sedimentation on shell banks in delaware bay

robert b. biggs

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UNIVERSITY OF DELAWARE
NEWARK, DELAWARE 19711

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Robert B. Biggs
College of Arts and Sciences
Department of Geology

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This report represents an interim record of progress during FY 1971 in one aspect of the geological investigation of Delaware Bay. Preliminary interpretations have been included as well as appendices presenting the raw data.

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SEDIMENTATION ON SHELL BANKS IN DELAWARE BAY

Introduction

The basic objective of FY 1971 research was to typify geological aspects of the environment which supports oysters in Delaware Bay. Recognizing that the distribution and abundance of oysters was much greater in the past than at present (Moore, 1911), we have used data presented in Maurer et al (1971) from recent oyster surveys to establish the limits of the area of investigation (Figure 1).

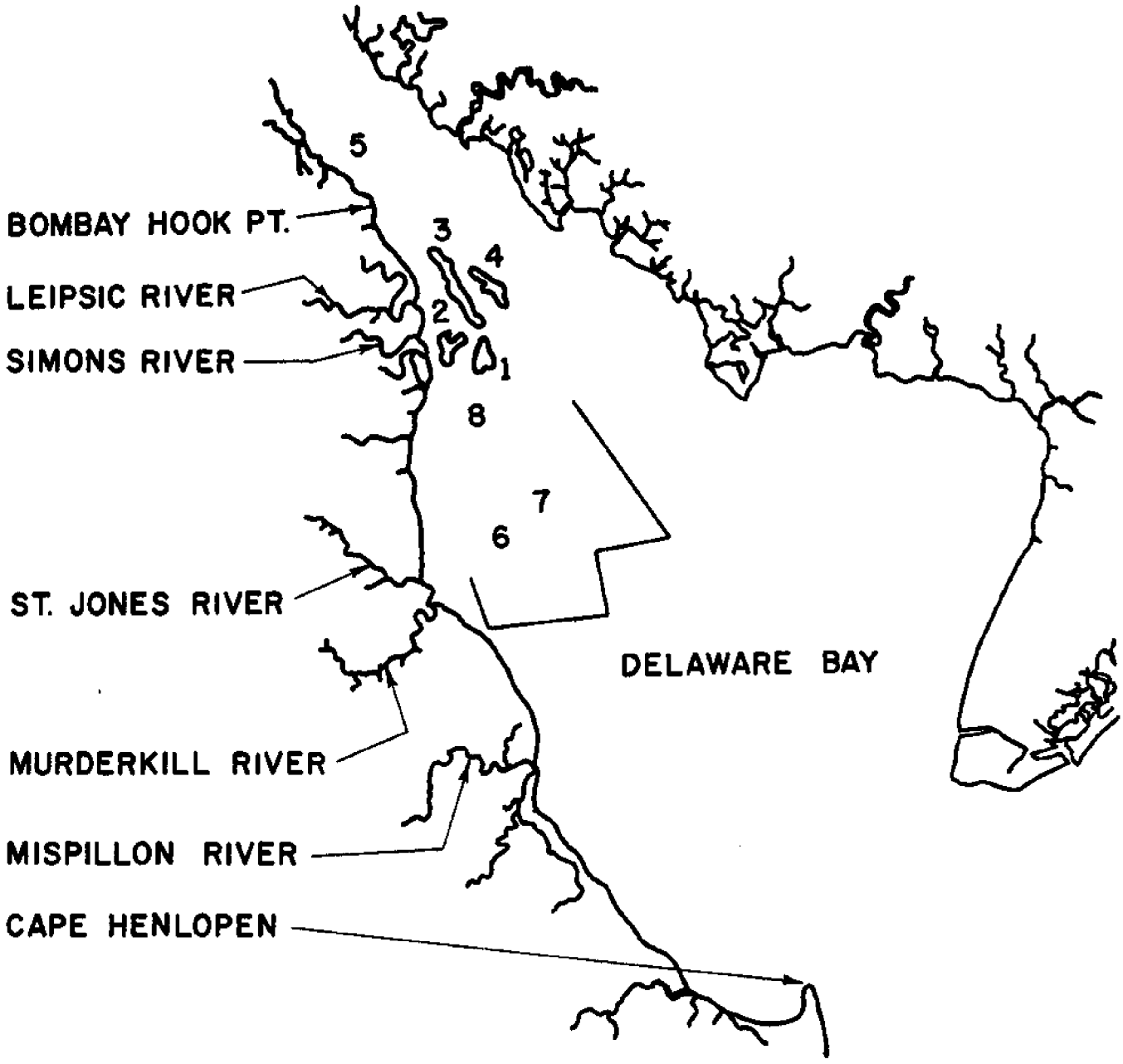

Figure 1: Location of oyster beds in Delaware Bay (from Maurer et al, 1971).

Procedure

A total of 96 bottom samples were taken with a Peterson grab or a piston corer with two meter barrel. Samples were numbered as follows; all samples are identified by the letters "SG" (Sea Grant) followed by the station number, followed by the letter "W" (R. V. Wolverine) or "S" (R. V. Skimmer) followed by the last two digits of the year ('71). The station number of each sampling location is illustrated in Figure 2 and the longitudes and latitudes (to the nearest .05 minute) are presented in Table 1. The designation of a letter (usually "A" or "B") after the station number in Table 1 indicates that more than one sample drop was made at the same location.

Grab samples were brought on board and dumped on a wooden deck, after which a gross description was made and a subsample placed in a plastic sample bag. Core samples were extruded from their plastic liners immediately after sampling and roughly described, then cut longitudinally and carefully described, measured, and subsampled. These results are documented and are available upon request. Core subsamples were also stored in plastic bags.

Preliminary data on the subsurface structure beneath the bottom of Delaware Bay was obtained by jetting a three-fourths inch aluminum pipe through the bottom sediments. The washings which returned to the surface were examined and described and the depths beneath the bottom were noted. These sampling locations are illustrated in Figure 2 and located by longitude and latitude in Table 1 tions of these samples is designated by the letters "BH"). Detailed descriptions of the logs of the wash holes are also available upon request. No samples of material washed from these holes were taken because of the biased nature of the sampling technique.

Samples were wet sieved through a 63 micron sieve and the material retained on the sieve was designated the sand fraction. The material passing the sieve was separated into a silt fraction (63 microns - 3 microns) and a clay fraction (less than 3 microns) by pipette analysis. Each of the three fractions was dried and weighed. Calculation of the weight percentage of each fraction was then performed.

Redox potential (Eh) of each grab sample was measured using an "ORION" specific ion pH meter with sleeve type calomel and platinum electrodes. Hydrogen ion activity (pH) was measured on the same samples using sleeve type calomel and glass electrodes. Both pH and Eh were measured several days after sample collection and this could cause biasing of the results. All sediment samples were stored in air-tight plastic bags so oxidation was minimized and results are probably usable on a relative scale.

Portions of each sediment sample have been catalogued and retained for future analyses.

Table 1

Location and grain size data on all sediment samples taken for Sea Grant during 1971. The letters "A" and "B" after sample numbers indicate two sampler drops for an individual station. Sample type "C" indicates piston core, "G" indicates Peterson grab, and "BH" indicates deep boring probe. Water depths are in feet. Sand is defined as particles coarser than 63 microns, silt is particles between 63 microns - 3 microns, and clay is particles finer than 3 microns.

SAMPLE NUMBER	TYPE	DEPTH	LATITUDE	LONGITUDE	WEIGHT PERCENT SAND	SILT	CLAY
1A	C	18	39-15.40	75-15.40			
1B	G	18	39-15.40	75-15.40	82.6	14.7	2.7
2	G	20	39-14.70	75-16.75	85.0	11.5	3.5
3	G	25	39-14.15	75-17.90	87.0	9.6	3.4
4A	G	50	39-14.00	75-18.25	49.0	41.5	9.5
4B	G	50	39-14.00	75-18.25	43.3	47.4	9.3
5	G	15	39-13.60	75-19.05	96.0	4.0	0.0
6	G	10	39-13.35	75-19.55	94.5	0.9	4.5
7	G	28	39-13.25	75-19.85	91.8	3.0	5.1
8A	G	11	39-13.10	75-20.20	67.8	15.3	16.9
8B	G	11	39-13.10	75-20.20	85.0	8.0	6.9
9	G	10	39-12.60	75-21.05	62.0	25.6	12.2
10	G	9	39-11.95	75-22.20	69.9	15.4	14.6
11	G	18	39-22.50	75-29.05	63.4	25.3	11.2
11	C	18	39-22.50	75-29.05			
12	G	9	39-22.40	75-29.65	79.3	12.6	8.1
13	G	60	39-22.55	75-28.15	100.0	0.0	0.0
14	G	18	39-22.80	75-27.30	99.2	0.7	0.0
15	G	15	39-23.00	75-26.35	70.3	16.3	13.4
16	G	16	39-23.15	75-25.90	3.9	28.0	68.0
17	G	27	39-23.10	75-26.10	79.0	10.1	9.9
18A	G	17	39-22.85	75-26.75	93.3	5.8	0.9
18B	G	17	39-22.85	75-26.75	76.8	13.1	10.0
19	G	11	39-19.40	75-25.75	25.2	58.1	16.6
20	G	25	39-19.60	75-20.55	3.3	74.6	22.0
21	G	50	39-20.00	75-25.10	3.7	37.5	58.6
22	G	25	39-20.25	75-24.75	54.5	31.6	13.9
23	G	17	39-20.90	75-24.35	98.6	1.4	0.0
24	G	11	39-21.20	75-24.10	100.0	0.0	0.0
25	G	8	39-06.60	75-20.35	1.9	72.5	25.5
26	G	12	39-07.00	75-21.05	33.0	56.6	10.3
26	C	12	39-07.00	75-21.05			
27	G	10	39-07.60	75-20.05	72.7	27.3	0.0

Table 1 (Con't.)

