

#92007

# CRUISE REPORT

ARGO MAINE: May 15-21, 1992

Sediment Sampling in Massachusetts Bay, Cape Cod Bay,  
Stellwagen Bank and east of Stellwagen Bank

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ARGOME.FCR 6/29/92

## CRUISE SUMMARY

The objectives of this cruise were to collect core and grab samples at 8 regional stations in Massachusetts and Cape Cod Bays (Figure 1). The samples will be analyzed for contaminant inventories, rates of sedimentary processes, physical and geotechnical properties, and benthic ecology.

Good weather and the absence of major equipment problems made it possible to exceed expectations for the cruise. Additional grab samples were collected at three locations in the northern section of Massachusetts Bay where our developing sediment database revealed low sample coverage. Three locations on Stellwagen Bank were sampled in order to characterize the chemistry of coarse sands present in this high energy environment.

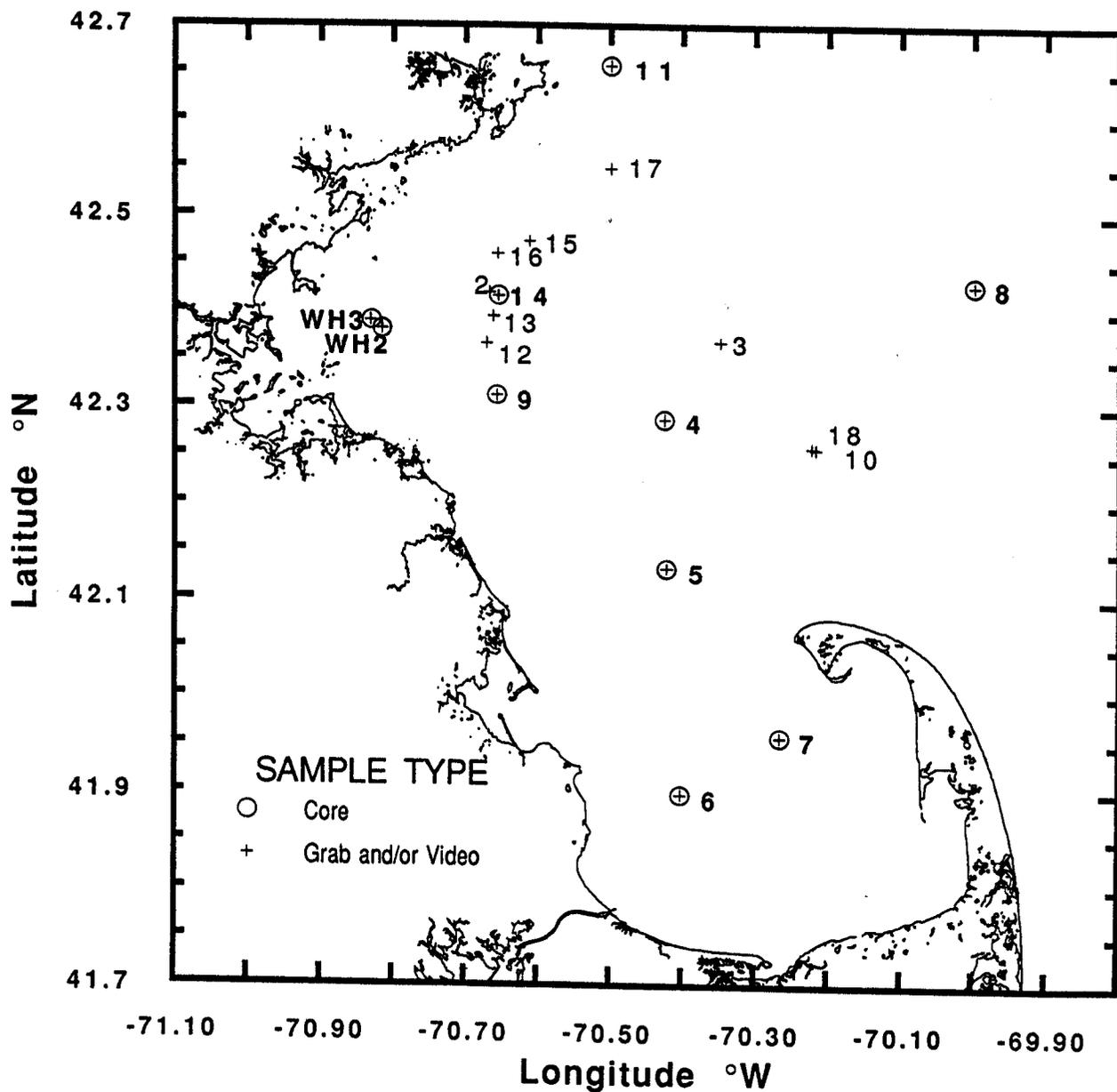
All of the samples scheduled for collection in early June at our two long-term monitoring sites near the future outfall were efficiently sampled on this cruise. This saved a considerable logistical effort normally expended during the mooring cruises aboard the USCGC White Heath.

