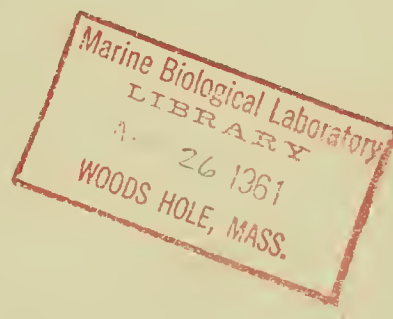


**RELATIVE ABUNDANCE OF PLANKTON OFF
NAPLES, FLORIDA, AND
ASSOCIATED HYDROGRAPHIC DATA, 1956-57**



SPECIAL SCIENTIFIC REPORT-FISHERIES No. 372

United States Department of the Interior, Stewart L. Udall, Secretary
Fish and Wildlife Service, Arnie J. Suomela, Commissioner
Bureau of Commercial Fisheries, Donald L. McKernan, Director

**RELATIVE ABUNDANCE OF PLANKTON OFF NAPLES,
FLORIDA, AND ASSOCIATED HYDROGRAPHIC DATA,
1956-57**

by

Alexander Dragovich



United States Fish and Wildlife Service
Special Scientific Report--Fisheries No. 372

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RELATIVE ABUNDANCE OF PLANKTON OFF NAPLES, FLORIDA, AND ASSOCIATED HYDROGRAPHIC DATA, 1956-57

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ABSTRACT

Some chemical, physical, and plankton characteristics of the surface waters at Naples, Florida, have been investigated. Concentrations of inorganic phosphate, total phosphate, nitrate-nitrite nitrogen, carbohydrate, and protein were determined over a period of 17 months. Water temperatures, salinities, occurrence, and composition of phytoplankton and zooplankton were also recorded.

INTRODUCTION

This study adds to the hydrographic and biological data available for the Florida red tide area. It is the fifth report by the U. S. Bureau of Commercial Fisheries on field studies of the Florida red tide. The first four reports were by Graham, Amison, and Marvin (1954), Marvin (1955a), Finucane and Dragovich (1959), and Dragovich, Finucane, and May (1961). Other studies on planktonic forms of the Florida west coast have been made by King (1950), Davis (1948 and 1950), Davis and Williams (1950), and Gunter *et al.* (1948).

Knowledge of the species composition and relative abundance of planktonic forms, together with associated physical and chemical parameters, is important in characterizing a marine environment (Cleve, 1900, and Russell, 1939). Previous plankton analyses for the Florida red tide area provide comparatively little informa-

tion regarding coincident aquatic conditions. In this report values for salinity, temperature, inorganic phosphorus, total phosphorus, nitrate-nitrite nitrogen, carbohydrate, and protein are given with abundance estimates of 48 taxa of phytoplankton and 13 zooplankton taxa. These data cover the coastal waters off Naples, Florida, for the period March 1956 to August 1957.

MATERIALS AND METHODS

Surface samples of water were collected from Naples Pier at Naples, Florida (lat. 26°07.9'N., long. 81°48.5' W. Fig. 1). The mean low water depth at the pier was 5 feet with a mean tidal range of 2.1 feet. Three or four times a month water samples were taken with 2-liter Erlenmeyer flasks for chemical analysis. Immediately after collection the samples were transferred to 200 mm. pyrex culture vials, capped with solid polyethylene screw caps, and sealed with plastic electrician's tape. They were tested

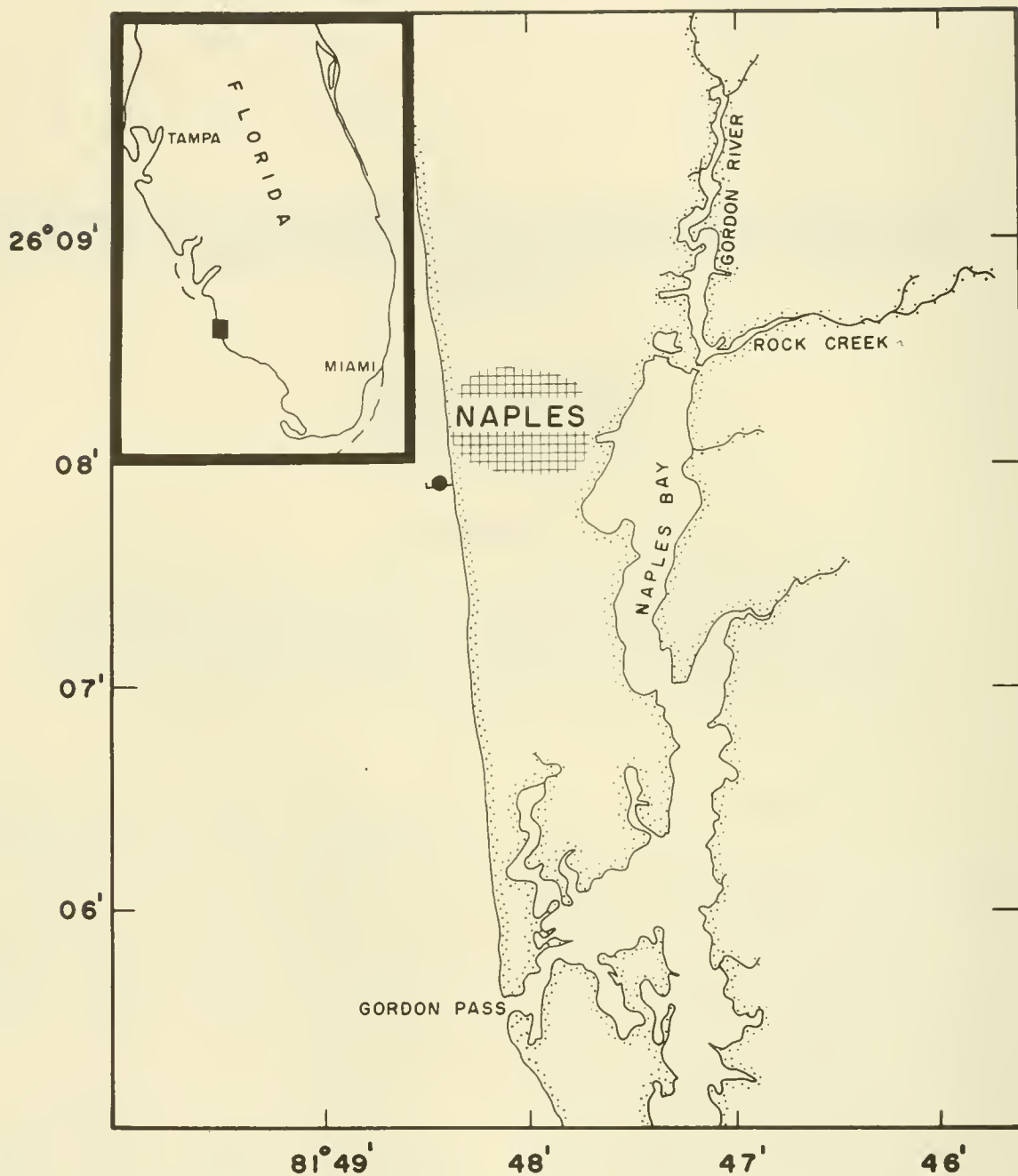


Figure 1.--Map of Naples area indicating station location. (The area included in this map is indicated as a black rectangle on the inset.)

for total and inorganic phosphorus, nitrate-nitrite nitrogen, carbohydrate, and protein.

Temperature, salinity, and plankton determinations were usually made 5 times a week. The particular col-

lection method employed was chosen to permit detection of delicate or minute organisms which would have been fragmented or destroyed if collected with a plankton net. Water samples to be analyzed for plankton were collected like the chemical samples, in

2-liter Erlenmeyer flasks previously rinsed with a portion of sample water, and examined within 24 hours after collection.

The counting technique for *Gymnodinium breve* and preparation of the samples for the estimation of relative abundance of other organisms were those described by Finucane and Dragovich (1959). Abundance estimates of microorganisms other than *G. breve* were made as follows: three 1-ml. portions of the sample were pipetted from just beneath the surface of the water and placed on a 3-depression slide. After microscopic examination of the three aliquots, the abundance of phytoplankton forms was recorded in terms of three categories: + = 1-24 cells per ml.; ++ = 25-99 cells per ml.; and +++ = 100 or more cells per ml. The same procedure was employed for zooplankton estimates, using these categories: x = 1-9 organisms per ml.; xx = 10-49 organisms per ml.; and xxx = 50-100 organisms per ml.

The following physical and chemical methods were employed:

Water temperature: determined with mercury thermometer calibrated to the nearest 10th of a degree centigrade.

Salinity: determined by Mohr-Knudsen method (Knudsen, 1901).

Nitrate-nitrite nitrogen: determined by the method of Zwicker and Robinson (1944) as modified by Marvin (1955b).

Inorganic phosphorus: determined according to the Robinson and Thompson (1948) method.

Total phosphorus: determined by the method of Harvey (1948).

Carbohydrates: determined by the method of Erdman and Little (1950) as modified by Zein-Eldin and May (1958).

Protein: determined by the method of Wangersky (Collier, 1958) as modified by Marvin et al., 1960.

