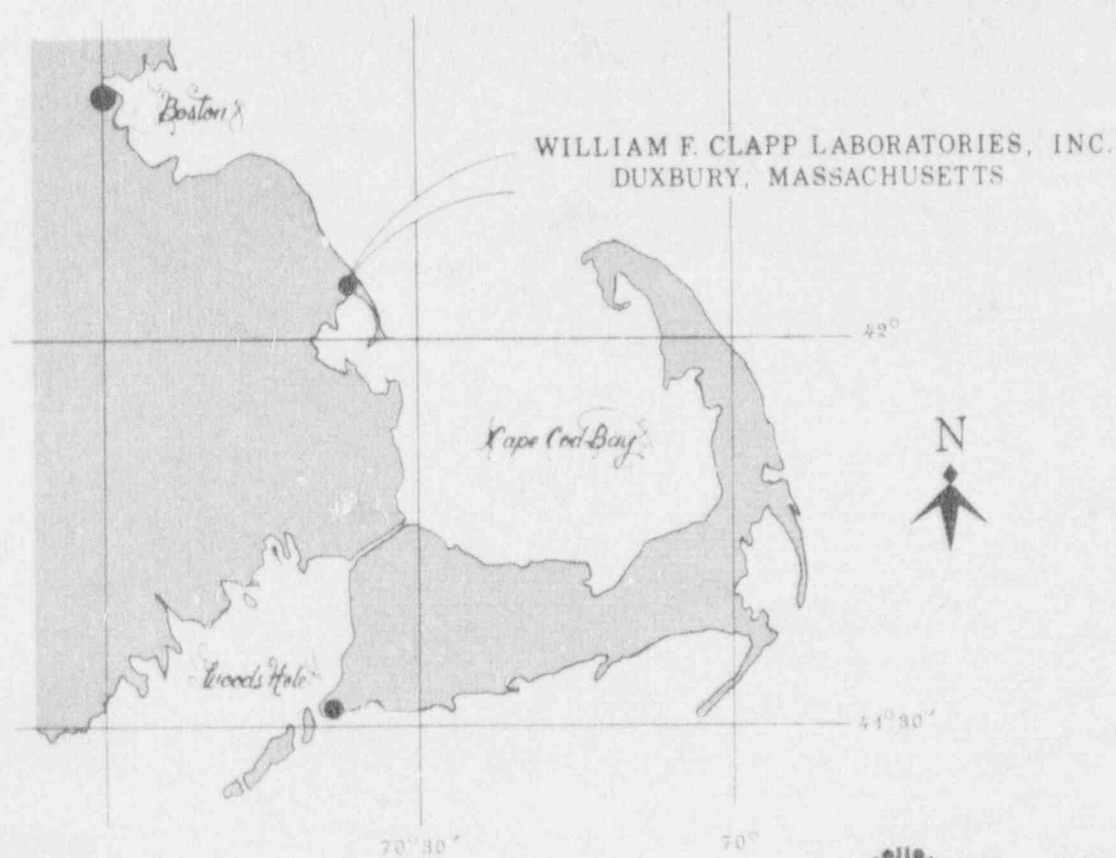
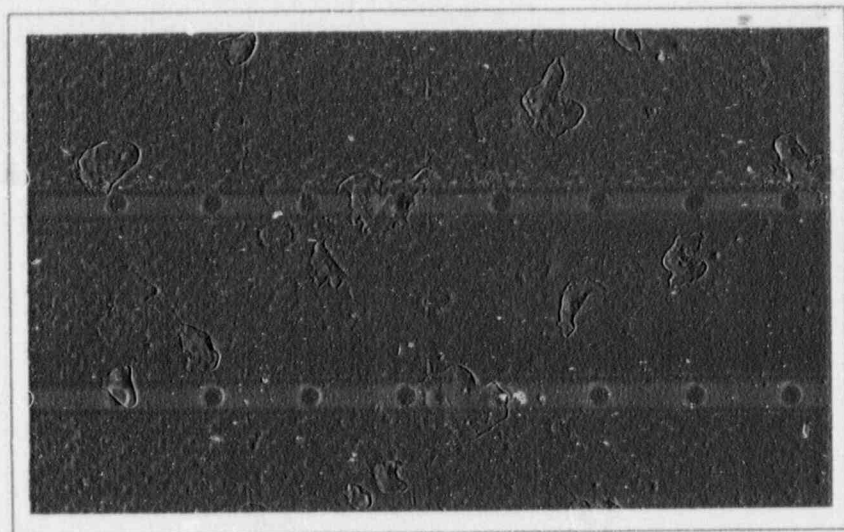