We tested a high quality color video camera attached to our grab sampler at each station and found it to be a significant help to our operations. The video revealed the presence of boulders, at one location proposed as a long-term monitoring site and allowed us to explore nearby areas for a more suitable sampling location. The camera also allowed an assessment of sample quality in terms of sediment loss or disturbance. Finally, the camera showed when and why malfunctions in the grab sampler occurred so that repairs could be made without delay.

On the cruise track between stations 17 and 3 we crossed the northern tip of Stellwagen Bank and observed a number of humpback and finback whales. On one occasion, two whales swam just under the vessel providing an unusually good photo opportunity. One whale was observed to slap the sea surface with its tail at 10-30 second intervals for no less than 10 minutes, an activity known as "tail bobbing". Although we were prepared to collect feces of whales for analysis of the bacterium spore Clostridium perfringens, no whale feces were observed on the sea surface. This measurement is of interests because Clostridium perfringens is a tracer of sewage sludge from Boston and it is important to estimate the contribution of this tracer from natural sources. Scientists from the Center for Coastal Research in Provincetown Massachusetts, who frequently are in close proximity to the whales in this area, have agreed to help provide material to address this question.

Figure 1

# Locations of Sediment Samples Collected May 16-21, 1992 Aboard the R.V. ARGO MAINE



## CRUISE REPORT

1. Vessel: ARGO MAINE
2. Cruise #: AM2-92
3. Project # and Name: 9480-02543, Studies of circulation and contaminant transport in Massachusetts coastal waters.
4. Funding Agencies: This is a 50% cost share between USGS and Massachusetts Water Resources Authority
5. Contract #: 5936 (MWRA's contract number)
6. Area of Operations: Massachusetts Bay, Cape Cod Bay, Stellwagen Bank and east of Stellwagen Bank
7. Dates and Ports of Call: Depart from US Coast Guard Dock in Boston May 16. Return to drop off MWRA representatives May 19. Depart Boston May 20. Return to Woods Hole 0253 hrs, May 21.
8. Chief Scientist: Mike Bothner
9. Scientific Party: From USGS - Adam Brown, Joan Brazier, Chuck Mason, Carol Parmenter, Rick Rendigs, Marilyn ten Brink, and Bill Winters. From MWRA - Anne Canaday and Ken Keay.
10. Ships Crew: Captain - Don Bradford, First Mate - David Whitney, Second Mate - John Steer, Third Mate - Kevin Lapham, Cook - Al Sterns.
11. Purpose of Cruise: To collect sediment samples in order to:
  - a. determine the inventory of contaminants (metals, organic chemicals, C. perfringens) in sediment cores from 8 new locations in Mass Bay, Cape Cod Bay and from a "control" site east of Stellwagen Bank.
  - b. determine the rates of sediment mixing and/or accumulation at these locations.
  - c. determine the geotechnical and textural characteristics of sediments at these locations to aid the interpretation of other sediment data.
  - d. complete the grab sampling not finished during the previous leg (if any) to confirm sidescan sonar interpretation. The extent of this effort depends on the success of the previous cruise with respect to weather and equipment.

