Key Largo Coral Reef Marine Sanctuary

LITERATURE SURVEY AND WATER QUALITY MONITORING PROGRAM

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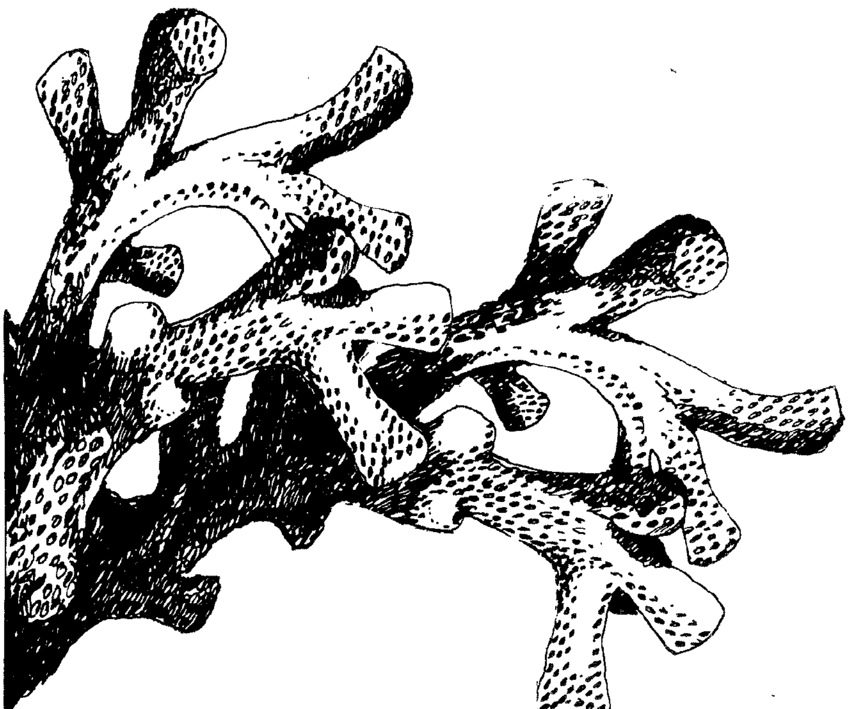

U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
OFFICE OF COASTAL ZONE MANAGEMENT

KEY LARGO CORAL REEF MARINE SANCTUARY

LITERATURE SURVEY AND WATER QUALITY

MONITORING PROGRAM

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INTRODUCTION

The Key Largo Coral Reef Marine Sanctuary, established on December 18, 1975, was created to preserve and protect the aesthetic appeal and natural state of the coral reef ecosystem within its boundaries (Figures 1 and 2). The Office of Coastal Zone Management of the National Oceanic and Atmospheric Administration has been charged with the responsibility of maintaining the Sanctuary; one of their principal tasks is the development and implementation of various types of monitoring programs which will provide data from which analyses of the present and future health of the Marine Sanctuary can be made.

A precursor to the development of any monitoring program is an examination of the existing literature to locate historical data suitable for use as a baseline against which new data can be evaluated. This report presents a review of the pertinent literature for the Key Largo Coral Reef Marine Sanctuary and adjacent areas. Unpublished data are also presented.

The literature review has been divided into four sections. The first section reviews water quality information for the Sanctuary and the following section reviews water quality for areas adjacent to the Sanctuary. The next two sections present, respectively, geological and biological studies conducted within the Sanctuary and geological and biological studies in the areas adjacent to the Sanctuary.

Water quality data for the Key Largo Coral Reef Marine Sanctuary are summarized in Table 2, while Table 5 presents water quality data for areas adjacent to the Marine Sanctuary.

Following the literature review is a discussion of water quality within the Sanctuary and factors that are important in maintaining a healthy reef environment. Recommendations are proposed for establishing a water quality monitoring program in the Sanctuary. This monitoring program will enable the Office of Coastal Zone Management to detect subtle, long-term changes in the water that flows through the Sanctuary. These recommendations emphasize long-term trends rather than transient disturbances such as hurricanes, occasional phytoplankton blooms, or severe cold spells, because the latter are unpredictable and ephemeral. Catastrophic events of short duration present severe logistical problems with respect to data collection and it is unlikely that the cost of monitoring such events would be justifiable.

METHODS

The search for water quality data began with the computerized information retrieval services available through the NOAA Library on Virginia Key, Miami, Florida. The search criteria were kept broad to ensure the retrieval of as many articles and unpublished documents as possible. The prime search words were "South Alantic Coast", "U.S. East Coast", "Florida Keys", and "Key Largo". From the references recovered using these key words, only those that dealt with the Atlantic coast of the Florida Keys between Miami and Key West were retained. This information was supplemented by interviews with scientists who have recently worked in the Florida Keys. The pertinent literature was examined during visits to several libraries, most of them in the Miami area. Appendix A summarizes the information sources used during the course of this project.

Appendix B presents a complete bibliography of the literature examined. Each article has been assigned a seven-character alphanumeric code composed of: the first three letters of the author's last name; his or her first initial; the last two digits of the publication year and a sequential alphabetic character for multiple publications in any given year. This code, borrowed from Bridges et al. (1978), can be adopted to computer listing, allows periodic updating and provides a convenient means of cross-indexing.

Several key words were selected from each article and the words compiled in a Key Word Index (Appendix C), arranged alphabetically and cross-indexed according to subject. Selected key words are not limited to those supplied by the author.

Appendix D is a copy of a computer print-out of data obtained by the Florida Department of Environmental Regulation at Station 28040975, located near the entrance to South Sound Creek, John Pennekamp State Park (see map in Appendix D).

In order to reduce the volume of material presented in this report, the original articles dealing with water quality have not been included as an appendix as was originally proposed. Instead, pertinent tables, graphs and figures were photocopied from the original articles and assembled as figures (Appendix E).

Figures 9, 11, 33, 41, and 42 are original summarizations of unpublished data supplied by Dr. George Griffin, University of Florida, Gainesville and the National Ocean Survey, Rockville, Maryland.

RESULTS

Water Quality Within the Sanctuary

Temperature:

The keepers of the Carysfort Light were the first to measure water quality in the Marine Sanctuary. Their daily records of surface water temperature were summarized by the U.S. Bureau of Fisheries and published by Vaughan (1918). He provided a table of 10-day means for the period 1878 to 1899, and presented maximum, minimum and mean temperatures for each interval (Figs. 3 and 4). Temperatures during this period ranged from 18.2°C to 30.3°C with a mean temperature of 25.8°C. Parr (1933), using the same data, constructed an average annual surface temperature curve for the period 1881 to 1885 and compared these data with data gathered from other lighthouses and lightships along the eastern coast of the U.S. (Fig. 5). He found that the Atlantic Coast of the U.S. could be divided into three areas of relatively uniform temperatures: the Straits of Florida, the Cape Hatteras region and the Gulf of Maine. Bumpus (1957) published mean monthly temperatures for Carysfort Light for the period 1878 to 1900 using the same data (Fig. 6). Vaughan (1918) and, to a lesser extent, Parr (1933) and Bumpus (1957) remain today the primary sources for surface temperature data in this area.

More recently Shinn (1966) presented bottom temperature data for Key Largo Dry Rocks (Station "A", Figs. 7 and 8) for the period February 1961 to February 1962. His data, derived from maximum-minimum thermometers placed on the bottom in less than 12 feet of water, show a temperature range of 20.0°C to 30.5°C at Key Largo Dry Rocks. Springer and McErlean (1962), in a study of tagged reef fishes, reported temperatures of 19.5°C and 21.9°C for December 7, 1960 and January 14, 1961, respectively, at Mosquito Bank, while at Molasses Reef temperatures were 25.0°C and 24.6°C for the same dates. Bottom temperatures (2.1 m) at Molasses Reef were monitored continuously during the period January to May 1974 by Griffin (unpublished data, Fig. 9). Griffin also measured temperature at a number of spot stations in the Sanctuary (Figs. 10 and 11) and found greater fluctuations closer to shore than in offshore waters.

Manker (1975) recorded summer surface temperatures at numerous locations in the Sanctuary during 1973 and 1974 (Figs. 12 and 13).

Salinity:

Manker (1975) and Griffin (1974, unpublished data) both measured surface salinity at a number of stations in the Sanctuary during 1973 and 1974. Manker's data appear in Fig. 13 and those of Griffin are summarized in Fig. 11. Their station locations are identified in Figs. 10 and 12, respectively.

Dissolved Oxygen:

Manker (1975) recorded dissolved oxygen at several stations in the Sanctuary. The data are shown in Fig. 13. Griffin (1974, unpublished data) also measured dissolved oxygen in the Sanctuary (Fig. 11).

Nutrients

No data on nutrient levels in Sanctuary waters have been found.

pH:

No pH measurements have been identified for Sanctuary waters.

Metals:

Manker (1975) measured lead, mercury, cobalt, zinc and chromium in bottom sediments, suspended particulate matter and coral specimens in the Sanctuary (Carysfort, Elbow and Molasses Reefs) as part of a larger study of Biscayne Bay, Florida Bay and the Upper Keys (Figs. 14 to 18). His stations are identified in Fig. 12.