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APPENDIX TABLES

EXPLANATION OF COLUMN HEADINGS AND SYMBOLS

Time	Eastern Standard Time		<u>Symbols for phytoplankton abundance:</u>
NO ₃ -NO ₂	Nitrate-nitrite nitrogen,		+ 1-24 cells per ml.
	μg. at./l.		++ 25-99 cells per ml.
PO ₄ -P	Phosphate phosphorus,		+++ 100 or more cells per ml.
	μg.at./l.		
In.	Inorganic		<u>Symbols for zooplankton abundance:</u>
Tot.	Total		x 1-9 organisms per ml.
Carbohydrate	Arabinose equivalents,		xx 10-49 organisms per ml.
	mg./l.		xxx 50-100 organisms per ml.
Protein	Tyrosine equivalents,		
	mg./l.		

Table 1.--Relative abundance of plankton with associated hydrographic data

M A R C H 1956

Day	1	2	5	6	7	8	9	12	13	14	15	16	19	20	21	22	23	26	27	28	29	30	
Time	0910	0910	0908	1000	1030	0840	0900	0905	0843	0905	1615	1540	1615	1154	1050	1500	1000	0918	0940	1050	1020	0900	
BIOLOGICAL DATA																							
Unicellular plankton																							
Amphidinium spp.																							
Cochlodinium spp.													+					+					
Gyrodinium breve																							
G. simplex																							
G. splendens																							
G. spp.																							
Gyrodinium spirale																							
G. spp.																							
Torodinium spp.																							
Polykrikos spp.																							
Nematodinium spp.																							
Pouchetia spp.																							
Oxyrhis spp.																							
Ceratium furca																							
C. fusus																							
C. tripos																							
Gonyaulax spp.																							
Peridiniopsis spp.																							
Peridinium depressum																							
P. digitale																							
P. divergens																							
P. spp.																							
Dinofysis tripos																							
D. spp.																							
Exuviella spp.																							
Prorocentrum sp.																							
Silicoflagellidae																							
Eulena spp.																							
Peranema spp.																							
Melosira spp.																							
Skeletonema spp.																							
Chaetoceros spp.																							
Quinardia spp.																							
Rhizosolenia spp.																							
Thalassiothrix spp.																							
Navicula spp.																							
Pleurosigma spp.																							
Nitzschia spp.																							

Table 1. cont'd

Day Time	1 0910	2 0910	5 0908	6 1000	7 1030	8 0840	9 0900	12 0905	13 0843	14 0905	15 1615	16 1540	19 1615	20 1154	21 1050	22 1500	23 1000	26 0918	27 0940	28 1050	29 1020	30 0900
BIOLOGICAL DATA																						
Unicellular plankton (Amatophora spp.)																						
Unidentified phytoplankton	++	++	++	++	++	+	++	+		++	++		++	++		++	++		++	++		
Strombidium sp.																						
Halteriidae												++										
Unidentified																						
Tintinnoidae				+						+						+	+			+		
Vorticella spp.																						
Cothurnia sp.																						
Pleuronema sp.																						
Unidentified ciliates																						
Multicellular plankton		++	+	+	+	+	+	+						++	+				+			+
Proales sp.																						
Synchaeta sp.																						
Unidentified Rotifera			x						x													x
Copepoda																						
Ostracoda																						
Chaetopoda																						
Coelenterata										x												
Nauplii		x								x												
Megalops and Zoaea															x							x
Veliger																						
Trochophore																						
Echinoderm larvae																						
Pisces larvae																						
HYDROGRAPHIC DATA																						
Temperature, °C.	19.5	19.9	21.9	22.6	23.5	24.0	22.9	23.5	24.9	25.0	26.8	26.8	24.0	20.8	19.2	20.9	19.8	19.4	19.5	20.5	21.0	21.9
Salinity, ‰	36.3	36.3	36.2	36.3	36.3	36.4	36.4	36.5	36.6	36.4	36.6	37.0	36.8	37.0	37.1	37.0	37.1	37.0	36.2	36.9	36.8	36.8
NO ₃ -NO ₂																						
In. PO ₄ -P	1.5					0.5					0.2					3.2						0.3
Tot. PO ₄ -P	2.9					1.0					0.2					3.5						0.7
Carbohydrate	1.6					4.1					0.9					1.1						0.7
Protein	3.2															1.0						

Table 2.--Relative abundance of plankton with associated hydrographic data

A P R I L 1956

Day	2	3	4	6	9	10	11	12	13	16	17	18	19	20	23	24	25	26	27	30	
Time	1030	1050	0940	0955	0930	0920	0920	0930	0930	0955	0915	1030	0900	0855	0935	0830	0835	0900	0835	0910	
BIOLOGICAL DATA																					
Unicellular plankton																					
Amphidinium spp.																					
Cochlodinium spp.																					
Gymnodinium breve						+															
G. splendens											+										
G. spp.	++	+	+	+	+	++	+	+	+	+	+	+	+	+			+			+	
Gyrodinium spirale																					
G. spp.	++	+	+	+	+	++	+	+	+											+	
Torodinium spp.																					
Polykrikos spp.																					
Nematodinium spp.																					
Pouchetia spp.				+									+								
Oxyrrhis spp.																					
Ceratium furca	+					+					+										
C. fusus																					
C. tripos																					
Gonyaulax spp.																					
Peridiniopsis spp.					+																
Peridinium depressum																					
P. digitale																					
P. divergens					+				+												
P. spp.		+			+	+						+	+	+							
Dinophysis tripos																					
D. spp.																					
Exuviella spp.																					
Prorocentrum sp.																					
Silicoflagellidae																					
Euglena spp.																					
Petaneia spp.																					
Melosira spp.		+	+	+	+	+	+	+	+	+	+									+	
Skeletonema spp.																					
Chaetoceros spp.		+			+																
Guinardia spp.																					
Rhizosolenia spp.																					
Thalassiothrix spp.																					
Navicula spp.																					
Pleurosigma spp.																					
Nitzschia spp.						+			+												

Table 2. cont'd

Day	2	3	4	6	9	10	11	12	13	16	17	18	19	20	23	24	25	26	27	30
Time	1030	1050	0940	0955	0930	0920	0920	0930	0930	0955	0915	1030	0900	0855	0935	0830	0835	0900	0835	0910
BIOLOGICAL DATA																				
Unicellular plankton																				
Grammatophora spp.																				
Unidentified phytoplankton	++	++	+	++	++	++	++	++	++	++	++	++	++	++	+	++	++	++	++	++
Strombidium sp.																				
Unidentified Haptophyta						++														
Tintinnopsis spp.	+				+	+														++
Unidentified Tintinnidae																				
Vorticella spp.	+		+				++			+	+	+		++	+	+	+	+	+	+
Cothurnia sp.																				
Pleuromma sp.																				
Unidentified ciliates																				
Multicellular plankton		+	+	+																
Proles sp.																				
Struchsetia sp.																				
Unidentified Rotifera														x						
Copepoda																				
Ostracoda																				
Chaetognata																				
Coelenterata																				
Nauplii					x	x				x	x	x		x				x	x	
Mesozoa and Zoaea																				
Veliger										x										
Trochophore																				
Echinoderm larvae																				
Plutea larvae					x															
HYDROGRAPHIC DATA																				
Temperature °C.	22.0	22.0	22.9	24.6	23.6	22.3	21.9	19.9	20.8	22.5	22.9	23.6	22.2	21.5	22.5	23.0	23.8	23.9	24.6	25.0
Salinity	37.0	36.8	37.0	37.2	37.3	37.2	37.2	37.3	37.3	37.2	37.2	37.6	37.4	36.7	36.9	36.9	36.8	37.2	37.8	37.3
NO ₃ -NO ₂																				
In. PO ₄ -P				0.5			3.2						0.2					0.2		
Tot. PO ₄ -P				0.8			4.2						0.2					0.8		
Carbohydrate				0.5			1.2											0.8		
Protein				1.0			1.7						1.5					0.1		

Table 3.--Relative abundance of plankton with associated hydrographic data

M A Y 1956

Day	1	2	3	4	7	8	9	10	11	14	15	16	17	18	21	22	23	24	25	28	29	31	
Time	0908	0830	1040	0845	0930	0950	1035	0920	0850	0900	0847	1025	0935	1000	0900	1055	0840	0830	0840	1000	0850	0850	
BIOLOGICAL DATA																							
Unicellular plankton																							
Amphidinium spp.		+																					
Cochlodinium spp.																							
Gymnodinium breve																							
G. simplex													+										
G. splendens																							
G. spp.		+	+																				
Gyrodinium spirale																							
G. spp.		+	+																				
Torodinium spp.																							
Polykrikos spp.			+																				
Nematodinium spp.																							
Pouchetia spp.																							
Oxyrrhis spp.																							
Ceratium furca																							
C. fusus																							
C. tripos																							
Gonyaulax spp.																							
Peridiniopsis spp.																							
Peridinium depressum																							
P. digitale																							
P. divergens																							
P. spp.		+																					
Dinophysis tripos																							
D. spp.																							
Exuviella spp.																							
Prorocentrum sp.																							
Silicoflagellidae																							
Euglena spp.																							
Peranema spp.																							
Melosira spp.																							
Skeletonema spp.																							
Chaetoceros spp.		+																					
Guinardia spp.																							
Rhizosolenia spp.																							
Thalassiothrix spp.																							
Navicula spp.																							
Pleurosigma spp.																							
Nitzschia spp.		+																					

