PROGRESS REPORT

FOR THE THIRTY-THIRD QUARTER

On

STUDY OF WOODBORER POPULATIONS IN RELATION TO THE OYSTER CREEK GENERATING STATION

To

GPU NUCLEAR CORPORATION

August 31, 1983

by

R.E. Hillman and C.I. Belmore

REPORT NO. 15194

April 21, 1983 to July 20, 1983

BATTELLE
New England Marine Research Laboratory
Duxbury, Massachusetts 02332

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EXECUTIVE SUMMARY

This progress report presents data from field and laboratory work during the period April 21, 1983 to July 21, 1983.

All field work during this quarter was carried out by GPU Nuclear personnel. Temperature, salinity, dissolved oxygen and pH were measured and recorded at each of the 20 stations during the three periods of exposure panel exchange.

Teredinidae were found in long-term exposure panels removed in May, 1983 for the first time since this program was initiated in 1975. A total of 194 specimens were found at 5 of the 20 locations. All were 1 mm or less in length. No shipworms were found in short-term exposure panels, indicating that small pits in the panel were due to a late release of larvae in November, 1982. All pits were either empty or contained small shells without any living material. Water temperatures must have dropped too soon for the larvae to survive and continue to bore into the panels.

Only two shipworms were found in the exposure panels examined in July, 1982. This year 123 shipworms were recorded from four sites. Since the longest specimen was 5 mm, it appears as if settlement started taking place the last week of June.

Limnoria attack continues to increase in 1983 as compared with 1982. Almost three times as many Limnoria tunnels were recorded from the exposure panels examined in May, June, and July, 1983 as were recorded during the same period in 1982.

All specimens examined for gonad condition during this quarterly report period were from panels that had been exposed for 12 months. For the most part, they were in the ripe to spent stage, although many appeared to have been in their present condition through the winter. One early active specimen was collected in June.

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INTRODUCTION

Battelle's New England Marine Research Laboratory 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 seventh annual report titled, "Study of Woodborer Populations in Relation to the Oyster Creek Generating Station", dated May 15, 1983.

This report presents data for the thirty-third quarterly period from April 21, 1983 to July 20, 1983.

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 periods of May 2-3, June 6-7, July 5-6, 1983. Long-term and short-term panels at all stations were retrieved and replaced by personnel from GPU's Oyster Creek Nuclear Generating Station.

Table 1 describes the geographical locations of the exposure sites. The data for the laboratory examination of the panels are presented in Tables 2 through 5.

Water Quality

Salinity, water temperature, dissolved oxygen and pH were taken at each site by the GPU Nuclear field team. The results for May, June, and July, 1983 are presented in Tables 6 through 8.

Teredinid Gonadal Development Studies

Table 9 shows the gonad condition of the teredinid borers collected in April, May, and June, 1983. Included are results from panels exposed for periods ranging from 6 to 12 months.