NUMBER	SAMPLE TYPE	DEPTH	LATITUDE	LONGITUDE	WEIGHT PERCENT SAND	SILT	CLAY
28	G	15	39-06.45	75-19.45	87.0	12.3	0.7
29	G	21	39-07.30	75-19.25	95.0	4.8	0.1
29	C	21	39-07.30	75-19.25			
30	G	17	39-07.75	75-18.55	96.7	3.3	0.0
31	G	21	39-08.10	75-17.65	75.8	19.4	4.5
31	C	21	39-08.10	75-17.65			
32	G	15	39-08.15	75-17.45	81.9	14.1	4.0
33	G	33	39-08.40	75-16.65	95.1	4.2	0.7
34	G	10	39-08.75	75-15.85	98.3	1.7	0.0
35	G	45	39-09.05	75-14.75	93.7	6.3	0.0
36	G	16	39-09.35	75-14.10	95.9	3.8	0.3
37	G	15	39-10.10	75-12.50	99.6	0.4	0.0
38	G	11	39-10.90	75-11.50	99.5	0.5	0.0
39	G	16	39-10.70	75-09.80	87.8	11.4	0.8
40	G	20	39-23.00	75-26.85	91.0	5.5	3.5
41	C	24	39-25.15	75-26.20			
42	C	12	39-23.20	75-26.00			
43	G	13	39-21.50	75-23.85	97.6	2.4	0.0
44	G	14	39-20.50	75-24.55	97.7	2.3	0.0
45	C	49	39-19.90	75-25.20			
46	C	35	39-19.65	75-25.50			
47A	G	11	39-15.00	75-23.40	79.9	16.6	3.4
47B	G	11	39-15.00	75-23.40	8.9	68.0	23.0
48	G	15	39-15.35	75-22.30	82.5	12.6	4.8
48	C	15	39-15.35	75-22.30			
49	G	24	39-15.65	75-21.75	75.3	19.1	5.6
49	C	24	39-15.65	75-21.75			
50	G	22	39-15.85	75-21.35	95.2	4.7	1.1
51	G	50	39-16.10	75-20.60	94.3	4.6	2.0
51	C	50	39-16.10	75-20.60			
52	G	18	39-16.65	75-19.75	68.6	22.3	11.1
52	C	18	39-16.65	75-19.75			
53	G	12	39-17.25	75-18.95	97.3	2.7	0.0
54	G	17	39-17.35	75-18.80	97.6	2.3	0.0
55	G	15	39-17.35	75-17.80	PEATY SILT NOT ANALYZED		
55	C	15	39-17.35	75-17.80			
56	C	17	39-15.35	75-15.50			
57	C	50	39-13.95	75-18.35			
58	C	25	39-13.20	75-20.00			
59	C	13	39-13.00	75-20.35			
60	G	12	39-13.90	75-21.10	77.5	18.9	3.6
60	C	12	39-13.90	75-21.10			
61A	G	12	39-14.30	75-21.70	90.8	7.2	2.0
61B	G	12	39.14.30	75.21.70	55.8	35.6	8.6

Table 1 (Con't.)

NUMBER	SAMPLE TYPE	DEPTH	LATITUDE	LONGITUDE	WEIGHT PERCENT SAND	SILT	CLAY
61	C	12	39-14.30	75-21.70			
62	G	15	39-14.80	75-21.90	59.8	35.1	5.0
62	C	15	39-14.80	75-21.90			
63	G	14	39-15.85	75-22.70	78.6	14.2	7.2
63	C	14	39-15.85	75-22.70			
64	G	19	39-16.25	75-23.00	52.5	34.0	13.5
64	C	19	39-16.25	75-23.00			
65	G	18	39-16.70	75-23.40	65.1	32.3	2.6
65	C	18	39-16.70	75-23.40			
66	G	14	39-13.30	75-19.70	98.3	0.5	1.2
67	C	13	39-12.35	75-22.75			
68	C	14	39-13.05	75-22.40			
69	C	14	39-13.35	75-22.05			
70	C	14	39-13.60	75-21.70			
71	C	12	39-13.25	75-21.30			
72	C	9	39-11.75	75-20.75			
73	C	12	39-10.95	75-20.60			
74	C	22	39-06.90	75-19.10			
75	G	46	39-06.15	75-18.85	72.5	25.9	1.6
75	C	46	39.06.15	75-18.85			
76	G	29	39-03.95	75-16.95	88.4	11.6	0.0
77	G	13	39-02.85	75-16.90	90.8	7.1	0.1
78	G	44	39-02.05	75-15.65	91.0	9.0	0.0
79	G	10	39-04.25	75-15.15	69.8	25.0	5.2
80	G	29	39-04.95	75-16.50	97.4	2.6	0.0
81	G	25	39-05.20	75-16.55	97.9	2.1	0.0
82	G	23	39-06.00	75-16.80	99.2	0.8	0.0
83A	G	24	39-07.20	75-17.20	55.8	40.2	3.9
83B	G	24	39-07.20	75-17.20	28.3	59.6	12.0
83	C	24	39-07.20	75-17.20			
84	C	19	39-08.75	75-18.25			
85	C	16	39-09.70	75-19.10			
86	C	21	39-09.80	75-17.40			
87	C	20	39-11.15	75-18.60			
88	G	13	39-21.70	75-23.80	97.2	2.7	0.0
89	C	18	39-20.35	75-27.10			
90	G	15	39-21.20	75-24.10	93.8	3.5	2.7
BH-1		3	39-15.70	75-23.25			
BH-2		5	39-14.20	75-24.00			
BH-3		5	39-11.25	75-23.60			
BH-4		7	39-07.30	75-19.80			
BH-5		11	39-07.30	75-19.80			
BH-6		8	39-09.75	75-16.80			
BH-7		8	39-10.50	75-14.95			
BH-8		9	39-16.40	75-24.10			
BH-9		9	39-18.95	75-26.50			
BH-10		8	39-18.65	75-26.20			
BH-11		5	39-21.50	75-25.75			

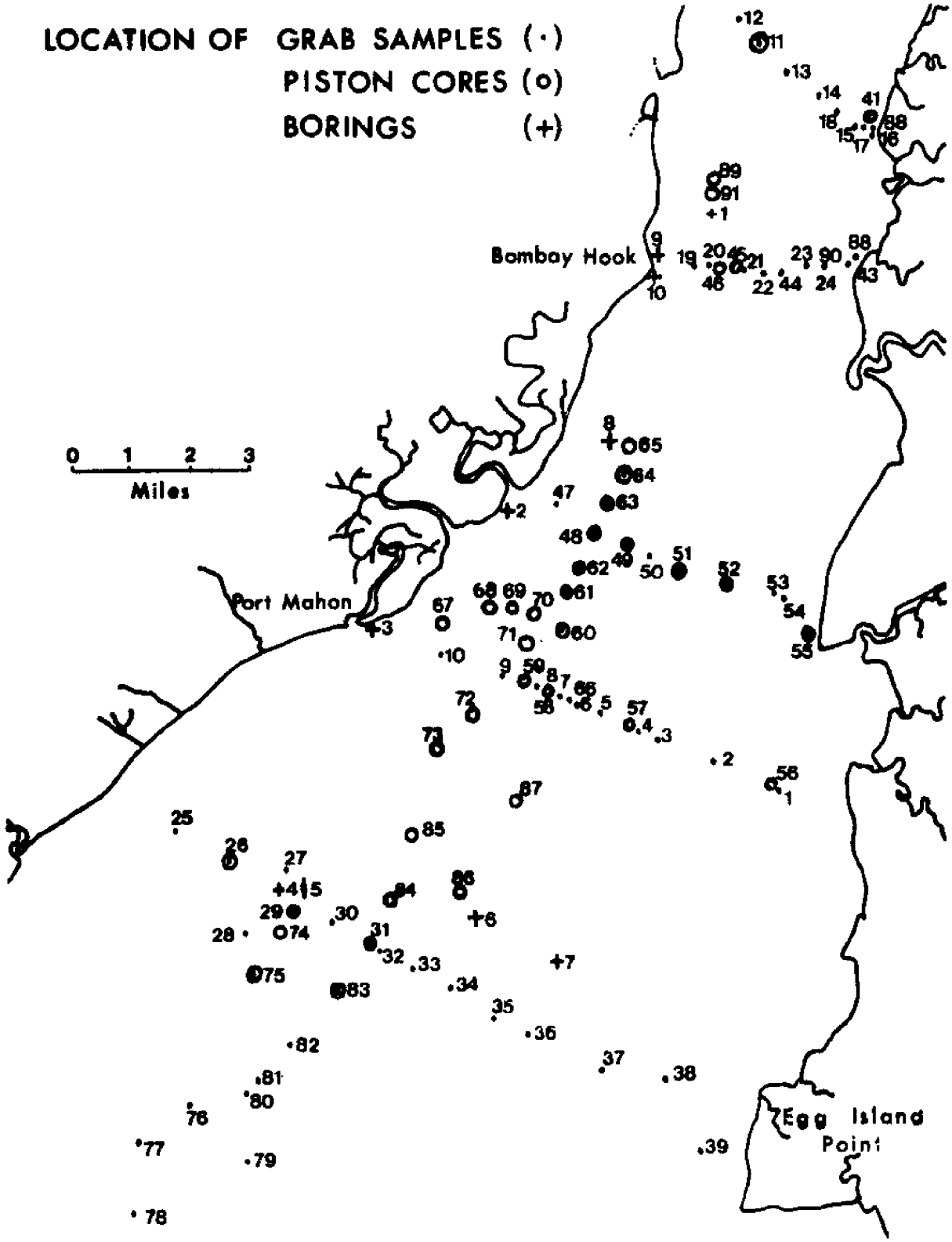

Figure 2 : Location of sampling stations for FY '71 Sea Grant study.

Results

Surface Sediments. Sediment particle size, redox potential, and pH were measured on the surface sediments of mid-Delaware Bay.

Results of size analysis are presented in Table 1 and are illustrated in Figures 3, 4, and 5. The general distribution of sediment types is clearly illustrated on the drawings. Sands characterize the central portion of the Middle Bay while sediments with large silt and clay components form belts near and parallel to the shores, particularly along the Delaware side. This suggests a silt and clay source along the Delaware shore and/or preferred deposition of fine sediments along the Delaware side. Most of the oyster beds along the Delaware side are positioned on black or gray silty sands or sandy silts.