Other objectives if time permitted included:

- e. Collect video and surface sediments at 3 locations on top of Stellwagen Bank.

f. Collect the normal amount of sediment usually collected on the WHITE HEATH at long term stations 2 and 3.

g. Collect whale feces, if any were obvious in whale feeding areas, in order assess the Clostridium perfringens contribution from these animals.

12. Navigation Techniques: Differential GPS (Montauk station) and Loran C (as a calibrated back-up). The GPS system worked continuously. No correction has been made for the distance between the GPS antenna and the "A" frames. The "A" frame for grab fitted with the video camera was 8.3 m from the antenna. The "A" frame for coring operations was 13.3 m from the antenna.

13. Major equipment and systems: Sampling equipment included: the hydraulically damped corer, Bill Winters' 4" diam gravity corer, Teflon Van Veen grab sampler, Page Valentine's camera system (on the old electric blue winch). Bathymetry was measured by the ship's Simrad echo sounder placed 8 feet (approximately three meters) below the water line. The depths listed in Table 1 have been corrected by +3 m to account for the transducer depth. No correction has been made for tide.

14. Tabulated data:

Days at sea: 6

Stations occupied: 19

Samples collected: See attached table for numbers, types, and station data.

15. Station map: see Figure 1

16. Appendix:

1. General sampling notes.

2. Macrofauna sampling field notes written by Ken Keay, MWRA.

ARGO MAINE 2-92 (AM2-92)

STATION	LAT/LONG	WATER DEPTH(m)*	DATE TIME	DEVICE/ SAMPLE I.D.**	PLANNED ANALYSES AND DEPTH INTERVAL (cm) IN SEDIMENTS					BENTHIC BIOLOGY
					CLOST.PRF	TRACE METALS	PUSH CORE	ORGANIC CHEM	BULK DENSITY#	
2	42d23.6912'n 70d39.6992'w	68	5-18-92 09:49:10	G1	No samples collected due to boulders					
3	42d22.1690'n 70d20.9300'w	32	5-20-92 20:54:50	G1	0-0.5 0-2	0-2 2-4 4-6	NONE	0-2	W500	N
4	42d17.2961'n 70d25.5096'w	92	5-18-92 17:48:10	G1	0-0.5 0-2	0-2	GEOTEC 0-15	0-2	W520	N
4	42d17.3017'n 70d25.4907'w		5-18-92 18:14:00	G2	0-0.5		CHEM 0-14			Y
4	42d17.2914'n 70d25.5020'w		5-18-92 19:05:30	S1					34.8-40.4	
4	42d17.3005'n 70d25.5038'w		5-18-92 19:22:10	S2					35-39	
4	42d17.2902'n 70d25.5017'w		5-18-92 19:39:10	S3					35-36.5	
4	42d17.2950'n 70d25.5123'w		5-18-92 18:33:00	GC1					105	
5	42d8.0040'n 70d25.3441'w	64	5-18-92 21:13:30	G1	0-0.5 0-2	0-2	GEOTEC 0-11.5	0-2	D238	N
5	42d8.0022'n 70d25.3502'w		5-18-92 21:33:30	G2	0-0.5		CHEM 0-13.3			Y
5	42d7.9957'n 70d25.3545'w		5-18-92 21:50:20	S1					58.8-59.4	
5	42d8.0057'n 70d25.3385'w		5-18-92 22:06:10	S2					47.8-49.2	
5	42d8.0078'n 70d25.3336'w		5-18-92 22:23:50	S3					56.8-58	

ARGO MAINE 2-92 (AM2-92)