Currents:

Manker (1975) measured surface currents at Molasses, Elbow and Carysfort Reefs (Fig. 13). He concluded that prevailing easterly winds produce a slight southwesterly drift in the back reef area. Manker's evidence for a southwesterly drift is unconvincing due to the small number of observations (maximum of 5 per station) and the long interval between measurements (4 days to one month) at any given station. Furthermore, a review of his data indicates that, in at least two instances, errors were made in calculating average current direction. Manker's data for stations 3 and 23, for example, are presented in Table 1. In each case, the map (Fig. 13), shows a southwesterly flow, yet no southwesterly component is apparent in the data for either station.

Table 1. Summary of Manker's (1975) current data for stations 3 (Molasses Reef) and 23 (Carysfort Reef). (Station 23 is identified as station 36 in Appendix B; see Fig. 12).

Station 3		Station 23	
Date	Current Direction (to)	Date	Current Direction (to)
6-11-73	70° (NE)	6-14-73	090° (E)
6-15-73	45° (NE)	7-18-73	000° (N)
7-19-73	350° (NW)	8-14-73	--- -
8-15-73	270° (W)	5-26-74	180° (S)
5-14-74	300° (NW)		

Turbidity:

Ambient turbidity levels were measured by towing an optical transmissometer along several traverses terminating at Carysfort, Elbow and Molasses Reefs (Fig. 19) by Dr. G. Griffin as part of his study of the effects of a dredge and fill operation on Key Largo (Griffin, 1974b). The unpublished results are shown in Figs. 20 to 25.

Griffin (1974, unpublished data) also measured turbidity at a number of stations in the Sanctuary (Fig. 11) as did Manker (1975), whose data are presented in Fig. 13.

Hanson and Poindexter (1972) measured irradiance and transmittance at Elbow Reef during the FLARE (Florida Aquanaut Research Expedition) project conducted by NOAA (Figs. 26 and 27). They found a mean transmittance of 8.1% $\pm$ 2.1% at Elbow Reef (normalized to a depth of 13 meters).

Pigments:

No pigment measurements were found for Sanctuary waters.

Coliform Bacteria:

No coliform bacteria counts were identified for Sanctuary waters.

Pesticides:

No pesticide measurements were identified for Sanctuary waters.

Summary:

Table 2 summarizes means and ranges of values for parameters measured in the Sanctuary.

Water Quality in Adjacent Areas

Review of water quality records in areas adjacent to, but outside the Marine Sanctuary is divided into three sections: Reef Tract, Florida Current and Inshore Areas. For the reef tract, the area of consideration extends from Fowey Rocks to Sombrero Key, while the area considered for inshore areas and Florida Current extends from Miami to Key West. A summary of available data is presented in Fig. 28 and Table 5 presents maximum and minimum values for all parameters discussed below.

REEF TRACT

Temperature:

Lighthouse temperature records for Fowey Rocks were published by Vaughan (1918) (Figs. 29 to 31), Parr (1933) (Fig. 5) and Bumpus (1957) (Fig. 32). Bumpus (1957) also published temperature records for Sombrero Key (Fig. 32). Griffin (1974, unpublished data) measured bottom temperatures at Hen and

Table 2. Summary of Water Quality Data for Key Largo Coral Reef Marine Sanctuary

Parameter	Units	Minimum	Mean	Maximum	Source	Methods	Period	Depth	Location	Type of Record
Temperature	°C	18.2	25.8	30.3	Vaughan (1918)	Hg thermometer	1878-1899	surface	Carysfort Reef	Daily
		22.0	27.0	30.8	Griffin (1974, unpub)	Thermistor/ Hg thermometer	10/72-5/74	various	various[1]	periodic
		22.5	25.4	28.5	Griffin (1974, unpub)	Rustrak #192 continuous recorder	1/74-6/74	2.1 m	Molasses Reef	continuous
		26.5	27.4	31.0	Manker (1975)	Thermistor/ Hg thermometer	6/73-8/73	surface	various[2]	periodic
		20.0	–[3]	30.5	Shinn (1966)	Taylor max/min thermometer	2/61-2/62	2.5 m	Key Largo Dry Rocks[4]	periodic[5]
Salinity	o/oo	34.6	36.0	36.6	Griffin (1974, unpub)	Beckman induction salinometer	10/72-5/74	various	various[1]	periodic
		36.3	36.7	36.9	Manker (1975)	Beckman induction salinometer	6/73-8/73	surface	various[2]	periodic
Dissolved Oxygen	ppm	6.1	7.2	9.3	Griffin (1974, unpub)	YSI #51-A oxygen meter	10/72-5/74	various	various[1]	periodic
		6.0	6.7	8.6	Manker (1975)	YSI #51-A oxygen	6/73-8/73	surface	various[2]	periodic
Turbidity	mg/l	0.01	0.9	8.0	Griffin (1974, unpub)	Hydroproducts Transmissometer	10/72-5/74	various	various[1]	periodic
		0.28	1.16	5.10	Manker (1975)	Hydroproducts	6/73-8/73	surface	various[2]	periodic
Transmittance	%	5.9	12.6	26.4	Hanson and Poindexter (1972)	Transmissometer Pyranometer	4/73	various	The Elbow	Daily for one week
Current Velocity	knots	0.0	0.3	0.7	Griffin (1974, unpub)	Hydroproducts rotor meter	10/72-5/74	various	various[1]	periodic
		0.1	0.2	0.6	Manker (1975)	Hydroproducts current meter	6/73-8/73	surface	various[2]	periodic
Metals:[6]	ppm									
Mercury		13	21	32	Manker (1975)	neutron activation analysis	5/74-6/74	surface	various[2]	periodic
Cobalt		3	5.9	10	Manker (1975)	neutron activation analysis	5/74-6/74	surface	various[2]	periodic
Chromium		97	151	266	Manker (1975)	neutron activation analysis	5/74-6/74	surface	various[2]	periodic

1 See Fig. 10 for list of Griffin's spot stations. Those within the Sanctuary (*) have been tabulated.
2 Stations 3, 6, 21, 23, 24, 35 and 36 (See Fig. 12).
3 No mean available for maximum/minimum data.
4 Station A only (See Fig. 7).
5 Can be considered continuous in the sense that the thermometer records continuously, but readings were taken periodically.

6 Suspended particulates.

Chickens Reef (depth 18 feet) and Mosquito Bank (depth 8 feet) with continuous recorders from January to May, 1974. The results are presented in Figs. 33 and 9 respectively. He also measured temperature at a number of spot stations along the reef tract. These data are summarized in Fig. 11. Manker (1975) measured surface temperature in his toxic metals survey, including stations at Fowey Rocks, Mosquito Bank, Hen and Chickens Reef, Hawk Channel, Pacific Reef and Triumph Reef. His station locations are shown in Fig. 12 and his data in Fig. 13.

Smith et al (1950) presented temperature data for Triumph Reef and Soldier Key (Fig. 34). Jones (1963) presented temperature data for Margot Fish Shoal (Fig. 35).

Vargo (1968) measured vertical and seasonal temperature variations at Fowey Rocks (Fig. 36) and Alligator Reef (Fig. 37).

Salinity:

Dole and Chambers (1918) presented daily salinity data (in g/kg chloride) for Fowey Rocks for the period 1914 to 1915 (Fig. 38) and correlated salinity fluctuations with precipitation.

Manker (1975) measured salinity (Fig. 13) at the locations mentioned above (see temperature section). Smith et al. (1950) recorded salinity at Triumph Reef and Soldier Key (Fig. 34) and Jones (1963) measured salinity at Margot Fish Shoal (Fig. 35). Griffin (1974, unpublished data) also recorded salinity at a number of stations along the reef tract (Figs. 10 and 11).

Dissolved Oxygen:

Dissolved oxygen has been reported for the reef tract by Manker (1975) (Fig. 13) and Griffin (1974, unpublished data) (Fig. 11). Smith et al. (1950) presented dissolved oxygen data for Triumph Reef and Soldier Key (Fig. 34) and Jones (1963) presented dissolved oxygen data for Margot Fish Shoal (Fig. 35).

Nutrients:

Smith et al. (1950) measured phosphates and nitrates at Triumph Reef and Soldier Key (Fig. 34) and Jones (1963) reported inorganic phosphate, total phosphorus, nitrate and nitrite data for Margot Fish Shoal (Fig. 35).

Simmons (1973) measured phosphate, nitrite, nitrate and ammonia at Brewster Reef (Fig. 39).

pH

Jones (1963) measured pH at Margot Fish Shoal (Fig. 35).

Metals:

Manker (1975) measured mercury, cobalt, chromium, zinc and lead concentrations at a number of locations on the reef tract (see Fig. 12 for station locations) in the suspended particulate fraction, bottom sediments, the 4 micron fraction of bottom sediments and in living corals (data presented in tabular form in Fig. 14 and graphically in Figs. 15 through 18).