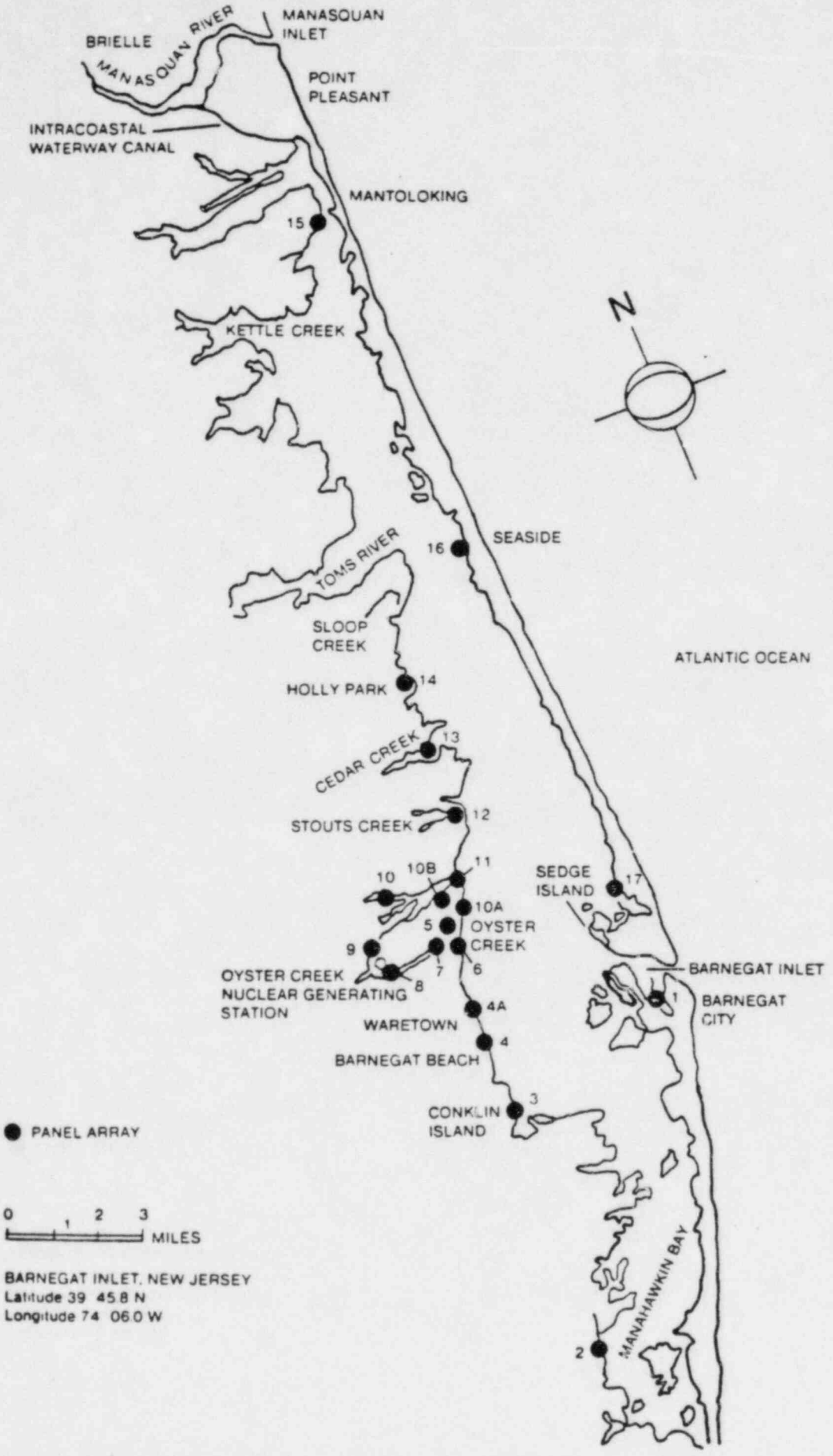

FIGURE 1. OUTLINE OF BARNEGAT BAY SHOWING GEOGRAPHIC LOCATIONS OF EXPOSURE PANELS

TABLE 1. GEOGRAPHICAL LOCATIONS OF BATTELLE NEW ENGLAND MARINE RESEARCH LABORATORY'S EXPOSURE PANEL ARRAYS IN 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 Bulkhead	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 East Bay Ave. Barnegat (Conklin Island)	Bulkhead	WC 16, 17, 18, 19	Lat. 39° 45'N Lonog. 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 R. Turner Rutgers U.	WC 21 Long. 74° 11'N	Lat. 39° 48'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

TABLE 1. (Continued)

Site No.	Site	Structure to be used for Suspension of Rack	Nearest Previous Data Stations	Approximate Latitude and Longitude
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
8.	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	Lat. 39° 49.2'N
10.	Teds Marina Bay Ave. Forked River	Pier	WC 33, 34	Lat. 39° 50.1'N Long. 74° 11.6'W
10A*.	Private Dock 1217 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

TABLE 1. (Continued)

