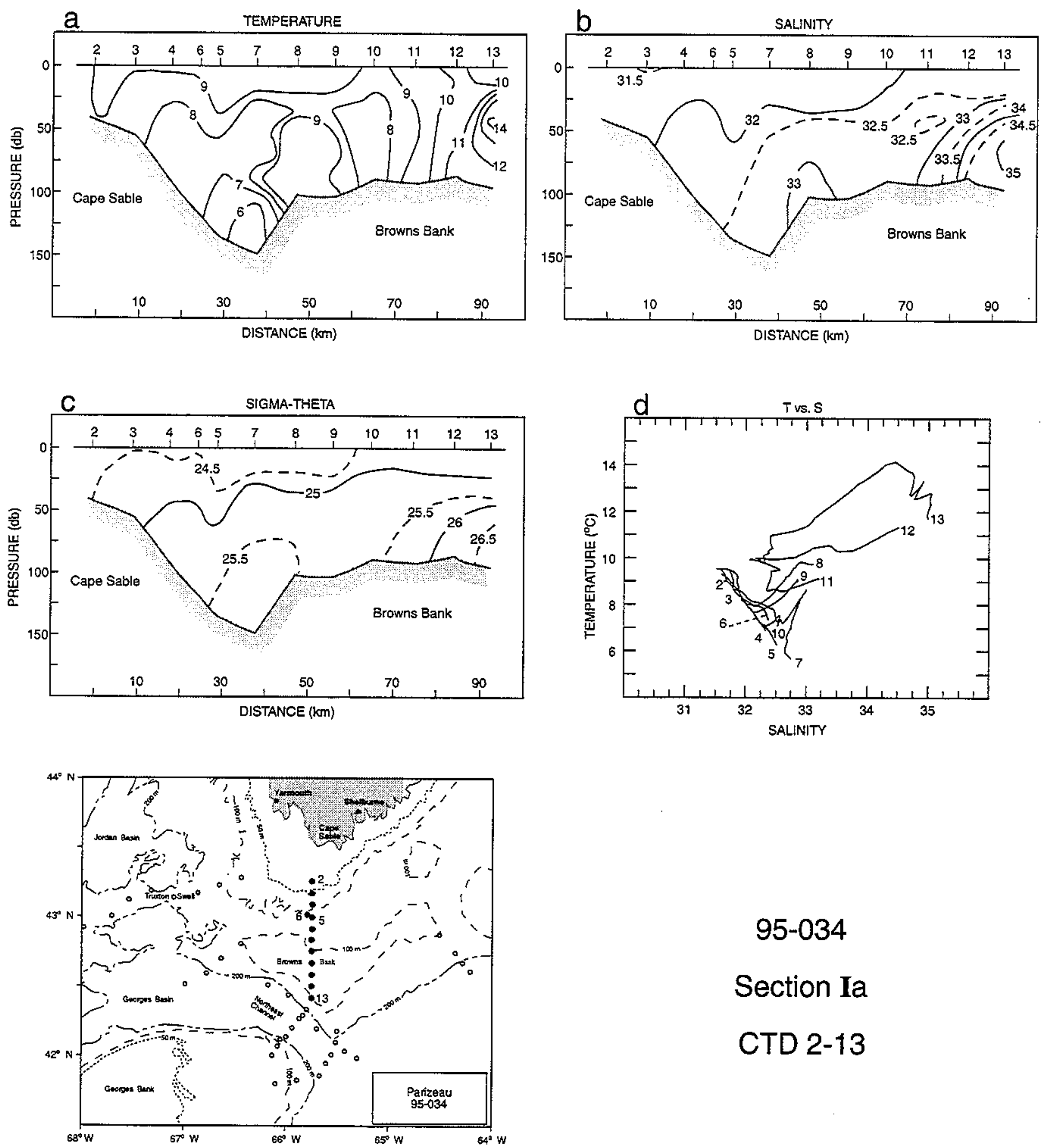


Fig. 3. Hydrographic section Ia (CTD 2-13) from Cape Sable to the offshore edge of Browns Bank.

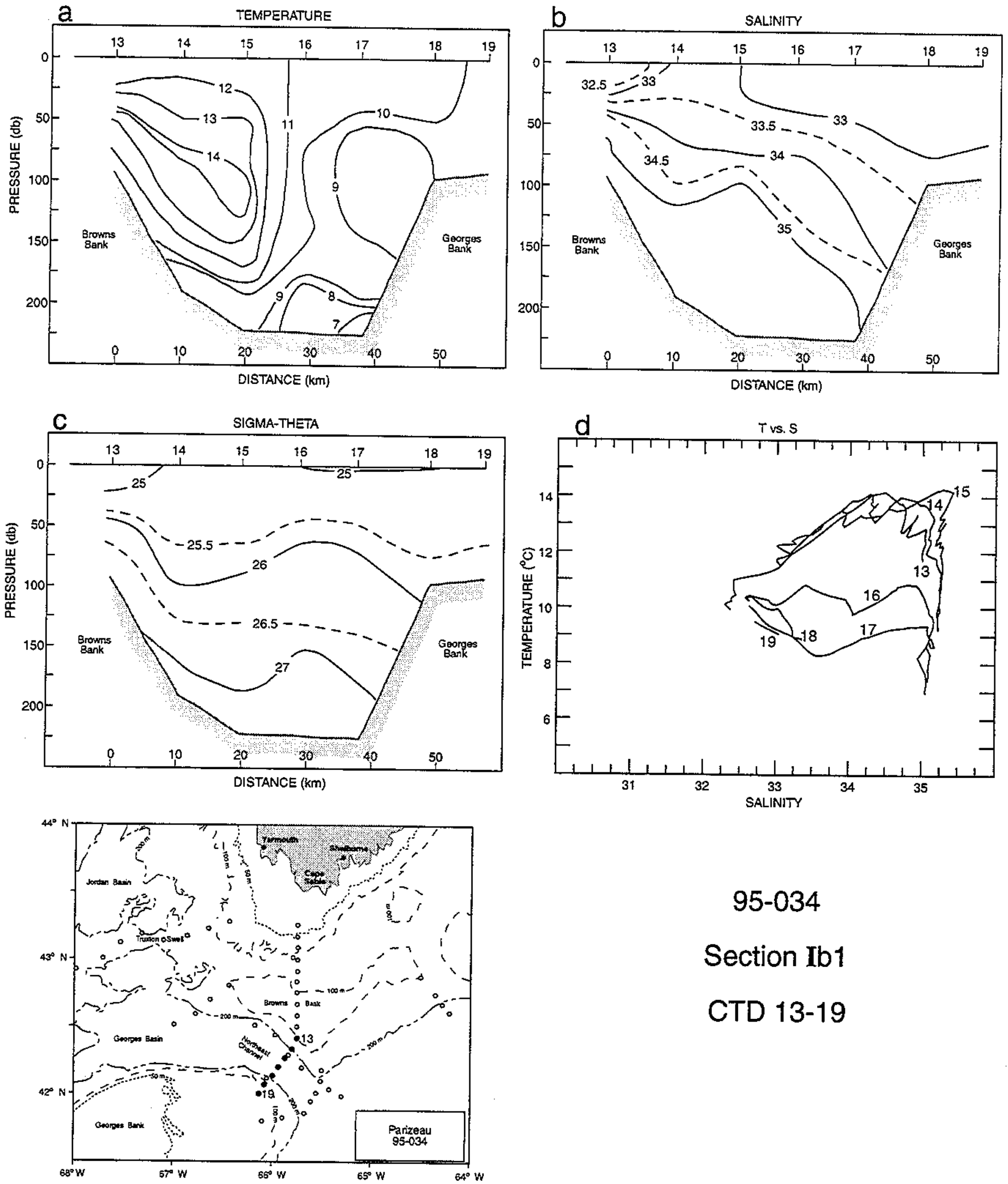


Fig. 4. Hydrographic section Ib1 (CTD 13-19) across Northeast Channel at the mooring line.

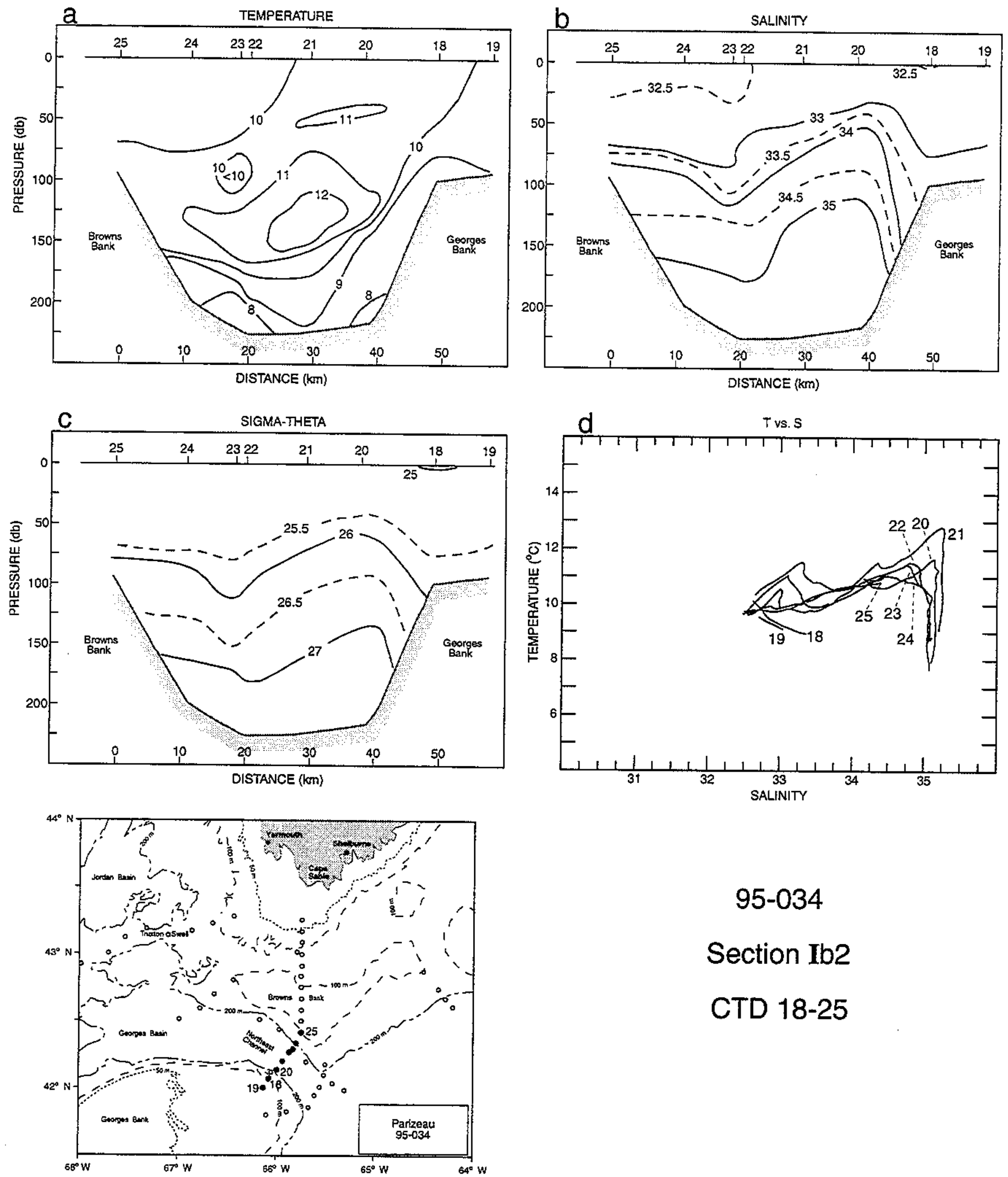
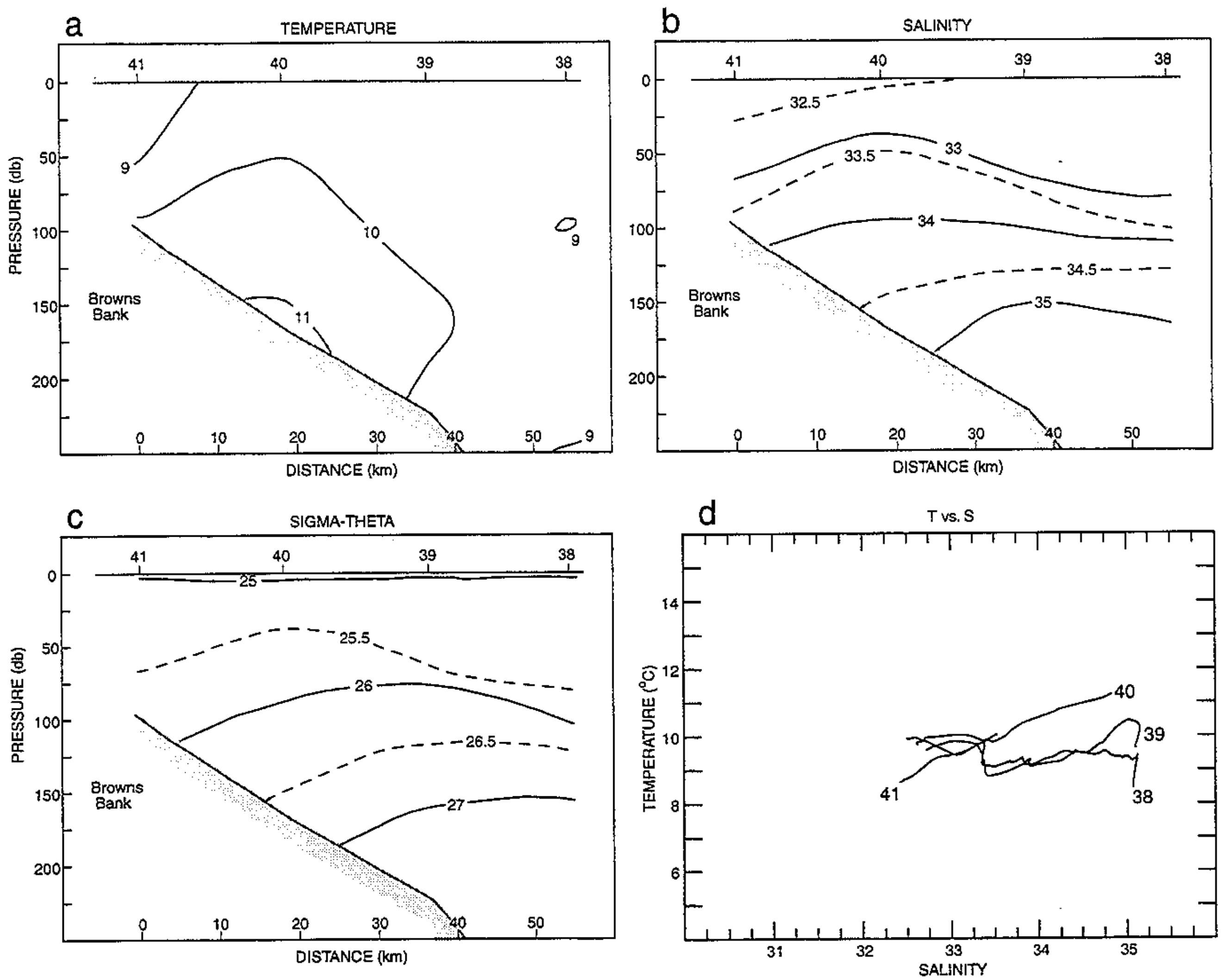
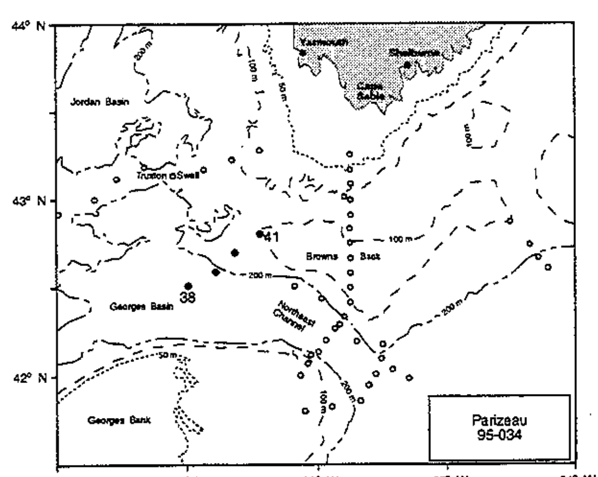