Table 3. cont'd

Day	1	2	3	4	7	8	9	10	11	14	15	16	17	18	21	22	23	24	25	28	29	31	
Time	0908	0830	1040	0845	0930	0950	1035	0920	0850	0900	0847	1025	0935	1000	0900	1055	0840	0830	0840	1000	0850	0850	
BIOLOGICAL DATA																							
Unicellular plankton																							
Grammatophora spp.																							
Unidentified phytoplankton	++	++	++	++	++	++	+	++	++	++	++	+	++	++	++	++	++	++	++	++	++	++	++
Strombidium sp.																							
Unidentified Halteriidae																							
Tintinnopsis spp.										++								+					
Unidentified Tintinnidae																							
Vorticella spp.								+												+			
Cothurnia sp.	+									+													
Pleuromma sp.										+													
Unidentified ciliates	+	+			+	+	+	+	+	+	+	+	+	+	++	+	+	+	+	++	+	+	+
Multicellular plankton																							
Proales sp.																							
Synchaeta sp.																							
Unidentified Rotifera																							
Copepoda																							
Ostracoda																							x
Chaetopoda																							
Coelenterata																							
Nauplii		x																					x
Megalops and Zooea																							
Veliger																							
Trochophore																							
Echinoderm larvae																							
Pisces larvae			x																				
HYDROGRAPHIC DATA																							
Temperature, °C.	24.9	24.9	25.9	26.3	27.7	27.5	27.7	27.0	27.4	28.0	28.2	28.5	27.5	27.7	27.0	29.5	27.0	27.5	28.2	27.5	26.9	26.5	26.5
Salinity, ‰	36.3	36.3	37.1	37.1	37.8	37.8	37.8	37.7	37.7	37.6	36.9	36.8	36.6	36.6	36.8	37.0	37.1	37.0	37.0	37.0	37.1	36.2	36.2
NO ₃ -NO ₂			0.3					0.3					0.4					1.8					0.4
In. PO ₄ -P			0.0					0.2					0.7					0.3					0.1
Tot. PO ₄ -P			0.9					0.6					0.6					0.6					0.4
Carbohydrate			1.7					2.6					1.6					1.6					
Protein			0.1					0.0					0.0					0.0					0.0

Table 4.--Relative abundance of plankton with associated hydrographic data

J U N E 1956

Day Time	1 0850	4 1055	5 0900	6 1250	7 1033	8 1010	11 0940	12 0900	13 0840	14 0850	15 1005	18 1040	19 0900	20 0930	21 0930	22 0845	25 0910	26 0840	27 0845	28 0845	29 0830
BIOLOGICAL DATA																					
Unicellular plankton																					
Amphidinium spp.																					
Cochlodinium spp.																					
Gymnodinium breve																					
G. simplex																					
G. splendens		+							+	+	+	+	+	+	++	+				+	+
G. spp.																					
Gyrodinium spirale			+																		
G. spp.				+																	
Torodinium spp.																					
Polykrikos spp.																					
Nematodinium spp.																					
Pouchetia spp.																					
Oxyrhis spp.																					
Ceratium furca																					
C. fusus																					
C. tripos																					
Gonyaulax spp.																					
Peridiniopsis spp.																					
Peridinium depressum																					
P. digitale																					
P. divergens							++														
P. spp.																					
Dinophysis tripos																					
D. spp.																					
Exuviella spp.																					
Prorocentrum sp.																					
Silicoflagellidae																					
Eulena spp.																					
Peranema spp.																					
Melosira spp.																					
Melosira spp.																					
Skeletonema spp.																					
Chaetoceros spp.																					
Chaetoceros spp.																					
Guinardia spp.																					
Rhizosolenia spp.																					
Thalassiothrix spp.																					
Thalassiothrix spp.																					
Navicula spp.																					
Pleurosigma spp.																					
Nitzschia spp.																					

Table 4. cont'd

Day	1	4	5	6	7	8	11	12	13	14	15	18	19	20	21	22	25	26	27	28	29	
Time	0850	1055	0900	1250	1033	1010	0940	0900	0840	0850	1005	1040	0900	0930	0930	0845	0910	0840	0845	0845	0830	
BIOLOGICAL DATA																						
Unicellular plankton																						
Grammatophora spp.																						
Unidentified phytoplankton	++	++	++	++	++	++	++	++	+	++	++		++	++					++	++		++
Strombidium sp.																						
Unidentified Halteridae																						
Tintinnomopsis spp.																						
Tintinnidae																						
Vorticella spp.																						
Cothurnia sp.																						
Pleuronema sp.																						
Unidentified ciliates	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	++	++	+	++	++	+	+
Multicellular plankton																						
Proales sp.																						
Synchaeta sp.																						
Unidentified Rotifera																						
Copepoda													x									
Ostracoda																						
Chaetoroda																						
Coelenterata																						
Nauvlii		x								x												
Medusae and Zoaea																						
Veliger										x												
Trochophore																						
Echinoderm larvae																						
Pisces larvae																						
HYDROGRAPHIC DATA																						
Temperature, °C.	27.8	28.5	28.3	29.8	28.6	28.5	27.8	27.5	27.2	27.0	28.0	27.9	28.8	29.0	28.0	29.1	29.5	30.0	30.0	30.0	29.0	29.0
Salinity, ‰	37.0	37.2	37.5	37.4	37.6	37.7	37.4	37.6	37.6	37.6	37.6	37.5	37.5	37.7	37.7	37.7	37.7	38.2	38.0	38.2	38.0	38.0
NO ₃ -NO ₂						0.4				1.5					0.4						0.3	
In. PO ₄ -P						0.6				0.2					0.5						1.0	
Tot. PO ₄ -P					1.0					1.1					0.3							
Carbohydrate					1.6					1.7					1.0						1.1	
Protein					0.5					0.4					0.4						0.4	0.0

Table 5.--Relative abundance of plankton with associated hydrographic data

J U L Y 1956

Day	2	3	5	6	9	10	11	12	13	16	17	18	19	20	23	24	25	26	27	30	31
Time	0910	0950	0830	0825	0850	0950	0925	0900	0935	0915	0915	0830	0845	0915	0900	0830	0845	0840	0830	0930	0830
BIOLOGICAL DATA																					
Unicellular plankton																					
Amphidinium spp.																					
Cochlodinium spp.																					
Gymnodinium breve																					
G. simplex																					
G. splendens																					
G. spp.	+	+	+	+	+	+	+	++													
Gyrodinium spirale																					
G. spp.			+		+	+	+														
Torodinium spp.																					
Polykrikos spp.																					
Nematodinium spp.																					
Pouchetia spp.																					
Oxyrrhis spp.																					
Ceratium furca																					
C. fusus																					
C. tripos																					
Conyaulax spp.																					
Peridionopsis spp.																					
Peridinium depressum																					
P. digitale																					
P. divergens																					
P. spp.	+	+	+		+		+														
Dinophysis tripos																					
D. spp.																					
Exuviella spp.																					
Prorocentrum sp.		+																			
Silicoflagellidae																					
Euglena spp.																					
Peranema spp.																					
Melosira spp.																					
Skeletonema spp.																					
Chaetoceros spp.																					
Guinardia spp.																					
Rhizolenia spp.																					
Thalassiothrix spp.																					
Navicula spp.																					
Pleurosigma spp.																					
Nitzschia spp.																					
Grammatophora spp.																					

Table 5. cont'd

Day	2	3	5	6	9	10	11	12	13	16	17	18	19	20	23	24	25	26	27	30	31
Time	0910	0950	0830	0825	0850	0950	0925	0900	0935	0915	0915	0830	0845	0915	0900	0830	0845	0840	0830	0930	0830
BIOLOGICAL DATA																					
Unicellular plankton																					
Unidentified phytoplankton	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++
Strombidium sp.																					
Unidentified Halteridae																					
Tintinnosis spp.																					+
Unidentified Tintinnidae																					
Vorticella spp.	+	+		+							+	+	+	+			+				+
Cothurnia sp.																					
Pleuronema sp.																					
Unidentified ciliates		+			+					+				+		+					+
Multicellular plankton																					
Proales sp.																					
Synchaeta sp.																					
Unidentified Rotifera																	x				x
Copepoda																					
Ostracoda																					
Chaetopoda																					
Coelenterata	x	x																			x
Nauplii		x																			x
Megaflops and Zooea																					
Velier																					
Trochophore																					
Echinoderm larvae																					
Pisces larvae																					
HYDROGRAPHIC DATA																					
Temperature, °C.	28.9	29.4	28.5	28.0	29.5	28.8	29.7	29.8	30.1	30.0	31.0	30.4	31.0	31.0	30.5	29.9	30.0	30.0	30.0	30.2	30.0
Salinity, ‰	38.0	38.0	37.8	37.7	37.7	37.8	37.8	38.0	38.0	38.0	38.0	38.2	38.2	38.3	38.1	38.2	38.4	38.0	38.0	38.1	38.0
NO ₃ -NO ₂			0.2				0.3							0.0							0.0
In. PO ₄ -P			0.6				0.3						1.2								0.3
Tot. PO ₄ -P			0.6				0.4														1.0
Carbohydrate			1.1				2.1						0.9								0.6
Protein			0.1				0.0						0.0								0.1