STATION	LAT/LONG	WATER DEPTH(m)*	DATE TIME	DEVICE/ SAMPLE I.D.**	PLANNED ANALYSES AND DEPTH INTERVAL (cm) IN SEDIMENTS			MAX CORE LENGTH(cm)	BENTHIC BIOLOGY
					CLOST.PRF	TRACE METALS	PUSH CORE		
5	42d48.0162'n 70d25.3447'w		5-18-92 23:20:00	GC1				111	
6	41d53.9044'n 70d24.1900'w	36	5-19-92 01:48:50	G1	0-0.5	CHEM 0-15			Y
6	41d53.9043'n 70d24.2065'w		5-19-92 02:10:30	G2	0-0.5 0-2	GEOTEC 0-13.5	D253		N
6	41d53.9006'w 70d24.2010'w		5-19-92 03:11:20	S1				58-58.2	
6	41d53.8869'n 70d24.1885'w		5-19-92 03:30:00	S2				55.2-56.4	
6	41d53.9016'n 70d24.2009'w		5-19-92 03:45:50	S3				53.5-54.5	
6	41d53.8961'n 70d24.2022'w		5-19-92 02:45:00	GC1				95	
7	41d57.4967'n 70d16.0043'w	39	5-19-92 13:33:40	G1	0-0.5 0-2	GEOTEC 0-14	W532		N
7	41d57.5061'n 70d16.0041'w		5-19-92 13:55:10	G2	0-0.5	CHEM 0-8			Y
7	41d57.4983'n 70d16.0009'w		5-19-92 14:06:30	S1				47.5-50.7	
7	41d57.4927'n 70d16.0097'w		5-19-92 14:17:40	S2				43.2-44	
7	41d57.5002'n 70d16.0005		5-19-92 14:29:20	S3				53.1-56.4	
7	41d57.4961'n 70d16.0079'w		5-19-92 15:43:20	GC1				278	

ARGO MAINE 2-92 (AM2-92)

STATION	LAT/LONG	WATER DEPTH(m)*	DATE TIME	DEVICE/ SAMPLE I.D.**	PLANNED ANALYSES AND DEPTH INTERVAL (cm) IN SEDIMENTS					BENTHIC BIOLOGY
					CLOST.PRF	TRACE METALS	PUSH CORE	ORGANIC CHEM	BULK DENSITY#	
8	42d25.8010'n 70d0.0123'w	192	5-16-92 23:47:50	G1	0-0.5 0-2	0-2	GEOTECH 0-14	0-2	D280	N
8	42d25.8016'n 70d0.0085'w		5-17-92 00:32:30	G2	0-0.5		CHEM 0-14			Y
8	42d25.7935'n 69d59.9483'w		5-17-92 11:57:00	S1					65.5	
8	42d25.7987'n 70d0.0045'w		5-17-92 13:37:30	S2					45-46.5	
8	42d25.7984'n 70d0.0111'w		5-17-92 14:42:10	S3					59	
8	42d25.7963'n 69d59.9966'w		5-17-92 01:30:50	GC1					285	
9	42d18.7473'n 70d39.4291'w	51	5-16-92 13:58:20	G1	0-0.5 0-2	0-2	GEOTECH 0-9	0-2	W501	N
9	42d18.7510'n 70d39.4025'w		5-16-92 15:23:20	G2	?		CHEM 0-9.5			Y
9	42d18.7569'n 70d39.4147'w		5-16-92 16:43:30	S1					53	
9	42d18.7525'n 70d39.4100'w		5-16-92 17:15:30	S2					55-56	
9	42d18.7498'n 70d39.4181'w		5-16-92 17:59:10	S3					55	
9	42d18.75'n 70d39.42'w			GC1	Four	attempts, no	recovery			
10	42d15.6029'n 70d13.3729'w	37	5-20-92 22:13:00	G1	0-2	0-2	N	N	N	WASHED