Currents:

The concept of a southerly flow of water in the shallow back reef area (referred to as a "countercurrent") has been a source of contention over the years. A southwesterly current flowing through Hawk Channel was reported by Agassiz as early as 1888. Vaughan (1935) attempted to verify this current by measuring current direction and velocity at four stations in Hawk Channel between Soldier Key and Rodriguez Key (Fig. 40). Measured velocities ranged from 0.05 m/sec to 0.34 m/sec, with a mean value of 0.12 m/sec. Vaughan noted that there was more motion toward the west than toward the east, but admitted that his data were inadequate for positive conclusions regarding the countercurrent. Smith et al. (1950) mentioned a southward flowing countercurrent in the lagoon channel between the Keys and the outer reefs, but provided no supporting data.

Jones (1963) measured current velocity and direction at Margot Fish Shoal (Fig. 35). He concluded that water transport is controlled directly by the wind, a shift in wind direction being reflected by a corresponding change in current direction within one hour (Fig. 35). He reported that tides have little influence on current patterns, that the countercurrent does not appear to exist shoreward of the outer reef, and that the general net flow is toward the north, probably about 0.1 m/sec.

Manker (1975) recorded current velocity and direction at various stations in the reef tract (Fig. 13).

Griffin (1974, unpublished data) recorded current velocity and direction every three hours for one month at Hen and Chickens Reef (Fig. 41). His data indicate a predominating current toward the northeast.

The National Ocean Survey (1963, unpublished data) measured currents every hour for four days at two depths (2 meters and 4 meters) in Hawk Channel between Soldier Key and Fowey Rocks (Fig. 42). The data show a predominant northeasterly flow along the bottom and an easterly flow at mid depth.

Enos and Perkins (1977) noted that a Florida countercurrent on the shallow shelf has been postulated but that it has not been adequately documented. They suggest that tide-induced water movement may result in a weak countercurrent southwestward along the shelf margin.

Turbidity:

Manker (1975) reported turbidity readings for a number of stations on the reef tract (Fig. 13) and Griffin (1974, unpublished data) gathered data on turbidity on the reef tract (Fig. 11). Griffin (1974, unpublished data) also recorded turbidity along two transects terminating at Pacific Reef and at Crocker Reef using an optical transmissometer (Figs. 20 and 25).

Pigments:

No records of pigment measurements have been found for Florida reef tract waters.

Coliform Bacteria:

No measurements of coliform bacteria have been found for Florida reef tract waters.

Pesticides:

No measurements of pesticide concentrations are available for reef tract waters.

FLORIDA CURRENT

Temperature:

Most reports dealing with the Florida current present temperature data. One, in particular, is noteworthy because it is a comprehensive summary of data accumulated during the past fifty years. This is the report by Churgin and Halminski (1974). Their Key West region (region 13) includes the area just south of the Sanctuary, from 23° to 25° north latitude (Fig. 43). Fig. 44 presents a temperature salinity curve for this region and temperature data for various months and depths are shown in Fig. 45.

Vargo (1968) presented temperature data for the Florida Straits, including temperature salinity envelopes for eight stations in the Florida Current (Fig. 46). Bsharah (1957) presented temperature data for 40 Mile Station (located 40 miles east of Miami) (Fig. 47) and Miller et. al. (1953) did the same for 10 Mile Station (10 miles east of Miami) (Fig. 48). Corcoran and Alexander (1963) measured vertical distribution of temperature over a 31 month period at 40 Mile Station (Fig. 49). Gomberg (1976) presented vertical temperature profiles for two stations in the Florida Current south of Key West (Fig. 50).

Salinity:

Salinity, like temperature, is reported in almost all the literature on the Florida Current. Churgin and Halminski (1974) summarized this data (Fig. 51) for the Key West region and presented a composite temperature salinity curve (Fig. 44). Vargo (1968) presented temperature salinity envelopes for eight stations in the Florida Current (Fig. 46). Bsharah (1957) presented data on vertical and seasonal variations in salinity at 40 mile station (Fig. 47) and Miller *et al*. (1953) did the same for 10 mile station (Fig. 52).

Dissolved Oxygen

Bsharah (1957) measured seasonal and vertical distribution of dissolved oxygen at 40 mile station (Fig. 47) and Churgin and Halminski (1974) summarized dissolved oxygen data for the Key West region (Fig. 53). Gomberg (1976) presented vertical dissolved oxygen profiles for two stations in the Florida Current south of Key West (Fig. 50).

Nutrients:

Alexander and Corcoran (1963) measured phosphate in the Florida Current from Miami to Cape Canaveral (Fig. 54). Corcoran and Alexander (1963) measured vertical distribution of ammonia, silicates and Kjeldahl nitrogen at 40 Mile Station and studied seasonal changes in the vertical distributions of phosphate-phosphorus and nitrate-nitrite nitrogen during the period May, 1958 to November 1960 (Fig. 49).

Bsharah (1957) measured nitrate, phosphate and total phosphorus at 40 Mile Station (Fig. 55).

Gomberg (1976) included phosphorus measurements in his study of the area between Key West and Cuba (Fig. 50).

Miller et al (1953) measured phosphate and nitrate at 10 Mile Station (Fig. 52) and Churgin and Halminski (1974) summarized phosphate records for the Key West region (Fig. 56).

pH:

No records of pH have been found for the Florida Current in the vicinity of the Marine Sanctuary.

Metals:

Alexander and Corcoran (1967) measured copper concentrations at eight stations between Fowey Rocks and Cat Cay (Fig. 57). Corcoran and Alexander (1963) measured the vertical distribution of iron at 40 Mile Station (Fig. 49) and vertical distribution of iron, copper and nickel in the Florida Current (Corcoran and Alexander, 1964) (Fig. 58).

Currents:

Most papers on the Florida Current deal in some way or another with currents, but most studies have focused on the Miami area or along transects running from Miami to Bimini, Fowey Light to Cat Cay, Sombrero Reef to Cay Sal Bank or Key West to Cuba. The edges of the Current (at depths less than 100 meters) in the vicinity of the Sanctuary have been ignored.

An important series of reports was published by Dr. Thomas N. Lee and his associates (Lee, 1972; 1975a; 1975b; Lee et al., 1977a; 1977b; 1977c). These reports examine the phenomenon of spin-off eddies and their effect on shallow water circulation in the Miami-Fort Lauderdale area. These eddies, which occur on the average of once per week, are recognized as warm, southward-oriented extrusions of the Florida Current. They appear to evolve as part of the final growth stage of unstable meanders of the Florida Current and both the meanders and eddies appear to be linked to wind perturbations (Lee et al., 1977b).

Turbidity:

Griffin (1974, unpublished data) measured turbidity in offshore waters (Fig. 11) up to two miles seaward of the outer reefs.

Manheim et al. (1970) found that appreciable amounts of suspended matter (greater than 1.0 mg/liter) in surface waters of the Atlantic continental margin are confined to nearshore areas. In the Straits of Florida a "strongly birefringent, fibrous material" was especially abundant. This material appeared to be derived from toilet paper and it was suggested that ship refuse is the most likely source.

Pigments:

Miller et al. (1953) reported seasonal variation of plant pigments at 10 Mile Station (Fig. 59) and Alexander and Corcoran (1967) studied seasonal changes in chlorophyll "a" concentration in the Florida Current during 1963 (Fig. 57).

Coliform Bacteria:

No studies of coliform bacteria concentrations have been identified for the waters of the Florida Current in the vicinity of the Sanctuary.

Pesticides:

No pesticide measurements have been found for Florida Current waters in the vicinity of the Marine Sanctuary.

INSHORE AREAS

Temperature:

Griffin (1974, unpublished data) measured surface temperature at numerous stations in the shallow waters along the Florida Keys (see Fig. 10 for station locations). These data are summarized in Fig. 11, categorizing the stations into three distinct groups: tidal creeks, Hawk Channel and inner reefs.

Manker (1975) also measured surface temperature at a number of stations on both sides of the Florida Keys (locations shown in Fig. 12; data presented in Fig. 13).

The Florida Department of Environmental Regulation has been monitoring surface water temperature at a number of coastal stations throughout the State. One of these (No. 28-04-0975) is located just inshore of the Marine Sanctuary, adjacent to channel marker #2 at the entrance to the John Pennekamp Coral Reef State Park Marina. This comprehensive set of data, measured monthly since 1974, has not yet been summarized or published. A copy of the raw data is included as Appendix D.

Harold Hudson (personal communication, 1979) has unpublished records of bottom water temperature dating from 1974. His measurements, made at Snake Creek, Hen and Chickens Reef, and at a third station midway between them, are part of a study of the effects of temperature on coral growth.

Dawes et al. (1974) determined seasonal temperature variations at Molasses Key (just south of Pigeon Key) and Bahia Honda Key as part of their study of the alga Eucheuma (Fig. 60).

Temperature data were collected by the Florida Department of Pollution Control (1973) (now the Department of Environmental Regulation) in residential canals of Key Largo (Fig. 61) and Michel (1973) measured temperature in a residential canal system at Venetian Shores, just north of Snake Creek (Figs. 62 and 63). Chesher (1974) measured temperature in a number of residential canals in his survey of canals in the Florida Keys (Fig. 69). His station locations are identified in Figs 64 through 68.

Shinn (1966) published a one year record of bottom temperatures at two inshore stations near Key Largo Dry Rocks (Stations "B" and "C", Figs. 7 and 8).