Table 6.--Relative abundance of plankton with associated hydrographic data

AUGUST 1956

Day	1	2	3	6	7	8	9	10	13	14	15	16	17	20	21	22	23	24	27	28	29	30	31	
Time	0830	0840	0820	0945	0830	0845	0845	0830	0915	0840	0930	0845	0830	0900	0900	0905	0845	1120	0845	0840	0900	0855	1000	
BIOLOGICAL DATA																								
<u>Unicellular plankton</u>																								
Amphidinium spp.																								
Cochlodinium spp.																								
Gymnodinium breve																								
G. simplex																								
G. splendens	+	+	+	+	+	+	+++	+++	+++	+++	+	+	+	+	+	+	+	+	+	+	+	+	+	+
G. spp.	+																							
Gyrodinium spirale													+											
G. spp.																								
Torodinium spp.																								
Poljkrikos spp.																								
Nematodinium spp.																								
Pouchetia spp.																								
Oxyrrhis spp.																								
Ceratium furca									+															
C. fusus																								
C. tripos																								
Gonyaulax spp.																								
Peridiniopsis spp.	+	+					+	+																
Peridinium depressum																								
P. digitale																								
P. divergens																								
P. spp.	+	+	+	+	+	+								+	+	+	+	+	+	+	+	+	+	+
Dinophysis tripos																								
D. spp.																								
Exuviella spp.																								
Proocentrum sp.																								
Silicoflagellidae																								
Euglena spp.																								
Peranema spp.																								
Melosira spp.	+							+																
Skeletonema spp.																								
Chaetoceros spp.	+	+	+	+	+	+																		
Guinardia spp.																								
Rhizosolenia spp.																								
Thalassiothrix spp.																								
Navicula spp.																								
Pleurosigma spp.																								
Nitzschia spp.							+																	

Table 6. cont'd

Day	1	2	3	6	7	8	9	10	13	14	15	16	17	20	21	22	23	24	27	28	29	30	31	
Time	0830	0840	0820	0945	0830	0845	0845	0830	0915	0840	0930	0845	0830	0900	0900	0905	0845	1120	0845	0840	0900	0855	1000	
BIOLOGICAL DATA																								
Unicellular plankton																								
Grammatophora spp.																								
Unidentified phytoplankton	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++
Strombidium sp.																								
Unidentified Halteriidae	+	+				+				+				+	+	+	+	+						+
Tintinnopsis spp.																								
Unidentified Tintinnidae																								
Vorticella sp.	+	+	+	+					+	+				+										+
Cothurnia sp.																								
Pleuonema sp.																								
Unidentified ciliates	+	+	+	+	+	+		+						+	+	+	+	+	+	+	+	+	+	+
Multicellular plankton																								
Proales sp.																								
Stenchaeta sp.																								
Unidentified Rotifera	x																							x
Copepoda		x									x							x	x					x
Ostracoda																								x
Chaetopoda																								
Coelenterata																								
Nauplii				x		xx																		
Megalops and Zoea		x	x			xx		x						x										
Veliger																								
Trochophore																								
Echinoderm larvae																		x						
Pisces larvae																								
HYDROGRAPHIC DATA																								
Temperature, °C.	30.0	31.0	30.1	31.9	31.2	31.0	31.1	31.0	30.8	31.0	31.0	31.0	31.0	31.0	31.0	31.0	30.0	31.2	30.5	30.7	30.4	31.7	31.6	31.6
Salinity, ‰	37.9	38.1	38.1	38.2	38.4	38.2	38.1	38.2	38.2	38.1	38.3	38.0	38.0	38.0	38.2	38.2	38.2	37.6	37.8	37.9	38.2	38.1	37.8	37.8
NO ₃ -N02		0.6					0.0					0.4					1.2							0.9
In. PO ₄ -P		0.3															0.7							0.2
Tot. PO ₄ -P		1.0									0.2						0.9							1.3
Carbohydrate		1.4					1.0				1.0						0.9							1.5
Protein		0.7					0.3				0.3						0.3							0.1

Table 7.--Relative abundance of plankton with associated hydrographic data

S E P T E M B E R 1956

Day	4	5	6	7	10	11	12	13	14	17	18	19	20	21	24	25	26	27	28
Time	0920	0845	0855	0842	0830	0855	0830	0830	0900	0900	0832	0835	0845	0830	0845	0830	0830	0830	0830
BIOLOGICAL DATA																			
Unicellular plankton																			
Amphidinium spp.																			
Cochlodinium spp.																			
Gymnodinium breve																			
G. simplex																			
G. splendens		+	++		+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
G. spp.																			
Gyrodinium spirale																			
G. spp.	+		+									+							
Toxodinium spp.																			
Polykrikos spp.																			
Nematodinium spp.																			
Pouchetia spp.																			
Ostrychia spp.																			
Ceratium furca													+	+					
C. fusus																			
C. tripos																			
Conyaulax spp.																			
Peridiniopsis spp.																			
Peridinium depressum																			
P. digitale																			
P. divergens		+																	
P. spp.																			
Dinophysis tripos	+				+++					+									
D. spp.																			
Exuviella spp.																			
Prorocentrum sp.																			
Silicoflagellidae																			
Euglena spp.																			
Peranema spp.																			
Melosira spp.	+	++	+																
Skeletonema spp.																			
Chaetoceros spp.		+										++							
Guinardia spp.																			
Rhizolenia spp.																			
Thalassiothrix spp.																			
Navicula spp.		+																	
Pleurosigma spp.																			
Mitochondria spp.																			

Table 7. cont'd

Day Time	4 0920	5 0845	6 0855	7 0842	10 0830	11 0855	12 0830	13 0830	14 0900	17 0900	18 0832	19 0835	20 0845	21 0830	24 0845	25 0830	26 0830	27 0830	28 0830
BIOLOGICAL DATA																			
Unicellular plankton																			
Grammatophora spp.																			
Unidentified phytoplankton	++	++	++	++	+	++	++	++	++	++	++	++	++	++	++	++	++	++	++
Scrombidium sp.															+				
Unidentified																			
Halteriidae			+			+							+						
Tintinnopsis spp.								+					+						
Unidentified																			
Tintinnidae																			
Vorticella spp.	++	++	+		+		+	+	+	+	+	+					+		
Cothurnia sp.																			
Pleuronema sp.																			
Unidentified ciliates	++	++		+		+	+	+	++	++	+	++	+	+	++	+	+	+	++
Multicellular plankton																			
Proales sp.	xx																		
Synchaeta sp.																			
Unidentified Rotifera							x								x				x
Copepoda									x										
Ostracoda																			
Chaetopoda																			
Coelenterata									x										
Nauplii									x										
Megalops and Zoea		x													x				
Veliger		x													x				
Trochophore																			
Echinoderm larvae																			
Pisces larvae																			
HYDROGRAPHIC DATA																			
Temperature, °C.	29.9	28.4	28.6	27.5	28.0	27.8	26.5	27.0	27.5	29.0	27.7	28.0	27.8	27.5	28.0	27.8	27.0	26.8	26.4
Salinity, ‰	37.6	37.7	37.4	37.2	37.1	37.3	37.3	38.5	37.4	37.2	37.3	38.3	36.7	36.4	36.4	35.9	35.9	36.4	36.5
NO ₃ -N, μg			0.4					0.5					0.4					1.3	
In. PO ₄ -P			0.3					0.3					0.1					1.4	
Tot. PO ₄ -P			0.6					0.3					0.4					1.8	
Carbohydrate			0.6					0.9					1.1					1.5	
Protein			0.1					0.2					0.1					0.8	

Table 8.--Relative abundance of plankton with associated hydrographic data

O C T O B E R 1956

	1	2	3	4	5	8	9	10	11	12	15	16	17	18	19	22	23	24	25	26	29	31	
	Day Time	0900	0820	0830	0825	0825	0900	0830	0830	0830	0830	0900	0830	0830	1005	0830	0900	0845.	0900	0830	0830	1000	1045
BIOLOGICAL DATA																							
Unicellular plankton																							
Amphidinium spp.																							
Cochlodinium spp.																							
Gymnodinium breve																							
G. simplex																							
G. splendens	+		+	+	+	+																	
G. sp.	+	+	+	+													+++						
Gyrodinium spirale																							
G. spp.			+																				
Torodinium spp.																							
Polikrikos spp.																							
Nematodinium spp.																							
Pouchetia spp.																							
Oxyrrhis spp.																							
Ceratium furca	+			+																			
C. fusus																							
C. tripos																							
Gonyaulax spp.																							
Peridiniopsis spp.				+																			
Peridinium depressum																							
P. digitale																							
P. divergens																							
P. spp.	+	+	+	+	+	+	+	++															
Dinophysis tripos																							
D. spp.																							
Exuviaella spp.																							
Prorocentrum sp.	+	+		+	+	+																	
Silicoflagellidae																							
Euglena spp.																							
Peranema spp.																							
Melosira spp.	+	+		+	+	+	+																
Skeletonema spp.																							
Chaetoceros spp.	+		+	+	+	+	+																
Guinardia spp.																							
Rhizosolenia spp.																							
Thalassiothrix spp.																							
Navicula spp.																							
Pleurosigma spp.																							
Nitzschia spp.																							