ARGO MAINE 2-92 (AM2-92)

STATION	LAT/LONG	WATER DEPTH(m)*	DATE TIME	DEVICE/ SAMPLE I.D.**	PLANNED ANALYSES AND DEPTH INTERVAL (cm) IN SEDIMENTS				MAX CORE LENGTH(cm)	BENTHIC BIOLOGY
					CLOST.PRF	TRACE METALS	PUSH CORE	ORGANIC CHEM		
11	42d39.4999'n 70d29.9823'w	89	5-17-92 20:18:40	G1	0-0.5	CHEM 0-11.5			Y	
11	42d39.5064'n 70d29.9991'w		5-17-92 20:47:10	G2	0-0.5 0-2	GEOTEC 0-15	0-2	W525	N	
11	42d39.5067'n 70d30.0058'w		5-17-92 23:21:50	S1				38.8-42.5		
11	42d39.5034'n 70d30.0022'w		5-17-92 23:54:50	S2				43-47.4		
11	42d39.5013'n 70d30.0003'w		5-18-92 00:18:10	S3				42-43.5		
11	42d39.5033 70d30.0000'w		5-17-92 21:52:50	GC1				257		
12	42d22.0084'n 70d40.2495'w	66	5-18-92 10:38:20	G1	Bored	clay	balls, move	station		
13	42d25.2029'n 70d39.9957'w	70	5-18-92 11:37:00	G1	Pre	tripped				
13	42d25.206'n 70d39.996'w		5-18-92 12:19:50	G2	0-0.5 0-2	0-2	GEOTEC 0-8	0-2	D254	
14	42d24.9970'n 70d39.2900'w	77	5-18-92 13:10:10	G1	0-0.5	CHEM 0-11.5			Y	
14	42d24.9936'n 70d39.2967'w		5-18-92 13:36:00	G2	0-0.5 0-2	GEOTEC 0-11.2	0-2	W526	N	
14	42d24.9995'n 70d39.2915'w		5-18-92 13:51:30	S1				59-61		
14	42d25.0052'n 70d39.3038'w		5-18-92 14:06:50	S2				55.5-57.8		

ARGO MAINE 2-92 (AM2-92)

STATION	LAT/LONG	WATER DEPTH(m)*	DATE TIME	DEVICE/ SAMPLE I.D.**	PLANNED ANALYSES AND DEPTH INTERVAL (cm) IN SEDIMENTS				BENTHIC BIOLOGY	
					CLOST.PRF	TRACE METALS	PUSH CORE	ORGANIC CHEM		BULK DENSITY#
14	42d25.0012'n 70d39.2995'w		5-18-92 14:26:40	S3						
14	42d24.9945'n 70d39.2949'w		5-18-92 15:05:30	GC1					69	
14	42d25.0057'n 70d39.3069'w		5-18-92 15:43:20	GC2					104	
15	42d28.3894'n 70d36.7179'w	81	5-20-92 15:28:00	G1	0-0.5 0-2	0-2	N	GEOTEC 0-14	W489	
16	42d27.6173'n 70d39.3889'w	74	5-20-92 16:04:20	G1	0-0.5 0-2	0-2	N	GEOTEC 0-13	W541	
17	42d33.0115'n 70d29.9998'w	84	5-20-92 17:32:30	G1	0-0.5 0-2	0-2	N	NONE	D-14	WASHED
17	42d33.0173'n 70d30.0118'w		5-20-92 17:53:40	G2	0-0.5 0-2	0-2	N	GEOTEC 0-14	W491	
18	42d15.5309'n 70d13.1013'w		5-20-92 22:25:30	G1	0-0.5 0-2	0-2	N	NONE	W509	
WH2	42d22.8732'n 70d48.8891'w	32	5-19-92 21:12:00	G1	0-0.5		CHEM 0-9			Y
WH2	42d22.8923'n 70d48.8973'w		5-19-92 21:31:10	G2	Washed					
WH2	42d22.8711'n 70d48.8959'w		5-19-92 21:46:10	G3	0-0.5 0-2		CHEM 0-11		W516	N
WH2	42d22.8687'n 70d48.8954'w		5-20-92 12:56:30	S1						15-17
WH2	42d22.8861'n 70d48.8867'w		5-20-92 13:07:40	S2						29.5-31.2