RESEARCH REPORT



 **Battelle**
Columbus Laboratories

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PROGRESS REPORT FOR THE THIRTEENTH QUARTER

on

WOODBORER STUDY ASSOCIATED WITH THE
OYSTER CREEK GENERATING STATION

to

JERSEY CENTRAL POWER & LIGHT COMPANY

September 15, 1978

by

B.R. Richards, C.I. Belmore, and R.E. Hillman

Report No. 14859

May 4, 1978 to August 10, 1978

BATTELLE
Columbus Laboratories
William F. Clapp Laboratories
Duxbury, Massachusetts 02332

23269

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WOODBORER STUDY ASSOCIATED WITH THE
OYSTER CREEK GENERATING STATION

by

B.R. Richards, C.I. Belmore, and R.E. Hillman

INTRODUCTION

The William F. Clapp Laboratories of Battelle's Columbus Laboratories is conducting an investigation to determine whether the generating station is affecting the resident marine borer population in Oyster Creek to the extent that that population is contributing significantly to marine borer-caused damage in Barnegat Bay.

A description of the program and procedures used may be found in the First Quarterly Report on Woodborer Study Associated with the Oyster Creek Generating Station, Report No. 14647, dated October 31, 1975, with the exception that the marine borer larvae program was discontinued in November, 1977.

This report presents the summary data for the thirteenth quarterly period from May 4, 1978, through August 10, 1978.

PROCEDURES AND INTERIM DATA

Exposure Panels

The long-term and short-term exposure panels were retrieved and replaced with new untreated pre-soaked (for two weeks) panels at the 20 exposure sites in Barnegat Bay and adjacent waters (Figure 1) during the weeks of June 1-2, July 10-13, and August 7-10, 1978. The rack at Site 13, Cedar Creek was missing in July. It was located in August and two long-term panels were removed and replaced in order to maintain the proper panel sequence.

Table 1 describes the geographical locations of the exposure sites. The summary data for the laboratory examination of the panels may be found in Tables 2 through 5.