Salinity:

Manker (1975) and Griffin (1974, unpublished data) included salinity measurements in inshore waters in their water quality surveys (Figs. 13 and 11, respectively).

Inshore salinity (reported as conductivity) is included in the Florida D.E.R. data in Appendix D and salinity was measured in the residential canals at Venetian Shores by Michel (1973) (Fig. 63). Chesher (1974) measured salinity in a number of canals in the Florida Keys (Fig. 69).

Dissolved Oxygen:

Manker (1975) and Griffin (1974, unpublished data) measured dissolved oxygen in inshore areas (Figs. 13 and 11, respectively).

Dissolved oxygen in residential canals was measured by the Florida Department of Pollution Control (1973) (Fig. 61) and at Venetian Shores by Michel (1973) (Fig. 63). Chesher (1974) included dissolved oxygen among the parameters he measured in his survey of residential canals in the Florida Keys (Fig. 69).

Dissolved oxygen has been measured monthly since 1974 by the Florida Department of Environmental Regulation (Appendix D) at their Pennekamp Station.

Nutrients:

Dawes et al. (1974) measured nitrate, nitrite, and phosphate concentration at Bahia Honda and Molasses Key (Fig. 60).

Michel (1973) determined nitrate and phosphate concentrations in the residential canal system at Venetian Shores (Fig. 63) and the Florida Department of Pollution Control (1973) measured phosphate, nitrate and organic nitrogen in numerous canals in the Florida Keys (Fig. 61).

Organic nitrogen, ammonia nitrogen, nitrate and total phosphorus have been measured monthly since 1974 by the Florida Department of Environmental Regulation (Appendix D) at their station near the entrance to John Pennekamp State Park.

Chesher (1974) determined orthophosphate and nitrate in his Florida Keys canal survey (Fig. 69).

pH:

Dawes et al. (1974) included pH measurements in their study of water quality at Molasses and Bahia Honda Keys (Fig. 60).

The Florida Department of Environmental Regulation data (Appendix D) include pH measurements.

Chesher (1974) determined pH in his survey of residential canals in the Florida Keys (Fig. 69).

Metals:

Manker (1975) included numerous nearshore stations in his toxic metals survey (Fig. 13). He determined mercury, cobalt, chromium, zinc and lead concentrations in suspended particulates, bottom sediments and coral specimens.

The Florida Department of Pollution Control (1973) measured chromium, copper, manganese, iron, nickel, lead, cadmium and cobalt in the waters and bottom sediments of residential canals in the Florida Keys (Fig. 61).

The Florida Department of Environmental Regulation water quality data (Appendix D) include cadmium, copper, iron, lead and zinc measurements.

Currents:

Manker (1975) measured current velocity and direction at a number of near-shore stations (Fig. 13).

Turbidity:

Both Manker (1975) and Griffin (1974, unpublished data) measured turbidity in inshore areas (Figs. 13 and 11, respectively).

Chesher (1974) measured turbidity in Jackson Turbidity Units (JTU) as well as horizontal visibility (Fig. 69) in his canal survey of the Florida Keys.

Turbidity is routinely monitored at John Pennekamp State Park by the Florida Department of Environmental Regulation (Appendix D).

Pigments:

Chlorophylls A, B and C are monitored by the Florida Department of Environmental Regulation (Appendix D), and color is also routinely determined.

Coliform Bacteria:

The Florida Department of Environmental Regulation performs coliform counts at their John Pennekamp State Park sampling station (Appendix D).

Chesher (1974) presented coliform data for a number of residential canals in the northern Florida Keys (Fig. 69).

Pesticides:

Concentrations of the pesticides Aldrin, Dieldrin, Heptachlor epoxide, DDE, and DDT in canal sediments in the Florida Keys were measured by Chesher (1974) (Fig. 70). The highest concentration encountered was that of p,p'-DDT, 328.2 ppb.

The Monroe County Mosquito Control District, under the jurisdiction and supervision of the Office of Entomology of the Florida Department of Health and Rehabilitative Services in Jacksonville, has been applying insecticides in the Florida Keys in an attempt to control mosquito populations.

Although these substances are sprayed along the land areas of the Florida Keys, there is a good probability that some portion of the applied insecticides ultimately finds its way to the inshore waters adjacent to the Marine Sanctuary.

Mosquito larvae are controlled by spraying a mixture of No. 2 diesel fuel, motor oil and Triton X207 from trucks. Another method, used since April 1979, consists of dropping small briquettes of Altosid SR-10 in standing bodies of water. This substance is a growth regulator that disrupts the mosquito's life cycle.

Adult mosquitos are sprayed on the ground with Baytex and in the air with Dibrom 14. Application volumes (in gallons) during Fiscal Year 1979 are shown in Table 3. The data reveal that peak insecticide use occurs in the summer and minimum use in the winter. Formulations are presented in Table 4.

Table 3. Monthly application rates (in gallons) of ground-applied adulticide, ground larvicide, air-applied adulticide and numbers of ALTOSID briquettes applied in Monroe County, Florida from October 1978 to September 1979[1].

Month	Ground* Adulticide	Ground* Larvicide	Air* Adulticide	ALTOSID Briquettes
October 78	178	12,310	151	
November 78	134	5,117	430	
December 78	42	1,579	0	
January 79	30	2,319	20	
February 79	20	211	0	
March 79	17	1,153	63	
April 79	27	7,119	0	250
May 79	200	6,195	753	159
June 79	214	3,410	913	697
July 79	251	5,552	678	782
August 79	24	6,630	279	216
September 79	160	7,738	422	166
Totals	1,517 gal.	59,333 gal.	3,709 gal.	2,270

[1]Source: Office of Entomology, Florida Department of Health & Rehabilitative Services, Jacksonville, Florida (personal communication, May, 1980).

* See Table 4 for formulations.

Table 4. Formulations of ground applied adulticide and larvicide and air applied adulticide used by Monroe County Mosquito Control District

Type of Insecticide	Ingredients	%
Adulticide, ground	Baytex[1]	93.0
Larvicide, ground	No. 2 Diesel Fuel	96.1
	Triton X 207	2.9
	30 wt. ND Motor Oil	1.0
Adulticide, air	Dibrom 14[2]	4.0
	Ortho Additive	5.5
	No. 2 Diesel Fuel	57.2
	X Lite Fog Oil	33.3

[1]Also known as Fenthion; chemical name Dimethyl methylthiotolyl phosphorothioate

[2] Also known as Naled; chemical name Dimethyl 1, 2 -dibromo - 2,2 - dichloroethyl phosphate.

Source: Narrative description of temporary control activities, Monroe County, for fiscal year 1979-1980. Mimeographed report from Lois M. Ryan, Director, Monroe County Mosquito Control District.

Summary:

Table 5 summarizes reported ranges of water quality parameters for areas adjacent to the Marine Sanctuary.

Table 5. Summary of ranges of values reported for water quality parameters in areas adjacent to the Key Largo Coral Reef Marine Sanctuary. (Asterisks indicate values estimated from graphs.)

A. REEF TRACT

Parameter	Units	Min.	Max.	Source	Remarks
Temperature					
	°C	15.6	31.2	Vaughan, 1918	
	°C	25.5	29.0	Griffin, 1974, unpubl. data	
	°C	18.1	30.7	Bumpus, 1957	converted from °F
	°C	23	29	Parr, 1933	*
	°C	19.58	30.5	Smith *et al.*, 1950[1]	
	°C	21	30	Jones, 1963	*
	°C	15	32	Schmidt and Davis, 1978	*
	°C	25.7	30.8	Manker, 1975[2]	

Table 5A. (continued)

Parameter	Units	Min.	Max.	Source	Remarks
Salinity	o/oo	34.2	38.8	Dole and Chambers, 1918	*
	o/oo	35.25	36.5	Smith _et_ _al_., 1950[1]	
	o/oo	36	38	Jones, 1963	*
	o/oo	34	39	Schmidt and Davis, 1978	*
	o/oo	35.9	36.4	Griffin, 1974, unpubl. data	
	o/oo	36.6	37.7	Manker, 1975[2]	
Dissolved Oxygen	ppm	6.2	8.6	Manker, 1975[2]	
	% Sat.	93.3	106.7	Smith _et_ _al_., 1950[1]	
	% Sat.	85	126	Jones, 1963	
	% Sat.	100	119	Griffin, 1974, unpubl. data	
	mg-At/l	.375	.447	Smith _et_ _al_, 1950[1]	
pH	-	7.0	8.3	Jones, 1963	
Turbidity	mg/l	0	10	Griffin, 1974, unpubl. data	*
	mg/l	0.24	1.68	Manker, 1975[2]	
Trans-mittance	-	0.032	0.310	Hanson & Poindexter, 1972	
Currents	knots	0	0.79	Jones, 1963	*
	knots	0	0.5	N.O.S., 1963, unpubl. data	*
	knots	0.2	0.6	Manker, 1975[2]	
Phosphate	ug-At/L	0	0.10	Smith _et_ _al_, 1950[1]	
	ug-At/L	0	0.2	Jones, 1963	inorganic
	ug-At/L	0.18	0.3	Jones, 1963	total
	ug-At/L	0.02	0.21	Simmons, 1973	inorganic
	ug-At/L	1.00	1.15	Simmons, 1973	total
Nitrate	ug-At/L	0	0.2	Smith _et_ _al_., 1950	
	ug-At/L	0.12	1.96	Simmons, 1973	
Nitrite	ug-At/L	0.01	0.13	Simmons, 1973	
Ammonia	ug-At/L	1.10	3.01	Simmons, 1973	
Pesticides	-	-	-	-	
Metals:					
Cd	-	-	-	-	
Co	ppm	1	12	Manker, 1975[2]	suspended partic.
	ppm	0.1	0.3	Manker, 1975[2]	sediments
	ppm	2	178	Manker, 1975[2]	4 micron fraction
	ppb	58	882	Manker, 1975[2]	corals