Fig. 5. Hydrographic section Ib2 (CTD 18-25) across Northeast Channel at the mooring line.





95-034

Section II

CTD 38-41

Fig. 6. Hydrographic section II (CTD 38-41) on the western flank of Browns Bank.

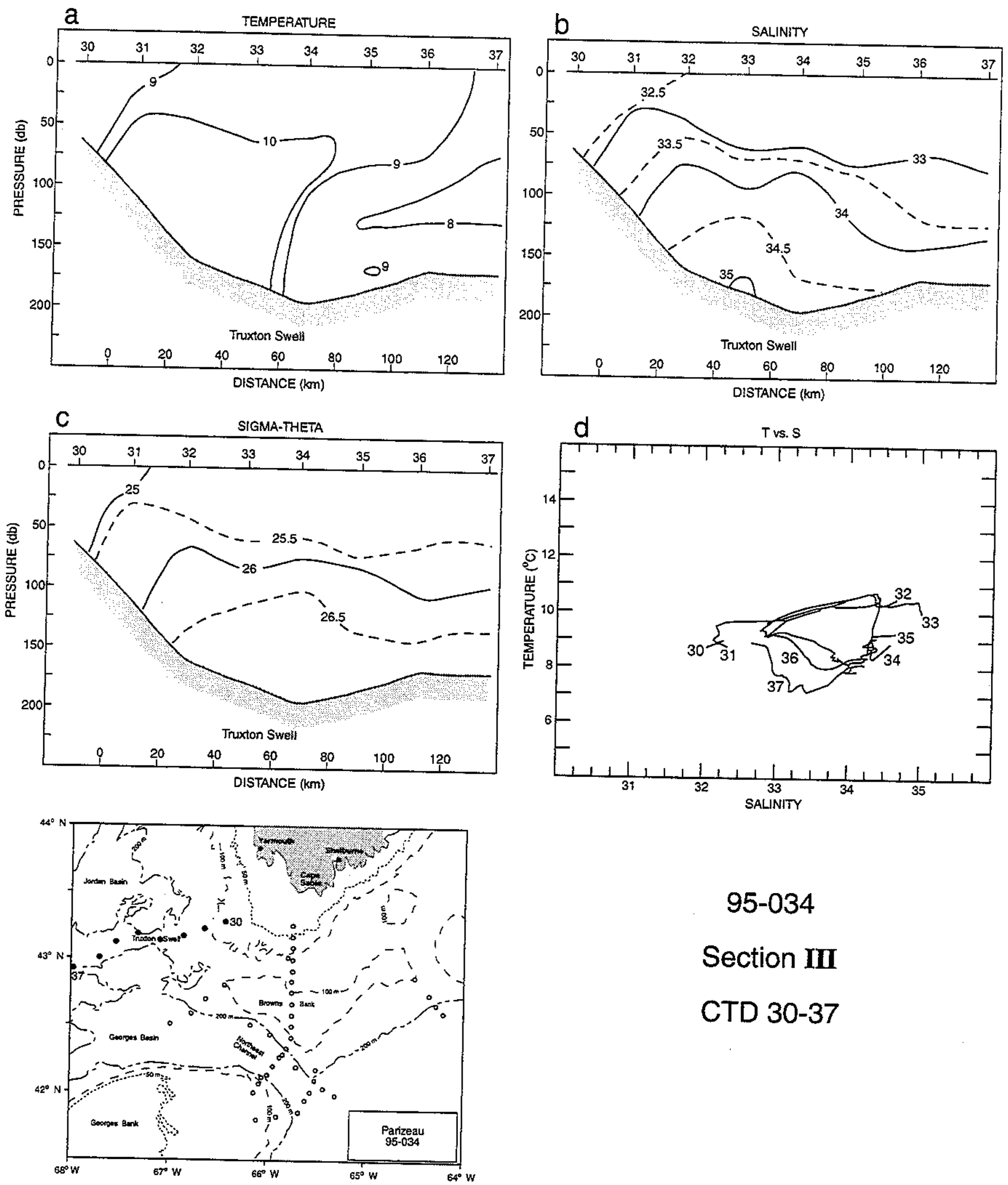


Fig. 7. Hydrographic section III (CTD 30-37) along Truxton Swell.

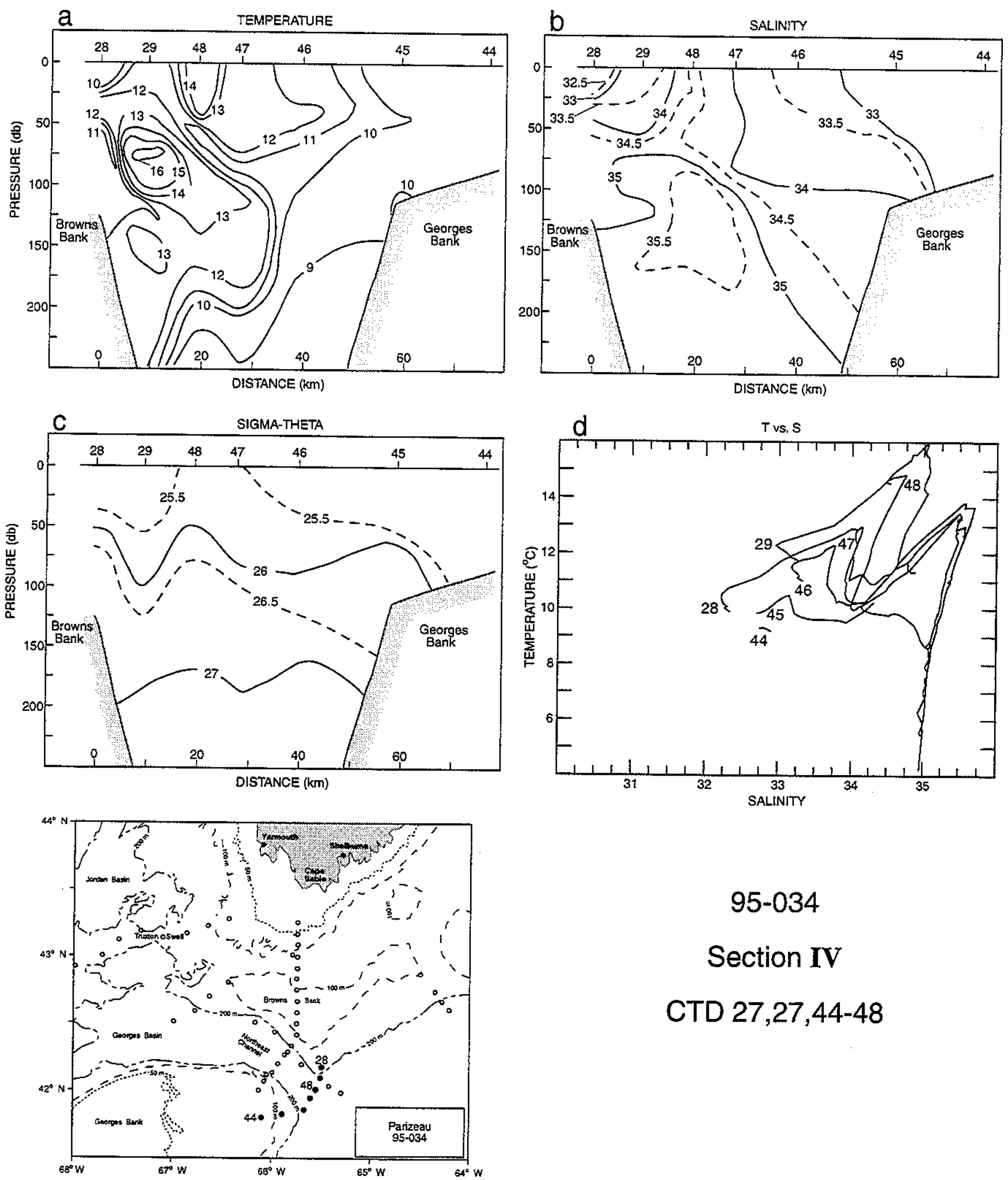
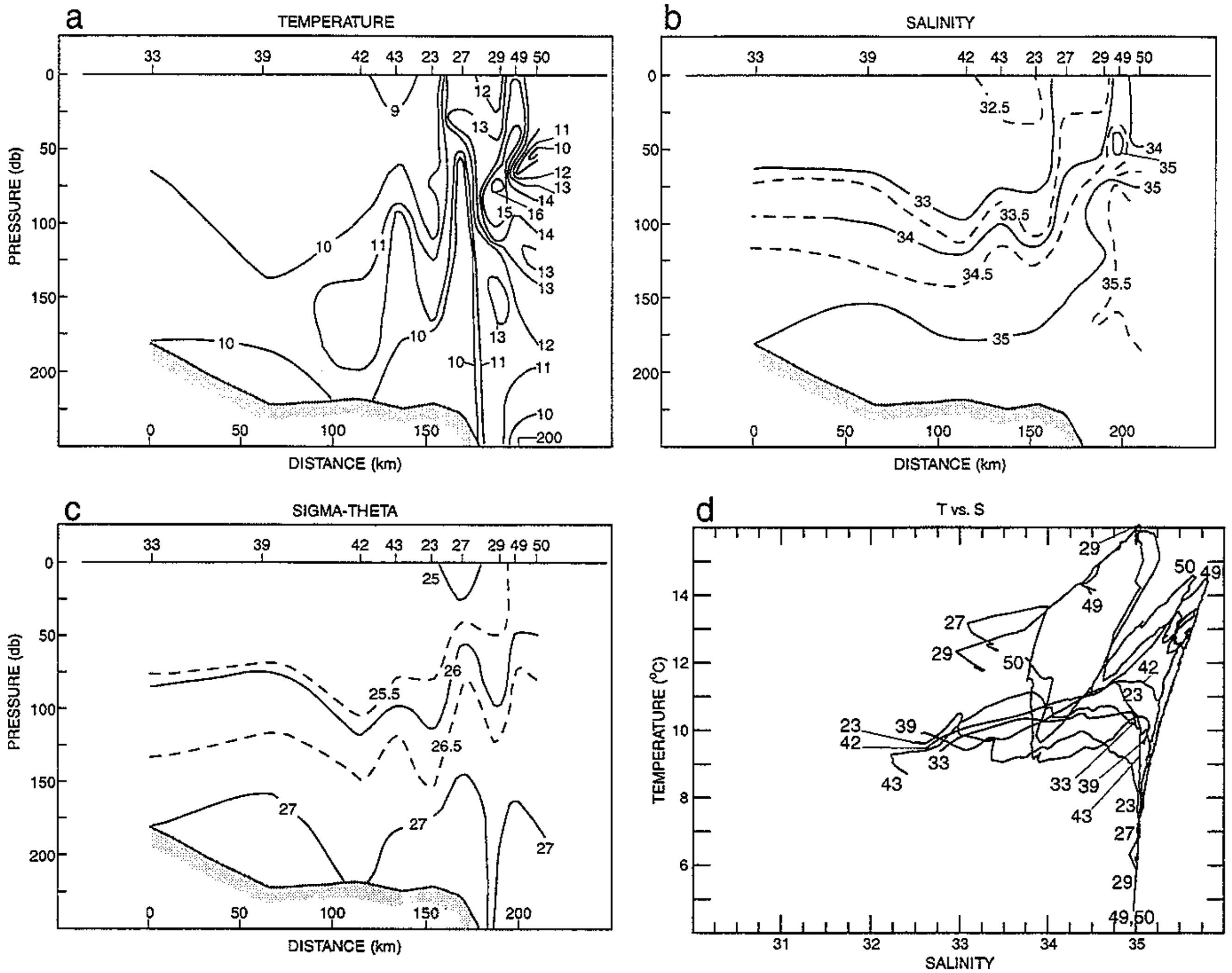
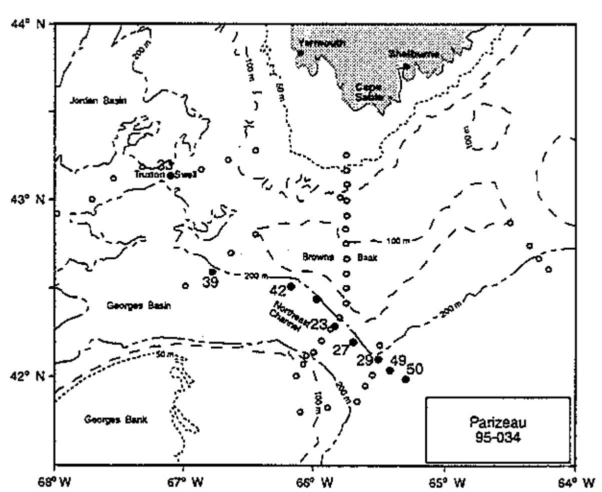