Redox potential and pH of soils and sediments have been measured by many investigators and have been used to describe composition, chemical reactivity, biological populations, and other properties of recent sediments. Most authors agree that pH and Eh of sediments are primarily a result of the balance between types of bacteria, organic matter, buffering and poising capacity of the sediments and interstitial water and the rate of oxygen diffusion in the pore water. The pH and Eh of Delaware Bay sediments (Figures 6 and 7) are distributed in a manner generally correlated with grain size distribution. Lowest pH and most negative Eh values are associated with sediments having a large silt and clay component. Fine grained sediments frequently contain higher concentrations of organic matter than sandier materials, perhaps because deposition of organic matter requires low physical energy environments usually associated with fine grained materials. Fine grained sediments have low permeability and resist diffusion of dissolved oxygen into interstitial waters. Dissolved oxygen is utilized in the pore waters and anaerobic conditions which sulfate reducing bacteria can develop. The relationship between particle size and pH and Eh is valid when viewed on a gross scale (e.g. in the illustrations) but not when examined for regressions, etc. This is because factors (chemical composition, mineral composition, rate of turnover by burrowing organisms, etc.) other than grain size partly control Eh and pH.

If one were to speculate that the Delaware liner supplies the Middle bay with silt and clay size sediment, then the deposition of this fine material is biased toward the Delaware side, perhaps because of the Coriolis effect. If extraneous materials (trace metals, pesticides, etc.) are attached to fine suspended particles, carried downriver, and deposited preferentially on the Delaware shore, then the Delaware side of the Bay is more susceptible to pollution sources from up-river.

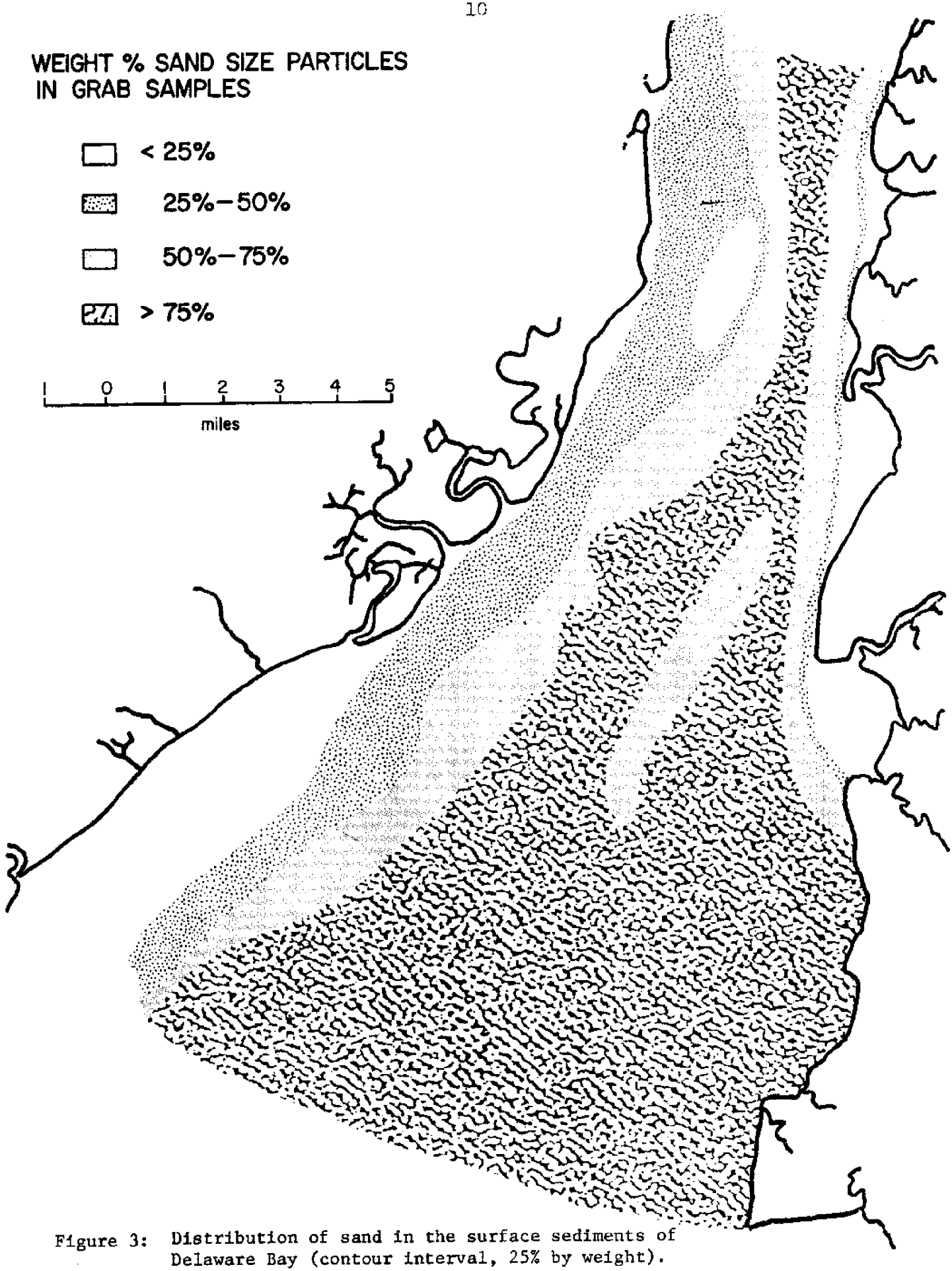

Figure 3: Distribution of sand in the surface sediments of Delaware Bay (contour interval, 25% by weight).

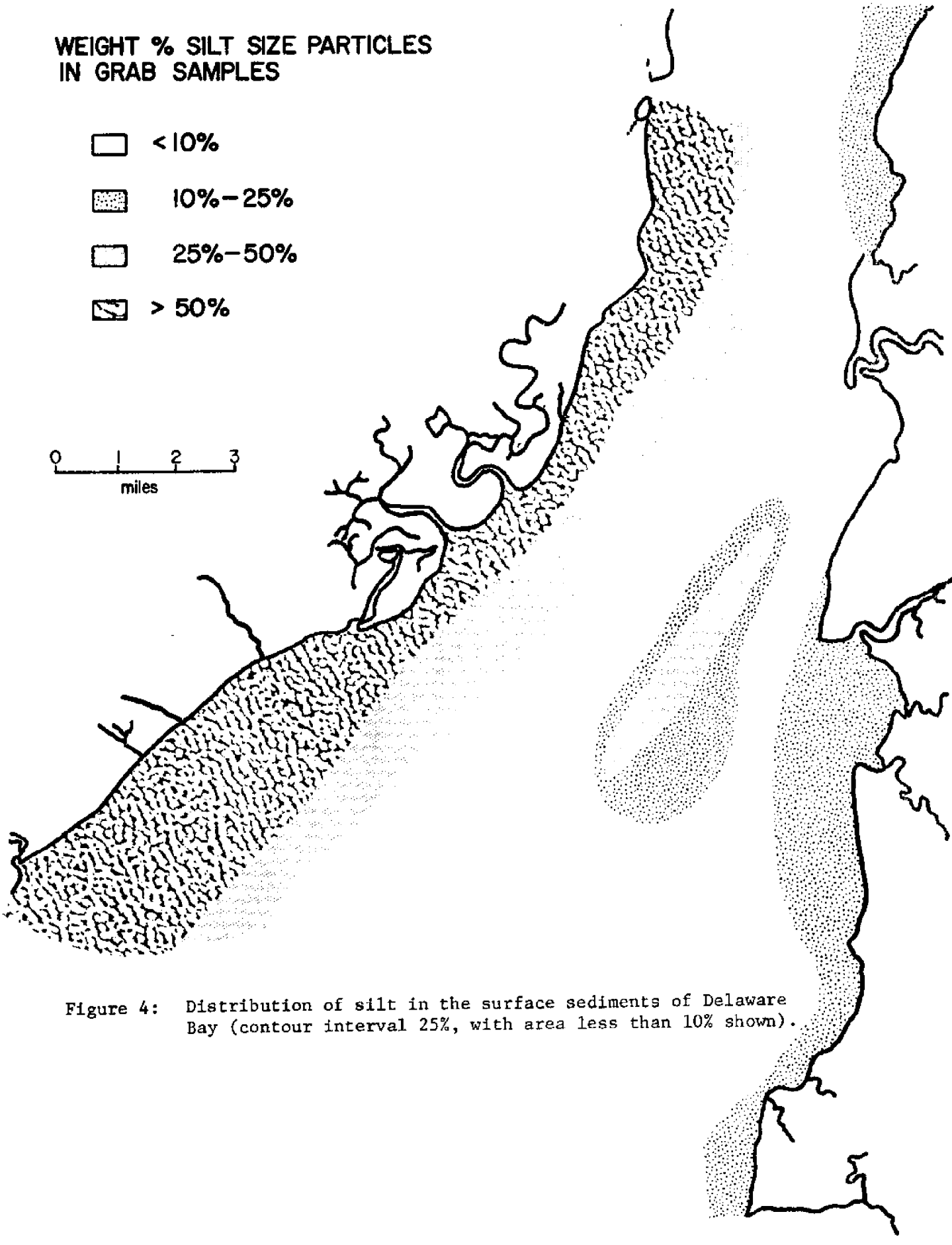

Figure 4: Distribution of silt in the surface sediments of Delaware Bay (contour interval 25%, with area less than 10% shown).