Site No.	Site	Structure to be used for Suspension of Rack	Nearest Previous Data Stations	Approximate Latitude and Longitude
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
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	Pier	WC 57	Lat. 40° 02.5'N Long. 74° 04.9'W
16.	Berkely Yacht Basin J. Street Seaside	Pier	WC 60, 61	Lat. 39° 55.9'N Long. 74° 04.9'W
16A*.	Municipal Dock Seaside Heights	Pier	WC 60, 61	Lat. 39° 56.6'N Long. 74° 04.9'W
16B*.	Bayside Boats State Highway #35 and Bay Boulevard Seaside Heights, NJ	Pier	WC 60, 61	Lat. 39° 56.6'N Long. 74° 04.9'W

TABLE 1. (Continued)

Site No.	Site	Structure to be used for Suspension of Rack	Nearest Previous Data Stations	Approximate Latitude and Longitude
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 10A, 10B installed April, 1978.
Site 16 discontinued November, 1981.
Site 16A installed December, 1981 - discontinued June, 1982.
Site 16B installed June, 1982.

TABLE 2. INCIDENCE OF TEREDINIDAE IN PANELS REMOVED MAY 2-3, 1983

Station	Panel	No. of Specimens	Percent Filled	Size Range in mm.	Species Identification	Remarks
1	P	167	<1	<1	167 Teredinidae*	90 empty pits, 77 with Teredinid shells
	C	0				
7	P	20	<1-1	<1	20 Teredinidae*	15 empty pits, 5 with Teredinid shells
	C	0				
8	P	1	<1	<1	1 Teredinidae*	1 empty pit
	C	0				
9	P	3	<1	<1	3 Teredinidae *	3 empty pits
	C	0				
11	P	3	<1	<1	3 Teredinidae *	3 empty pits
	C	0				

Stations 2-6, 10-10B, 12-17 - No Teredinidae present.

P = Long-term panel submerged November 1-2, 1982.

C = Short-term panel submerged April 5-6, 1983.

* = Not speciated due to size.

TABLE 3. INCIDENCE OF TEREDINIDAE IN PANELS REMOVED JUNE 6-7, 1983

Station	Panel	No. of Specimens	Percent Filled	Size Range in mm.	Species Identification	Remarks
Stations 1-17 no Teredinidae present.						

TABLE 4. INCIDENCE OF TEREDINIDAE IN PANELS REMOVED JULY 5-6, 1983

Station	Panel	No. of Specimens	Percent Filled	Size Range in mm.	Species Identification	Remarks
1	P	5	<1	<1	5 Teredinidae*	
	C	26	<1	<1	26 Teredinidae*	
11	P	8	<1	<1-5	1 Teredo spp, 7 Teredinidae*	
	C	6	<1	<1-2	6 Teredinidae*	
13	P	0				
	C	13	<1	<1-1	13 Teredinidae*	
14	P	28	<1	<1-1	28 Teredinidae*	
	C	37	<1	<1-1	37 Teredinidae*	

Stations 2-10B, 12, 15-17 - No Teredinidae present.

P = Long-term panel submerged January 3-4, 1983.

C = Short-term panel submerged June 6-7, 1983.

* = Not speciated due to size.

TABLE 5. INCIDENCE OF LIMNORIA IN PANELS REMOVED MAY, JUNE, AND JULY, 1983

Station	Panel	May		June		July	
		No. of Tunnels	No. of Specimens	No. of Tunnels	No. of Specimens	No. of Tunnels	No. of Specimens
1	P	3	2	2	3*	2	0
	C	0		0		1	2*
2	P	4	2	96	130*	670	800**
	C	0		15	17	34	57*
3	P	0		1	2*	19	12
	C	0		1	1	3	4
4	P	0		54	66*	54	80*
	C	0		16	11	1	2*
4A	P	21	10	2200	3504*	3500	6000**
	C	8	3	900	1500*	990	1500*

Stations 5-17, no Limnoria present.

P = Long-term panel, submerged 6 months.

C = Short-term panel, submerged 1 month.