Fig. 8. Hydrographic section IV (CTD 27,29,44-48) across the mouth of Northeast Channel and Northeast Peak.



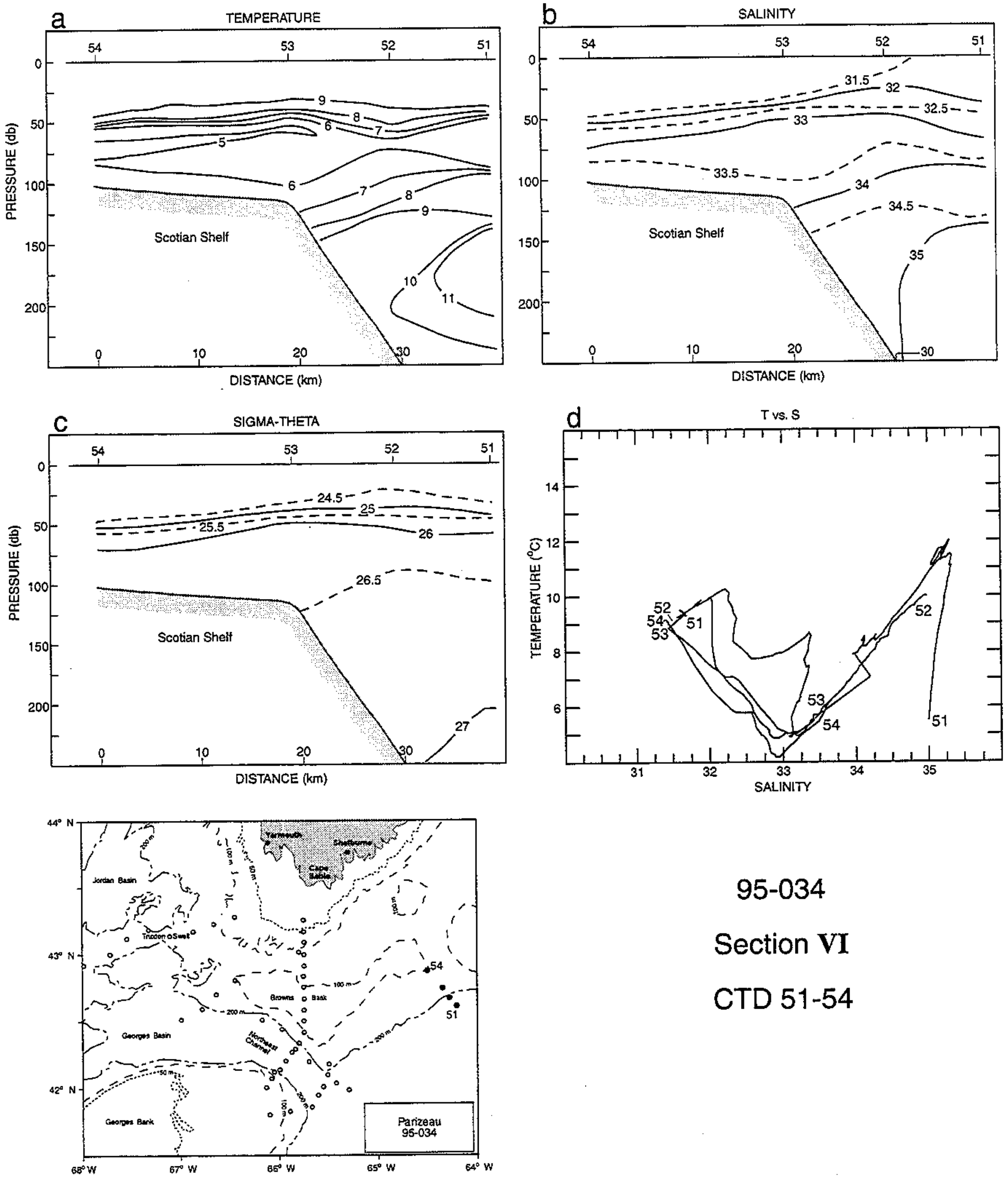


95-034

Section V

CTD 33,39,42,43,23,27,29,49,50

Fig. 9. Hydrographic section V (CTD 33,39,42,43,23,27,29,49,50) along the slope water inflow axis from Truxton Swell to the slope water, roughly along the 200m isobath.



95-034

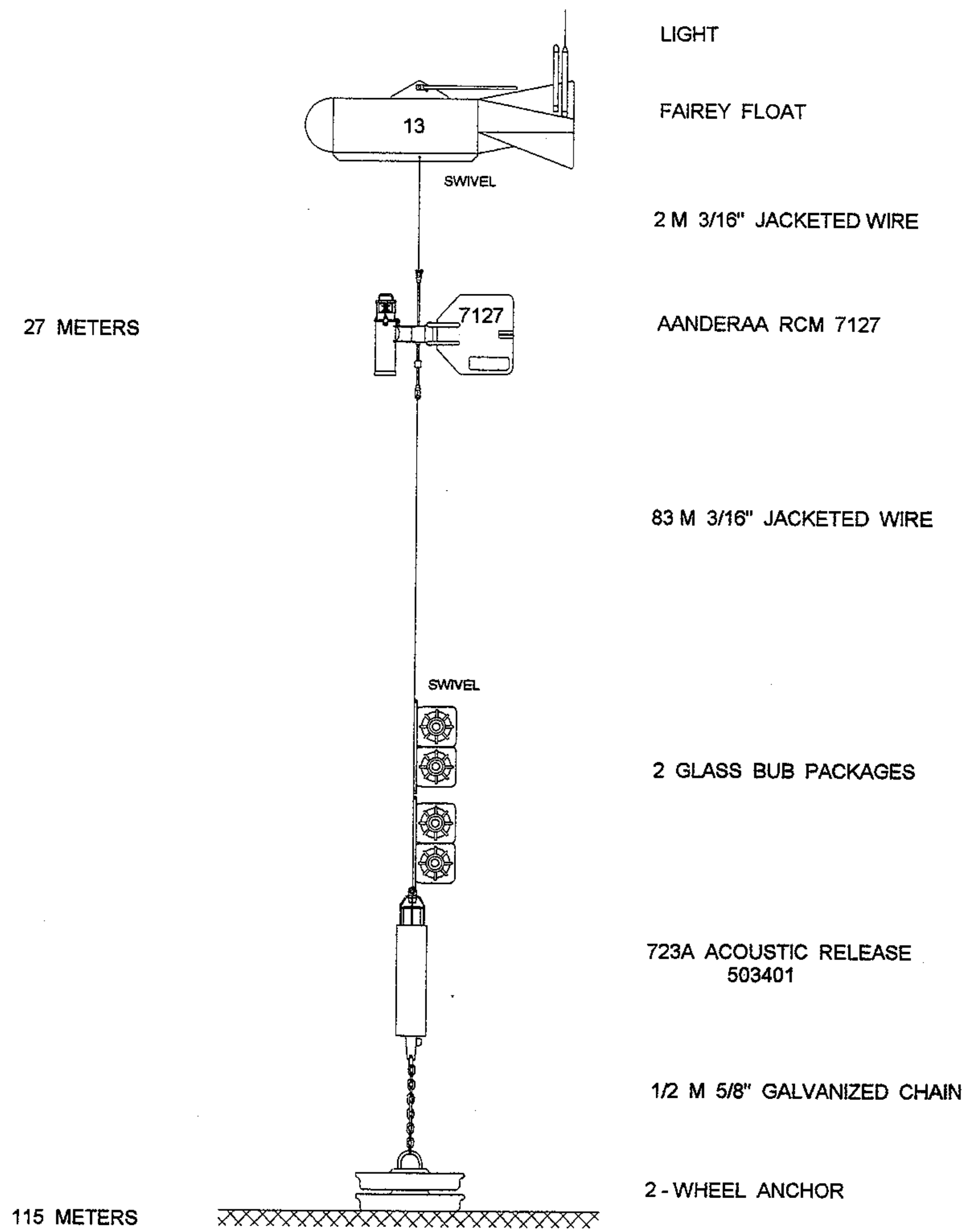
Section VI

CTD 51-54

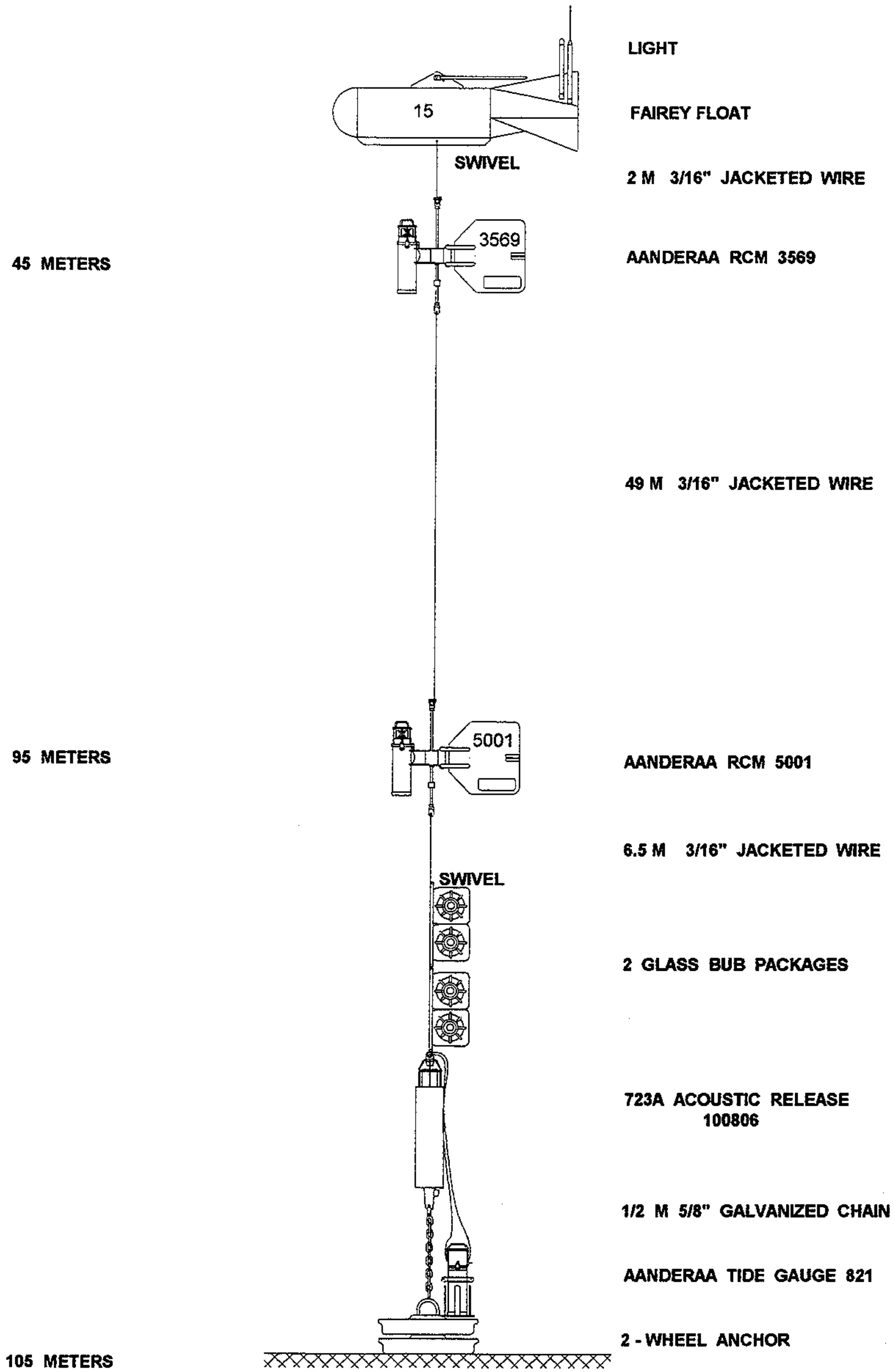
Fig. 10. Hydrographic section VI (CTD 51-54) across the Scotian Shelf break off Shelburne.