ARGO MAINE 2-92 (AM2-92)

STATION	LAT/LONG	WATER DEPTH(m)*	DATE TIME	DEVICE/ SAMPLE I.D.**	PLANNED ANALYSES AND DEPTH INTERVAL (cm) IN SEDIMENTS				BENTHIC BIOLOGY	
					CLOST.PRF	TRACE METALS	PUSH CORE	ORGANIC CHEM		BULK DENSITY#
WH2	42d22.8750'n 70d48.8968'w		5-20-92 13:21:40	S3	Discarded?				21.1-22.1	
WH2	42d22.8806'n 70d48.8979'w		5-20-92 13:37:50	S4					25.4-26	
WH2	42d22.8786'n 70d48.8970'w		5-20-92 13:49:30	S5					28.2-28.7	
WH3	42d23.3926'n 70d49.8536'w	36	5-19-92 22:07:40	G1	0-0.5 0-2	GEOTEC 0-11	0-2	W516		N
WH3	42d23.3921'n 70d49.8397'w		5-19-92 22:32:30	G2	0-0.5	CHEM 0-9			46.8-47.8	Y
WH3	42d23.4006'n 70d49.8231'w		5-20-92 12:01:00	S1					47.1-48.4	
WH3	42d23.3951'n 70d49.8298'w		5-20-92 12:16:50	S2					48.4-49.5	
WH3	42d23.3930'n 70d49.8281'w		5-20-92 12:26:30	S3					39.5-40.5	
WH3	42d23.3934'n 70d49.8255'w		5-20-92 12:35:00	S4						

\* Corrected for 3 meter transducer depth

\*\*G= Van Veen grab sample

S= Hydraulically damped gravity core

GC= Conventional gravity core

## APPENDIX 1.

### General Sampling Notes

The hydraulically damped gravity corer was used with the maximum amount of weight (approx 500 lbs), including two sets of stainless steel plates. Core barrels consisted of the standard red thread fiberglass tubing 3.3" i.d. All barrels were sharpened on the cutting end and thoroughly washed with soap and water. Sediment in contact with the core barrel was discarded during subsampling. Some contact with the core barrel was unavoidable for the surface most sample having high water content.

Three cores with this device were taken at each station. One was for depth profiles of trace metals, isotopes, C.perfringens, texture, bulk density, organic carbon. A second was for organic geochemistry, and the third is for archive. These cores have been stored frozen.

A gravity corer was used to obtain longer cores for geotechnical and geochemical analyses. The corer used 4 inch i.d. PVC schedule 40 pipe as a barrel 10 feet long and fitted with a stainless steel nose piece and core catcher. The core head (weights plus structure) weighed approximately 400 lbs. A rubber stopper on a shaft served as a check valve. The corer was typically lowered at approximately 40 m/min, estimated by eye. Cores were maintained upright continuously. The cores were cut into 100 cm sections at sea and stored outside until they were returned to the lab where they were refrigerated until bulk x-rays and cutting could begin.

Two grab samples were collected from each station using a teflon coated Van Veen sampler with an outer frame constructed by Ted Young. The video camera and light was mounted on brackets in line with the hinge on either side of the grab. Our grab has been modified to allow complete removal of the grab doors and hinge providing unrestricted access to the grab surface. Plywood sheeting was placed over open parts of the frame base outside of the bucket to prevent over-penetration in soft sediments. It was necessary to cut holes in the sheeting to minimize the paddle effect that was sufficient to pre-trip the grab, even under rather flat sea conditions. In soft sediments, the grab was typically filled to capacity with some disturbance of the sediment surface in spite of our attempts at gentle landings.