Table 5A. (continued)

Parameter	Units	Min.	Max.	Source	Remarks
Cu	-	-	-	-	
Cr	ppm	37	141	Manker, 1975[2]	suspended partic.
	ppm	5	10	Manker, 1975[2]	sediments
	ppm	15	34	Manker, 1975[2]	4 micron fraction
	ppb	361	1381	Manker, 1975[2]	corals
Fe	-	-	-	-	
Hg	ppm	6	21	Manker, 1975[2]	suspended partic.
	ppm	0.1	0.4	Manker, 1975[2]	sediments
	ppm	1	137	Manker, 1975[2]	4 micron fraction
	ppb	36	549	Manker, 1975[2]	corals
Mn	-	-	-	-	
Ni	-	-	-	-	
Pb	ppm	14	34	Manker, 1975[2]	sediments
Si	-	-	-	-	
Zn	ppm	1	22	Manker, 1975	sediments
	ppm	3	141	Manker, 1975	4 micron fraction
	ppb	891	4767	Manker, 1975	corals
Pigments	-	-	-	-	
Coliform	-	-	-	-	

B. FLORIDA CURRENT[3]

Parameter	Units	Min.	Max.	Source	Remarks
Temperature	°C	17	25	Gomberg, 1976	*
	°C	15	30	Vargo, 1968	*
	°C	26	30	Corcoran and Alexander, 1963	*
	°C	23	32	Bsharah, 1957	*
	°	13	30	Miller _et al._, 1953	*
	°C	10.90	31.80	Churgin & Halminski, 1974	
Salinity	o/oo	36	36.5	Vargo, 1968	*
	o/oo	35	36.5	Miller _et al._, 1953	*
	o/oo	34.16	37.20	Churgin & Halminski, 1974	
	o/oo	35.8	36.3	Griffin, 1974, Unpubl. data	

Table 5B. (continued)

Parameter	Units	Min.	Max.	Source	Remarks
Diss. Oxygen	ml/l	3.2	4.5	Bsharah, 1957	*
	ml/l	2.87	6.06	Churgin & Halminski, 1974	
	% Sat.	80	108	Gomberg, 1976	*
	% Sat.	95	114	Griffin, 1974, unpubl, data	
pH	-	-	-	-	
Turbidity	mg/l	0	8	Griffin, 1974, unpubl. data	
Currents	knots	0.97	4.66	Lee _et al_., 1977a	
Phosphate	ug-At/l	<.1	0.8	Miller, _et al_, 1977	*
	ug-At/l	0	0.5	Gomberg, 1976	*
	ug-At/l	0	0.1	Corcoran and Alexander, 1963	*
	ug-At/l	0	0.4	Bsharah, 1957	* PO_4-P
	ug-At/l	1.0	1.9	Bsharah, 1957	* Total P
	ug-At/l	0	1.22	Churgin & Hlaminski, 1974	
Nitrate	ug-At/l	<5	30	Miller _et al_., 1953	*
	ug-At/l	<5	>25	Bsharah, 1957	*
Nitrite	-	-	-	-	
Ammonia	ug-At/l	0.7	3.0	Corcoran and Alexander, 1963	*
Pesticides	-	-	-	-	
Metals:					
Cd	-	-	-	-	
Co	-	-	-	-	
Cu	ug/l	2	19	Alexander & Corcoran, 1967	* soluble
	ug/l	0	0.7	Alexander & Corcoran, 1967	* particulate
Cr	-	-	-	-	
Fe	ug/l	5	8.4	Corcoran and Alexander, 1963	* particulate
	ug/l	0	4	Corcoran and Alexander, 1963	* soluble
	ug/l	5.5	8.5	Corcoran and Alexander, 1964	* particulate
	ug/l	0	6.7	Corcoran and Alexander, 1964	* soluble
Hg	-	-	-	-	
Mn	-	-	-	-	
Ni	ug/l	0.5	4	Corcoran and Alexander, 1964	* soluble
	ug/l	0.01	0.15	Corcoran and Alexander, 1964	* particulate

Table 5B. (continued)

Parameter	Units	Min.	Max.	Source	Remarks
Pb	-	-	-	-	
Si	ug-At/1	0.15	0.3	Corcoran and Alexander, 1963 *	
Zn	-	-	-	-	
Pigments	mg/m^3	0.2	0.3	Alexander and Corcoran, 1963 *	chlorophyll
	mg/m^3	0	0.7	Alexander and Corcoran, 1967 *	chlorophyll
Coliform	-	-	-	-	

C. INSHORE AREAS

Parameter	Units	Min.	Max.	Source	Remarks
Temperature	°C	13.3	33.8	Shinn, 1966	
	°C	19.5	28.5	Griffin, 1974, unpubl. data	
	°C	18.25	32.3	Smith _et al._, 1950[4]	
	°C	20.5	33.0	Dawes _et al._, 1974	
	°C	26.9	32.0	Manker, 1975[5]	
	°C	25.40	32.60	Chesher, 1974	canals
	°C	23.0	27.0	Fla. Dept. Poll. Cont., 1973	
	°C	15.8	24.8	Michel, 1973	canals
	°C	20.5	33.7	Griffin, 1974, unpubl. data	canals
Salinity	o/oo	33.06	39.26	Smith _et al._, 1950[4]	
	o/oo	35.2	36.9	Griffin, 1974, unpubl. data	
	o/oo	30.96	37.0	Manker, 1975[5]	
	o/oo	32.25	40.80	Chesher, 1974, unpubl. data	canals
	o/oo	36.442	37.918	Michel, 1973	canals
	o/oo	27.6	43.5	Griffin, 1974, unpubl. data	canals
Diss. Oxygen	ppm	0.9	9.6	Manker, 1975[5]	
	ppm	0	13.15	Chesher, 1974	canals
	ppm	0.2	7.8	Fla. Dept. Poll. Cont., 1973	canals
	ppm	0	10.8	Griffin, 1974, unpubl. data	canals
	mg-At/1	0.297	0.525	Smith _et al._, 1950	
	ml/1	3.12	5.98	Michel, 1973	canals
	% Sat.	78.3	117.0	Smith _et al._, 1950[4]	
	% Sat.	84	118	Griffin, 1974, unpubl. data	
	% Sat.	0	164	Griffin, 1974, unpubl. data	canals
	% Sat.	61.2	117.0	Michel, 1973	canals

Table 5C (continued)

Parameter	Units	Min.	Max.	Source	Remarks
pH	-	7.6	9.1	Dawes *et al.*, 1974	
		8.17	9.32	Chesher, 1974	canals
Turbidity	mg/l	0	27.4	Griffin, 1974, unpubl. data	
	mg/l	0.19	10.2	Manker, 1975[5]	
	mg/l	2	43	Griffin, 1974, unpubl. data	canals
	JTU	1.30	36.60	Chesher, 1974	canals
	visibility	1.0	32.0	Chesher, 1974	canals (in feet)
Trans-mittance	T/10 cm	0.45	0.87	Griffin, 1974, unpubl. data	canals
Currents	knots	0.094	0.657	Vaughan, 1935	
		0.1	1	Manker, 1975[5]	
Phosphate	ppm	0.022	0.21	Dawes *et al.*, 1974	
	ppm	0.03	0.07	Fla. Dept. Poll. Cont., 1973	canals
	ppm	0	15.000	Chesher, 1974	canals, ortho-phosphate
	ug-At/l	0	0.06	Smith *et al.*, 1950	
	ug-At/l	0.5	2.46	Michel, 1973	canals
Nitrate	ppm	0.0026	1.000	Dawes *et al.*, 1974	
	ppm	0.20	0.26	Fla. Dept. Poll. Cont., 1973	canals
	ppm	0.02	0.11	Chesher, 1974	canals
	ug-At/l	0	1.6	Smith *et al.*, 1950	
		0.20	0.60	Michel, 1973	canals
Nitrite	ppm	0.0007	0.0264	Dawes *et al.*, 1974	
Ammonia	mg/l	0.76	1.48	Fla. Dept. Poll. Cont., 1973	canals
Pesticides					
Aldrin	ppb[6]	12.2	44.5	Chesher, 1974	canal sediments
Heptachlor Epoxide	ppb[6]	7.7	18.3	Chesher, 1974	canal sediments
Dieldrin	ppb[6]	11.1	39.8	Chesher, 1974	canal sediments
o,p' DDE	ppb[6]	14.8	27.4	Chesher, 1974	canal sediments