APPENDIX A Diagrams for Moorings Deployed During *C.S.S. Parizeau* Cruise 95-034

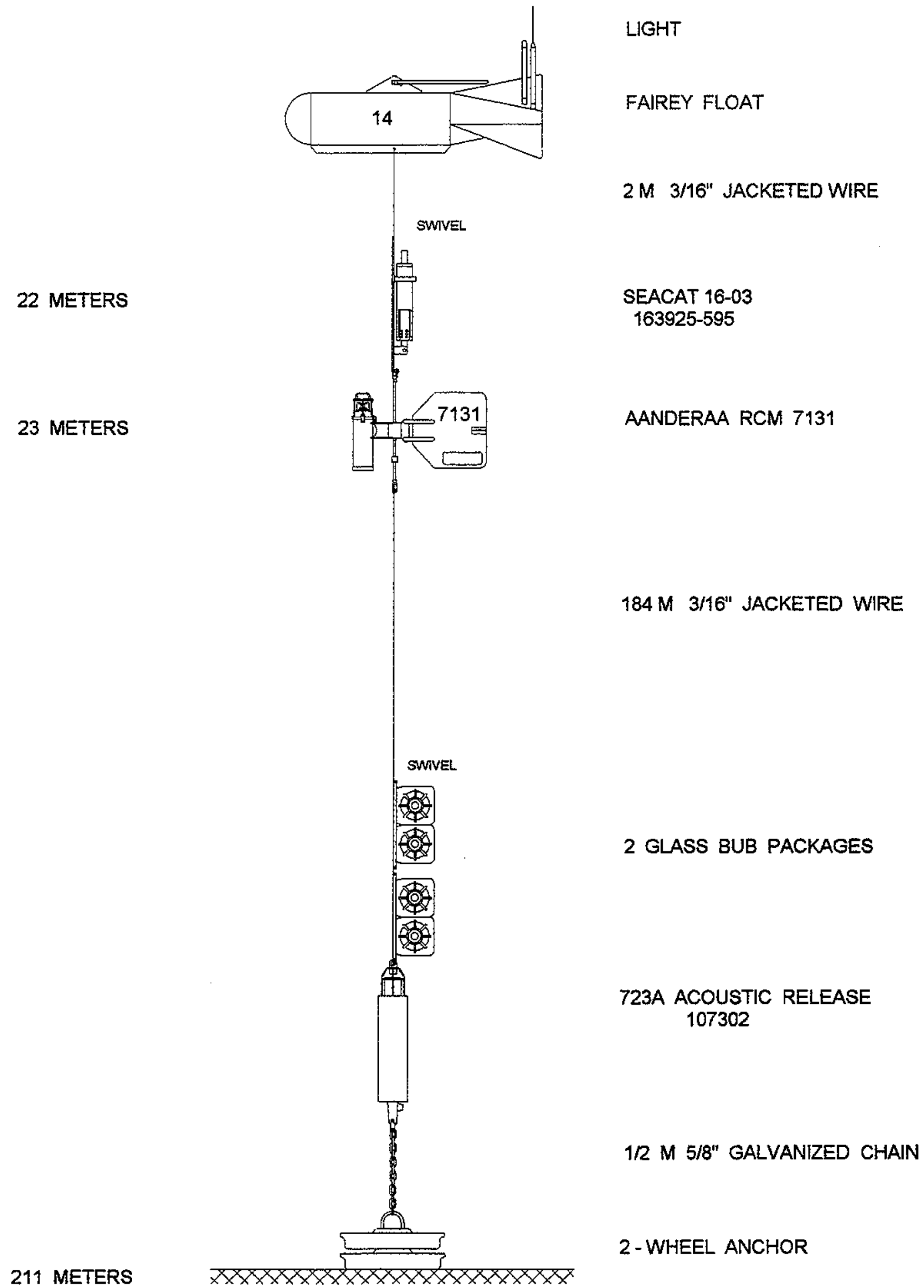
MOORING # 1205 C2A P. SMITH GLOBEC NOVEMBER 1995



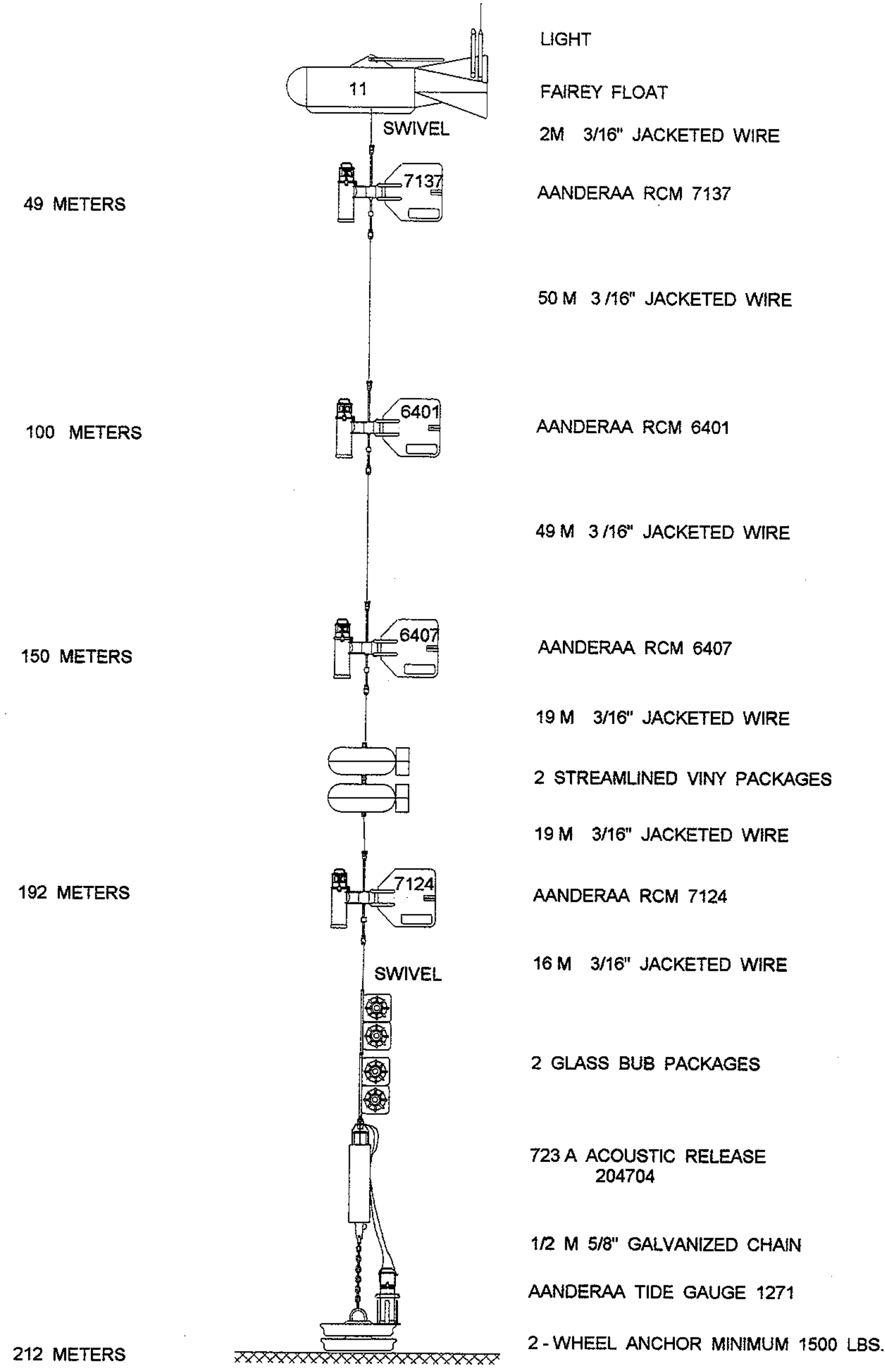
MOORING # 1206 C2 GLOBEC P. SMITH NOVEMBER 1995



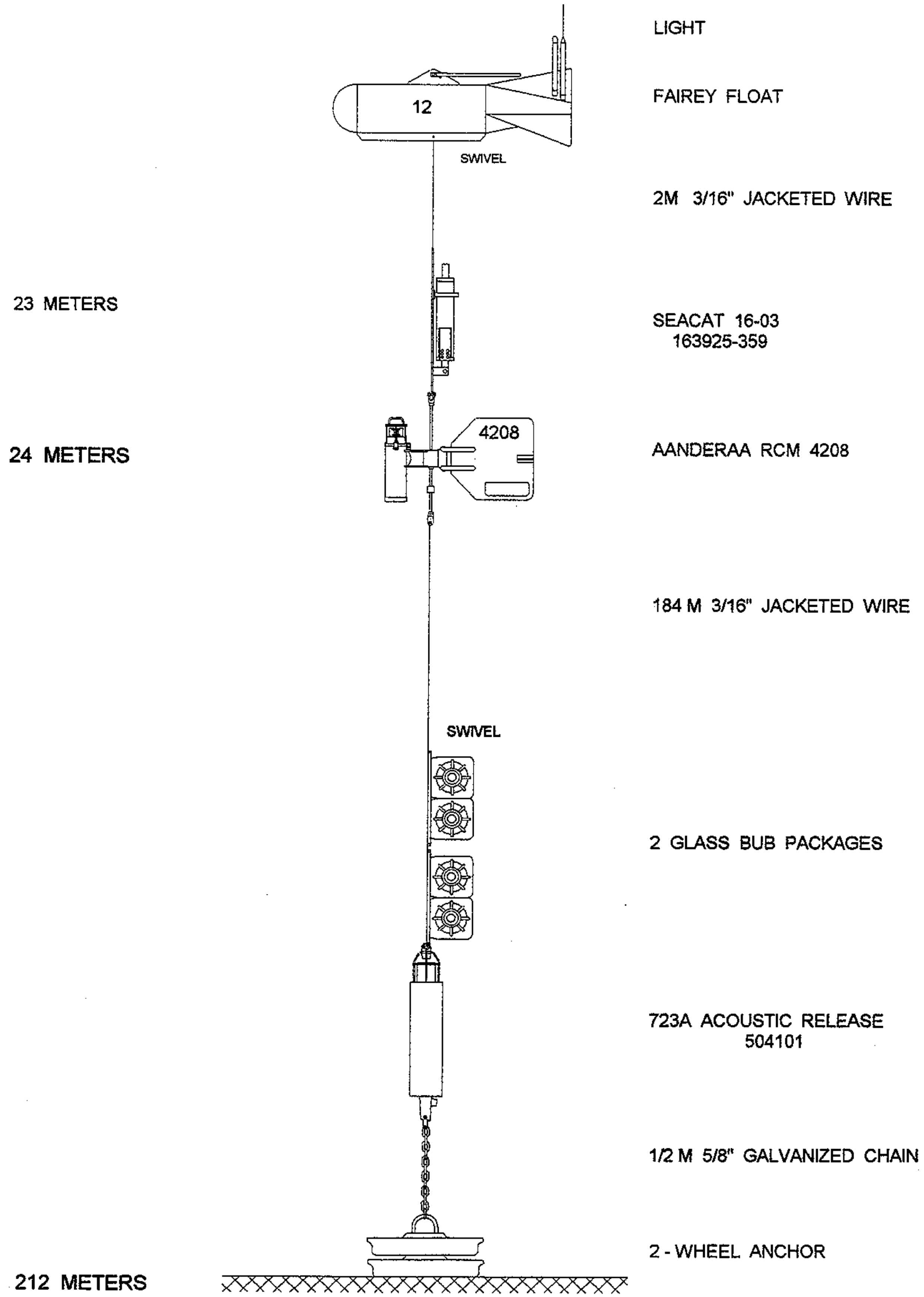
MOORING # 1207 NECWA P. SMITH GLOBEC NOVEMBER 1995