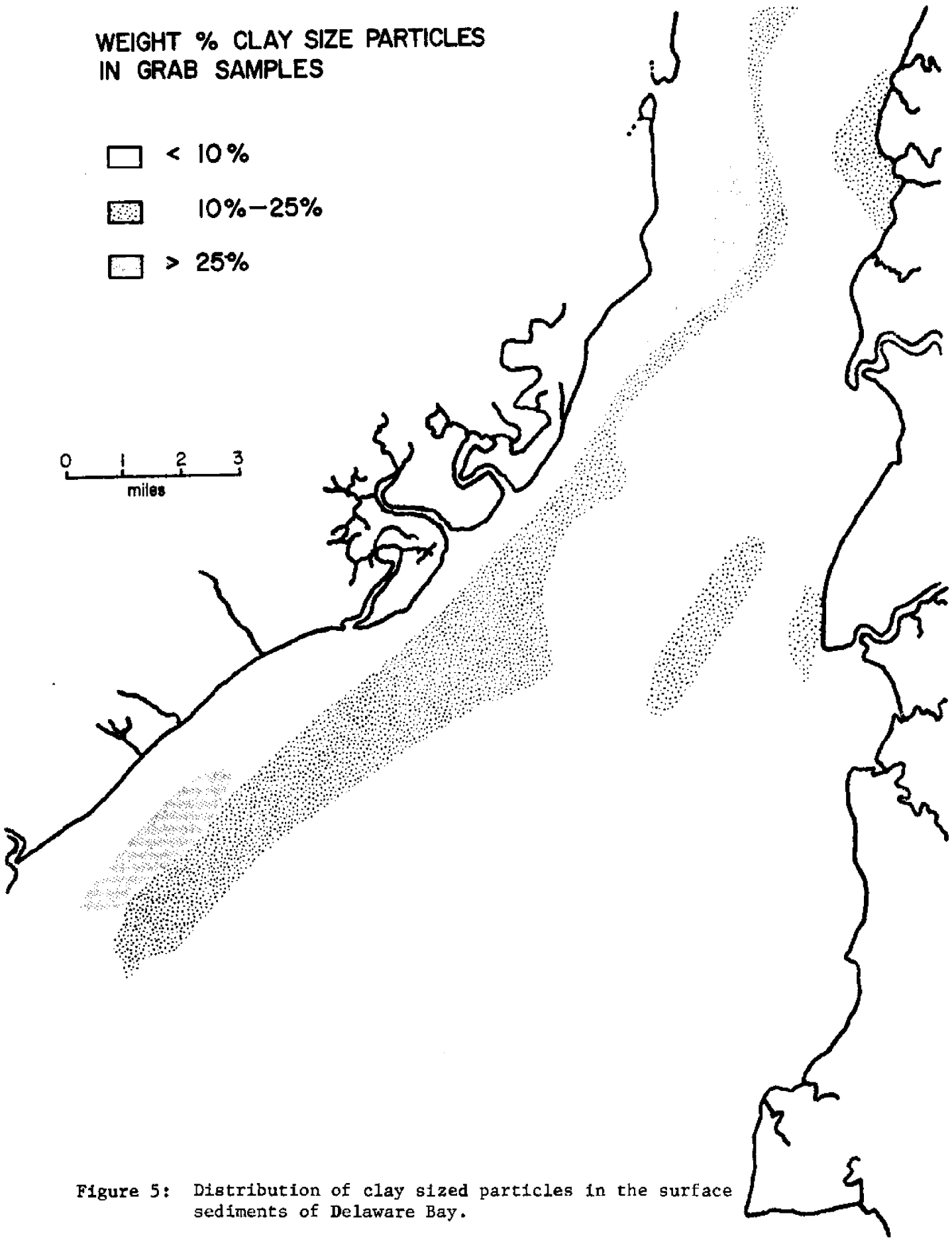

Figure 5: Distribution of clay sized particles in the surface sediments of Delaware Bay.

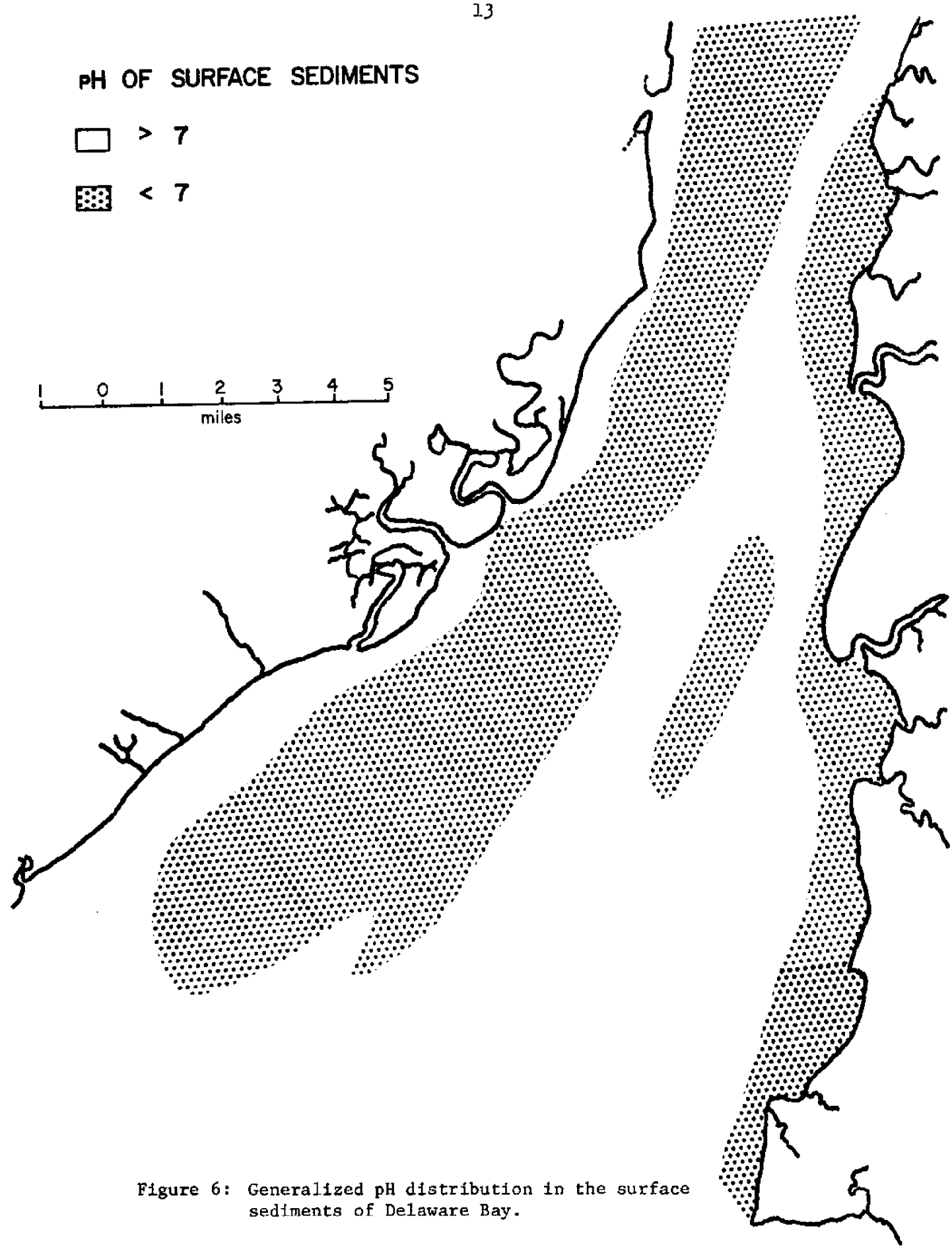

Figure 6: Generalized pH distribution in the surface sediments of Delaware Bay.

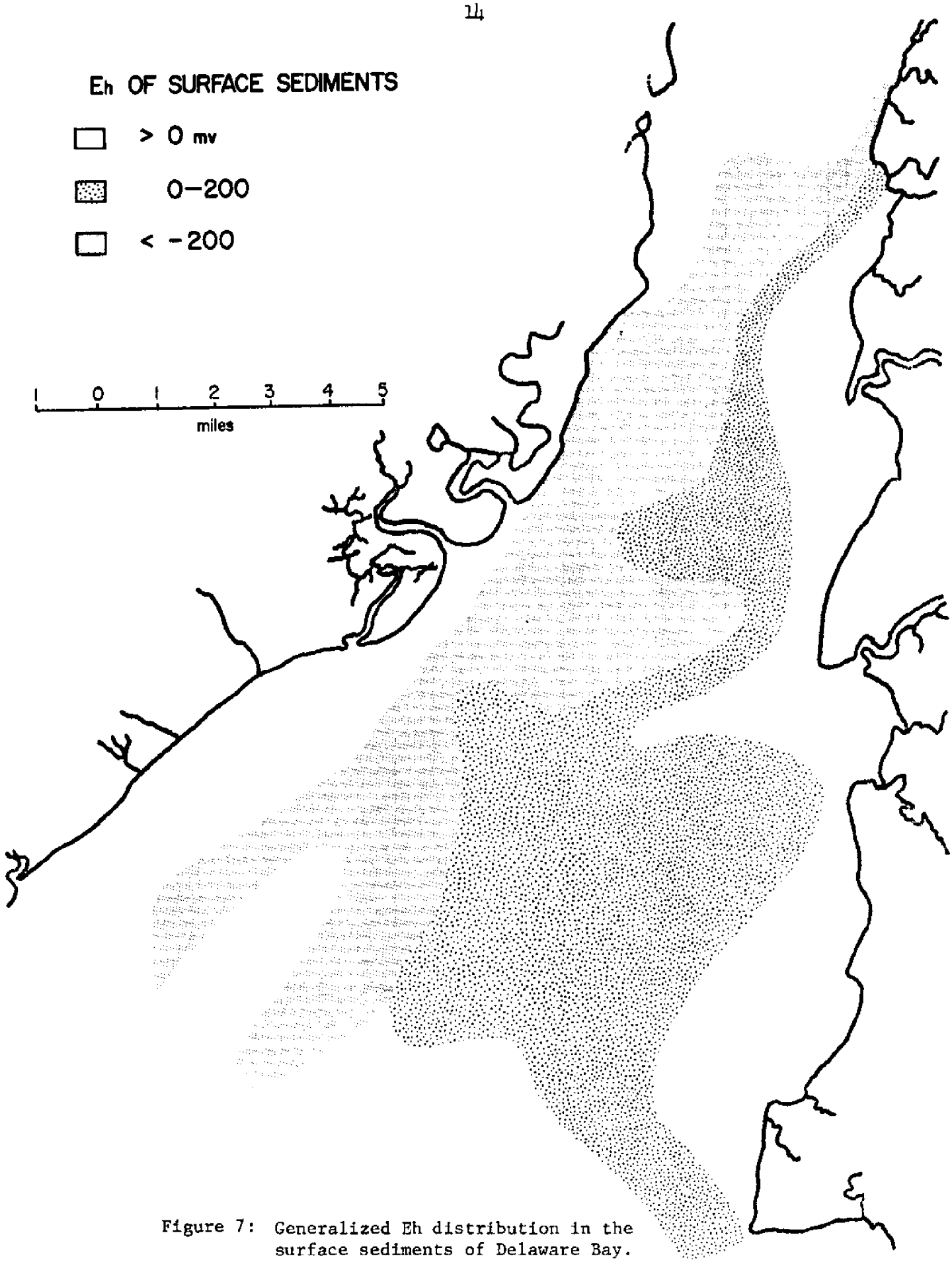

Figure 7: Generalized Eh distribution in the surface sediments of Delaware Bay.