Table 5C (continued)

Parameter	Units	Min.	Max.	Source	Remarks
p,p' DDE	ppb[6]	12.3	43.7	Chesher, 1974	canal sediments
o,p' DDT	ppb[6]	9.6	20.4	Chesher, 1974	canal sediments
p,p' DDT	ppb[6]	Trace	328.2	Chesher, 1974	canal sediments
Metals:					
Cd	mg/l	0.0015	0.002	Fla. Dept. Poll. Cont., 1973	canals
	ppm	0.17	0.25	Fla. Dept. Poll. Cont., 1973	canal sediment
Co	ppm	1	22	Manker, 1975[5]	
	mg/l	0.01	0.03	Fla. Dept. Poll. Cont., 1973	canals
	mg/l	0.1	0.6	Manker, 1975[5]	sediment
	mg/kg	2.2	8.0	Fla. Dept. Poll. Cont., 1973	canal sediment
	ppm	1	52	Manker, 1975[5]	4 micron fraction
Cu	mg/l	0.00	0.16	Fla. Dept. Poll. Cont., 1973	canals
	mg/l	1	10	Fla. Dept. Poll. Cont., 1973	canal sediments
Cr	ppm	25	345	Manker, 1975	suspended partic.
	mg/l	0.02	0.20	Fla. Dept. Poll. Cont., 1973	canals
	ppm	3	23	Manker, 1975	sediment
	mg/kg	5.5	11.0	Fla. Dept. Poll. Cont., 1973	canal sediment
	ppm	7	34	Manker, 1975	4 micron fraction
Fe	mg/l	.01	.35	Fla. Dept. Poll. Cont., 1973	canals
	mg/kg	280	390	Fla. Dept. Poll. Cont., 1973	canal sediment
Hg	ppm	4	270	Manker, 1975	suspended partic.
	ppm	0.2	1.7	Manker, 1975	sediment
	ppm	1	39	Manker, 1975	4 micron fraction
Mn	mg/l	0.01	0.03	Fla. Dept. Poll. Cont., 1973	canals
Ni	mg/l	0.01	0.22	Fla. Dept. Poll. Cont., 1973	canals
	mg/kg	18	25	Fla. Dept. Poll. Cont., 1973	canal sediment
Pb	mg/l	0.12	0.25	Fla. Dept. Poll. Cont., 1973	canals
	mg/kg	0.6	6.6	Fla. Dept. Poll. Cont., 1973	canal sediment
	ppm	12	36	Manker, 1975	sediment

Table 5C (continued)

Parameter	Units	Min.	Max.	Source	Remarks
Si	-	-	-	-	
Zn	ppm	1	22	Manker, 1975	sediment
	ppm	1	53	Manker, 1975	4 micron fraction
Pigments	-	-	-	-	
Coliform	No./100ml	0	246.5	Chesher, 1974	canals

[1]Station 9, Triumph Reef
[2]Stations 3, 11, 21, 23, 24, 26, 32, 34, 35, 36 and 37
[3]Only the upper 100 meters were considered at deep stations
[4]Stations 6, 7, 8 and 10
[5]Stations 1, 2, 4, 5, 6, 7, 8, 9, 10, 12, 13, 14, 19, 20, 21, 22 and 25
[6]dry weight basis

The lagoon systems to the west of Key Largo have been extensively studied. These basins are effectively separated from the Marine Sanctuary by the land mass of Key Largo and are not expected to influence water quality in the Sanctuary to any great extent. The reader is referred to Goodell and Gorsline (1961) for water quality data for Florida Bay, Lynts (1966) for Buttonwood Sound and Segar _et al_. (1971) for Card Sound and South Biscayne Bay.

Geological/Biological Studies Within the Sanctuary

In contrast to the dearth of chemical data for Sanctuary waters, the reefs of the Marine Sanctuary have attracted a great deal of attention from biologists and geologists. The following is a review of articles that deal directly with the reefs and shoals of the Key Largo Coral Reef Marine Sanctuary.

GEOLOGY

Sedimentology:

Enos and Perkins (1977) published a comprehensive review of the sedimentology of the Florida Keys and reef tract. This report includes a series of benthic community maps, topographic profiles, sediment thickness, porosity and permeability data, as well as underwater and aerial photographs. They discuss the ecology and distribution of organisms that contribute to, or modify sediments. Further, they review the topography and hydrography of the Florida Keys and discuss the formation of sand shoals, patch reef banks and tidal deltas.

The process of grain accretion in sediments has been examined in the Marine Sanctuary by Boyer (1972) and Hattin and Dodd (1978). Boyer, working between Molasses Reef and Rodriguez Key, found that accretionary features such as grain coatings, intragranular void fillings, and internal and external cements of reef tract calcarenites result from non-skeletal submarine carbonate precipitation and lithification. These processes are most abundant along the platform edge and are less abundant on back reefs. Muddy environments inhibit cementation because of their impermeability, poor aeration and high organic content. Hattin and Dodd (1978), sampling the sediments of White Bank, showed that submarine cementation is a recent phenomenon (1705 $\pm$ 120 years).

Chesher (1973) included sediment analysis in his study of the sea-biscuit Meoma ventricosa. He reported that, in the Molasses and Alligator Reef areas, average grain size was about 0.45 mm with a sorting coefficient of 1.54; porosity averaged 47.5% by volume; permeability averaged 0.909; organic carbon was about 1.8% (by weight) of the total substrate; no hydrogen sulfide was found in the upper 20 cm of sand; and temperature was slightly lower in the sand than in the water during the day.

Reef Distribution:

Marszalek et al. (1977) concluded that reef distribution is a result of factors that affect exchange between the reef tract and the coastal lagoons and Florida Bay, such as land barriers, tidal passes and orientation to wind-driven currents. They described Carysfort Reef and Key Largo Dry Rocks as well-developed reefs, while Long Reef and French Reef are poorly developed. They also counted more than 6000 patch reefs between Miami and the Marquesas. An aerial photomosaic of the Florida reef tract is in preparation (Marszalek, personal communication, 1979).

Hurricane Effects:

Hurricanes occasionally sweep over the reefs with devastating force. The effects of two major hurricanes which passed directly over the northern reef tract, Donna in 1960 and Betsy in 1965 (Fig. 71), were studied by Ball et al. (1967), Perkins and Enos (1968) and Shinn (1972). The effects of Hurricane Donna were investigated by Ball et al. (1967). They looked at Key Largo Dry Rocks, Molasses Reef, the Elbow and White Bank and found that the most obvious effect was freshly broken coral rubble, that massive coral heads were more resistant than other types, that patch reefs were not as badly damaged as outer reefs and that sediment transport was shoreward on the shoals along the outer reefs.

Perkins and Enos (1968) studied the effects of Hurricanes Betsy and Donna and found that coral damage by Betsy was not as extensive because the weaker colonies had already been removed by Hurricane Donna. They also reported little damage to patch reefs, documented the deposition of 1 to 6 inches of "soupy mud" over the firm mud bottom in Hawk Channel and noted that very turbid water flowed over Carysfort Reef with little apparent damage to the coral. Shinn (1972) found that the reefs at Key Largo Dry Rocks recovered quickly after the passage of Hurricanes Donna and Betsy. After one year damage was visible only to those familiar with the area's pre-storm condition. Two years after Hurricane Betsy the reef had completely recovered.

Topography:

The topography of the Florida reef tract has been described by numerous authors (Agassiz, 1888; Enos and Perkins, 1977; Hoffmeister et al., 1964a; Multer, 1969; and Shinn, 1963). A generalized profile across the shallow shelf in the area of the Sanctuary is shown in Fig. 72 (after Enos and Perkins, 1977). Agassiz (1888) included a bathymetric profile across the reef tract in the vicinity of Carysfort Reef, and Enos and Perkins (1977) presented a series of profiles across the reef tract, including several within the Sanctuary (profiles D, E, F and G, Fig. 73).

Shinn (1963) studied the Acropora reefs at Key Largo Dry Rocks and Molasses Reef and described the formation of spur and groove topography, documenting his work with underwater and aerial photographs. In 1977 Shinn et al. concluded that most linear reefs are localized by pre-existing topography, that reef accumulation rates are greater near Key Largo and at Dry Tortugas than anywhere else in the reef tract and that accumulation rates were greater in the past than they are today.

Bathymetry:

Carysfort Light was used as the western terminus of bathymetric transects across the Florida Straits by Hurley et al. (1962) and Malloy and Hurley (1970). Their figures and bathymetric maps include soundings taken at the extreme eastern boundary of the Sanctuary (100 meters depth).

General:

Field guides published by Hoffmeister et al. (1964a) and Multer (1969) discuss the more important geological features of the Sanctuary reefs.

BIOLOGY

Foraminifera:

Foraminiferan distribution between Rodriguez Key and Molasses Reef was investigated by Wright and Hay (1971) and again by Rose and Lidz (1977). The former reported that distribution is correlated with grain size distribution and that most living forams are found on vegetation and settle to the bottom after death. Both reports include species lists.