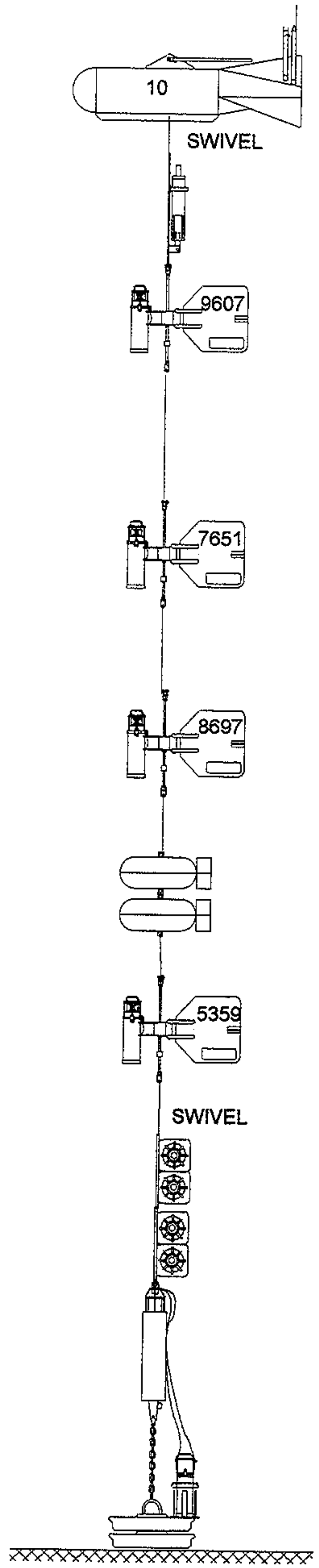
MOORING # 1208 NECW P. SMITH GLOBEC NOVEMBER 1995



MOORING # 1209 NECEA P. SMITH GLOBEC NOVEMBER 1995

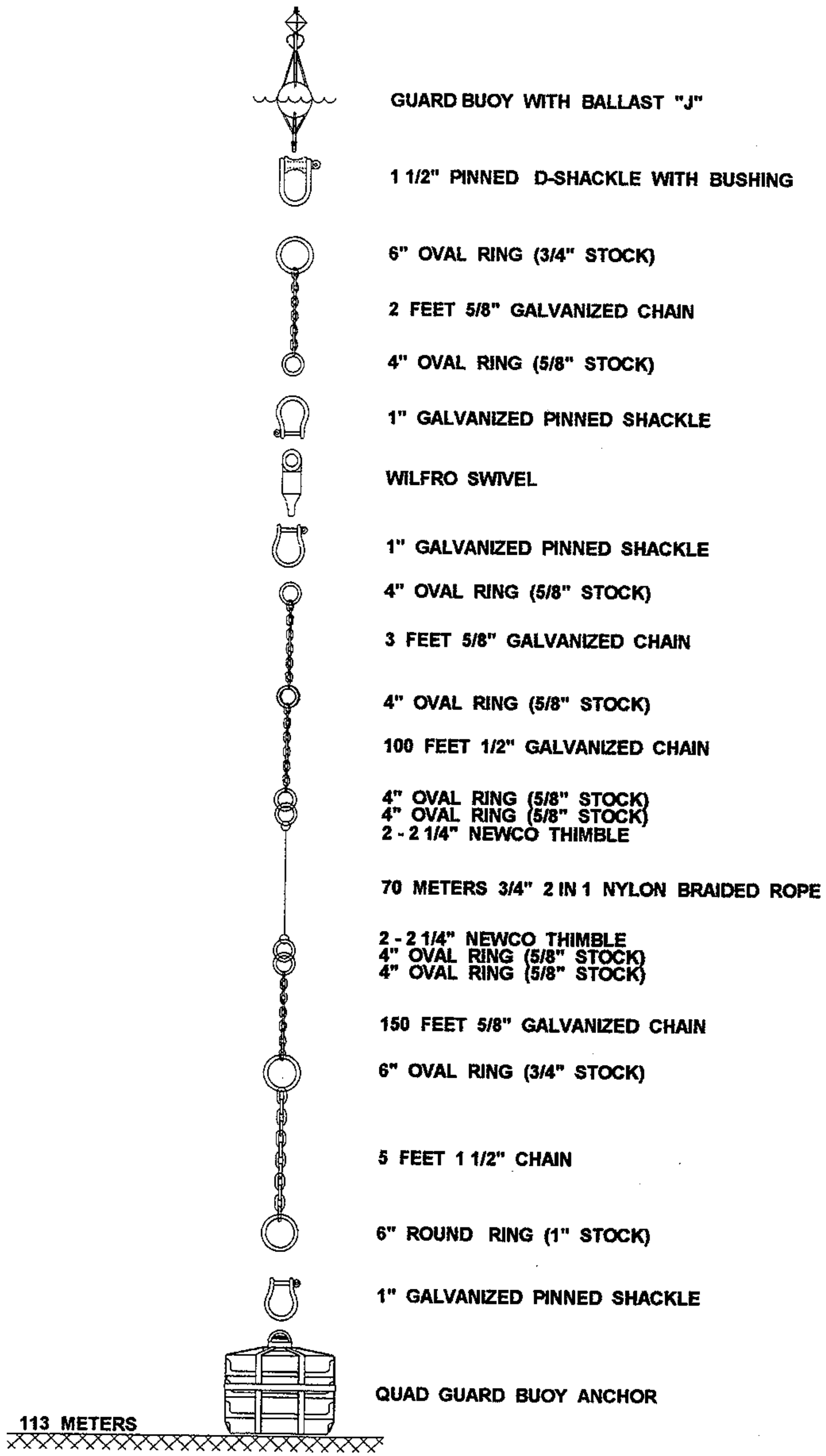


MOORING # 1210 NECE P. SMITH GLOBEC NOVEMBER 1995

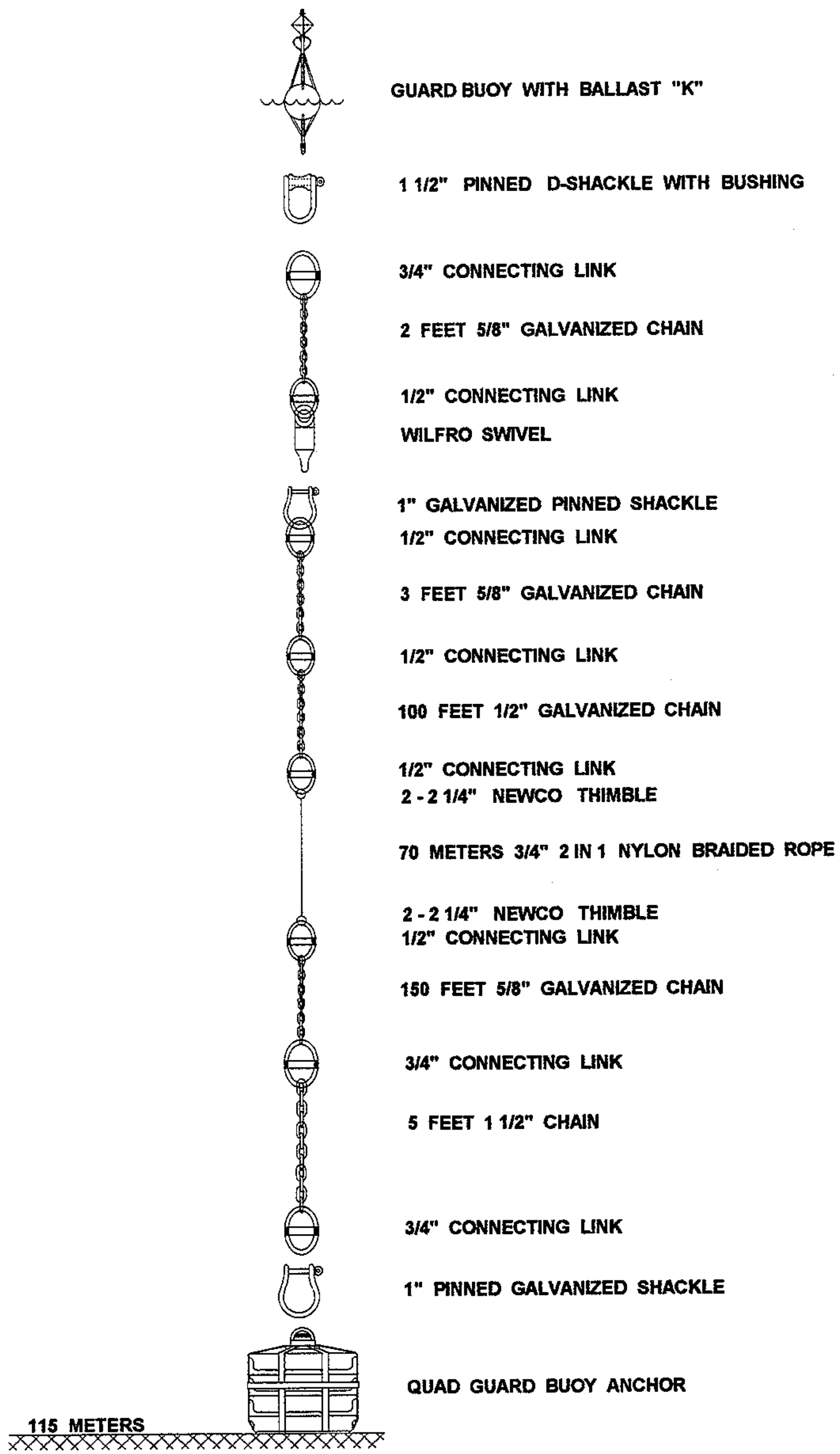


	LIGHT
	FAIREY FLOAT
	2M 3/16" JACKETED WIRE
49 METERS	SEACAT 16-03 163925-365
50 METERS	AANDERAA RCM 9607
	50 M 3/16" JACKETED WIRE
101 METERS	AANDERAA RCM 7651
	49 M 3/16" JACKETED WIRE
151 METERS	AANDERAA RCM 8697
	19 M 3/16" JACKETED WIRE
	2 STREAMLINED VINY PACKAGES
	19 M 3/16" JACKETED WIRE
193 METERS	AANDERAA RCM 5359
	16 M 3/16" JACKETED WIRE
	2 GLASS BUB PACKAGES
	723 A ACOUSTIC RELEASE 402908
	1/2 M 5/8" GALVANIZED CHAIN
	AANDERAA TIDE GAUGE 334
213 METERS	2 - WHEEL ANCHOR MINIMUM 1500 LBS.

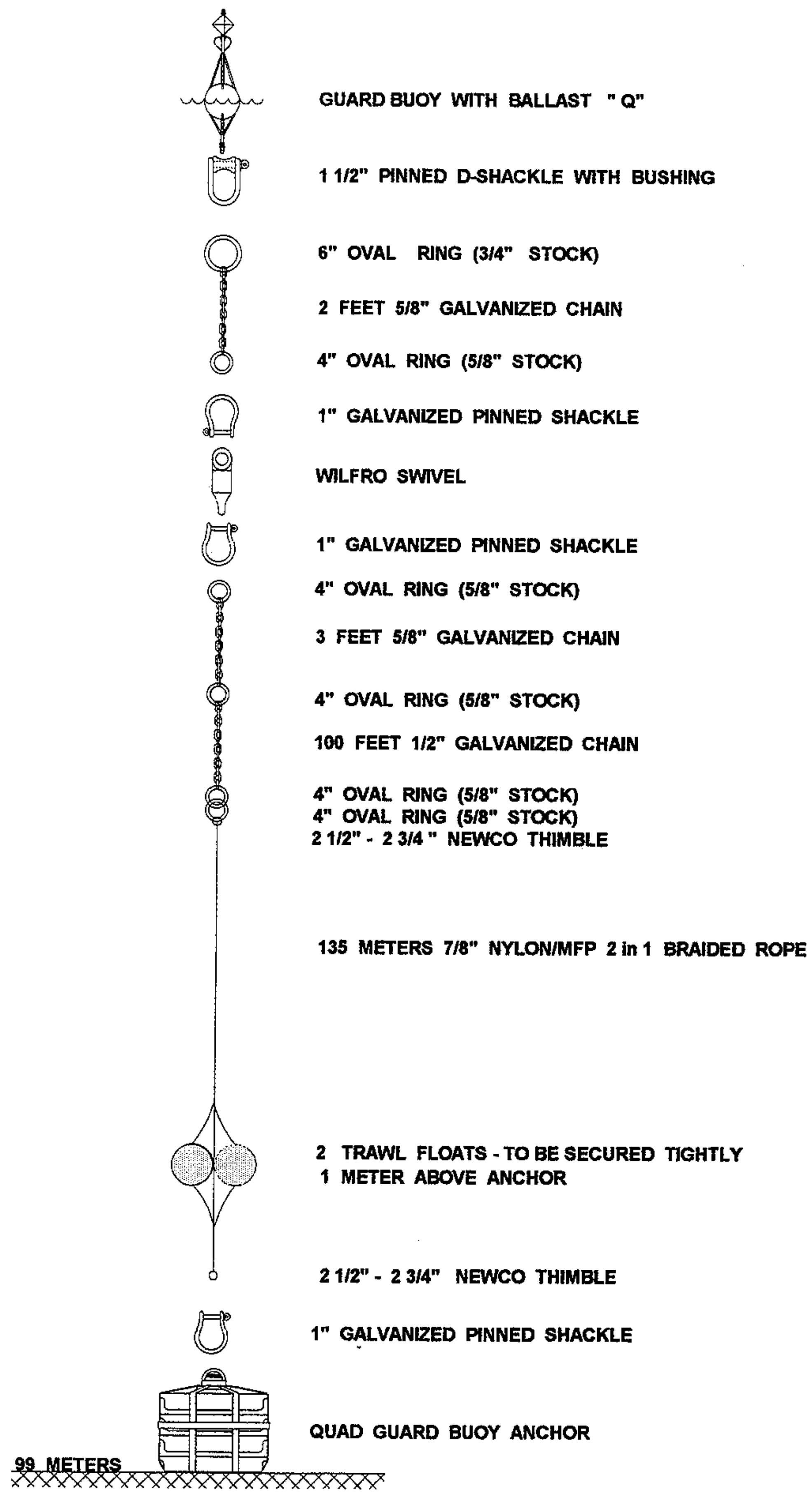
GUARD BUOY MOORING 1205A C2 P. SMITH GLOBEC NOV 1995