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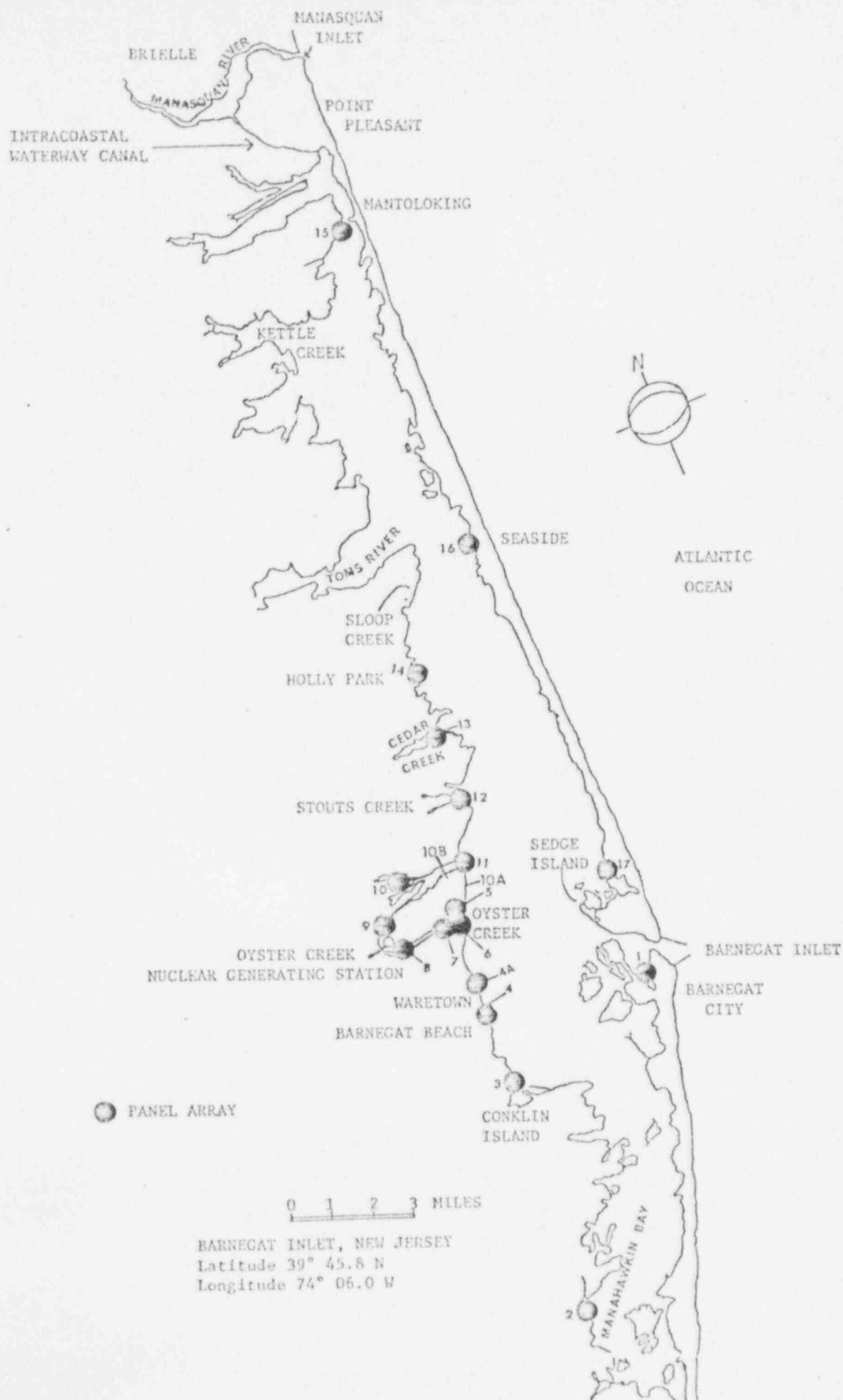


FIGURE 1. OUTLINE OF BARNEGAT BAY SHOWING GEOGRAPHICAL LOCATIONS OF EXPOSURE PANELS

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TABLE 1. GEOGRAPHICAL LOCATIONS OF WILLIAM F. CLAPP LABORATORIES' EXPOSURE
PANEL ARRAYS SUBMERGED JUNE, 1975, BARNEGAT BAY, NEW JERSEY

Site No.	Site	Structure to be used for Suspension of Rack	Nearest Previous Data Stations	Approximate Latitude and Longitude
1.	Barnegat Coast Guard Station, Barnegat Inlet	Finger Pier	WC 1 WFCL 1948-1967	Lat. 39° 45.8'N Long. 74° 06.5'W
2.	Ashton Marina 1450 Bay Ave. Manahawkin	Bulkhead	WC 13,14	Lat. 39° 40'N Long. 74° 13'W
3.	Iggie's Marina Fast Bay Ave. Barnegat (Conklin Island)	Bulkhead	WC 16,17,18,19	Lat. 39° 45'N Long. 74° 12.5'W
4.	Liberty Harbor Marina Washington Ave. Waretown	Bulkhead	WC 21 R. Turner Rutgers U.	Lat. 39° 47'N Long. 74° 11'W
4-A*.	Holiday Harbor Marina Lighthouse Drive Waretown	Bulkhead	WC 21 R. Turner Rutgers U.	Lat. 39° 48'N Long. 74° 11'N
5.	Mouth of Oyster Creek, Lot 4, Compass Road Offshore End	Dock	WC 29,30 Rutgers U.	Lat. 39° 48.5'N Long. 74° 10.3'W
6.	Oyster Creek #1 Lagoon, Inshore End 37 Capstan Drive	Dock		Lat. 39° 48.5'N Long. 74° 10.35'W
7.	Private Dock Dock Ave. Oyster Creek Sands Pt. Harbor Waretown	End of Dock	WC 27,28 R. Turner Rutgers U.	Lat. 39° 48.5'N Long. 74° 11.1'W