Table 8. cont'd

Day	1	2	3	4	5	8	9	10	11	12	15	16	17	18	19	22	23	24	25	26	29	31
Time	0900	0820	0830	0825	0825	0900	0830	0830	0830	0830	0900	0830	0830	1005	0830	0900	0845	0900	0830	1000	1045	
BIOLOGICAL DATA																						
Unicellular plankton																						
Grammatophora spp.																						
Unidentified																						
Phytoplankton	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++
Strombidium sp.																						
Unidentified																						
Halteriidae				+			+					+				+						
Tintinnopsis spp.																						
Unidentified																						
Tintinnidae																						
Cothurnia sp.																						
Pleuonema sp.																						
Unidentified ciliates																						
Multicellular plankton																						
Proales sp.																						
Synchaeta sp.																						
Unidentified Rotifera																						
Copepoda	x	x	x				x					x	x	x							x	x
Ostracoda																						
Chaetopoda																						
Coelenterata																						
Nauplii																						
Megalops and Zoaea																						
Veliger																						
Trochophore																						
Echinoderm larvae																						
Pisces larvae																						
HYDROGRAPHIC DATA																						
Temperature, °C.	27.5	27.2	28.0	28.0	27.8	29.0	27.8	27.8	27.0	25.2	23.5	24.0	23.9	24.8	25.0	24.8	26.0	26.0	26.0	25.5	24.5	25.0
Salinity, ‰	36.5	36.5	36.7	36.6	36.4	36.7	36.3	36.3	36.6	36.6	36.0	35.3	34.5	34.9	35.6	35.7	35.4	35.7	35.9	35.8	36.0	36.2
NO ₃ -NO ₂				0.0					0.2	0.2				0.5					0.3			0.2
In. PO ₄ -P				0.4					0.2	0.2				1.0					0.7			0.4
Tot. PO ₄ -P				0.5					0.7	0.7				1.3					0.8			0.6
Carbohydrate				1.5					2.0	2.0				1.8					1.5			2.6
Protein				0.1					0.2	0.2				0.2					0.2			0.3

Table 9.--Relative abundance of plankton with associated hydrographic data

N O V E M B E R 1956

Day	1	2	5	6	7	8	9	13	14	15	16	19	20	21	23	26	27	28	30	
Time	0840	0820	0900	0830	0830	0830	0830	0840	0825	0930	0910	0845	0900	0845	0825	0900	0840	0840	0825	
BIOLOGICAL DATA																				
Unicellular Plankton																				
Amphidinium spp.																				
Cochlodinium spp.																				
Gymnodinium breve																				
G. simplex																				
G. splendens																				
G. spp.	+	+++	+	+++	+	+	+													+
Gyrodinium spirale																				
G. spp.																				
Torodinium spp.		+																		
Polvkrikoia spp.																				
Nematodinium spp.																				
Pouchetia spp.																				
Oxyrrhis spp.																				
Ceratium furca																				
C. fusus																				
C. tripos																				
Gonaulax spp.																				
Peridinium spp.																				
Peridinium depressum																				
P. digitale																				
P. divergens																				
P. spp.	+	+	+	+	+															+
Dinophysis trimoa																				
D. spp.																				
Exuvella spp.																				
Proocentrum sp.																				
Silicoflagellidae																				
Eutima spp.																				
Peranema spp.																				
Melosira spp.																				
Skeletonema spp.																				
Chaetoceros spp.																				
Guinardia spp.																				
Rhizosolenia spp.																				
Thalassiothrix spp.																				
Navicula spp.																				
Pleurosigma spp.																				
Nitzschia spp.																				

Table 9. cont'd

Day	1	2	5	6	7	8	9	13	14	15	16	19	20	21	23	26	27	28	30
Time	0840	0820	0900	0830	0830	0830	0840	0840	0825	0930	0930	0845	0900	0845	0825	0900	0840	0840	0825
BIOLOGICAL DATA																			
Unicellular plankton																			
Grammatophora spp.																			
Unidentified phytoplankton	++	++	++	++	++	++	++	++	++	++	++	+	++	++	++	++	++	++	++
Stombidium sp.																			
Unidentified Halteridae	+	+	+	+++	+	+	+	+	+	+	+				+	+			+
Tintinnopsis spp.	+	+	+	+	+	+		+	+	+					+				+
Unidentified Tintinnidae																			
Vorticella spp.	+	+	+	+	+	+		+							+				+
Cothurnia sp.																			
Pleuronema sp.																			
Unidentified ciliates	+	+	+	+	+	+	+	+	++	+	+	+	+	+	+	+	+	+	+
Multicellular plankton																			
Proales sp.																			
Synchaeta sp.																			
Unidentified Rotifera	x																		x
Copepoda										x									
Ostracoda																			
Chaetopoda																			
Coelenterata																			
Nauplii																			
Megalops and Zoea	x	x	x			x				x					x		x	x	x
Veliger																			
Trochophore																			
Echinoderm larvae														x					
Places larvae																			
HYDROGRAPHIC DATA																			
Temperature, °C.	24.5	24.0	24.0	23.0	23.3	23.5	22.8	20.0	21.0	21.0	22.1	22.0	22.0	22.0	19.0	19.8	18.5	17.0	18.8
Salinity, ‰	36.3	36.3	35.8	35.6	38.6	38.6	38.5	35.7	35.6	35.8	35.8	36.1	36.3	36.2	36.2	36.3	36.1	36.0	36.2
NO ₃ -NO ₂	0.2					2.2			4.4						0.8				
In. PO ₄ -P	0.6					0.3			0.2						1.7				
Tot. PO ₄ -P	0.6					0.5			0.5						1.7				
Carbohydrate	0.4					0.5			1.6						2.4				
Protein	0.2					0.5			0.6										

Table 10.--Relative abundance of plankton with associated hydrographic data

O C T O B E R 1956

Day	3	4	5	6	7	10	11	12	13	14	17	18	19	20	21	26	27	31	
Time	0915	0945	0915	0900	0855	0915	0845	0825	0840	0825	0855	0925	0900	0955	0830	0830	0930	0850	
BIOLOGICAL DATA																			
Unicellular plankton																			
Amphidinium spp.																			
Cochlodinium spp.																			+
Gymnodinium breve																			
G. simplex																			
G. splendens																			
G. spp.	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+++	+	+	++	++
Gyrodinium spirale																			
G. spp.			+								+					+			++
Torodinium spp.																			
Polykrikos spp.																			
Nematodinium spp.																			
Pouchetia spp.																			
Oxyrrhis spp.																			
Ceratium furca		+	+									++							+
C. fusus																			
C. tripos																			
Gonyaulax spp.																			
Peridiniopsis spp.																			
Peridinium depressum																			
P. digitale																			
P. divergens																			
P. spp.	+	+	+	+	+	+	+	+	+	+	+	+++	+	+	+	+	+	++	++
Dinophysis tripos																			
D. spp.																			
Exuviaella spp.																			
Prorocentrum sp.																			
Silicoflagellidae																			
Euglena spp.																			
Peranema spp.																			
Melosira spp.			+																
Skeletonema spp.																			
Chaetoceros spp.																			
Chaetoceros spp.																			
Guillardia spp.																			
Rhizosolenia spp.																			
Thalassiothrix spp.																			
Navicula spp.																			
Pleurosigma spp.																			
Nitzschia spp.			+								+								

Table 10. cont'd

Day Time	3 0915	4 0945	5 0915	6 0900	7 0855	10 0915	11 0845	12 0825	13 0840	14 0825	17 0855	18 0925	19 0900	20 0955	21 0830	26 0830	27 0930	31 0850
BIOLOGICAL DATA																		
Unicellular plankton																		
Grammatophora spp.																		
Unidentified phytoplankton	++	++	++	++	++	++	++	++	+	+	++	++	++	++	++	++	++	++
Strombidium sp.																		
Unidentified Halteridae	+	+	+			+	+						+	+			+	
Tintinnopsis spp.									+++	+								
Unidentified Tintinnidae																		
Vorticella spp.				+		+	+	+				+	+	+	+			+
Corchurnia sp.																		
Pleuromma sp.																		
Unidentified ciliates	+	+	++	++	++	+	+	+	+	+	+	+	+	+	+	+	+	++
Multicellular plankton																		
Proales sp.																		
Synchaeta sp.	x	x				x	x	x						x				x
Unidentified Rotifera																		
Copepoda	x								x					x				x
Ostracoda																		
Chaetopoda																		
Coelenterata																		
Nauplii													x					
Megalops and Zoea																		
Veliger																		
Trochophore																		
Echinoderm larvae														x				
Pisces larvae	x																	
HYDROGRAPHIC DATA																		
Temperature, °C.	18.0	18.0	18.2	17.7	19.0	19.8	20.0	20.0	21.0	21.4	22.0	22.4	22.0	22.0	21.5	19.5	18.2	17.5
Salinity, ‰	36.0	36.0	36.1	36.2	36.3	36.4	36.5	36.5	36.5	36.6	36.5	36.6	36.5	36.5	36.6	36.8	36.8	36.7
NO ₃ -NO ₂				0.4					1.3					1.2			1.6	
In. PO ₄ -P									2.6					0.2			0.8	
Tot. PO ₄ -P														0.7			0.9	
Carbohydrate									0.6					0.8			1.5	
Protein									0.2					1.3			1.0	