Subsampling of the grabs included:

1. approximately 2 cc of material from 0-0.5 cm for analysis of C. perfringens - samples placed in sterile whirlpack bags;
2. approximately 50 cc of sediment from 0-2 cm interval for metals, texture, organic carbon, and in some cases, for additional C. perfringens analyses - samples placed in acid washed polyethylene containers and frozen;
3. approximately 50 cc of sediment from 0-2 cm for organic geochemical measurements - stored frozen in solvent washed teflon jars.

4. tubes 20 cm long, 8.4 cm i.d., pushed into an undisturbed section of the grab to recover a core through the entire sample - stored refrigerated for geotechnical measurements.

5. approximately 20 cc of material from 0-2 cm collected using a cut off 50 cc syringe for estimating water content and bulk density - stored refrigerated in pre-weighed glass bottles.

## APPENDIX 2.

Macrofauna sampling field notes  
Kenneth E. Keay  
Massachusetts Water Resources Authority

### Procedures:

Except where noted, all benthic grab sampling followed the same procedure. After a the ship came on station, the 0.1m<sup>2</sup> Young-Van Veen (with attached video camera) was lowered until the bottom became visible on the monitor. The vessel was allowed to drift slightly while an area of the bottom approximately 50m across was surveyed for bottom type. The vessel then came back on station, and the grab was lowered into the bottom and retrieved.

The first grab at each station was usually processed for sediment chemistry. A second grab at each station had a single 3.3 inch (8.4 cm) diameter core removed from the center for metals and sediment grain size. The remainder of the second grab was put into a basin for sieving. The sediments on the outside of the sub-core, and on the hands of the person removing it from the grab, were also carefully rinsed into the basin containing the sample. At some stations, the order of the grabs was reversed, and the macrofauna sample was taken from the first grab.

Approximately 1-2 liters of sediment at a time were transferred from the basin into a bucket. A moderate flow of filtered seawater was introduced to the bucket, and the overflow directed through a screen having a 300 micron mesh size. After the sediment had broken up and the rinse water started to run somewhat clearer, the material on the screen was transferred to a jar labelled "e", for "elutriate". The residue in the bucket was then washed onto the sieve, gently rinsed to break up balls of sediment, and washed into a second jar, labelled "r", for "residue". This procedure was repeated until the entire grab had been processed.

After sieving the samples were fixed by the addition of full strength borax-saturated buffered formalin to a final concentration of approximately 10-20% by volume. The layer of borax remaining in the bottom of the formalin bottle was agitated into suspension immediately prior to addition to the sample jar. Sample jars were labelled both internally and externally.

The times listed below are Eastern Daylight Savings time. In the station table, times are GMT.

May 16, 1992

Station 9:                   Southwestern Massachusetts Bay                   42° 18.75'N 70° 39.40'W  
Water depth 51 meters

On station at approximately 0930 hours. Biology grab taken approximately 1130. The sediment was a sandy mud (muddy sand?) that sieved relatively easily. The sample contained numerous amphipods and nephthyds, as well as 2 or 3 mahogany quahogs (Arctica?).

Station 8:                   East of Stellwagen Bank                   42° 25.80'N 70° 00.01'W  
Water depth 192 meters.

On station at approx. 2000 hrs. The sea-floor was very soft; after several grabs we were unable to prevent serious over-penetration of the grab. It appeared that much of the sediment surface was lost through the crack in the doors of the grab in each case. The grab chosen for macrofauna processing was marginal at best, and may under-represent the smaller surface fauna. The biology grab was taken at approx 2100 hrs.

The sediment was a fine clayey-silt, the consolidated sediment from deeper in the grab took a long time to break up and wash through the sieve. There were relatively few worms or other organisms identifiable on the sieve.