Fungi:

Thompson (1969) studied the distribution of Deuteromycete fungi along a transect extending from Key Largo to Molasses Reef via Mosquito Bank.

Diatoms:

Diatom distribution was the subject of papers by Miller et al. (1977), who showed that characteristic diatom assemblages are associated with different substrates, and by Montgomery et al. (1977), who suggested that attached diatom populations may be nutrient limited. Montgomery et al. concluded that the diatom flora of Molasses Reef differs from that of Sombrero Reef or Western Sambo Reef.

Echinoderms:

McPherson (1968) studied the sea urchin Eucidaris tribuloides and Chesher (1969) investigated the biology of the sea biscuit Meoma ventricosa. Both worked at Molasses Reef as well as reefs outside the Sanctuary.

Corals:

Working at Key Largo Dry Rocks, Shinn (1966) conducted field measurements of coral (Acropora cervicornis) growth rates (Fig. 8). He reported an average growth rate of 10 cm/year and compared growth on the reef with that of corals transplanted close to shore. The near-shore colonies expelled their zooxanthellae due to thermal stress (33.8°C) during September-November and died the following spring due to an influx of cold water (13.3°C minimum water temperature).

Thompson (1979) subjected corals to different dilutions of drilling mud at Carysfort Reef in a field toxicology experiment. He found that three species of Porites (P. asteroides, P. divaricata and P. furcata) and Dichocoenia stokesii survived all tested dilutions while Montastrea annularis, Agaricia agaricites and Acropora cervicornis suffered significant mortality after a 65 hour exposure to a 1000:1 dilution. Burial under either natural carbonate sediment or drilling mud for periods as short as two hours caused stress to corals.

Antonius (1973)studied predation on corals by the marine bristle worm Hermodice carunculata and infection by Oscillatoria submembranacea and reported the stress phenomenon called a "shut-down reaction" whereby the coral's living tissue disintegrates as a result of stress (Antonius, 1977).

Fishes:

Fish censuses have been conducted by Alevizon and Brooks (1975) at Grecian Rocks and Key Largo Dry Rocks, and by Jones and Thompson (1978) at Molasses, French and Carysfort Reefs. Springer and McErlean (1962) conducted a tagging study of the fishes at Mosquito Bank and Molasses Reef and found that they are territorial.

Bohnsack (1980, unpublished data) conducted fish censuses at Molasses, French, and Elbow Reefs. The results will be published as part of a study comparing fish communities at Looe Key Reef (off Big Pine Key) with the reefs of the Marine Sanctuary.

Reef Ecology:

The Harbor Branch Foundation (Fort Pierce, Florida) operated a field laboratory at John Pennekamp State Park in the early 1970's and conducted a series of reef studies at sites that are now under the jurisdiction of the Marine Sanctuary. The results of this effort have been published by Antonius (1973, 1974a, 1974b, 1977) and Griffin and Antonius (1974). Although a number of scientists (Voss, 1973; Dustan, 1977a, 1977b and Thomas, 1979) have voiced concern over signs of poor health in the Sanctuary's reefs, Antonius (1974b) was the first to attempt a quantitative analysis of reef health in the Sanctuary. He measured the percentage of live corals at Carysfort (92.75%), Elbow (92.90%), Molasses (93.13%), Key Largo Dry Rocks (88.61%-93.52%), Grecian Rocks (83.33%-87.84%) and Hen and Chickens Reef (14%-18.03%). The Sanctuary reefs will soon be re-surveyed in order to see if any changes have occurred over the intervening years (Dr. Dennis Taylor, personal communication, 1979).

Dustan (1977a) documented recreational pressure on the coral reefs, citing anchor chafing and boat groundings as agents of reef destruction. He showed that reef corals recovered slowly after being damaged by the wreck of the catamaran "Maya" at Key Largo Dry Rocks in 1974 and recommended that permanent moorings be placed on the reefs to prevent anchor damage. Dustan (1977b) found low coral recruitment rates at Carysfort Reef, reported that coral infection by Oscillatoria may be related to temperature and suggested that coral populations are declining.

In 1972, NOAA conducted a series of coral reef studies with the undersea habitat "EDELHAB" during the FLARE project. Summaries of each mission were published in the Annual Report of the Manned Undersea Science and Technology (MUST) Program (U.S. Department of Commerce, 1973, pages 21-26). At both Long Reef and Elbow Reef it was noted that large, predatory fish were scarce, while small reef fishes were abundant (Missions 1 and 6). At Elbow Reef (Mission 6) large numbers of diseased fish were observed and it was suggested that there may be a correlation between overfishing, lack of large predators and presence of diseased fish. These findings were contradicted by Mission 8, however, during which it was reported that Elbow Reef is in excellent health, comparable to similar reefs in the Bahamas.

Deep Reefs:

Due to the physiological limitations imposed by the use of SCUBA, most research in the Sanctuary to date has been restricted to waters less than 30 meters deep. NOAA recently conducted a series of investigations of the deeper regions of the Sanctuary (Carysfort, Elbow and French Reefs), using the submersible "Johnson Sea-Link", the results of which have not yet been published.

Aerial Surveys:

Finally, Thompson (1974) tested a water penetration film along an aerial transect from Key Largo to Molasses Reef and found it to be a valuable tool for mapping benthic communities in shallow water. Workable resolution was lost at a depth of 40 to 50 feet.

Geological/Biological Studies in Adjacent Areas

In the course of this search for water quality data pertaining to the Key Largo Coral Reef Marine Sanctuary, a considerable portion of the published literature relating to the Florida Keys, Florida coral reefs and Florida Current was examined. Rather than discuss this extensive volume of published material article by article the reader is referred to the Key Word Index (Appendix C) in which all the reviewed literature is cross-indexed according to subject.

The coral and coral reef literature is voluminous and a complete listing is beyond the scope of this review. A few noteworthy references have been included, such as the three International Coral Reef Symposia (University of Miami, 1977;Great Barrier Reef Committee, 1974; and Mukundan and Gopinadha Pillai, 1972), the most recent review of Goreau et al. (1979) and the works of Buddemeier and Kinzie (1976), Jones and Endean (1973, 1976), Wells (1957), Yonge (1963), Stoddart and Yonge (1971), Stoddart and Johannes (1978), and Johannes (1972, 1975).

A number of recent guides to the identification of corals and of marine organisms associated with coral reefs have also been included.

For regional bibliographies, the reader is referred to the works of Schmidt and Davis (1978), U.S. Department of Commerce (1979), U.S. Department of the Interior (1976), Rosendahl (1975), Tabb and Iverson (1971), Voss et al. (1969), Morrill and Olson (1955) and Joseph and Nichy (1955).

DISCUSSION

Currents

In designing a water quality monitoring program for a system of unrestricted circulation such as the Marine Sanctuary, an area of primary interest must be consideration of currents. There is little historical current data for the Marine Sanctuary and very little is known about the patterns and structure of the currents in adjacent areas.

The Florida Current, whose waters flow northward through the eastern region of the Sanctuary, has been intensively studied, but most studies have focused on the Miami area or along transects running from Miami to Bimini, Fowey Light to Cat Cay, Sombrero Reef to Cay Sal Bank or Key West to Cuba. The edges of the Current (at depths less than 100 meters) in the vicinity of the Sanctuary have been ignored.

This vast reservoir of warm, oceanic water serves to moderate temperature and salinity along the eastern boundary of the Sanctuary. Its waters pass immediately seaward of the reef tract and under the influence of prevailing easterly breezes and the thrust of waves impinging on the reef, a drift of Gulf Stream water flows over the shallow outer reef.

The fate of this water after it passes over the reefs is uncertain. Aggassiz (1888), Smith et al. (1950), and Manker (1975) reported that a southerly countercurrent flows through Hawk Channel. Neither Aggassiz nor Smith et al. offered evidence to support this hypothesis and Manker's data are unconvincing. Vaughan (1918) attempted to demonstrate a southerly flow in Hawk Channel but failed. Continuous records of surface currents in adjacent areas (Griffin, 1974, unpublished data; National Ocean Survey, 1963, unpublished data) reveal that the predominant current in Hawk Channel flows toward the northeast.

Part of the confusion may be due to spin-off eddies similar to those studied by Lee et al. (1977a). Such an eddy could possibly be perceived as a counter current if encountered during a limited study of current patterns. It should be noted that Lee's work was conducted in the Miami-Ft. Lauderdale area; spin-off eddies have not been demonstrated in the area of the Sanctuary. Rapidly moving fronts of clear water, generally flowing to the south or southwest, have been noted in the patch reef area of Biscayne National Monument (Richard Curry, personal observation) and it is probable that spin-off eddies or extrusions from the Florida current do occur in the Sanctuary, especially in areas where the outer reef structure is poorly developed or entirely missing.

The influence of wind speed and direction on surface currents in the shallow waters between the Florida Keys and the reef tract was demonstrated by Jones (1963). Surface currents in this area are wind-induced and, as a result, are as variable in both direction and velocity as are the breezes that drive them. It seems reasonable that predominantly southeast winds, coupled with the northeastern orientation of Hawk Channel, would result in a net flow of surface water to the northeast in Hawk Channel.