Table 11.--Relative abundance of plankton with associated hydrographic data

J A N U A R Y 1957

Day	1	2	3	4	7	8	9	10	11	14	15	16	17	18	21	22	23	24	25	28	29	30	31	
Time	0855	1050	0835	0820	0940	0835	0835	0835	0845	0910	0855	0937	0925	0835	0900	0940	0920	0940	0830	0830	0825	0825	0840	
BIOLOGICAL DATA																								
Unicellular plankton																								
Amphidinium spp.																								
Cochlodinium spp.	+																							
Gymnodinium breve		+						+++																
G. simplex																								
G. splendens																								
G. spp.	+			+	+	+	+	+++	+++	+	+	+	+	+	+	+	+	+	+	+	+	++	+	+
Gyrodinium spirale																								
G. spp.	+	+					+											++						
Torodinium spp.																								
Polykrikos spp.																								
Nematodinium spp.																								
Pouchetia spp.																								
Oxyrrhis spp.																								
Ceratium furca	+	+										+												
C. fusus																								
C. tripos																								
Gonyaulax spp.																								
Peridiniopsis spp.			+																					
Peridinium depressum																								
P. digitale																								
P. divergens																								
P. spp.	+			+	+			+	+															+
Dinophysis tripos																								
D. spp.																								
Exuviella spp.																								
Prorocentrum sp.					+																			
Stilicoflagellidae																								
Euglena spp.																								
Peranema spp.																								
Melosira spp.	+	+	+	+	+																			
Skeletonema spp.																								
Chaetoceros spp.	+	+	+	+	+																			
Guinardia spp.																								
Rhizosolenia spp.																								
Thalassiothrix spp.																								
Navicula spp.																								
Pleurosigma spp.							+																	
Nitzschia spp.	+	+	+	+			+																	

Table 11. cont'd

Day	1	2	3	4	7	8	9	10	11	14	15	16	17	18	21	22	23	24	25	28	29	30	31	
Time	0855	1050	0835	0820	0940	0835	0835	0835	0845	0910	0855	0937	0925	0835	0900	0940	0920	0940	0830	0830	0825	0825	0840	
BIOLOGICAL DATA																								
Unicellular plankton																								
Grammatophora spp.																								
Unidentified phytoplankton																								
Strombidium sp.																								
Unidentified																								
Halteridae																								
Tinninopsis spp.																								
Unidentified																								
Tintinnidae																								
Vorticella spp.																								
Cothurnia sp.																								
Pleuronema sp.																								
Unidentified ciliates																								
Multicellular plankton																								
Proales sp.																								
Synchaeta sp.																								
Unidentified Rotifera																								
Copepoda																								
Ostracoda																								
Chaetopoda																								
Coelenterata																								
Nauplii																								
Megalops and Zoea																								
Veliger																								
Trochophore																								
Echinoderm larvae																								
Pisces larvae																								
HYDROGRAPHIC DATA																								
Temperature, °C.	18.0	19.5	17.5	17.0	19.5	19.5	19.0	19.5	20.0	20.0	19.0	21.0	22.0	17.5	18.0	19.0	19.5	20.0	19.5	21.0	21.4	19.5	21.9	
Salinity, ‰	36.9	36.7	36.7	36.7	36.3	36.3	36.3	36.4	36.2	36.1	36.2	36.3	36.1	36.4	36.1	36.2	36.2	36.1	36.2	36.3	36.3	36.6	36.9	
NO ₃ -NO ₂			0.4					0.2					0.1									0.5	0.3	
In. PO ₄ -P			1.0					0.3					1.0									0.1	0.2	
Tot. PO ₄ -P			1.0					0.5														0.4	0.6	
Carbohydrate			1.5					2.2					0.9									1.2	0.6	
Protein			0.6					1.0					3.5									1.0	0.5	

Table 12.-Relative abundance of plankton with associated hydrographic data

F E B R U A R Y 1957

Day	1	4	5	6	7	8	11	12	13	14	15	18	19	20	21	25	26	27	28
Time	1015	0850	0925	0835	1010	0930	1015	0910	0850	0835	0830	0900	0835	0855	0835	0835	0825	0825	0845
BIOLOGICAL DATA																			
Uncellular plankton																			
Amphidinium spp.													+						
Cochlodinium spp.							+												
Gymnodinium breve												+							
G. simplex							+					+							
G. splendens		+	+	+	+	+	+	+	+	+	+	++	+	+	+	+	+	+	+
Gyrodinium spirale																			
G. spp.	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Torodinium spp.																			
Polykrikos spp.							+												
Nematodinium spp.																			
Nematodinium spp.																			
Pouchetia spp.																			
Oxyrrhis spp.																			
Ceratium furca								+						+					
C. fusus																			
C. tripos																			
Gonyaulax spp.																			
Peridiniopsis spp.																			
Peridinium depressum																			
P. digitale																			
P. divergens																			
P. spp.	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Dinophysis tripos																			
D. spp.																			
Exuvia spp.																			
Prorocentrum sp.																			
Silicoflagellidae																			
Euglena spp.																			
Peranema spp.	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Melosira spp.	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Skeletonema spp.																			
Chaetoceros spp.	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Guinardia spp.																			
Rhizosolenia spp.																			
Thalassiothrix spp.																			
Navicula spp.																			
Pleurosigma spp.																			

Table 13.--Relative abundance of plankton with associated hydrographic data

M A R C H 1957

Day	1	4	5	6	7	8	8	8	11	12	13	14	15	18	19	20	21	22	25	26	27	29
Time	0830	0920	0830	0840	0840	0845	0855	0820	0825	0825	0825	0825	0825	0825	0840	0840	0915	0900	0840	0840	0840	0835
BIOLOGICAL DATA																						
Unicellular plankton																						
Amphidinium spp.																						
Cochlodinium spp.																						
Gymnodinium breve																						
G. simplex																						
G. splendens																						
Gyrodinium spirale																						
G. spp.																						
Torodinium spp.																						
Polysirkos spp.																						
Nematodinium spp.																						
Pouchetia spp.																						
Oxyrhis spp.																						
Ceratium furca																						
C. fusus																						
C. tripos																						
Gonyaulax spp.																						
Peridiniopsis spp.																						
Peridinium depressum																						
P. digitale																						
P. divergens																						
P. spp.																						
Dinophysis tripos																						
D. spp.																						
Exuviaella spp.																						
Prorocentrum sp.																						
Silicoflagellidae																						
Euglena spp.																						
Peranema spp.																						
Melosira spp.																						
Skeletonema spp.																						
Chaetoceros spp.																						
Guinardia spp.																						
Rhizosolenia spp.																						
Thalassiothrix spp.																						
Navicula spp.																						
Pleurosigma spp.																						
Nitzschia spp.																						

Table 13. cont'd

Day	1	4	5	6	7	8	11	12	13	14	15	18	19	20	21	22	25	26	27	29	
Time	0830	0920	0830	0840	0840	0845	0855	0820	0825	0825	0825	0910	0840	0940	0915	0900	0910	0840	0840	0835	
BIOLOGICAL DATA																					
Unicellular plankton																					
Grammatophora spp.					+																
Unidentified phytoplankton	+	++	++	+	+	+	+	+	++	++	++		++		++	+	+	+	+		
Strombidium sp.																					
Unidentified Halteridae					+	+++	+	+	+	+	+			++	++	+	+	+	+		
Tintinnopsis spp.	+			+	+	+															
Unidentified Tintinnidae																					
Vorticella spp.										+	+					+					
Cothurnia sp.																					
Pleuronema sp.																					
Unidentified ciliates	+		++	+	+	+	+	+	+	+	+	+	+			+	+			+	+
Multicellular plankton																					
Proales sp.																					
Synchaeta sp.																					
Unidentified Rotifera																					
Copepoda				x	x	x	x	x			x				x	x	x	x	x	x	x
Ostracoda																					
Chaetopoda																					x
Coelenterata						x															
Nauplii	x	x		x	x	x	x	x	x	x	x										
Megalops and Zoaea			x	x	x	x	x	x	x	x	x	xx			x	x	x	x	x	x	x
Veliger																					x
Trochophore																					
Echinoderm larvae																					
Pisces larvae													x								
HYDROGRAPHIC DATA																					
Temperature, °C.	20.9	21.5	21.5	21.2	21.5	21.0	18.8	19.5	20.2	20.8	21.3	22.5	22.8	24.0	23.8	22.9	24.8	23.5	20.9	22.0	
Salinity, ‰	35.7	35.8	35.5	35.2	35.3	35.1	34.9	35.0	35.3	35.0	35.4	34.8	34.8	34.8	34.8	35.0	35.0	34.8	34.4	34.6	
NO ₃ -NO ₂					2.2										1.0						
In. PO ₄ -P					1.0										0.4						
Tot. PO ₄ -P					1.6										1.6						
Carbohydrate															0.4						
Protein					6.1										6.5						

Table 14.--Relative abundance of plankton with associated hydrographic data

A P R I L 1957

Day	1	2	3	4	5	8	8	9	10	11	12	15	16	17	18	19	22	23	24	25	26	29	30	
Time	0925	0825	0930	0910	0835	0855	1020	0820	0830	1320	0850	0835	0830	0820	0835	0825	0820	0830	0830	0835	0830	0930	0910	
BIOLOGICAL DATA																								
Unicellular plankton																								
Amphidinium spp.																								
Cochlodinium spp.	+	+								+			+											
Gymnodinium breve						+																		
G. simplex						+																		
G. splendens																								
G. spp.																								
Gyrodinium spirale																								
G. spp.																								
Torodinium spp.																								
Polkrikos spp.																								
Nematodinium spp.																								
Pouchetia spp.																								
Oxyrrhis spp.																								
Ceratium furca																								
C. fusus																								
C. tripos																								
Gonaulax spp.																								
Peridiniopsis spp.																								
Peridinium depressum																								
P. ditale																								
P. divergens																								
P. spp.																								
Dinohystris tripos																								
D. spp.																								
Exuviella spp.																								
Prorocentrum sp.																								
Silicoflagellidae																								
Euglena spp.																								
Peranema spp.																								
Melosira spp.																								
Skeletonema spp.																								
Chaetoceros spp.																								
Guinardia spp.																								
Rhizosolenia spp.																								
Thalassiothrix spp.																								
Navicula spp.																								
Pleurosigma spp.																								
Nitzschia spp.																								