Literature Cited

Maurer, D. L., L. Watling, and R. Keck. (1971). The Delaware Oyster Industry, A Reality? Trans. Amer. Fish. Soc.; 100 (1): 100-111.

Moore, H. F. (1911). Condition and Extent of the Natural Oyster Beds of Delaware. Bur. Fish. Doc. No. 745:1-29.

Appendix A

This appendix contains an exact copy of the field notes taken during sampling. Data include sample number, date and time, water depth and sample type and gross description.

SAMPLE #: SG-1-W-71 DATE: 5/24/71: 1537

Type sample: Peterson Grab (2 bags)

Water Depth: 18 feet

Sample Description: Gray organic mud-Crassostrea virginica shells. Brown woody peat.

Type Sample: 8' piston core

Sample Description: (bent barrel in middle) 3' Gray organic mud-Crassostrea virginica shells

SAMPLE #: SG-2-W-71 DATE: 5/24/71 TIME: 1637

Type Sample: Peterson Grab

Water Depth: 20'

Sample Description: Gray-green sand and some shell (1 bag)

SAMPLE #: SG-3-W-71 DATE: 5/24/71 TIME: 1650

Water Depth: 25'

Type Sample: Peterson Grab

Description: Gray-green sand and shells (1 bag)

SAMPLE #: SG-4-W-71 DATE: 5/24/71 TIME: 1700

Water Depth: 50'

Type Sample: Peterson Grab

Description: Gray green sand and shell frag. plus stiffer gray clayey mud (2 bags)

SAMPLE #: SG-5-W-71 DATE: 5/24/71 TIME: 1715

Water Depth: 15'

Type Sample: Peterson Grab

Description: Gray green fine sand-shells rare (1 bag)

SAMPLE #: SG-6-W-71 DATE: 5/24/71 TIME: 1726

Water Depth: 10'

Type sample: Peterson Grab

Description: Gray sand and black mud and shell frag. (1 bag)

SAMPLE #: SG-7-W-71 DATE: 5/24/71 TIME: 1734

Water Depth: 28'

Type Sample Peterson

Description: Gray-green sand-oyster shells.

SAMPLE #: SG-8-W-71 DATE: 5/24/71 TIME: 1740

Water Depth: 11'

Type Sample: Peterson

Description: Black mud-green mud-fine sand (2 bags)

SAMPLE #: SG-9-W-71 DATE: 5/24/71 TIME: 1800

Water Depth: 10'

Type Sample: Peterson

Description: Gray and green mud with oyster shells (1 bag)

SAMPLE #: SG-10-W-71 DATE: 5/24/71 TIME: 1808

Water Depth: 9'

Type Sample: Peterson

Description: Gray silty sand-small shell (1 bag)

SAMPLE #: SG-11-W-71 DATE: 5/25/71 TIME: 1115

Water Depth: 18'

Type sample: Peterson

Description: Gray black mud and live clams Macoma (1 bag)

SAMPLE #: SG-11-W-71 DATE: 5/25/71 TIME: 1130

Water Depth: 18'

Type of sample: 8' piston core

Description: 6' of black mud

SAMPLE #: SG-12-W-71 DATE: 5/25/71 TIME: 1155

Water depth: 9'

Type of sample: Peterson

Description: Gray green silty sand Macoma Sp. clams alive (1 bag)

SAMPLE #: SG-13-W-71 DATE: 5/25/71 TIME: 1205

Water Depth: 50'

Type of sample: Peterson

Description: Cse sand and coal sand (1 bag)

SAMPLE #: SG-14-W-71 DATE: 5/25/71 TIME: 1215

Water depth: 18'

Type of sample: Peterson grab

Description: live oysters on sandy gravel

SAMPLE #: SG-15-W-71 DATE: 5/25/71 TIME: 1225

Water depth: 15'

Peterson grab

Description: black mud and oxidized fine sand
Mussels and clams (1 bag)

SAMPLE #: SG-16-W-71 DATE: 5/25/71 TIME: 1237

Water Depth: 16'

Peterson grab

Description: Peat and gray mud and tight gray clay (1 bag)

SAMPLE #: SG-17-W-71 DATE: 5/25/71 TIME: 1244

Water depth: 27'

Peterson grab

Description: Very black mud and fine sand (1 bag)

SAMPLE #: SG-18-W-71 DATE: 5/25/71 TIME: 1248

Water depth: 17'

Peterson (two lowerings)

Description: Black mud and coaly sand (2 bags)

SAMPLE #: SG-19-W-71 DATE: 5/25/71 TIME: 1340

Water depth: 11'

Peterson grab

Description: Black mud and oxidized layer (1 bag)

SAMPLE #: SG-20-W-71 DATE: 5/25/71 TIME: 1410

Water depth: 25'

Peterson grab (2 lowerings)

Description: Black mud (good core site) (1 bag)

SAMPLE : SG-21-W-71 DATE: 5/25/71 TIME: 1419

Water depth: 50'

Peterson grab

Description: Stiff gray green clay

SAMPLE #: SG-22-W-71 DATE: 5/25/71 TIME: 1435

Water depth: 25'

Peterson grab:

Description: gray, med-stiff mud (1 bag)

SAMPLE #: SG-23-W-71 DATE: 5/25/71 TIME: 1445

Water depth: 17'

Type sample: Peterson (2 lowerings)

Description: Brown coaly cse. sand

SAMPLE #: SG-24-W-71 DATE: 5/25/71 TIME: 1450

Water depth: 11'

Type sample: Peterson grab (2 lowerings)

DESCRIPTION: Brown cse sand coaly (1 bag)

SAMPLE #: SG-25-W-71 DATE: 5/26/71 TIME: 1055

Water depth: 8'

Type sample: Peterson

Description: dark gray green mud (1 bag)

SAMPLE #: SG-26-W-71 DATE: 5/26/71 TIME: 1115

Water depth: 12'

Type sample: Peterson grab: black mud and Crassostrea shell

Piston core: 8' barrel

Description: 6' gray black mud + shell + brown peat

SAMPLE #: SG-27-W-71 DATE: 5/26/71 TIME: 1145

Water depth: 10'

Type sample: Peterson

Description: Dark gray silt, mica, oxidized silt, fine shell
(1 bag)

SAMPLE #: SG-28-W-71 DATE: 5/26/71 TIME: 1230

Water Depth: 15'

Type sample: Peterson

Description: hard sand - fine grain dark grey w/clams
Ensis and other shells.

SAMPLE #: SG-29-W-71 DATE: 5/26/71 TIME: 1307

Water depth: 21'

Type sample: Peterson

Description: cse sand with small shell fragments and gray silt.

Piston Core: 8' barrel (Smear to head-8' penetration)
(bent barrel in middle) 3' core sucked into head

SAMPLE #: SG-30-W-71 DATE: 5/26/71 TIME: 1340

Water depth: 17'

Type of sample: Peterson

Description: Gray silty mud

Piston Core: 8' barrel (sample washed out, maybe fine sand)

SAMPLE #: SG-31-W-71 DATE: 5/26/71 TIME: 1407

Type of sample: Peterson

Water depth: 21'

Description: Brown oxidized sand over black sand with
oyster shells (1 bag)

Piston core: 8' barrel - 4' penetration (barrel bent in middle)
4' fine grey sand.

SAMPLE #: SG-32-W-71 DATE: 5/26/71 TIME: 1436

Type of sample: Peterson

Water depth: 15'

Description: fine gray sand (1 bag) silty light brown
oxidized silt

SAMPLE #: SG-33-W-71 DATE: 5/26/71 TIME: 1450

Water Depth: 33'

Type of Sample: Peterson grab

Description: washed fine silty sand + fine coquina (1 bag)

Piston core: 8' 6" fine gray sand barrel pipe bent 2' above cutter

SAMPLE #: SG-34-W-71 DATE: 5/26/71 TIME; 1515

Water depth: 10'

Peterson grab:

Description: gray green fine sand.

SAMPLE #: SG-35-W-71 DATE: 5/26/71 TIME: 1530

Water depth: 45'

Peterson grab:

Description: Shelly sand, fine gray green (1 bag)

SAMPLE #: SG-36-W-71 DATE: 5/26/71 TIME: 1537

Water depth: 16'

Peterson grab:

Description: Fine gray green sand with some coal (1 bag)

SAMPLE #: SG-37-W-71 DATE: 5/26/71 TIME: 1550

Water depth: 15'

Type of sample: Peterson grab

Description: clean brown sand with oyster shells (1 bag)

SAMPLE #: SG-38-W-71 DATE: 5/26/71 TIME: 1610

Water depth: 11'

Type of sample: Peterson grab

Description: brown coaly sand

SAMPLE #: SG-39-W-71 DATE: 5/26/71 TIME: 1622

Water depth: 16'

Type of sample: Peterson

Description: brown cse sand and shells

Piston core: 5' barrel (2'fine gray sand and shells)

SAMPLE #: SG-40-W-71 DATE: 5/27/71 TIME: 1130

Water depth: 20'

Type of sample: 6' barrel piston core

Description: 3' cse sand, sucked up (dark gray green + coal) in barrel, collected as bulk sample.