* = Gravid females present

** = Gravid females and juveniles present

TABLE 6. WATER QUALITY AT EXPOSURE PANEL STATIONS MAY, 1983

Station	Date	Time	Depth in Feet	Salinity 0/00	Temperature (°C)	O_2 (mg/l)	pH
1	5/2/83	0950	4.5	19.8	15.0	8.2	8.1
2	5/2/83	1035	2.5	20.3	16.1	7.4	7.7
3	5/2/83	1120	0.5	19.1	17.2	7.6	7.7
4	5/2/83	1145	1.0	19.9	17.9	6.8	7.5
4A	5/2/83	1210	1.0	18.1	18.6	7.1	7.8
5	5/2/83	1310	0.5	13.9	18.2	7.7	7.7
6	5/2/83	1330	0.5	14.1	18.1	7.6	7.6
7	5/2/83	1352	0.5	14.2	18.6	7.3	7.5
8	5/2/83	1418	3.0	13.2	18.2	7.4	7.5
9	5/2/83	1448	4.5	13.9	19.0	7.7	7.8
10	5/3/83	1326	3.5	15.0	16.1	6.4	7.3
10A	5/2/83	1533	1.0	14.9	18.8	7.8	7.8
10B	5/2/83	1553	2.5	15.0	18.8	8.2	8.0
11	5/2/83	1615	0.8	15.6	18.1	8.2	7.9
12	5/3/83	1245	2.0	16.0	17.6	7.8	7.8
13	5/3/83	1212	2.0	12.1	18.5	7.6	8.2
14	5/3/83	1140	2.5	14.5	17.6	7.6	8.1
15	5/3/83	0912	3.0	10.2	17.3	7.6	7.6
16B	5/3/83	0950	4.0	10.9	16.9	8.3	8.0
17	5/3/83	1034	0.5	20.9	15.1	8.4	7.8

TABLE 7. WATER QUALITY AT EXPOSURE PANEL STATIONS JUNE, 1983

Station	Date	Time	Depth in Feet	Salinity 0/00	Temperature (°C)	O_2 (mg/l)	pH
1	6/6/83	0945	4.5	24.0	17.6	7.6	8.0
2	6/6/83	1040	1.0	19.9	22.5	6.6	8.1
3	6/6/83	1120	1.0	17.6	22.7	6.2	7.9
4	6/6/83	1145	1.0	18.8	22.3	7.0	8.0
4A	6/6/83	1210	1.2	18.5	23.0	6.6	7.9
5	6/6/83	1430	0.8	17.0	23.2	6.9	8.1
6	6/6/83	1445	2.0	17.0	22.3	7.4	8.0
7	6/6/83	1505	0.5	4.9	23.7	6.1	7.0
8	6/6/83	1405	3.5	2.0	23.0	6.2	6.2
9	6/6/83	1335	3.5	13.9	23.6	6.3	7.3
10	6/7/83	1425	2.5	12.8	21.7	4.4	7.0
10A	6/6/83	1545	1.0	16.2	23.0	6.4	8.0
10B	6/6/83	1604	2.0	16.0	23.0	6.5	8.0
11	6/7/83	1500	0.7	11.8	24.6	6.4	7.9
12	6/7/83	1355	1.5	14.6	24.3	6.6	7.8
13	6/7/83	1325	2.0	11.8	24.0	5.4	7.3
14	6/7/83	1215	2.5	14.6	22.8	6.1	8.0
15	6/7/83	0905	2.5	11.2	21.7	7.0	7.5
16B	6/7/83	0950	3.5	9.7	21.7	6.3	7.6
17	6/7/83	1040	0.2	21.0	21.6	5.2	7.9