Table 14, cont'd

Day	1	2	3	4	5	8	8	9	10	11	12	15	16	17	18	19	22	24	25	26	29	30	
Time	0925	0825	0930	0910	0835	0855	1020	0855	0820	0830	1320	0850	0835	0830	0820	0835	0825	0830	0830	0835	0930	0910	
BIOLOGICAL DATA																							
Unicellular plankton																							
Grammatophora sp.					+																		
Unidentified																							
Mytoplankton	++	++	++	++	+	++	++	++	+	+	+	+	++	++	++	+	+	+	++	+	+	++	
Strombidium sp.																							
Unidentified																							
Halteriidae	+		+			+			+					+									
Tintinnopsis spp.	+	+				+			+					+									
Unidentified																							
Tintinnidae																							
Vorticella sp.	+	+	+			+			+		+			+									
Cothurnia sp.																							
Pleuonema sp.																							
Unidentified ciliates	+	+				+			+		+			+									
Multicellular plankton																							
Proales sp.																							
Synchaeta sp.																							
Unidentified Rotifera																							
Copepoda																							
Ostracoda																							
Cheetopoda																							
Coelenterata																							
Nauplii																							
Megalops and Zoaea	x	x				x	x	x				x		x				x	x				
Veliger																							
Trochophore																							
Echinoderm larvae																							
Piscea larvae																							
HYDROGRAPHIC DATA																							
Temperature, °C.	21.0	22.2	23.5	23.4	24.5	25.5	26.4	25.6	26.0	26.0	27.6	25.0	24.4	24.0	24.4	24.5	24.5	24.3	25.0	25.5	25.2	25.1	25.0
Salinity, ‰	34.6	34.6	35.2	35.1	35.3	35.2	35.0	35.2	35.1	35.0	35.0	34.8	35.0	35.1	35.0	35.1	35.1	35.0	35.0	35.5	35.2	35.1	35.6
NO ₃ -NO ₂																							
In. PO ₄ -P				1.5								1.1			0.8			0.9		1.0			
Tot. PO ₄ -P				0.3								0.5			0.2			0.4		0.1			
Carbohydrate				1.2								1.0			0.6			0.4		0.6			
Protein				0.5								0.2			0.2			0.3		0.2			
				0.7								0.5			0.3			0.5		0.5			

Table 15.--Relative abundance of plankton with associated hydrographic data

M A Y 1957

Day Time	1 0830	2 0840	3 0835	6 0915	7 0830	8 0825	9 0830	10 0830	13 0920	14 0825	15 0910	16 0750	17 0840	20 0900	21 0825	22 0900	23 0835	24 0840	
BIOLOGICAL DATA																			
Unicellular plankton																			
Amphidinium spp.	+								+					+					
Cochlodinium spp.	+	+							+				+						
Gymnodinium breve																			
G. simplex																			
G. splendens																			
G. spp.	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Gyrodinium spirale																			
G. spp.	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Torodinium spp.																			
Polykrikos spp.																			
Nematodinium spp.																			
Pouchetia spp.																			
Oxyrrhis spp.																			
Ceratium furca																			
C. fusus																			
C. tripos																			
Gonyaulax spp.																			
Peridiniopsis spp.																			
Peridinium depressum																			
P. digitale																			
P. divergens																			
P. spp.	+	+																	
Dinophysis tripos																			
D. spp.																			
Exuviella spp.																			
Prorocentrum sp.	+																		
Silicoflagellidae																			
Euglena spp.	+	+																	
Peranema spp.																			
Melosira spp.																			
Skeletonema spp.																			
Chaetoceros spp.																			
Guinardia spp.																			
Rhizosolenia spp.																			
Thalassiothrix spp.																			
Navicula spp.																			
Pleurosigma spp.																			
Nitzschia spp.																			

Table 15. cont'd

Day	1	2	3	6	7	8	9	10	13	14	15	16	17	20	21	22	23	24	
Time	0830	0840	0835	0915	0830	0825	0830	0830	0920	0825	0910	0750	0840	0900	0825	0900	0835	0840	
BIOLOGICAL DATA																			
Unicellular plankton																			
Grammatophora spp.																			
Unidentified phytoplankton	++	++		+	+	++	++	+	+	++			+	+	+	+	+		
Strombidium sp.				+															
Unidentified Halteridae	+			+															
Tintinnopsis spp.		+																	
Unidentified Tintinnidae				+	+	+	+	+					+	+	+	+	+	+	
Vorticella spp.	+	+		+			+												
Coturnia sp.																			
Pleuronema sp.																			
Unidentified ciliates	+	+	+	+	+	+	+	+	+				+	+	+	+	+	+	
Multicellular plankton																			
Proales sp.																			
Synchaeta sp.																			
Unidentified Rotifera	x	x			x		x	x						x	x	x	x	x	
Copepoda	x			x	x			x							x				
Ostracoda																			
Chaetopoda				x															
Coelenterata																			
Neurili																			
Meгалons and Zoöea	x	x		x	x	x	x	x	x	x			x						
Veliger	x				x									x					
Trochophore																			
Echinoderm larvae																			
Pisces larvae							x												
HYDROGRAPHIC DATA																			
Temperature °C.	25.6	25.9	26.5	25.5	25.1	25.0	24.5	24.8	26.8	27.1	27.2	26.7	27.5	28.8	29.5	29.8	29.0	29.0	
Salinity ‰	35.3	35.2	35.3	35.1	35.5	35.6	35.4	35.4	35.4	35.7	35.6	35.4	35.5	35.8	35.7	35.8	35.6	36.0	
NO ₃ -NO ₂		1.0					0.2					0.8					0.2		
In. PO ₄ -P		0.8					0.6					0.3					0.3		
Tot. PO ₄ -P		1.0					17.4					2.4					1.0		
Carbohydrate		0.3					0.7					1.4					0.7		
Protein		0.9					0.5					0.6					0.6		

Table 16.--Relative abundance of plankton with associated hydrographic data

J U N E 1957

Day Time	3 0855	4 0850	5 0825	6 1000	7 0825	10 0910	11 0930	12 0849	13 0840	14 0840	17 0845	18 0815	19 0840	20 0905	21 0845	24 0920	25 1000	26 0955	27 0835	28 0830	
BIOLOGICAL DATA																					
Unicellular plankton																					
Amphidinium spp.																					
Cochlodinium spp.		+																			
Gymnodinium breve			+																		
G. simplex																					
G. splendens		+																			
G. spp.		+																			
Gyrodinium spirale																					
G. spp.																					
Torodinium spp.																					
Polykrikos spp.																					
Nematodinium spp.																					
Pouchetia spp.																					
Oxyrrhis spp.																					
Ceratium furca																					
C. fusus																					
C. tripos																					
Gonyaulax spp.																					
Peridiniopsis spp.																					
Peridinium depressum																					
P. digitale																					
P. divergens																					
P. spp.																					
Dinophysis tripos																					
D. spp.																					
Exuviella spp.																					
Prorocentrum sp.																					
Silicoflagellidae																					
Euglena spp.																					
Persnema spp.																					
Melosira spp.																					
Skeletonema spp.																					
Chaetoceros spp.																					
Guinardia spp.																					
Rhizosolenia spp.																					
Thalassiothrix spp.																					
Navicula spp.																					
Pleurosigma spp.																					
Nitzschia spp.																					