GUARD BUOY MOORING 1205B C2 P. SMITH GLOBEC NOV 1995



GUARD BUOY MOORING 1205C C2 P. SMITH GLOBEC NOV 1995



GUARD BUOY MOORING 1207A NECW P. SMITH GLOBEC NOV 1995

GUARD BUOY WITH BALLAST "M"

1 1/2" PINNED D-SHACKLE WITH BUSHING

6" OVAL RING (3/4" STOCK)

2 FEET 5/8" GALVANIZED CHAIN

4" OVAL RING (5/8" STOCK)

1" GALVANIZED PINNED SHACKLE

WILFRO SWIVEL

1" GALVANIZED PINNED SHACKLE

4" OVAL RING (5/8" STOCK)

3 FEET 5/8" GALVANIZED CHAIN

4" OVAL RING (5/8" STOCK)

100 FEET 1/2" GALVANIZED CHAIN

4" OVAL RING (5/8" STOCK)
4" OVAL RING (5/8" STOCK)
2 - 2 1/4" NEWCO THIMBLE

170 METERS 3/4" 2 IN 1 NYLON BRAIDED ROPE

2 - 2 1/4" NEWCO THIMBLE
4" OVAL RING (5/8" STOCK)
4" OVAL RING (5/8" STOCK)

150 FEET 5/8" GALVANIZED CHAIN

6" OVAL RING (3/4" STOCK)

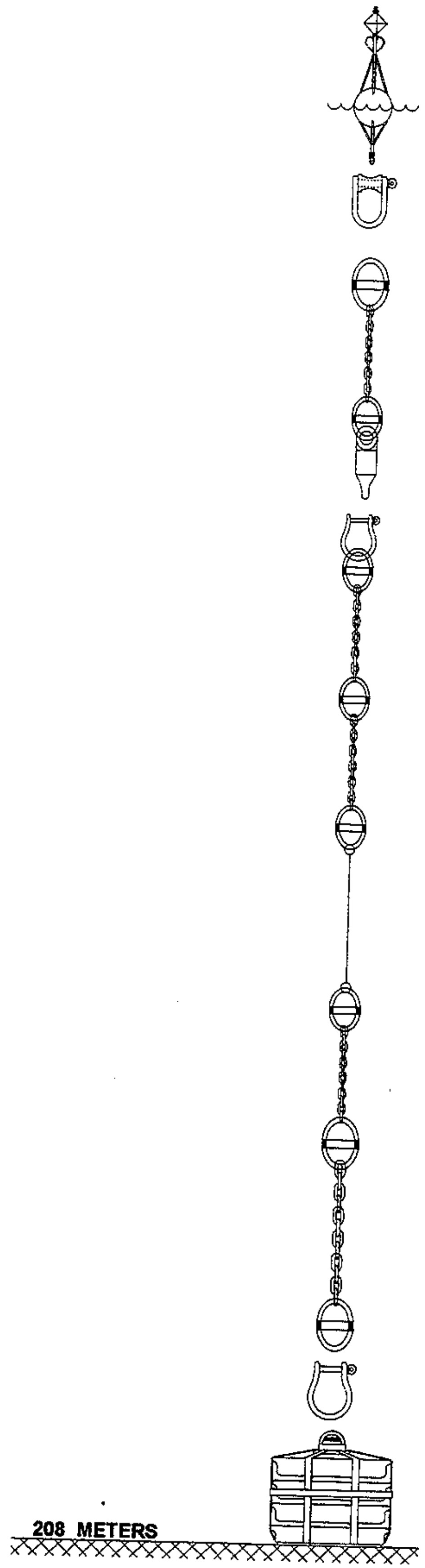
5 FEET 1 1/2" CHAIN

6" ROUND RING (1" STOCK)

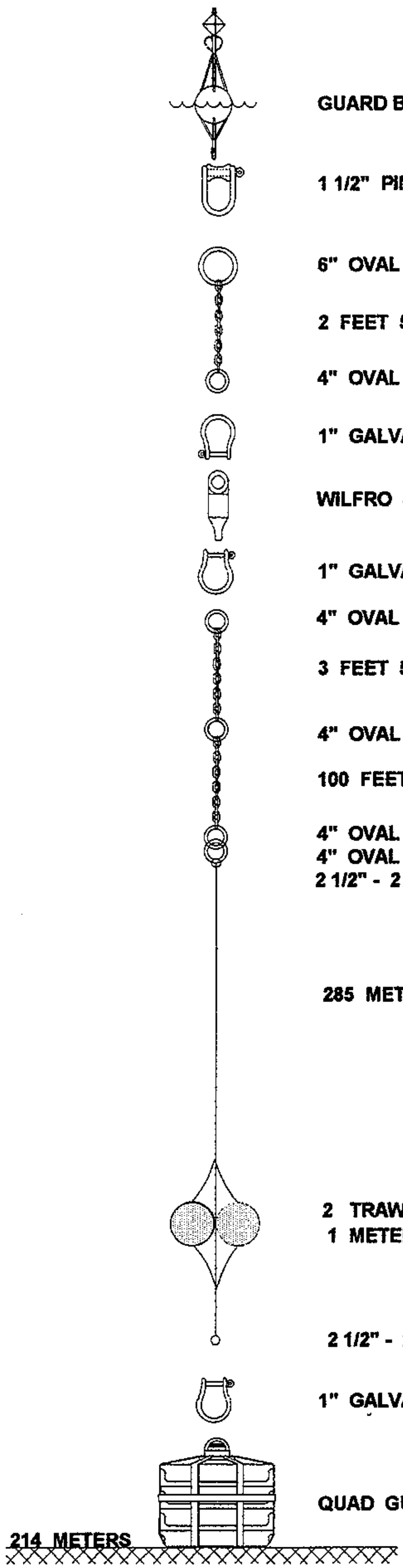
1" GALVANIZED PINNED SHACKLE

QUAD GUARD BUOY ANCHOR

GUARD BUOY MOORING 1207B NECW P. SMITH GLOBEC NOV 1995



GUARD BUOY MOORING 1207C NECW P. SMITH GLOBEC NOV 1995



GUARD BUOY WITH BALLAST "L"

1 1/2" PINNED D-SHACKLE WITH BUSHING

6" OVAL RING (3/4" STOCK)

2 FEET 5/8" GALVANIZED CHAIN

4" OVAL RING (5/8" STOCK)

1" GALVANIZED PINNED SHACKLE

WILFRO SWIVEL

1" GALVANIZED PINNED SHACKLE

4" OVAL RING (5/8" STOCK)

3 FEET 5/8" GALVANIZED CHAIN

4" OVAL RING (5/8" STOCK)

100 FEET 1/2" GALVANIZED CHAIN

4" OVAL RING (5/8" STOCK)
4" OVAL RING (5/8" STOCK)
2 1/2" - 2 3/4 " NEWCO THIMBLE

285 METERS 7/8" NYLON/MFP 2 in 1 BRAIDED ROPE

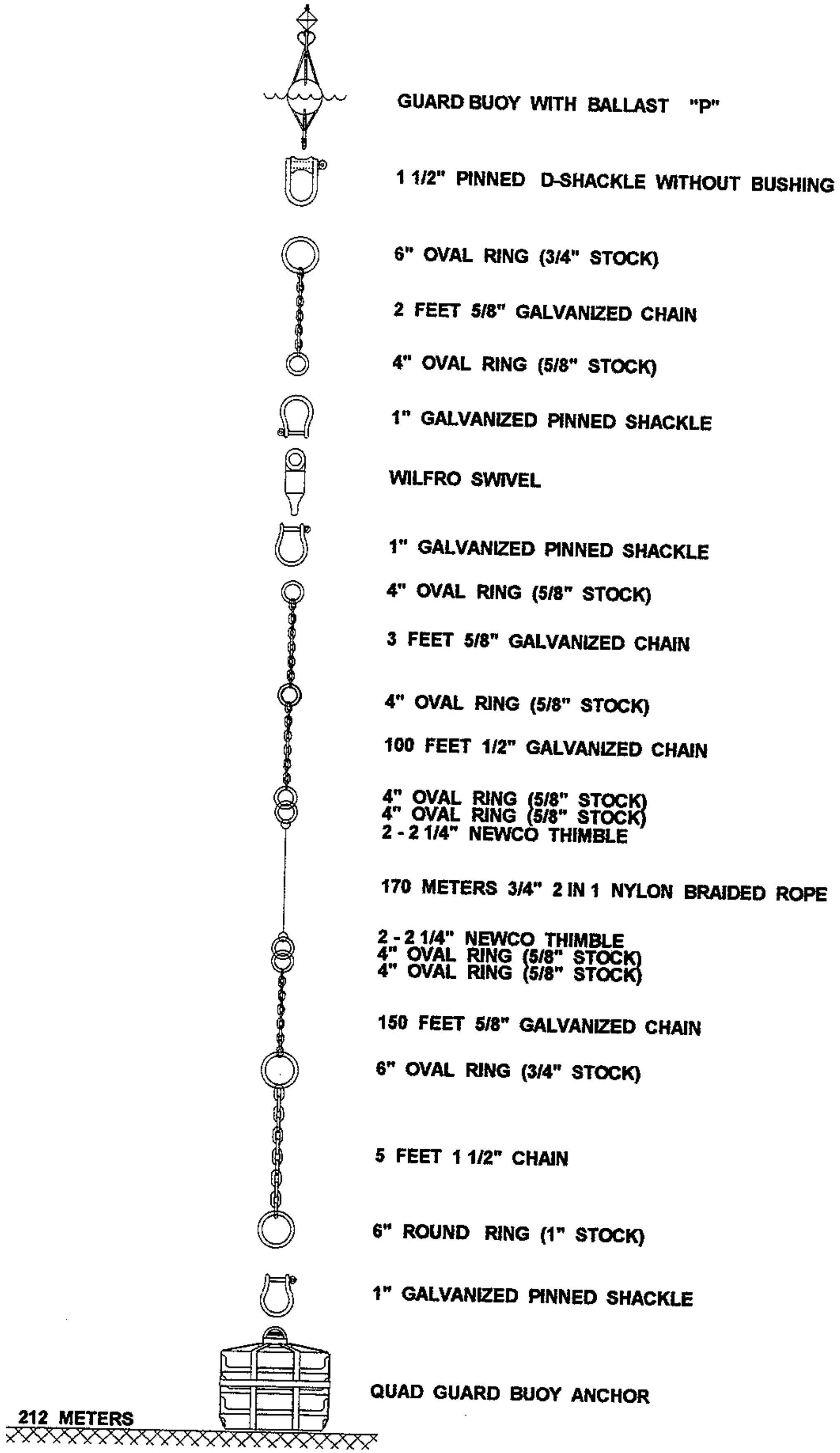
2 TRAWL FLOATS - TO BE SECURED TIGHTLY
1 METER ABOVE ANCHOR