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TABLE 1. (continued)

Site No.	Site	Structure to be used for Suspension of Rack	Nearest Previous Data Stations	Approximate Latitude and Longitude
3.	Oyster Creek-R.R. Bridge Discharge Canal	Cross Member Bridge	WC 26 Rutgers U.	Lat. 39° 48.7'N Long. 74° 12'W
9.	Forked River South Branch Intake Canal	Cross Member R.R. Bridge	WC 31 Rutgers U.	Lat 39° 49.2'N Long. 74° 12.2'W
10.	Teds Marina Bay Ave. Forked River	Pier	WC 33,34	Lat. 39° 50.1'N Long. 74° 11.6'W
10A*.	Private Dock 1-16 Aquarius Ct. Forked River	Under Dock		Lat. 39° 49'N Long. 74° 10'W
10B*.	Private Dock 1307 Beach Blvd. Forked River	Under Dock		Lat. 39° 49.4'N Long. 74° 10.1'W
11.	Forked River (near mouth) 1413 River View Drive	Bulkhead	WC 35 Rutgers U.	Lat. 39° 49.7'N Long. 74° 10'W
12.	Stouts Creek 1273 Capstan Drive	Bulkhead	WC 38,40,41 R. Turner Wurtz Rutgers U.	Lat 39° 50.5'N Long. 74° 08.8'W
13.	Rocknak's Yacht Basin Seaview Ave. Lanoka Harbor Cedar Creek	End of Pier	WC 46	Lat. 39° 52'N Long. 74° 09'W

TABLE 1. (continued)

Site No.	Site	Structure to be used for Suspension of Rack	Nearest Previous Data Stations	Approximate Latitude and Longitude
14.	Dicks Landing Island Drive Bayville (Holly Park)	Pier	WC 49 R. Turner Nelson	Lat. 39° 54'W Long. 74° 08.1'W
15.	Winter Yacht Basin Inc. Rt. 528 Mantoloking Bridge W. Mantoloking	Pier	WC 57	Lat. 40° 02.5'N Long. 74° 03.5'W
16.	Berkely Yacht Basin J. Street Seaside	Pier	WC 60,61	Lat. 39° 55.9'N Long. 74° 04.9'W
17.	Island Beach State Park (Sedge Island)	Pier	WC 68	Lat. 39° 47.1'N Long. 74° 05.9'W

All exposure panel racks suspended in a minimum water depth at mean low water of at least three feet. Racks hung with nylon line from existing structures so the bottom panels are close to, but not touching the bottom. Racks at Forked River railroad bridge and Oyster Creek railroad bridge suspended with wire rope.

WC = Woodward-Clyde

WFCL = William F. Clapp Laboratories

*Site 4-A installed April, 1977

Sites 10 A, 10 B installed April, 1978.

TABLE 2. SUMMARY DATA FOR INCIDENCE OF TEREDINIDAE IN PANELS REMOVED
MAY 31 THROUGH JUNE 1, 1978

Site	Panel	No. of Specimens \pm	Percent Filled	Size Range in mm.	Species Identification	Remarks
1-17	No teredinidae present					

TABLE 3. SUMMARY DATA FOR INCIDENCE OF TEREDINIDAE IN PANELS REMOVED
JULY 10-12, 1978

Site	Panel	No. of Specimens \pm	Percent Filled	Size Range in mm.	Species Identification	Remarks
6	P	0				
	C	1	<1	<1		
7	P	93	10	<1-36	71 <i>T. bartschi</i>	Dead. Several with larvae.
	C	58	3	<1-35	5 <i>T. bartschi</i>	Dead. One with larvae.
10B	P	1	<1	2	<i>B. gouldi</i>	
	C	0				
11	P	1	<1	13	<i>T. navalis</i>	
	C	0				