TABLE 8. WATER QUALITY AT EXPOSURE PANEL STATIONS JULY, 1983

Station	Date	Time	Depth in Feet	Salinity 0/00	Temperature (°C)	O_2 (mg/l)	pH
1	7/5/83	0912	3.5	24.1	22.8	6.1	7.7
2	7/5/83	0955	1.2	20.5	28.5	3.5	7.6
3	7/5/83	1042	1.2	19.9	29.2	4.2	7.4
4	7/5/83	1105	1.0	20.1	29.5	4.4	7.6
4A	7/5/83	1124	1.5	19.9	29.5	5.6	7.9
5	7/5/83	1412	0.5	13.2	29.2	6.5	7.6
6	7/5/83	1425	1.2	15.2	28.7	6.3	7.7
7	7/5/83	1705	0.8	13.2	27.5	7.2	7.5
8	7/5/83	1326	3.5	18.0	27.8	4.6*	7.6
9	7/5/83	1345	3.5	14.8	29.5	6.8	7.7
10	7/5/83	1506	3.5	11.0	28.0	3.8**	6.4**
10A	7/5/83	1632	1.0	18.6	28.0	7.2	7.8
10B	7/5/83	1610	2.5	17.0	28.8	6.7	7.7
11***	7/5/83	1600	1.0	15.0	28.8	5.6	7.4
12	7/5/83	1225	1.5	16.6	27.5	6.6	7.7
13	7/6/83	1200	2.0	12.5	27.5	5.6	7.0
14	7/6/83	1130	2.5	14.4	26.8	5.6	7.5
15	7/6/83	0850	3.0	15.9	25.6	4.5	7.2
16B	7/6/83	0925	3.5	10.8	26.4	5.1	7.1
17	7/6/83	1015	0.5	23.5	26.3	3.2	7.8

*Value may be too low, DO meter may have needed to be recalibrated.
**Readings erratic: pH and DO meters became slightly wet during a heavy thundershower.
***Meters changed at Station 11.

TABLE 9. CONDITION OF GONADS OF TEREDINID BORERS REMOVED FROM EXPOSURE PANELS IN BARNEGAT BAY FROM APRIL THROUGH JUNE, 1983.

EA=Early active; LA=Late active; R=Ripe; PS=Partially spawned; S=Spent; M=Male; F=Female; H=Hermaphrodite

Specimen No.	Station	Month Removed	No. Months Exposed	Species	Sex	Gonad Condition	Comments
1219 a	17	Apr 83	12	Teredo navalis	M	PS	Special panel
b				Teredo navalis	M	PS	
c				Teredo navalis	H	PS	
d				Teredo navalis	M	S	
e				Teredo navalis			No discernable gonad
f				Teredo navalis			No discernable gonad
g				Teredo navalis	M	PS	
h				Teredo navalis	M	S	
1220 a	11	Apr 83	12	Teredo navalis	M	S	Special panel
b				Teredo navalis	F	PS	
c				Teredo navalis	H	S	
d				Teredo navalis	F	PS	
e				Teredo navalis	F	S	
f				Teredo navalis	F	PS	
g				Teredo navalis	H	S	

TABLE 9. (Continued)

Specimen No.	Station	Month Removed	No. Months Exposed	Species	Sex	Gonad Condition	Comments
h				Teredo navalis	F	PS	
i				Teredo navalis	F	R	
j				Teredo navalis	F	R	
k				Teredo navalis	F	R	
1221 a	11	Apr 83	12	Bankia gouldi			Special panel; no discernable gonad
b				Bankia gouldi	M	S	
1222 a	14	May 83	12	Bankia gouldi	M	S	Special panel
b				Bankia gouldi	M	S	
c				Bankia gouldi			No discernable gonad
1223 a	11	May 83	12	Teredo navalis	M	S	Special panel
b				Teredo navalis			No discernable gonad
c				Teredo navalis	M	PS	
d				Teredo navalis	F	PS	
e				Teredo navalis	F	PS	
f				Teredo navalis	F	PS	
1224	7	May 83	12	Bankia gouldi			Special panel; no discernable gonad

TABLE 9. (Continued)

Specimen No.	Station	Month Removed	No. Months Exposed	Species	Sex	Gonad Condition	Comments
1225	13	May 83	12	Bankia gouldi	M	S	Special panel
1226 a	15	May 83	12	Teredo navalis	H	S	Special panel
b				Teredo navalis	H	S	
1227 a	10A	May 83	12	Bankia gouldi	M	S	Special panel
b				Bankia gouldi			No discernable gonad
1228	12	May 83	12	Bankia gouldi	M	S	Special panel
1229 a	17	May 83	12	Teredo navalis	H	S	Special panel
b				Teredo navalis	F	PS	
c				Teredo navalis	M	S	
d				Teredo navalis	M	PS	
e				Teredo navalis	M	EA	
f				Teredo navalis	M	S	
g				Teredo navalis	H	PS	
h				Teredo navalis	M	PS	
i				Teredo navalis	H	PS	
j				Teredo navalis	M	PS	
k				Teredo navalis	H	PS	