2 1/2" - 2 3/4" NEWCO THIMBLE

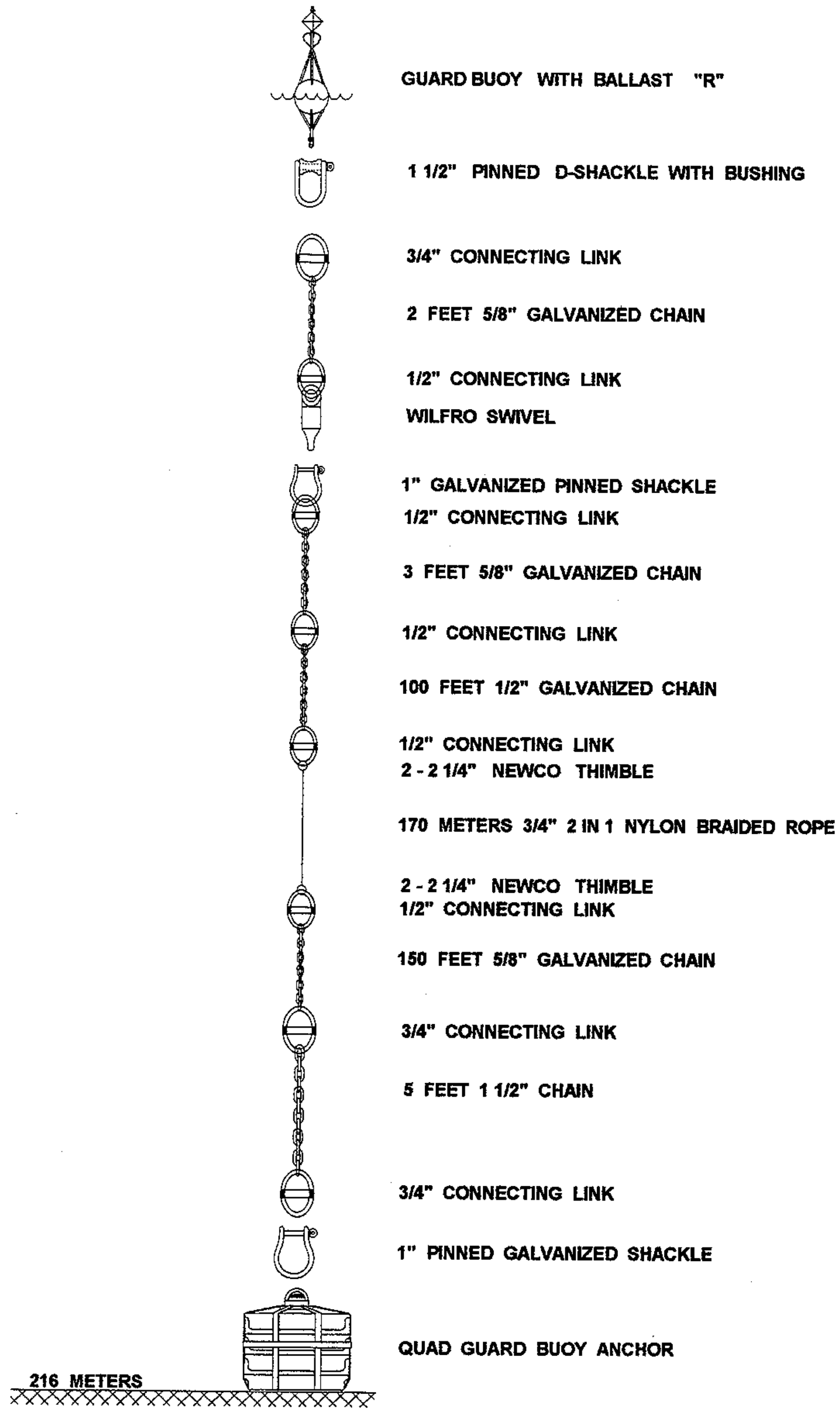
1" GALVANIZED PINNED SHACKLE

QUAD GUARD BUOY ANCHOR

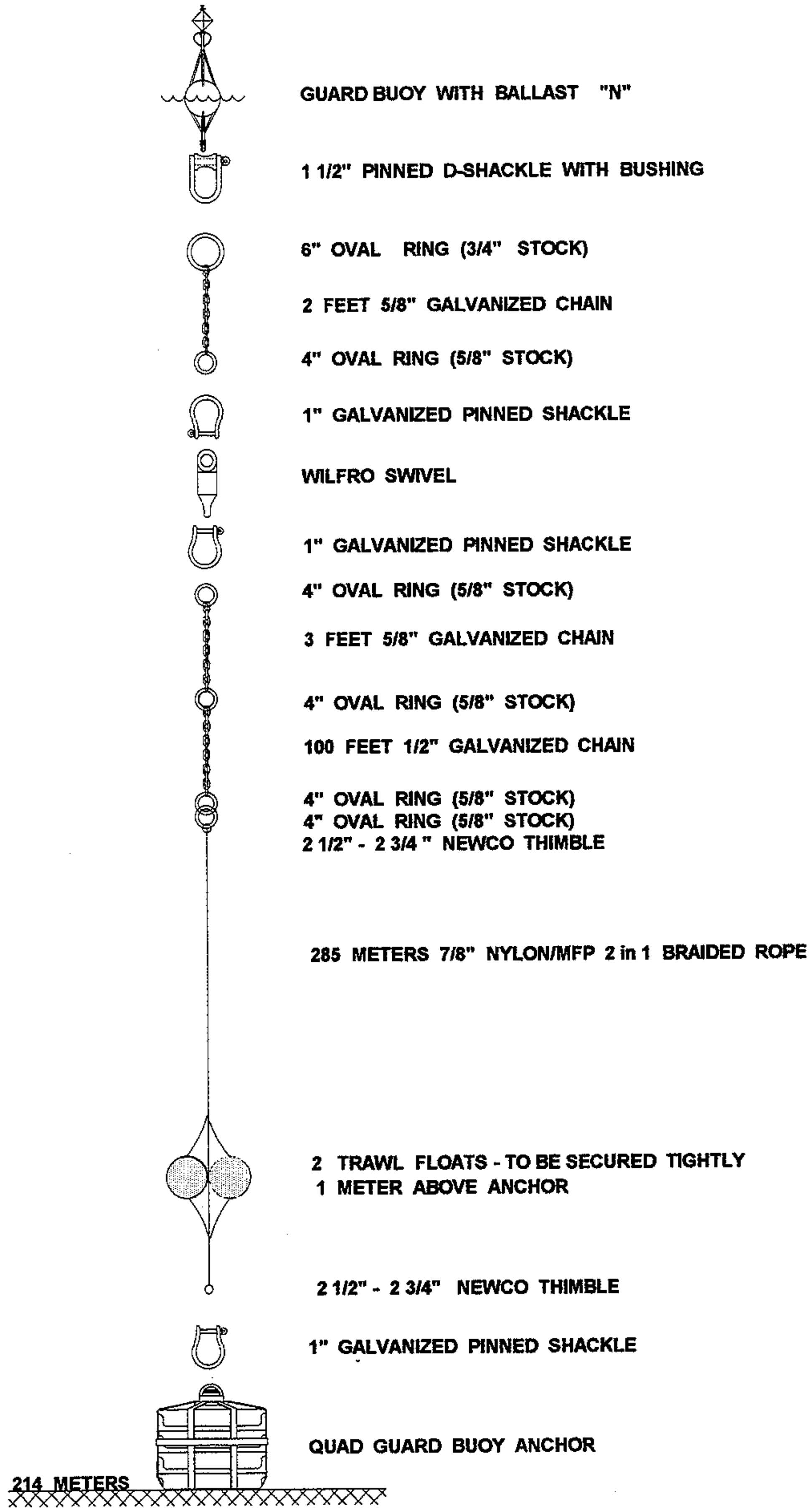
GUARD BUOY MOORING 1209A NECE P. SMITH GLOBEC NOV 1995



GUARD BUOY MOORING 1209B NECE P. SMITH GLOBEC NOV 1995

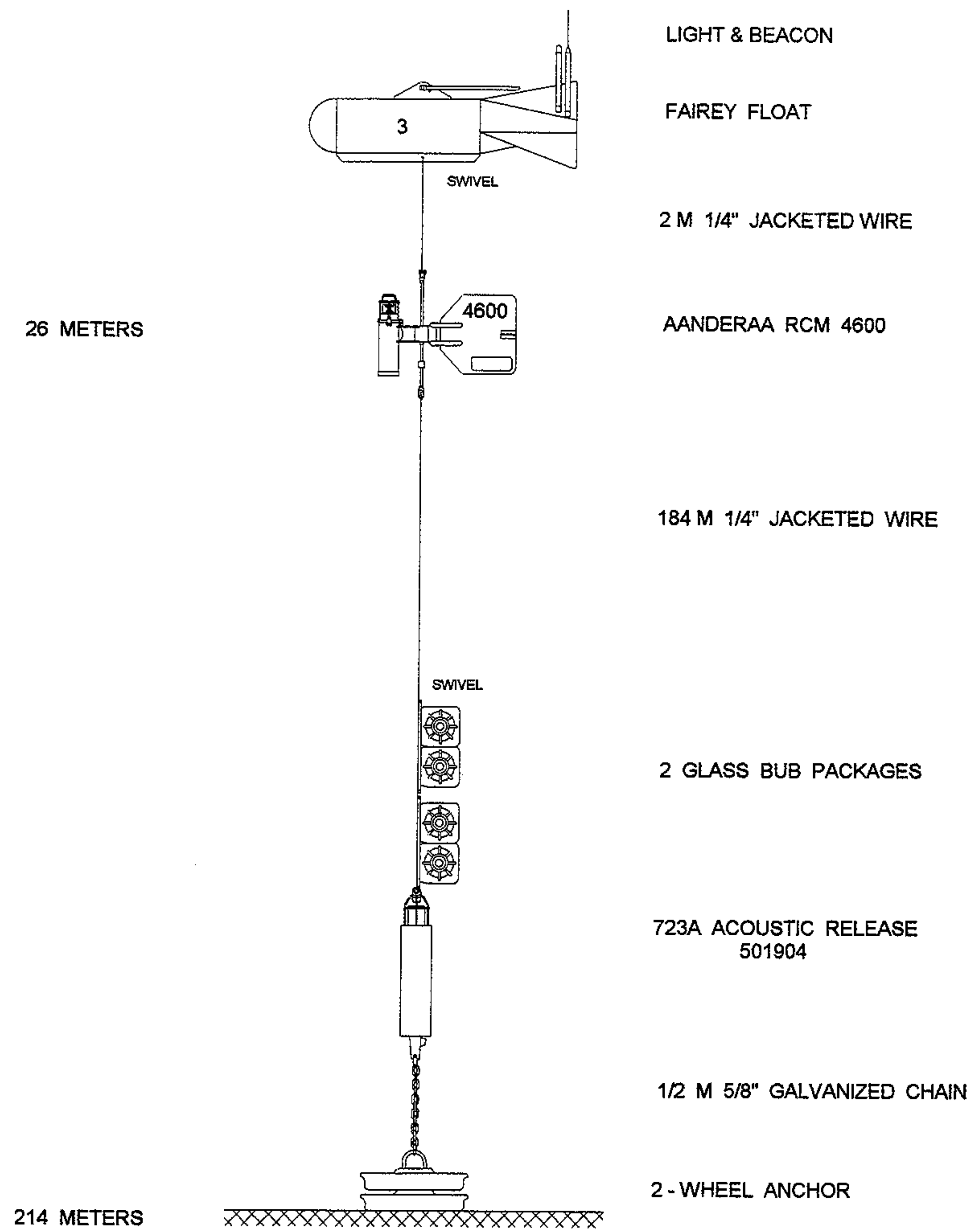


GUARD BUOY MOORING 1209C NECE P. SMITH GLOBEC NOV 1995

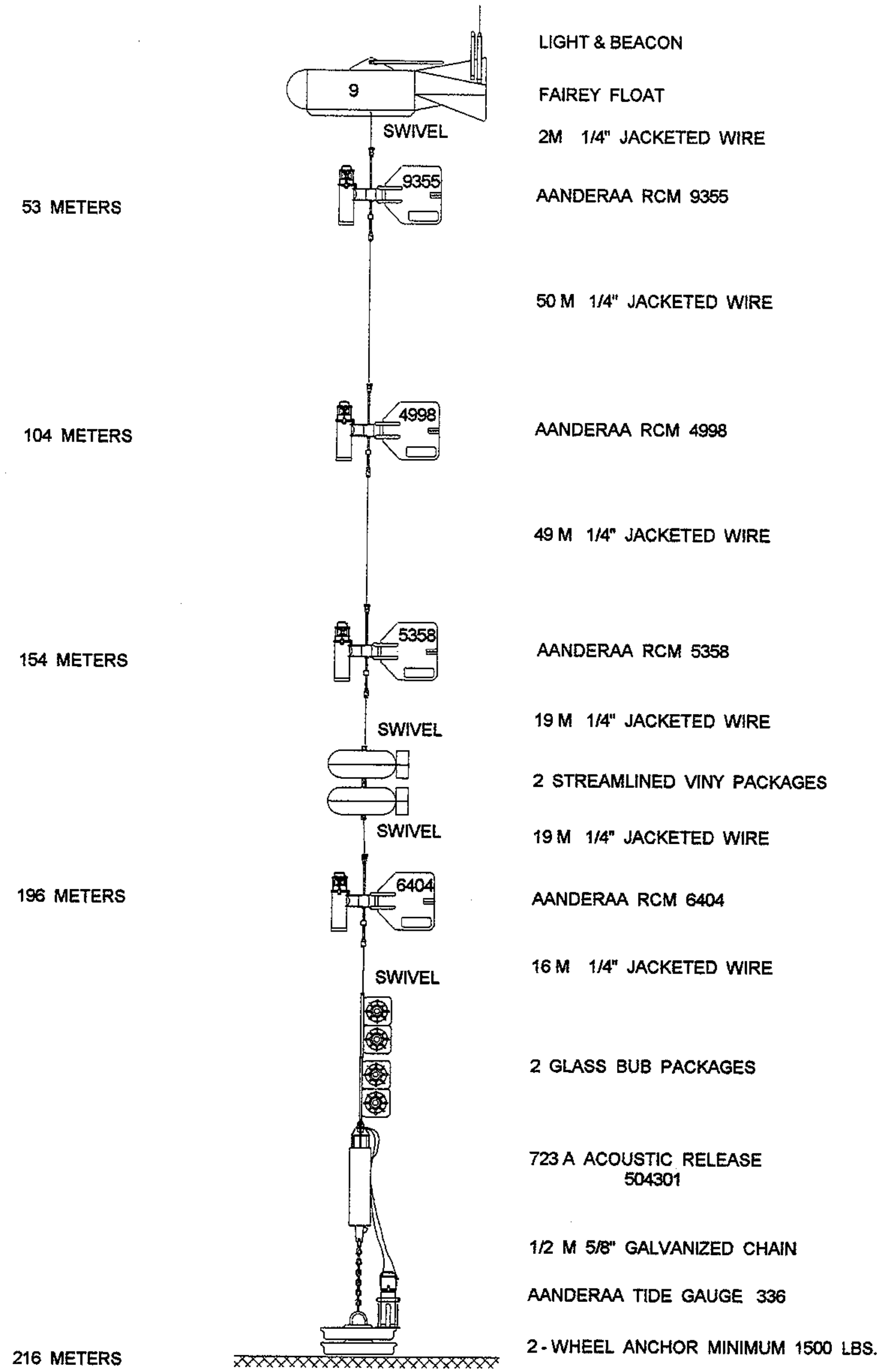


APPENDIX B Diagrams for Moorings Recovered During *C.S.S. Parizeau* Cruise 95-034