Sites 1-5, 8-10A, 12, 14-17 - no teredinidae present

Site 13 - rack missing

P = Long-term panels, submerged January, 1978

Long-term panels - 10A and 10B submerged April, 1978

C = Short-term panels, submerged June, 1978

TABLE 4. SUMMARY DATA FOR INCIDENCE OF TEREDINIDAE IN PANELS REMOVED
AUGUST 8-9, 1978

Site	Panel	No. of Specimens \pm	Percent Filled	Size Range in mm.	Species Identification	Remarks
1	P	9	<1	<1-17	1 <i>T. navalis</i>	
	C	4	<1	<1-1		
5	P	12	2	<1-52	2 <i>T. bartschi</i>	1 dead. 10 embryonic.
	C	4	<1	<1-1		
6	P	1	<1	9	<i>Teredo</i> spp.	
	C	1	<1	<1		
7	P	730	20	<1-77	120 <i>T. bartschi</i> , 1 <i>B. gouldi</i>	Umbonate larvae.
	C	1800	1	<1-11	2 <i>T. bartschi</i> , <i>Teredo</i> spp.	All but 2 embryonic.
10A	P	0				
	C	1	<1	13	<i>B. gouldi</i>	Submerged April, 1978.
10B	P	1	2	70	<i>B. gouldi</i>	Submerged April, 1978.
	C	0				
11	P	4	1	<1-48	2 <i>B. gouldi</i> , 2 <i>Teredinidae</i>	
	C	5	<1	<1-11	4 <i>B. gouldi</i>	
12	P	0				
	C	1	<1	1		
13	P	1	<1	28	<i>B. gouldi</i>	
13	P	4	1	<1-35	2 <i>B. gouldi</i>	Panel submerged 7 mos.
	C	0				
14	P	1	<1	2		
	C	1	<1	1		

Sites 2-4, 8-10, 15-17 - No *Teredinidae* present.

Long-term panels submerged February, 1978 - unless otherwise noted.

Site 13 - Rack located. Panels removed for July and August.

TABLE 5. SUMMARY DATA FOR INCIDENCE OF *Limnoria* IN
PANELS REMOVED JUNE, JULY, AND AUGUST, 1978

Site	Panel	June		July		August	
		No. of Tunnels	No. of Specimens	No. of Tunnels	No. of Specimens*	No. of Tunnels	No. of Specimens**
1	P	2	2	22	40	83	5
	C	0	0	6	10		
2	P	3	3	51	88	550 \pm	800 \pm
	C	0	0	8	14	8	14
4	P	19	24	670 \pm	735 \pm	560 \pm	800 \pm
	C	8	10	74	110	0	0
4A	P	17	25	415 \pm	760 \pm	430 \pm	650 \pm
	C	7	11	67	102	16	11

Sites 3, 5-17 - No *Limnoria* present.

* - gravid females.

** - gravid females and juveniles.

Water Quality

Salinity, water temperature, dissolved oxygen, and pH were determined with a Hydrolab (Model II B). The results for June, July, and August may be found in Tables 6 through 8.

In July the water at the sites in Stouts Creek and Forked River near Teds Marina had a dark discoloration, probably due to the presence of humic material. The humic material is believed to be carried from the swamps down the creeks after heavy rains.

Teredinid Gonadal Development Studies

Table 9 shows the gonad condition of the teredinid borers collected from May through August, 1978. Included are results from special long-term panels exposed for a 12-month period.