TABLE 9. (Continued)

Specimen No.	Station	Month Removed	No. Months Exposed	Species	Sex	Gonad Condition	Comments
l				Teredo navalis	M	PS	
m				Teredo navalis	M	PS	
n				Teredo navalis	F	PS	
o				Teredo navalis	M	PS	
p				Teredo navalis	F	PS	
q				Teredo navalis	M	PS	
r				Teredo navalis	F	PS	
s				Teredo navalis	M	S	
1230	7	MAY 83	12	Teredo navalis			Special panel; no discernable gonad
1231 a	1	MAY 83	12	Teredo navalis	F	S	Special panel
b				Teredo navalis	F	PS	
c				Teredo navalis	H	S	
d				Teredo navalis	M	LA	
e				Teredo navalis	M	S	
f				Teredo navalis	H	LA	
g				Teredo navalis	H	PS	
h				Teredo navalis	F	S	

TABLE 9. (Continued)

Specimen No.	Station	Month Removed	No. Months Exposed	Species	Sex	Gonad Condition	Comments
i				Teredo navalis	M	PS	
j				Teredo navalis	F	R	
k				Teredo navalis	H	S	
l				Teredo navalis	H	S	
m				Teredo navalis	H	PS	
n				Teredo navalis	M	PS	
o				Teredo navalis	H	S	
p				Teredo navalis	H	S	
q				Teredo navalis	H	S	
1232 a	11	May 83	12	Teredo navalis	F	EA	Special panel
b				Teredo navalis			No discernable gonad
c				Teredo navalis	F	EA	
1233 a	11	May 83	12	Teredo navalis	H	S	Special panel
b				Teredo navalis	M	S	
c				Teredo navalis	M	S	
d				Teredo navalis	F	PS	

TABLE 9. (Continued)

Specimen No.	Station	Month Removed	No. Months Exposed	Species	Sex	Gonad Condition	Comments
e				Teredo navalis	M	PS	
f				Teredo navalis	M	PS	
g				Teredo navalis	M	PS	
h				Teredo navalis	M	PS	
i				Teredo navalis	M	PS	
1234	13	Jun 83	12	Bankia gouldi	F	PS	Special panel
1235	14	Jun 83	12	Bankia gouldi			Special panel; no discernable gonad
1236	15	Jun 83	12	Bankia gouldi	M	PS	Special panel
1237	15	Jun 83	12	Teredo navalis	F	S	Special panel
1238 a	7	Jun 83	12	Teredo navalis	M	EA	Special panel
b				Teredo navalis	M	EA	
c				Teredo navalis	M	EA	
1239	10B	Jun 83	12	Bankia gouldi	M	PS	Special panel
1240 a	1	Jun 83	12	Teredo navalis	F	S	Special panel
b				Teredo navalis	F	R	
c				Teredo navalis	M	S	
1241	10A	Jun 83	12	Teredo navalis	F	S	Special panel

TABLE 9. (Continued)

Specimen No.	Station	Month Removed	No. Months Exposed	Species	Sex	Gonad Condition	Comments
1242	11	Jun 83	12	Teredo navalis	F	S	Special panel
1243 a	11	Jun 83	12	Bankia gouldi	F	S	Special panel
b				Bankia gouldi	M	PS	
c				Bankia gouldi	M	PS	
1244 a	17	Jun 83	12	Teredo navalis	M	S	Special panel
b				Teredo navalis	F	R	
c				Teredo navalis	F	R	
d				Teredo navalis	M	PS	
e				Teredo navalis	F	LA	
f				Teredo navalis	F	LA	
g^1				Teredo navalis	M	PS	
g^2				Teredo navalis	F	R	Necrotic
g^3				Teredo navalis	F	R	Necrotic
1245	11	Jun 83	12	Bankia gouldi	M	PS	Special panel
1246 a	11	Jun 83	12	Teredo navalis	F	LA	Special panel
b				Teredo navalis	F	PS	
c				Teredo navalis	M	S	
d				Teredo navalis	H	S	