SAMPLE #: SG-41-W-71 DATE: 5/27/71 TIME: 1205

Water depth: 24'

Type of sample: 6' barrel piston core

Description: 5' clean gray mud and clay. Some peaty layers lower down.

SAMPLE #: SG-42-W-71 DATE: 5/27/71 TIME: 1225

Water depth: 12'

Type sample: 6' piston core

Description: 5' brown peat with tight gray clay (peat layers throughout)

SAMPLE #: SG-43-W-71 DATE: 5/27/71 TIME: 1310

Water depth: 13'

Type sample: Peterson (2 drops)

Description: #1 Crassostrea shell bed
#2 Brown cse sand and gravel

SAMPLE #: SG-44-W-71 DATE: 5/28/71 TIME: 1335

Water depth: 14'

Type sample: Peterson grab

Description: cse brown coaly sand

SAMPLE #: SG-45-W-71 DATE: 5/29/71 TIME: 1345

Water depth: 49'

Type sample: 6' piston core

Description: 5' penetration gray-green clay

SAMPLE #: SG-46-W-71 DATE: 5/27/71 TIME: 1400

Water depth: 35'

Type of sample: 6' piston core

Description: 6' black silty mud over gray clayey silt with lots of mica, stiff.

SAMPLE #: SG-47-W-71 DATE: 5/27/71 TIME: 1445

Water depth: 11'

Type of sample: Peterson

Description: Gray brown silt (1 bag)
Cse gray sand and shell (1 bag)

SAMPLE #: SG-48-W-71 DATE: 5/27/71 TIME: 1505

Water depth: 15'

Type of sample: Peterson

Description: Oyster shell on top and gray sand underneath (1 bag)

Type of sample: 6' piston core (full smear)

Description: 3' gray silt and shell fragments

SAMPLE #: SG-49-W-71 DATE: 5/27/71 TIME: 1520

Water depth: 24'

Type of sample: Peterson

Description: (1 bag) black mud and oyster shells
6' piston core: (full smear) 5' green gray mud

SAMPLE #: SG-50-W-71 DATE: 5/27/71 TIME: 1545

Water depth: 22' (oyster mound)

Type of Sample: Peterson

Description: Oyster shell and silt

SAMPLE #: SG-51-W-71 DATE: 5/27/71 TIME: 1550

Water depth: 50'

Type of sample: Peterson

Description: Cse brown sand and shell frags. (1 bag)

Type of sample: 6' piston core

Description: (full barrel smear) 5' gray cse sand

SAMPLE #: SG-52-W-71 DATE: 5/27/71 TIME: 1615

Water depth: 18'

Type sample: Peterson

Description: Gray silty sandy mud with small shell fragments

Type of sample: 6' piston core

Description: 3' gray silt and shell fragments
1' peat
1' gray clayey silt-soft

SAMPLE #: SG-53-W-71 DATE: 5/27/71 TIME: 1640

Water depth: 12'

Type of sample: Peterson

Description: Brown med sand (1 bag)

SAMPLE: SG-54-W-71 DATE: 5/27/71 TIME: 1645

Water depth: 17'

Type of sample: Peterson

Description: Clean brown sand (1 bag)

SAMPLE #: SG-55-W-71 DATE: 5/27/71 TIME: 1655

Water depth: 15'

Type of sample: Peterson

Description: Woody peat

Type of sample: 6' piston core (poor trip)

Description: 1 1/2' brown peat
1 1/2' gray silty mud soft

SAMPLE #: SG-56-W-71 DATE: 5/27/71 TIME: 1730

Water depth: 17'

Type of sample: 6' piston core

Description: 1-1/2' brownish peat
1-1/2' gray silty mud

SAMPLE #: SG-57-W-71 DATE: 5/27/71 TIME: 1810

Water depth: 50'

Type of sample: 6' piston core

Description: 3' gray black silt and shell frag.
2' gray clay stiffer
1' peaty grass frag in clay

SAMPLE #: SG-58-W-71 DATE: 5/27/71 TIME: 1835

Water depth: 25'

Type of sample: 6' piston core (full smear)

Description: 3' fine gray sand and shell frag.

SAMPLE #: SG-59-W-71 DATE: 5/28/71 TIME: 1025

Water depth: 13'

Type of sample: 6' piston core (3' smear)

Description: 5' gray black mud

SAMPLE: SG-60-W-71 DATE: 5/28/71 TIME: 1045

Water depth: 12'

Type of sample: Peterson grab

Description: (1 bag brown gray fine sand shell)

Type of sample: 6' piston core (5' smear)

Description: 1-1/2' gray sand and shell
1' silty brown clay

SAMPLE #: SG-61-W-71 DATE: 5/28/71 TIME: 1100

Water depth: 12'

Type of sample: Peterson grab

Description: Brown sand and shell on gray mud (2 bags)

Type of sample: 6' piston core

Description: 1-1/2' brown sand and shell mud
1' brown peaty clay
1' gray clay
1' brown peaty clay
1-1/2' gray clay

SAMPLE: SG-62-W-71 DATE: 5/28/71 TIME: 1120

Water depth: 15'

Type of sample: Peterson grab

Description: Brown and black mud (1 bag)

Type of sample: 6' piston core (3' smear)

Description: 1-1/2 gray silt, and shell
1' stiffer gray clay

SAMPLE #: SG-63-W-71 DATE: 5/28/71 TIME: 1140

Water depth: 14'

Type of sample: Peterson grab

Description: black mud and shell (1 bag)

Type of sample: 6' piston core (5' smear)

Description: 6' gray silty clay and shell frag.

SAMPLE #: SG-64-W-71 DATE: 5/28/71 TIME: 1200

Water depth: 19'

Type of sample: Peterson

Description: brown and black mud (1 bag)

Type of sample: 6' piston core (full smear)

Description: 6' black-gray silty clay

SAMPLE #: SG-65-W-71 DATE: 5/28/71 TIME: 1215

Water depth: 18'

Type of sample: Peterson grab

Description: black mud

Type of sample: 6' piston core (full smear)

Description: 5' black mud and gray silty clay

SAMPLE #: SG-66-W-71 DATE: 5/28/71 TIME: 1330

Water depth: 14'

Type of sample: 6' piston core (1st lowering)

Description: 1-1/2 black silt and shell (maybe fine sand lost)

Type of sample: 6' piston core (2nd lowering)

Description: sand washed out-gray green fine sand-
very small shell and coal frag.

SAMPLE SG-67-S-71 DATE: 6/3/71 TIME: 1345

Water depth: 13'

Type of sample: 6' piston core

Description: 4' brown peat and gray silt

SAMPLE SG-68-S-71 DATE: 6/3/71 TIME: 1415

Water depth: 14'

Type of sample: 6' piston core

Description: 4 1/2' gray green clay

SAMPLE SG-69-S-71 DATE: 6/3/71 TIME: 1435

Water depth: 14'

Type of sample: 6' piston core

Description: 3' gray silt

1 1/2' brown peat

SAMPLE SG-70-S-71 DATE: 6/3/71 TIME: 1455

Water depth: 14'

Type of sample: 6' piston core

Description: 5' gray silt

SAMPLE SG-71-S-71 DATE: 6/3/71 TIME: 1525

Water depth: 12'

Type of sample: 6' piston core

Description: 1' grey to black mud

2' med. grey sand w/shell

SAMPLE SG-72-S-71 DATE: 6/3/71 TIME: 1540

Water depth: 9'

Type of sample: 6' piston core

Description: 2' gray sand w/some shell

6" grey to tan silty sand very tight

SAMPLE SG-73-S-71 DATE: 6/3/71 TIME: 1600

Water depth: 12'

Type of sample: 6' piston core

Description: 1-1/2' grey sand

1-1/2 grey mud tight

SAMPLE SG-74-S-71 DATE: 6/4/71 TIME: 1015

Water depth: 22'

Type of sample: 6' piston core

Description: 1' Coquina

1.5 ft. grey green clay

SAMPLE SG-75-S-71 DATE: 6/4/71 TIME: 1030

Water depth: 46'

Type of sample: 6' piston core

Description: material is apparently sucked up

dk grey green sand

SAMPLE:SG-76-S-71 DATE: 6/4/71 TIME: 1031

Water depth: 29'

Type of sample: 6' piston core

Description: bulk scale only - core washed out

dark grey green sand

SAMPLE SG-77-S-71 DATE: 6/4/71 TIME: 1115 to 1130

Water depth: 13'

Type of sample: 6' piston core

Description: 2 drops attempted

both washed out

2 bulk bags recovered

both dark grey sands

SAMPLE 78-S-71 DATE: 6/4/71 TIME: 1200

Water depth: 44'

Type of sample: 6' piston core

Description: wash out

3 cm clay in cutter

light grey sand and gravel

2 bulk bags

SAMPLE SG-79-S-71 DATE: 6/4/71 TIME: 1225

Water depth: 10'

Type of sample: 6' piston core wash out

Description: 1 bulk bag

fine dark green sand w/opaques

SAMPLE SG-80-S-71 DATE: 6/4/71 TIME: 1250

Water depth: 29'

Type of sample: 6' core attempted; complete wash out

Description: disconnected corer

Type of sample: Peterson dredge attached and recovered

Description: 1 sample dark grey coarse sand

SAMPLE SG-81-S-71 DATE: 6/4/71 TIME: 1320

Water depth: 25'

Type of sample: Peterson grab

Description: coarse brown green sand w/opaques

SAMPLE SG-82-S-71 DATE: 6/4/71 TIME: 1400

Water depth: 23'

Type of sample: Peterson grab

Description: med. green sand

SAMPLE SG-83-S-71 DATE: 6/4/71 TIME: 1420

Water depth: 24'

Type of sample: Peterson grab

Description: surface silt

grey-green mud - 2 bags

mud

Type of sample: 6' piston core

Description: 1.0' soupy green sand

2.5' grey green sandy silt w/shell - tight

0.5' grey green fine grain sand - very tight

SAMPLE SG-84-S-71 DATE: 6/4/71 TIME: 1500

Water depth: 19'

Type of sample: 6' piston core

Description: 1' dark grey mud w/coquina

1' dark green sandy silt w/coquina fetid

1' grey green fine sand fetid

SAMPLE SG-85-S-71 DATE: 6/4/71 TIME: 1520

Water depth: 16'

Type of sample: 6' piston core

Description: 0.5' grey green silt w/coquina

3.0' grey green silt w/ coquina layer

0.5' grey green clay

SAMPLE SG-86-S-71 DATE: 6/4/71 TIME: 1550

Water depth: 21'

Type of sample: 6' piston core

Description: 1.5' grey green sand w/coquina

1.5' soupy grey green sandy silt

SAMPLE SG-87-S-71 DATE: 6/4/71 TIME: 1620

Water depth: 20'

Type of sample: 6' piston core

Description: 2.5'grey green silt

1.0'grey green sand w/large shell frags.