TABLE 6. WATER QUALITY AT EXPOSURE PANELS STATIONS, JUNE, 1978

Station	Date	Time	Depth in Feet	Salinity - o/oo	Temp. - °C	O ₂	pH
1	5/31/78	1000	8	21.5	15.6	9.4	8.5
2	5/31/78	1040	3	17.7	21.9	9.2	8.2
3	5/31/78	1117	2	17.9	19.6	7.8	8.1
4	5/31/78	1145	5	18.5	20.0	8.1	8.0
4A	5/31/78	1200	3	17.9	21.1	8.6	8.2
5	5/31/78	1215	2	15.2	24.7	8.9	7.6
6	5/31/78	1230	2	15.8	25.2	8.9	7.6
7	5/31/78	1245	2	16.5	25.5	8.0	7.7
8	5/31/78	1350	2	16.9	26.5	7.5	7.8
9	5/31/78	1400	4	17.9	21.0	8.0	8.1
10	5/31/78	1520	5	14.5	17.5	8.3	7.2
10A	5/31/78	1435	3	16.5	25.0	8.0	8.0
10B	5/31/78	1450	4	16.5	23.0	10.5	8.5
11	5/31/78	1500	3	17.2	20.2	7.7	8.1
12	5/31/78	1540	4	15.2	21.0	9.3	8.2
13	5/31/78	1617	3	11.2	22.5	8.3	7.5
14	5/31/78	1645	3	14.5	22.5	9.0	8.3
15	5/31/78	1730	3	9.2	24.5	9.1	8.3
16	6/1/78	0815	3	15.2	21.5	9.0	8.3
17	5/31/78	0715	2	16.5	22.3	8.4	8.1

TABLE 7. WATER QUALITY AT EXPOSURE PANEL STATIONS JULY, 1978

Station	Date	Time	Depth in Feet	Salinity - o/oo	Temp. - °C	O ₂	pH
1	7/11/78	1115	5.0	24.9	21.5	7.6	9.3
2	7/11/78	1000	1.0	18.5	24.5	6.7	9.0
3	7/11/78	1210	1.0	20.6	24.5	6.7	9.3
4	7/11/78	1230	2.0	21.3	25.0	5.2	8.8
4A	7/11/78	1300	2.0	21.3	25.5	5.6	9.0
5	7/11/78	1330	1.5	17.6	28.5	7.6	9.2
6	7/11/78	1335	1.0	17.9	29.5	8.3	9.4
7	7/11/78	1345	1.5	16.5	28.5	5.6	9.1
8	7/11/78	1355	0.5	15.5	28.0	7.6	9.3
9	7/11/78	1415	0.5	18.5	26.0	8.4	9.5
10	7/11/78	1745	2.0	14.5	24.5	4.5	8.1
10A	7/11/78	1625	0.5	18.2	25.5	8.4	9.4
10B	7/11/78	1615	0.5	18.9	24.0	9.3	9.6
11	7.11/78	1545	1.0	18.9	23.0	7.1	9.4
12	7/11/78	1800	2.5	16.2	26.5	6.5	9.6
13	7/11/78	1900	0.5	10.4	25.5	8.2	9.1
14	7/11/78	1915	0.5	13.5	25.5	7.9	9.5
15	7/12/78	0930	3.0	15.2	24.0	7.8	9.1
16	7/11/78	1945	2.0	11.1	26.0	7.4	9.2
17	7/10/78	0825	1.5	22.0	26.5	7.7	9.4

TABLE 8. WATER QUALITY AT EXPOSURE PANEL STATIONS AUGUST, 1978

Station	Date	Time	Depth in Feet	Salinity - o/oo	Temp. - °C	O ₂	pH
1	8/8/78	0925	6.0	23.4	24.5	6.4	8.3
2	8/8/78	0855	2.0	17.9	26.0	6.2	8.0
3	8/8/78	1020	3.0	18.5	26.5	6.4	7.9
4	8/8/78	1040	3.5	20.6	26.0	5.0	7.7
4A	8/8/78	1100	3.5	20.6	26.5	7.6	8.1
5	8/8/78	1125	4.0	18.5	30.0	6.8	8.0
6	8/8/78	1137	4.0	17.9	30.0	8.0	8.0
7	8/8/78	1150	3.0	18.5	30.5	6.4	7.8
8	8/8/78	1235	6.0	19.2	30.5	7.4	8.0
9	8/8/78	1306	6.0	19.2	27.5	7.4	8.2
10	8/8/78	1525	3.0	16.5	25.0	4.1	7.5
10A	8/8/78	1415	3.5	19.9	28.5	7.2	8.3
10B	8/8/78	1405	3.5	13.8	28.0	7.8	8.2
11	8/8/78	1333	4.0	20.6	28.0	7.4	8.2
12	8/8/78	1545	3.5	18.5	26.5	7.2	8.4
13	8/8/78	1625	3.0	15.8	25.5	6.1	8.0
14	8/8/78	1700	3.0	13.1	26.0	7.2	8.6
15	8/9/78	0815	3.5	13.1	26.0	6.4	8.4
16	8/8/78	1745	4.5	10.4	27.0	4.5	7.4
17	8/8/78	1820	1.5	23.4	28.0	15.0	9.0