May 17, 1992

Station 11:                   North of Stellwagen Bank, East of Cape Anne  
Water Depth 89 meters.   42° 39.50'N 70° 29.98'W

On station at about 1615 hrs. Benthic grab taken approximately 1700 hrs. Sediment primarily a fine silt that sieved relatively easily. The sample contained numerous small polychaetes.

May 18, 1992

Station 14:                   Western Stellwagen Basin                   42° 25.00'N 70° 39.29'W  
Water depth 77 meters

Station 2 had to be abandoned due to large amounts of gravel in the sediment matrix. The first alternate chosen was about a kilometer south and east of station 2, the second alternate a kilometer further southeast of that. Both alternates were in an area identified as a discontinued dumping ground on the Bathymetric Fishing Map of Massachusetts Bay. The grabs from each of the first 2 alternates showed evidence of dredge spoils, with broken bottles, coal slag, and what appeared to be clumps of Boston Blue clay that had once dried thoroughly. Station 14 was taken as an alternate to station 2, in a separate depositional area about a nautical mile north of the original station 2.

On station at about 0915 hrs, biology grab taken about 0930 hrs. The sediment was a soft silt with many worm tubes that was relatively easy to sieve. There was one large (10 x 4 cm) holothurian in this sample, as well as dozens of what appeared to be burrowing sea anemones (?), and some nephthyds. Numerous smaller organisms.

Station 4: Southern Stellwagen Basin 42° 17.30'N 70° 25.49'W  
Water depth 92 meters

On station at approx 1330 hrs, biology grab taken at about 1420. The sediment was a soft silt, similar to station 14. The fauna also appeared to bear similarities to station 14, with numerous burrowing anemones and abundant smaller worms.

Station 5: Southern Stellwagen Basin (between MB and CCB)  
Water depth approx 64 meters. 42° 08.00'N 70° 25.35'W

On station at approximately 1700 hrs, macrofaunal grab taken at approx 1730. The sediment at this station appeared to have a firmer, clayey texture than the sediments at stations 14 and 4, and took longer to sieve. The sample contained a burrowing sea-star and numerous burrowing anemones, as well as a large nemertean worm. Overall, there appeared to be fewer organisms in this grab than in the grab from station 4.

Station 6: Western Cape Cod Bay. 41° 53.90'N 70° 24.19'W  
Water depth 36 meters

On station at about 2130 hrs, benthos grab taken approx 2145. The sediment appeared to be a silty sand, and contained several ophiuroids, as well as either several large nemerteans or fragments of one large worm. The sample also contained numerous small bivalves.

May 19, 1992

Station 7: Eastern Cape Cod Bay. 41° 57.51'N 70° 16.00'W  
water depth 39 meters

On station about 1000 hrs, macrofauna sample taken about 1020. The sediment was a silty sand that passed easily through the sieve. The sample contained over a dozed ophiuroids, many nemerteans, and what appeared to be infaunal ascideans.

May 19, 1992

Station WH2: Near MWRA outfall 42° 22.87'N 70° 48.89'W  
Bothner long-term monitoring station  
Water depth 32 meters.

On station about 1700, macrofauna sample taken about 1720. The sediment at this station contains a large component of sand about the same size as the mesh used (300 $\mu$ m). This made the sample very hard to sieve, and would have resulted in numerous jars of "residual" sample filled with sand. We altered the sieving protocol to include the normal elute and sieve step, followed by a more intensive wash and rinse step. After this second level of rinsing, the residual sand in the bucket was spread out on the sieve and any visible tubes or organisms were picked off. This sample is probably best treated as qualitative only.

The sample contained numerous large amphipods.

Station WH3: Near MWRA outfall 42° 23.39'N 70° 49.84'W  
Bothner long-term station.  
Water depth 36 meters.

On station about 1900 hours, benthic biology sample taken approx 1915. The sediment was a silty sand that sieved rather easily. The sample contained numerous large amphipods, as well as numerous small polychaetes.