SAMPLE SG-88A-S-71 DATE: 6/8/71 TIME: 1500

Water depth: 13'

Type of sample: 6' piston core 1444

Description: 1' shelly gravel and well rd. qtz. grains collected as bulk samples

SAMPLE SG-88B-S-71 DATE: 6/8/71 TIME: 1530

Water depth: 13'

Type of sample: 6' piston core 1444

Description: 1' shelly cse sand well rd. quartz grains
collected as bulk sample.

SAMPLE SG-89-S-71 DATE: 6/8/71 TIME: 1330

Water depth: 8'

Type of sample: 6' piston core

Description: 4'stiff grey green silt

SAMPLE SG-90-S-71 DATE: 6/10-71 TIME: 1050

Water depth: 15'

Type of sample: 6' piston core

Description: 1-1/2" brown coaly sand (cse.) blk.
grey silt
(black mud washed out above)
collected as a bulk sample

SAMPLE SG-91-S-71 DATE: 6/10-71 TIME: 1010

Water depth: 20'

Type of sample: 6' piston core

Description: 4' recovery, gray to green silt and clay.

SAMPLE SG-92-S-71

No sample recovered.

SAMPLE SG-93-S-71 DATE: 6/23/71 TIME: 1100

Water depth: 100'

Type of sample: 6' piston core

Description: 87 cm black silty sand w/minor small shell frags.

Correlate of seismic record fix 270

SAMPLE SG-94-S-71 DATE: 6/23/71 TIME: 1130

Correlate w/seismic fix 272

Water depth: 74'

Type of sample: 6' piston core

Description: 0-25 washed grey-green silty sand w/coquina and high opaque content approx. 46 cm

25-40 coquina in black silty sand

40-45 grey green stiff silt w/misc. frags. - shell, org, mica

SAMPLE SG-95-S-71 DATE: 6/23/71 TIME: 1620

Water depth: 26'

Type of sample: 6' piston core

Description: fine black sand and shells hash

- appeared to be washed

collected as 2 bulk samples

SAMPLE SG-96-S-71 DATE: 6/21/71 TIME: 1625

Water depth: 26'

Type of sample: 6' piston core =90 cm

Description: 0-25 grey mud w/shell

35-90 grey green silt and sandy silts

Appendix B

This appendix contains the descriptive logs of each of the piston cores immediately after extrusion onto the deck. All measurements are in meters and centimeters.

Core 11-W-71	187 cm
0-3 cm	Light brown soupy silt (sample 0-10).
3-187	Dark gray mud with layers of sand and grey green mud. (samples at 30-40, 60-70, 90-100, 120-130, 150-160)

Core 26-W-71	Peaty layer 1.1 m long - (extended length) no allowance made for compaction.
0-10 cm	Sample, gray brown muddy sand.
10-19 cm	Dark grey mud - few shell (10%) frags.
19-31	Dark grey mud - rich shell frag. layer (60%).
31-50	Light grey mud - a few shell frags. 10%, some plant frags - mud is stiff.
50-60	Peaty layer --- sample.
60-63	Bottom of peat layer.
63-66	Stiff fetid dark grey mud, no shale.
66-90	Good peat.
90-100	Dark grey fetid mud no shell fairly stiff.
100-110 cm	Sample, gray silt.

Core 29-W-71	1.5 m recovered. Barrel bent, sucked catcher out of bottom.
0-10 cm	(sampled) coquina in dark grey mud.
10-13	Same composition.
13-20	Grey silt mud - stiff - very few shell frags.
20-30	(sampled)
30-34	Grey silt mud - stiff few shell frags.
34-47	Grey mud w/some peat frags.
47-90	Peat (sampled).
90-100	Fairly stiff grey mud few shell frags.
100-110	Same as above - but very loose.
110-120	(sampled) Gray, sandy mud.
120-140	Fairly stiff grey mud few shell frags.
140-150	Loose grey mud - more shell frags and larger.

Core 31-W-71	1.1 m recovered.
0-10	sample
50-60	sample
100-110	sample

Very uniform appearance - lithology - dark grey silt or a little fine sand. Shell layer at 31-35 cm.

Core 41	165 cm
0-6	Dark grey mud.
6-14	Light grey mud.
14-23	Dark grey mud.
23-28	Sandy layer of dark grey mud.
28-55	Light grey mud with a little peat.
55-145	Stiff grey mud w/peat layers; percent peat increased with depth.
145-165	Stiff grey mud.

Core 45-W-71	150 cm
0-4	Crse. brown sand w/coal.
4-150	Med. grey mud with then (2-3 cm) of sand @ approx. 2 cm. intervals ---- thicker (2 cm) sand layers (2 cm at 113-115 and 118-121 cm).
	(samples at 0-10, 30-40, 60-70, 90-100, 120-130).

Core 46-W-71	165 cm
0-4	Brownish green silt.
4-14	Black mud.
14-31	Grey green loose clay.
31-63	Black mud.
63-66	Greenish fine sand.
66-70	Black fine mud.
70-78	Grey green silt-mud.
78-100	Black mud with greenish dark grey zones (86-91) and organic fragments, (85-85).
100-159	Stiff grey greenish clay with thin peat lines and sandy layer throughout.
159-165	Dark grey-green soft mud.
	(samples at 0-10, 30-40, 60-70, 90-100, 120-130, 150-160)

Core 47-W-71	52 cm
0-2	Loose sand.
2-9	Grey cohesive muddy sand.
9-43	Light grey silt w/interlayered sandy zones - mica prominent.
43-45	Medium grey sandy mud.
45-47	" " muddy sand.
47-52	" " sandy mud.
	(samples at 2-10, 30-40).

Core 49-W-71	154 cm
0-22	Dark black mud.
22-154	Grey-green mud with interlayered sands.
	(samples at 0-10, 30-40, 6070, 90-100, 120-130, 130-140).

Core 51-W-71	160 cm
0-7	Grey green silty sand.
7-22	" " silt.
22-29	" " silty sand.
29-32	" " silt.
32-57	" " silty sand.
57-60	" " silt.
60-69	" " sand.
69-79	" " alternating silty sand and sandy silt.
79-82	" " sand.
82-89	" " sandy silt.
89-96	" " sand.
96-113	" " silt.
113-117	" " silty sand.

117-133	Grey green silt w/layers of sandy silt.
133-141	" " sand.
141-150	" " silt w/layers of sandy silt.
150-160	" " sand.

(samples at 0-10, 30-40, 70-80, 100-110, 130-140, 150-160).

Core 52-W-71 125 cm

0-12	Dark grey mud (sample 0-10).
12-14	Loose clay.
14-72	Grey green silt w/interlayered silty sand (sample 30-40).
72-88	Brownish grey mud w/plant fragments (sample 72-88). high organic content.
88-125	Mushy grey green clay (sample 90-100).

Core 55-W-71 Unknown length

top 30 cm	Peat ---- sampled.
30-90 cm	Overcompacted grey clay with organic fragments ---- sampled.

Core 56-W-71 120 cm

0-23	Grey green mud (1 sample).
23-70	Peat (4 samples).
70-94	Light grey silty sand. (sample 90-100)
94-115	Light grey silt w/fine sand.
115-120	Light med. grey mud w/coarse sand.

Core 57-W-71 174 cm

0-14	Dark black mud.
14-16	Black layer of fine sand.
16-52	Black mud w/grey layers (sandy shell layer 25-27 cm).
52-55	Black fine sand.
55-78	Uniform black mud.
78-82	Color transition black to light grey green medium sand with small pebbles.
82-122	Fine grey green silty sand with broken shell fragments throughout.
122-181	Grey-green mud w/organic peat throughout; peat concentrations increase with depth.
	(samples at 0-10, 30-40, 60-70, 90-100).

Core 58-W-71 128 cm

0-20	Dark grey loose fine sand with shells from 18-20.
20-30	Grey green mud.
30-43	Firm dark grey sand w/shell fragments.
43-45	Loose dark grey sand.
45-128	Alternating layers 2-8 cm thick of loose silty sand and firmer silty muds.
	(samples at 0-10, 30-40, 60-70, 90-100).

Core 59-W-71

0-3	Light brown soupy silt.
3-133	Black mud w/a few interlayerod grey green muds (thickest from 81-92) and thin layers of sandy silt.
	(samples at 0-10, 30-40, 60-70, 90-100, 120-130).

Core 60-W-71	80 cm
0-2	Loose brown silt.
2-26	Med-grey mud w/shell fragments, (sample 2-10).
26-39	Same as above w/fewer shell frags, (sample 30-40).
39-41	" " " w/more shell frags.
41-53	" " " w/few shells, (sample 50-60).
53-54	Grey mud w/peaty layer.
54-66	Grey mud without shells, (sample 60-66).
66-80	Light grey mud grading to a light brown or tan @ bottom w/same root, (sample 66-80).

Core 61-W-71	160 cm
0-2	Silty sand-light grey brown.
2-41	Medium grey mud w/a few shell frags. (sample 2-10, 30-40)
41-66	Peat.
66-91	Light blue grey mud with many peat fragments (sample 80-90).
91-115	Peat.
115-121	Brown clay (sample 115-121).
121-158	Stiff grey brown clay on top grading to gray clay (sample 140-150).
158-160	Peat.