TABLE 9. CONDITION OF GONADS OF TEREDINID BORERS REMOVED FROM EXPOSURE PANELS IN BARNEGAT BAY FROM JUNE THROUGH AUGUST, 1978

EA = Early Active; LA = Late Active; R = Ripe; PS = Partially Spawned;
M = Male; F = Female; H = Hermaphrodite

Specimen No.	Station	Month Removed	No. Months Exposed	Species	Sex	Gonad Condition	Comments
368a	11	May/June	12	<i>Bankia gouldi</i>	M	LA	Leucocytic infiltration in mantle; possible encysted ciliate in mantle
b					M	LA	
369a	12	May/June	12	<i>Bankia gouldi</i>	M	LA	
b					M	EA	Cysts
370	11	May/June	12	<i>Teredo navalis</i>	F	EA	
371	10	May/June	12	<i>Bankia gouldi</i>	M	PS	
372a	7	May/June	12	<i>Bankia gouldi</i>	M	R	
b					F	PS	
c					F	PS	
d					F	PS	
e					M	R	
373	13	May/June	12	<i>Bankia gouldi</i>	M	EA	
374a	1	May/June	12	<i>Teredo navalis</i>	F	R	
b					F	LA	
c					F	R	
d					F	R	
e					F	PS	<i>Minchinia</i> plasmodia
f					H	PS	<i>Minchinia</i> plasmodia
g					F	R	
h					F	R	
i					F	PS	
375	9	May/June	12	<i>Bankia gouldi</i>	M	R	
376a	17	May/June	13	<i>Teredo navalis</i>	M	PS	<i>Minchinia</i> plasmodia; specimen dead
b					F	PS	<i>Minchinia</i> spores; specimen dead
377a	7	July	2	<i>Teredo bartschi</i>	H	R	Specimen dead
b					H	R	Specimen dead

TABLE 9. (continued)

Specimen No.	Station	Month Removed	No. Months Exposed	Species	Sex	Gonad Condition	Comments
378a	7	July	6	<i>Teredo bartschi</i>			No discernable gonad; large unidentified metazoans in tissue; specimen dead
b							No discernable gonad; specimen dead
c					H	PS	Specimen dead
d					H	R	Specimen dead
e							No discernable gonad; specimen dead
379	2	July	12	<i>Teredo navalis</i>	F	EA	<i>Minchinia</i> spores
380	11	July	6	<i>Teredo navalis</i>	M	EA	
381a	7	August	6	<i>Teredo bartschi</i>	H	PS	
b					H	PS	
c					H	PS	
d					H	PS	
e					H	PS	
f					H	PS	
g							No discernable gonad; large unidentified metazoan in tissues
h					H	PS	
i					H	PS	
382a	13	August	7	<i>Bankia gouldi</i>	M	EA	
b					M	LA	
383	13	August	6	<i>Bankia gouldi</i>	M	EA	
384	1	August	6	<i>Teredo navalis</i>	M	EA	Necrotic areas in tissues
385a	11	August	1	<i>Bankia gouldi</i>	M	EA	
b							No discernable gonad
c					M	EA	
d					M	EA	
386	11	August	6	<i>Bankia gouldi</i>	M	EA	
387	10B	August	4	<i>Bankia gouldi</i>	M	LA	
388	10A	August	1	<i>Bankia gouldi</i>			No discernable gonad