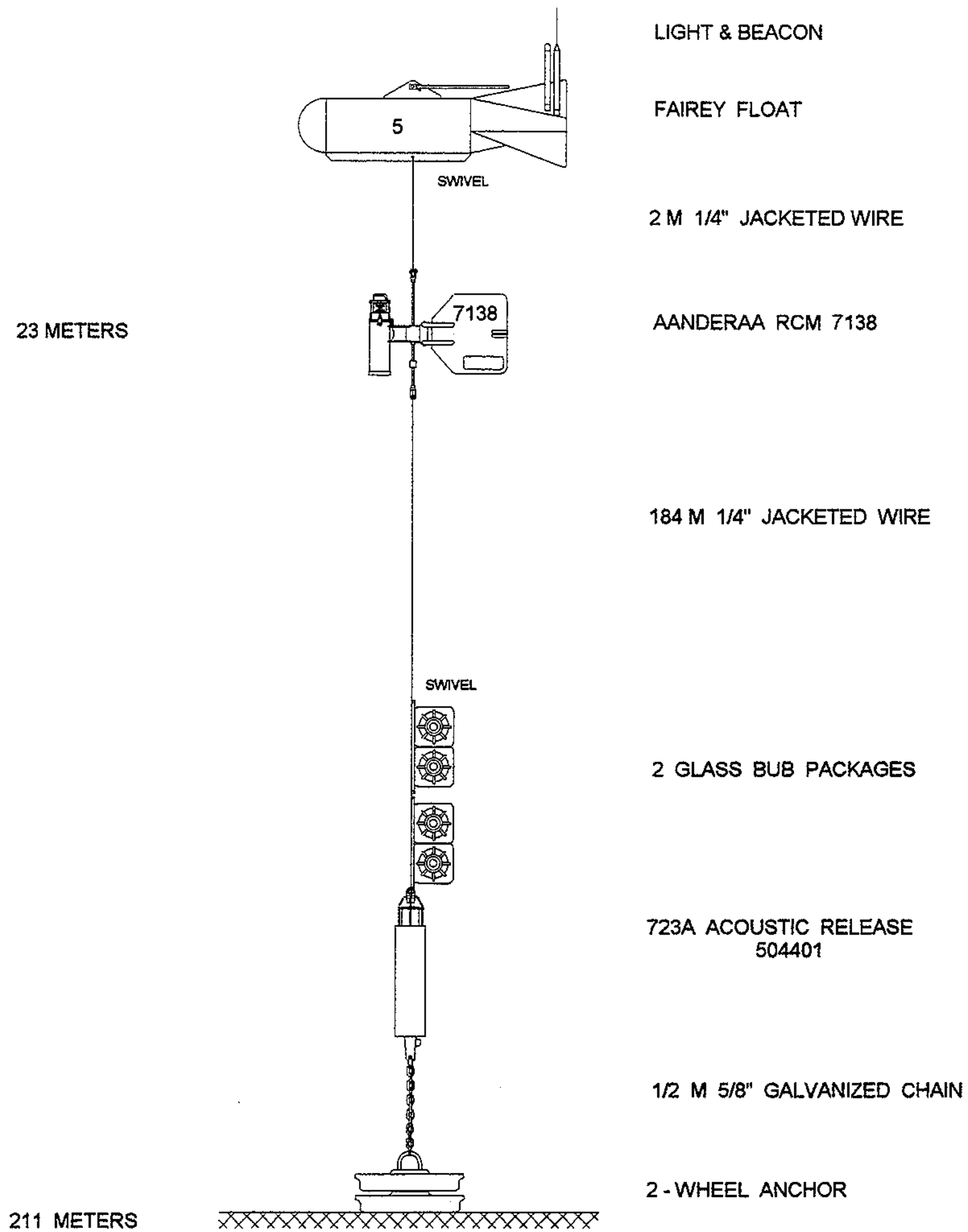
MOORING # 1188 SMITH GLOBEC NECWA JUNE 1995



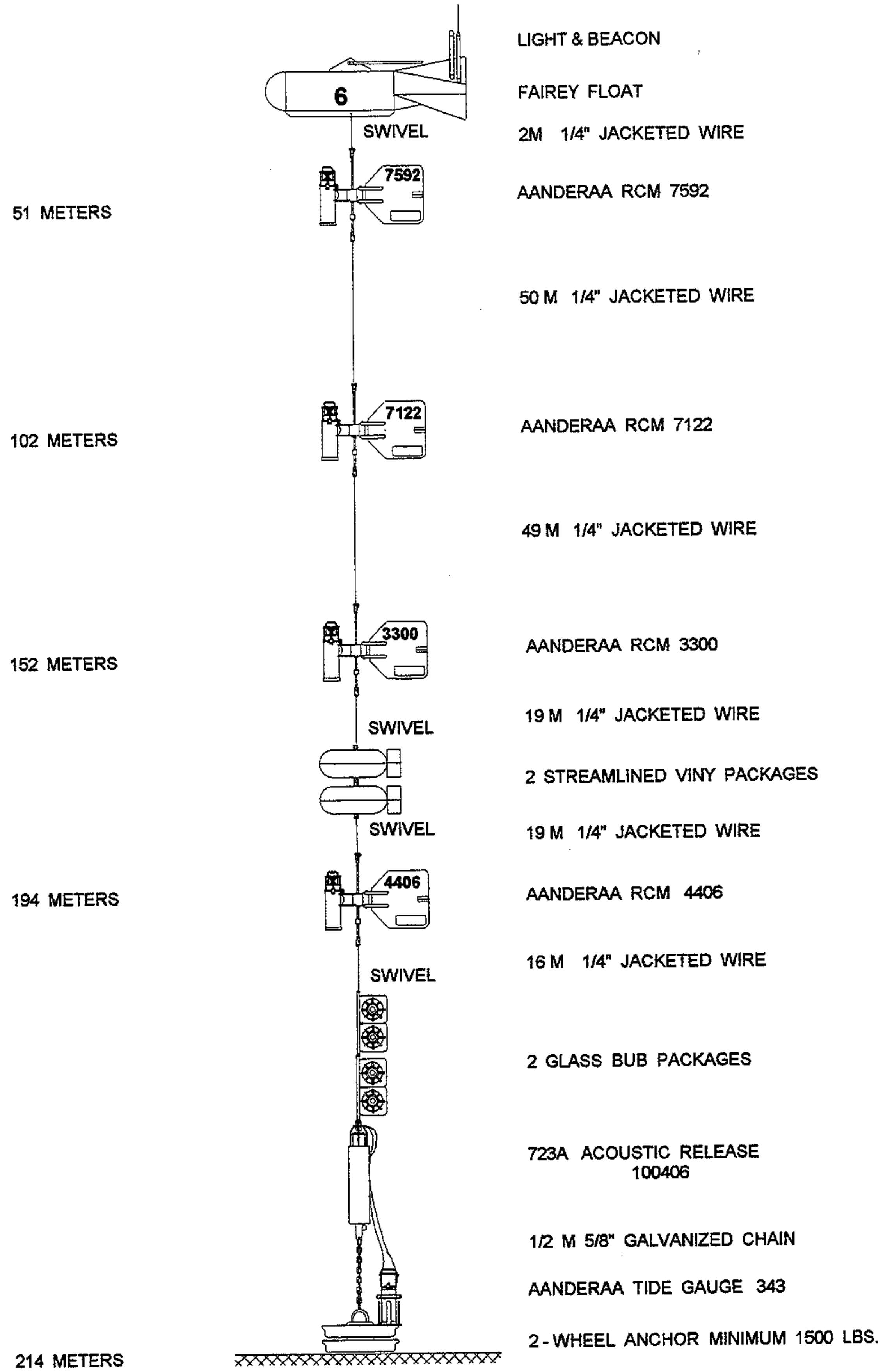
MOORING # 1189 SMITH GLOBEC NECW JUNE 1995



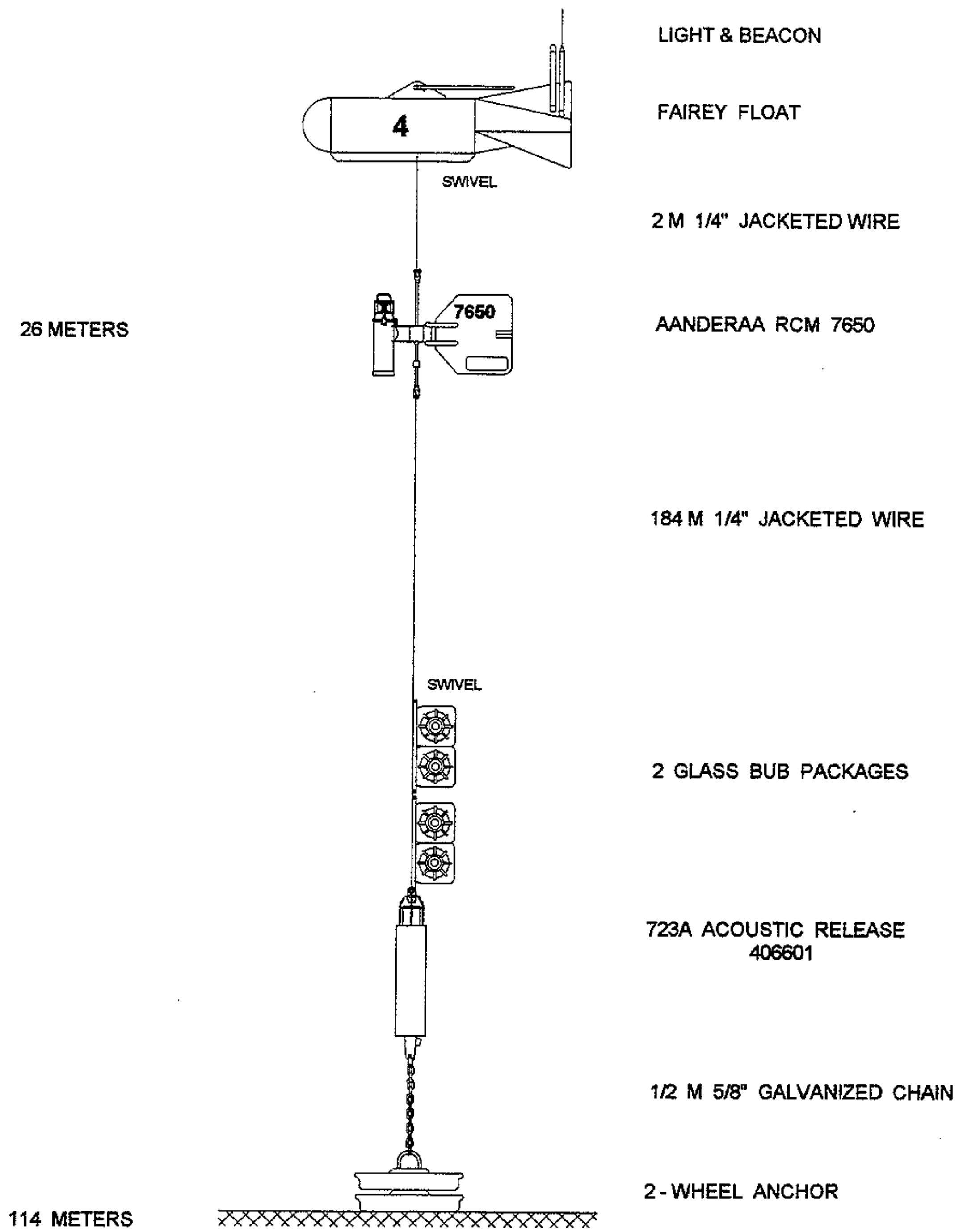
MOORING # 1190 SMITH GLOBEC NECEA JUNE 1995



MOORING # 1191 NECE P. SMITH GLOBEC NOVEMBER 1995



MOORING # 1192 SMITH GLOBEC C2A JUNE 1995



MOORING # 1193   SMITH GLOBEC C2 JUNE 1995