Table 16. cont'd

Day	3	4	5	6	7	10	11	12	13	14	17	18	19	20	21	24	25	26	27	28	
Time	0855	0850	0825	1000	0825	0910	0930	0849	0840	0840	0845	0815	0840	0905	0845	0920	1000	0955	0835	0830	
BIOLOGICAL DATA																					
Unicellular plankton																					
Grammatophora spp.						+															
Unidentified phytoplankton	+	+	++	++	++	+	+	+	+	+	+	+	+	+	+	+	+	++	++	++	++
Strombidium sp.																					
Unidentified Halteridae		+	+	+																	
Tintinnopsis spp.																					
Unidentified Tintinnidae	+	+			+	+	+	+	+	+	+	+	+	+	+	+	+				
Vorticella spp.																					
Cothurnia sp.																					
Pleuronema sp.																					
Unidentified ciliates	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+				
Multicellular plankton																					
Proales sp.																					x
Synchaeta sp.																					
Unidentified Rotifera	x					x	x		x	x	x	x	x	x	x						
Copepoda																					
Ostracoda						xx	x														
Chaetopoda																					
Coelenterata								x													x
Nauplii	x									x	x	x									
Megalops and Zocea	x								x	x	x	x				x					
Veliger																					
Trochophore							x														
Echinoderm larvae																					
Pisces larvae																					
HYDROGRAPHIC DATA																					
Temperature °C.	28.5	29.4	29.1	31.0	29.5	27.9	28.5	28.7	28.4	28.8	28.3	28.4	28.6	29.2	29.8	29.0	29.5	29.7	30.0	30.0	30.0
Salinity ‰	35.8	36.0	35.9	36.0	35.7	36.3			33.1	36.9	36.7	37.0	36.8	36.9	36.7	36.8	36.3	36.7	36.2	36.2	36.1
NO ₃ -NO ₂				0.2					1.0		0.5			0.5						0.5	
In. PO ₄ -P				1.2					0.6		0.6			0.7						0.7	
Tot. PO ₄ -P				12.7					1.0		1.7			1.0						5.2	
Carbohydrate				1.2					1.2		1.4			0.5						0.3	
Protein				0.4					0.9		0.6			0.6						0.9	

Table 17.--Relative abundance of plankton with associated hydrographic data

J U L Y 1957

Day	1	2	3	5	8	9	10	11	12	15	16	17	18	19	22	23	24	25	26	29	30	31
Time	0845	0915	0820	0845	0845	0945	0830	0835	0830	0915	0905	0830	1000	0915	1010	0825	0835	0835	0835	0720	0835	0900
BIOLOGICAL DATA																						
Unicellular plankton																						
Amphidinium spp.		+											+									
Cochlodinium spp.																						
Gymnodinium breve																						
G. simplex																						
G. splendens	+	+	+	+	+	+++	+	+	+	+	+	+	+	+	+	+	+	+	+	+++	+	++
G. spp.																						
Gyrodinium spirale																						
G. spp.	+								+													+
Torodinium spp.																						
Polkrikos spp.	+	+		+														+				
Nematodinium spp.																						
Pouchetia spp.																						
Oxvrrhis spp.																						
Ceratium furca				+	+			+													+	+
C. fusus																						
C. tripos																						
Gonyaulax spp.	+			+	+		+	+	+							+					+	+
Peridiniopsis spp.				+	+				+													
Peridinium depressum			+																			
P. dilatate																						
P. diversens																						
P. spp.	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Dinophysis tripos																						
D. spp.																						
Exuviella spp.																						
Prorocentrum sp.		+		+	+																+	+
Silicoflagellidae	+			+	+																+	+
Euplena spp.	+	+	+	+	+																+	+
Peranema spp.																						
Melosira spp.																						
Skeletonema spp.																						
Chaetoceros spp.		+		+	+		+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Gutnardia spp.																						
Rhizosolenia spp.																						
Thalassiothrix spp.																						
Navicula spp.																						
Pleurosigma spp.																						
Nitzschia spp.																						
Grammatophora spp.				+																	+	+

Table 17. cont'd

Day Time	1 0845	2 0915	3 0820	5 0845	8 0845	8 0945	9 0830	10 0830	10 0835	11 0835	12 0830	15 0915	16 0905	17 0830	18 1000	19 0915	22 1010	23 0825	24 0835	25 0835	26 0835	29 0720	30 0835	31 0900	
<u>BIOLOGICAL DATA</u>																									
Unicellular plankton																									
Unidentified phytoplankton		+	++													++									
Strombidium sp.																									
Unidentified Halteriidæ			+	+	+																				
Tintinnopsis spp.																									
Unidentified Tintinnidæ			+	+	+																				
Vorticella spp.			+																						
Cothurnia sp.																									
Pleuronema sp.																									
Unidentified ciliates		+	+	+																					
Multicellular plankton																									
Proales sp.																									
Synchaeta sp.																									
Unidentified Rotifera	x	x	x	x	x																				
Copepoda	x	x																							
Ostracoda																									
Chaetopoda																									
Coelenterata																									
Nauplii																									
Megalops and Zoea	x																								
Veliger																									
Trochophore																									
Echinoderm larvae																									
Pisces larvae																									
<u>HYDROGRAPHIC DATA</u>																									
Temperature, °C.	30.5	30.0	30.0	30.0	30.0	30.0	30.2	30.5	30.1	30.0	30.0	30.4	30.8	30.3	30.3	29.9	31.0	30.0	30.0	30.0	30.5	30.7	31.5	30.5	
Salinity, ‰	38.6	35.1	35.1	35.4	35.8	36.1	36.2	36.0	35.6	35.6	35.6	35.1	36.0	35.9	35.5	35.5	35.5	35.4	35.0	32.4	35.3	35.3	35.2	34.0	
NO ₃ -NO ₂				1.1					0.5						0.3					0.4			1.2		
In. PO ₄ -P				0.5					0.4											1.1			0.7		
Tot. PO ₄ -P				1.6					0.8											1.7			0.8		
Carbohydrate				1.3					0.9											0.8			4.1		
Protein				0.9					8.0											1.0			0.6		

Table 18.--Relative abundance of plankton with associated hydrographic data

AUGUST 1957

Day	1	2	5	6	7	8	9	9	12	13	14	15	16	19	20	21	22	23	26	27	28	
Time	0835	0900	0900	0850	0835	0840	0835	0840	0910	0900	0900	0850	0820	1030	0840	0830	0840	0930	0940	0945		
BIOLOGICAL DATA																						
Unicellular plankton																						
Amphidinium spp.																						
Cochlodinium spp.																						
Gymnodinium breve																						
G. simplex																						
G. splendens					+	+	+	+	+	+	++	+++							++	++		
G. spp.	+	++	+	+++	++	+	+	+	+	+	+++								++	++		
Gyrodinium spirale																						
G. spp.	+																					
Torodinium spp.																						
Polysirkos spp.				+																		
Nematodinium spp.																						
Pouchetia spp.																						
Oxyrhis spp.																						
Ceratium furca		+	+	+	+	+	+															
C. fusus																						
C. tripos			+																			
Conaulax spp.	+	+	+	+	+	+	+	+	+	+												
Peridinium spp.		+	+	+	+	+	+	+														
Peridinium depressum				+																		
P. ditale																						
P. divergens		+	+	+	+	+	+	+	+	+	+++											
P. spp.	+	+	+	+	+	+	+	+	+	+												
Dinophysis tripos																						
D. spp.	+			+++																		
Exuviella spp.																						
Procertrum sp.			+++	+++	+++	+	+++															
Silicoflagellidae	+																					
Eulena spp.	+		+							+												
Peranema spp.																						
Melosira spp.					+	+	+	+	+	+												
Skeletonema spp.																						
Chaetoceros spp.	+		+		+	+	+	+	+	+												
Guinardia spp.		+							+													
Rhizosolenia spp.																						
Thalassiothrix spp.																						
Navicula spp.																						
Pleurosigma spp.																						
Nitzschia spp.										+												++

Table 18. cont'd

	Day	1	2	5	6	7	8	9	12	13	14	16	19	20	21	22	23	26	27	28	
Time	0835	0900	0850	0835	0840	0835	0840	0835	0910	0900	0900	0820	1030	0840	0830	0840	0930	0940	0945		
BIOLOGICAL DATA																					
Unicellular plankton																					
<i>Grammatophora</i> spp.																					
Unidentified phytoplankton		++																			
<i>Strombidium</i> sp.																					
Unidentified Halteriidae									+		+										
<i>Tintinnopsis</i> spp.									+												
Unidentified Tintinnidae		+							+	+	+										
<i>Vorticella</i> spp.										+											
<i>Cothurnia</i> sp.											+										
<i>Pleuronema</i> sp.																					
Unidentified ciliates		+							+	+	+										
Multicellular plankton																					
<i>Proales</i> sp.																					
<i>Synchaeta</i> sp.																					
Unidentified Rotifera																					
Copepoda		x							x		x										
Ostracoda																					
Chaetopoda																					
Coelenterata																					
<i>Nauplii</i>																					
Megalops and Zoea		x																			
<i>Veliger</i>		x																			
Trochophore																					
Echinoderm larvae																					
Pisces larvae									x												
HYDROGRAPHIC DATA																					
Temperature, °C.	30.1	30.5	30.1	29.0	30.0	30.0	30.0	30.2	31.0	29.5	30.1	30.0	29.5	31.0	30.0	30.7	31.0	30.8	29.5	30.0	
Salinity, ‰	34.4	35.3	32.8	32.4	33.7	33.5	34.3	34.3	34.6	34.9	35.0	34.8	34.9	34.7	33.4	34.8	35.1	34.6	34.4	34.8	
NO ₃ -NO ₂																					
In. PO ₄ -P																					
Tot. PO ₄ -P																					
Carbohydrate																					
Protein																					

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