Core 62-W-71	76 cm
0-5	Fine dark grey green sand (sampbe 0-10).
5-10	Dark black soft mud.
10-15	Fine dark grey green sand.
15-46	Medium grey - green sandy silt. (sample 30-40).
46-52	Grey green sand with large shell fragments and 1 cm dia. pebbles.

52-60	Grey-green cohesive sandy silt.
60-76	Very stiff tight medium grey green mud, (sample 60-70).

Core 63-W-71 158 cm

0-7	Grey silty sand w/shell fragments, (sample 0-7).
7-23	Grey green mud.
23-46	Grey green mud w/interlayered grey green silty sand , (sample 30-40)
46-52	Grey green mud.
52-70	Grey green silty sand w/shell fragments, (sample 60-70).
70-158	Grey-green mud w/interlayered organic fragments.
	(samples at 0-10, 30-40, 90-100, 120-130, 150-158).

Core 64-W-71 160 cm

0-2	Light brown silt-soft.
2-160	Dark black mud w/thin interlayered sands and occasional grey-green layers.
	(samples at 0-10, 30-40, 60-70, 90-100, 120-130, 145-160).

Core 65-W-71 160 cm

0-3	Grey-green soupy silt.
3-115	Black mud w/interlayered sandy silts and gray-green muds (eg. 58-62).
115-160	Grey green mud w/a fine cohesive sand layers & shell fragments in bottom 20 cm.
	(samples at 0-10, 30-40, 60-70, 90-100, 120-130)

Core 66-W-71

Both cores collected as bulk samples.

Core 67-S-71 144 cm

0-21	Block sandy silt w/shell fraqs.
21-31	Peaty silt - grey brown.
31-36	Light grey-tan clay, fairly stiff with peat.
36-41	Stiff dark grey clay.
41-47	" " " " with peat.
47-81	" " " " with few organic fragments.
81-83	" " " " with shell fraqs.
83-119	" " " " no shells.
119-139	Peat.
139-144	Dark black-grey stiff clay.

Core 68-S-71 148 cm

0-2	Soupy light brown silt.
2-16	Soft-med. grey mud w/sandy layer 11-13.
16-34	Grey green sandy silt.
34-148	Grey green clay; stiff w/occasional thin peaty layers.

Core SG-69-S-71 157 cm

0-11	Grey green sandy silt (fairly stiff) w/coquina.
11-21	Grey green silt (stiff).
21-34	Grey green silt w/coquina
34-47	Grey green silt.
47-53	Grey green silt w/coquina.
53-73	Grey green silt.

73-113	Peat
113-144	Grey green silt w/high peat content grading to barren grey green silt.
144-157	Fetid peat.

Core 70-S-71

0-2	Light brown soupy silt.
2-17	Dark grey mud.
17-36	Mottled black & green mud.
36-68	Black mud w/thin sand layers.
68-81	Grey green silt w/fine sand layer 71-75.
81-100	Dark brown peat.
100-118	Grey green clay w/high peat content.
118-125	Purple-brown silt without peat.
125-137	Stiff blue-grey clay w/sand.

Core 71-S-71 84 cm

0-5	Soupy grey green sand.
0-10	Fairly stiff black mud.
10-14	Soupy grey green sand w/small shell frags.
14-39	Dark grey silt-fairly stiff.
39-84	Cohesive grey green silt sand w/up to 50% coquina in the bottom 14 cm.

Core 72-S-71 72 cm

0-21	Firm dark grey mud.
21-23	Dark grey fine sandy silt - appears carbonaceous.
23-36	Firm dark grey mud w/shell frags increasing in number & size from 30 cm.
36-61	Grey green silty sand.
61-65	Med. tan very stiff clay.

65-67	Light grey clay w/med. sand - stiff.
67-72	Light grey tan clay; very stiff.

Core 73-S-71 90cm

0-10	Dark grey silt.
10-20	Dark grey silt w/soupy silt layers.
20-37	Dark grey silt.
37-51	Dark grey silt grading down into dark grey-green silt with increasing shell content.
51-87	Grey green stiff clay with a few organic layers.
87-90	Peat.

Core 74-S-71 65 cm

0-25	Grey green silt (fairly cohesive), with 50% coquina.
25-74	Moderate stiff grey green silty clay.

Core 75-S-71 60 cm

Uniform dark green sand w/shell frags;
Appears to be suck-up collected as bulk sample.

Core 83-S-71 68 cm

0-10	Grey green soupy sand. (wash?)
10-58	Grey green sandy silt; compaction increases noticeably with increasing depth scattered shell layers.
58-68	Fine clean grey green sand.

Core 84-S-71	94 cm
0-3	Soupy fine sand.
3-16	Fetid black silty mud with high coquina content.
16-22	Grey green silt (very fetid) with coquina.
22-94	Tight very fetid grey green silt w/a few shell frags throughout, compaction increases with depth.

Core 85-S-71	92 cm
0-3	Soupy fine sand (wash?)
3-10	Light grey green silt w/shells.
10-39	Grey green silt w/dark grey zone (15-17).
39-67	Grey green silt w/high coquina content.
67-85	Grey green silt.
85-92	Tight grey green clay.

Core 86-S-71	80 cm (core appears to be disturbed)
0-15	Coarse grey green sand with a few shell frags - coarse shells @ lower boundery.
15-55	Silty grey green sand.
55-80	Soupy grey-green sandy silt w/shell frags.

Core 87-S-71	100 cm
0-2	Soupy light brown silt.
2-57	Dark grey silt - uniform and monotonous.
57-77	Grey green silt.
77-100	Silty sand w/large shell fragments.

Core 88-S-71	30 cm
0-30	Shelly gravel and well-rounded quartz grains.

Core 89-S-71 145 cm

0-13	Dark grey & med. grey green sandy silt; soupy at top, grading to firm at bottom; clam shell 1/2" across @ 12 cm.
13-145	Stiff grey green silt with mica.

Core SG-91-S-71 113cm

0-7	Grey & green mottled silt.
7-113	Grey-green silt w/mica.

Core SG-93-S-71 87 cm

0-87	Black silty sand with minor amt. of shell frags.

Core SG-94-S-71 46 cm.

0-25	Washed grey-green silty sand with coquina & high conc. of opaques.
25-40	Coquina in black silty sand.
40-45	Stiff grey green silt w/misc. frags. of shell, organics & mica.

Core SG-96-S-71 90 cm

0-3	Soupy greenish black silt.
3-7	Black silt layer.
7-15	Alternating layers of black & grey green silt.
15-32	Dark grey silty sand w/small shell fragments.
32-34	Soupy grey green sandy layer.
34-54	Stiff grey green sandy silt. Could be Pleistocene, appears to correlate w/ seismic @ fixes 291 & 292.

Appendix C

This appendix contains data on the deeper sub-bottom character of the sediments of central Delaware Bay. The ten descriptive logs were obtained by pumping water down through a pipe and examining the washings returned to the surface. All measurements are in meters below the bay bottom.

BH1 - on 4' shoal NNE of Goose Point; depth = 1m.

6/7/71

0-4m.	Grey silt, stiff sandy silt & shell.
4.5	Tough brown peat.
5.25	Hard coarse milky sand.

BH2 - 1/2 mi. S. of Leipsic River 200 ft offshore; depth = 1.5 m.

6/7/71

0-9m	Black mud changing to grey.
9m - 12m	Grey green greasy mud w/a few organic fragments.

BH3 - 30 feet offshore of marsh, 100 yds. N. of Pt. Mahn cut.

6/7/71

0-6m	Grey green clay w/organics.
6m	Peat & organics.
6.5	Tough light grey green clay.
7.0	Very tough fine light grey sand.
8.0	Tough light grey greasy clay w/organics.
8.5	Light blue grey sandy silt.
9.0	Light grey medium sand.
9.25	Very hard black carbonaceous silt.

BH4 - on shoal N. 60 E. of Kitts Hummock; depth = 2.25m

6/8/71

0-6.5	Dark grey fine sand.
6.5	Thin pure shell layer.
6.75	Greenish silt & fine sand & 90% coquina, clam shell very hard (sample).
7.25	Same as above but much more silt; light grey, much softer very little sand & much less shell than above.

9.0	Brown wash - organics & shell & grey silt - feels like a peaty mud; - doesn't bounce.
9.5	Light grey wash, very hard clay.
10.5	Clean fine sand to 11 m. milky plume (sample).

BH5 - 200 yds from BH4 toward shore; depth 3.75 m.

6/8/71

	Fine grey sand w/silt.
7.0	Grey silt w/shell frags.
8.0	Shelly & grey mud & organic frags.
8.5	Brown organic wash.
9.0	Out of mat - light tan silt & shell.
9.5	Hard light grey - brown silt, - small amt. very fine black sand.
9.75	Increasing organic content, running level uncertain - also increase concentration of very fine dark sand & silt - tough.
10.25	Milky med. sand.

BH6 - Joe Flowger Shoal; depth = 2.75 m.

6/8/71

	Fine grey green silty sand - much mica.
7-8.0	Greasy gray green silt.
9.0	Gray silty sand w/some organics.
11.0	Mostly green silt, trace of sand.
14.0	Picking up small shell.
17.0	Organic frags in greasy gray green clay.
18.0	Bottom.

BH7 - On cross ledge; depth = 2.75 m.

6/8/71

Clean green sand w/high opaque content.

0-10.0 Clean coarse sand.

10.25 Lost circulation.

BH8 - On "HRD" East of Thrum cap; depth = 3m.

6/10/71

Fine grey green sand (sample)

0-6.5 Hard grey-green fine sand w/minor silt & "grains" of bright green clay.

6.5 Very hard non-scraping bottom - presumed to be green clay.

Hole abandoned.

BH9 - 100 yds. N. & 100 yds. offshore of Bombay Hook tower. depth = 3 m.

6/10/71

0-9 m Coarse to fine brown sand.

Lost circulation at 9m. still in sand (!)

BH 10 - 100 yds. S. & 100 yds. offshore of Bombay Hook tower. depth = 2.75 m.

6/10/71

0-7.75 Brown silt & coarse brown sand.

7.75 Fine sand w/light tan silt and green clay.

8.0 Can't penetrate any further; "feels" like bottom layer in BH8.