The importance of a southerly current in the vicinity of the Sanctuary lies in the possibility that such a current might carry pollutants from Biscayne Bay and the Miami area into the Sanctuary. This possibility has been mentioned in the literature (Dustan, 1977b; Manker, 1975) but it has never been substantiated.

Topography:

To the west of the Sanctuary lies Hawk Channel, a wide, natural channel with maximum depths of 15 to 20 feet. This channel extends the entire length of the Keys and separates them from the outer reefs. A secondary channel, referred to as a "moat" by Griffin (Figs. 20 to 25), lies between Hawk Channel and the outer reef, separated from Hawk Channel by White Bank, a linear sand shoal that parallels the Keys. This shoal can be seen in profiles E, F and G in Fig 73. In other areas (see profiles B, C and D, Fig. 73) patch reef banks form a similar barrier. This secondary channel is narrower and somewhat deeper than Hawk Channel (maximum depths of 25 to 30 feet). It is, however, poorly defined and loses its identity completely south of the Sanctuary (compare profiles B-G with profiles H-L, Fig. 73). Nevertheless, the topographical barriers that separate the secondary channel from Hawk Channel play an important role in maintaining good water quality in the outer reef. They serve to isolate the reef from the more turbid, more variable water in Hawk Channel (see Fig. 11).

Temperature:

Temperature is the only water quality parameter for which adequate historical data exist. Fig. 74 summarizes twenty-one years of surface temperature data for Carysfort Reef provided by Vaughan (1918). Mean temperature is indicated by the solid line and the dotted lines indicate a band one standard deviation wide on either side of the mean. Minimum temperatures (22.5°C) occur in early January and maximum temperatures (29°C) occur in mid-August. Temperature variation, as indicated by the standard deviation, is least in summer and greatest in winter. This probably reflects alternating warm and cool weather as cold fronts pass through the region during the winter.

Fig. 75 shows Shinn's (1966) maximum-minimum temperature records for Key Largo Dry Rocks superimposed on Vaughan's data. No substantial difference is evident.

Temperature fluctuates over a much wider range in nearshore waters than it does on the outer reef. Smith et al. (1950) reported a temperature range of 24.35°C to 29.8°C for the outer reef (Triumph Reef) while nearshore waters (East Elliot Key) showed a temperature range of 19.2°C to 32.3°C (Fig. 34). Shinn (1966) reported a temperature range of 20.0°C to 30.5°C at Key Largo Dry Rocks while close to shore temperature ranged from 13.3° to 33.8°C (Fig. 8). Griffin's unpublished data (1974) (Fig. 11) show that temperature variations are greatest in Hawk Channel and decrease with distance from shore.

Temperature is also the only water quality parameter whose effects on corals have been studied in the Sanctuary.

Shinn (1966) showed that a temperature of 33.8°C arrested coral growth and caused expulsion of zooxanthellae. When temperatures fell to 13.3°C the corals died. These experiments were conducted with *Acropora cervicornis*, a coral species that thrives in the shallow waters behind the outer reef.

Vaughan (1917) cited A.G. Mayer's laboratory experiments with corals that led him (Mayer) to conclude that corals die at a temperature of 13.9°C. Vaughan set the minimum temperature for coral growth at 18.15°C, basing this conclusion on a comparison of recorded temperatures at Carysfort Reef and Fowey Rocks. At Carysfort Reef, where the reef is healthy, minimum recorded temperature was 18.15°C while at Fowey Rocks where the reef is poorly developed, minimum temperature was 15.6°C.

Jaap (1979) observed zooxanthellae expulsion by the corals *Acropora palmata*, *Millepora complanata* and *Montastrea annularis* at Middle Sambo Reef (near Key West) during a period of elevated temperature. Most of the corals regained their normal color after six weeks. He concluded that short periods of thermal stress have no lasting effect on corals. Shinn (1966) also reported that corals that had expelled their zooxanthellae in September had resumed their normal color by December when maximum temperatures had dropped to 27°C.

Salinity:

Manker (1975) and Griffin (1974, unpublished data) recorded surface salinity in the Sanctuary. Manker's values range from 36.3 o/oo to 36.9 o/oo (Fig. 13) while Griffin recorded values from 34.6 o/oo to 36.6 o/oo (Fig. 11). Griffin's data are more representative since they were recorded throughout the year while Manker's measurements were restricted to the summer months.

Dole and Chambers (1918) showed that precipitation patterns resulted in short-term salinity fluctuations at Fowey Rocks (Fig. 38). Their data indicate a salinity range between 34.2 o/oo and 38.8 o/oo in surface waters.

Salinity, like temperature, is more variable close to shore than on the outer reefs. This can be seen by comparing inshore and offshore salinity ranges in Griffin's (1974, unpublished) data (Fig. 11). Smith *et al*. (1950) reported a salinity range of 35.25 o/oo to 36.50 o/oo for the outer reef (Truimph Reef) while nearshore waters (East Elliot Key) showed a salinity range of 34.43 o/oo to 37.40 o/oo (Fig. 34).

Temperature - Salinity Relationship

The temperature-salinity envelopes shown in Figs. 44 and 46 give excellent examples of the ranges of salinity and temperature of waters around the outer reef. Synoptic temperature and salinity readings obtained now could be expected to plot within the envelope observed by Vargo (1968) as shown in Fig. 46. Stations close to shore will have values which fall outside this T-S plot, but a similar diagram could be developed for waters at various locations in the back reef area. Once established, the T-S plot characteristics should not change unless water from a different source is introduced into the area. Therefore the T-S plot can be used as a diagnostic tool in a monitoring program.

Turbidity

Griffin (1974, unpublished data) has provided excellent background data on turbidity in the Sanctuary. Ambient turbidity fluctuates greatly, depending on wind and sea-state conditions, depth of water and type of sediment. In general, turbidity ranges from practically nil to about 10 mg/l (transmissometer readings converted to mg/l).

Turbidity is greater close to shore than it is in the outer reef area. This is partially due to the nature of the sediments, runoff from adjacent land areas and current patterns. Close to the reef, the sediments consist mostly of medium to coarse grained particles which settle quickly after being disturbed, while in Hawk Channel fine, easily-suspended sediments predominate (Enos and Perkins, 1977). These fine particles are put into suspension during periods of high wind to give the inshore water a chalky white color. Griffin's traverse data (Figs. 20 to 25) clearly show the resuspension of sediment by ship wakes. It can also be seen that the highest turbidity levels occur during the winter months (mid-December to early February). Griffin's spot station data (Fig. 11) show turbidity fluctuations to be greatest inshore and least on the outer reefs and Atlantic Ocean.

Unpublished turbidity data for Biscayne National Monument (National Park Service) show a higher turbidity in Hawk Channel (approximately 0.7 N.T.U.) than in the secondary channel west of the outer reef (approximately 0.2 NTU). The water on either side of the outer reef has essentially the same turbidity. Over the patch reefs, turbidity values vary widely but the range is always between that observed in Hawk Channel and that of the secondary channel.

Hanson and Poindexter (1972), in comparing transmittance at Elbow Reef with Government Cut and Pacific Reef (Fig. 27), expected to find increased turbidity at Government Cut because it is an outlet for the polluted waters of Biscayne Bay but were surprised to find greater transmittance at Government Cut (7.0%) than at Pacific Reef (5.5% $\pm$ 1.2%). The large standard deviations, however, coupled with the fact that there are only two data points for Government Cut, render any differences statistically insignificant. They suggested that the large variations in transmittance were caused by currents and reported that natural fluctuations in cloudiness, sea state and turbidity result in a day to day variability of 45-58% in solar irradiance reaching the coral reefs.

Nutrients:

Concentrations of primary nutrients within the boundaries of the Sanctuary have not been investigated. Data from adjacent waters indicate low nutrient levels. Phosphates are a normal constituent of seawater. They normally occur in low concentrations in the Florida Current. Reported values for the Florida Current (Table 5B) are consistently less than 1 ug-at/l, with slightly higher values found at depths greater than 100 meters.

Jones (1963) (Fig. 35) reported that ortho-phosphate concentrations on Margot Fish Shoal ranged between 0.0 and 0.1 ug-atoms/l having a mean around 0.04 ug-atoms/l. These data agree well with the data collected by the National Park Service on the patch reefs in Biscayne National Monument (Curry, R. personal observation).

Simmons (1973) reports slightly higher values (Fig. 39), with a mean of 0.12 ug-atoms/l. Her nitrate and nitrite data for Brewster reef show a range of 0.16 to 1.96 ug-atoms/l and 0.01 to 0.13 ug-atoms/l, respectively. These values are in good agreement with National Park Service data (Curry, R., personal observation). Simmons reports a mean concentration of 1.84 ug-atoms/l for ammonium on Brewster Reef. The Park Service, on the other hand, has observed a mean of 0.7 ug-atoms/l on the patch reefs between Hawk Channel and the secondary channel. Simmons also reported a mean total phosphate phosphorus concentration of 1.06 ug-atoms/l which is about four times greater than that reported by Jones (1963) for Margot Fish Shoal. The specific cause of these higher values for ammonium and total phosphate can not be explained at present. Simmon's values do, however, agree with measurements observed in the Florida Straits by Bsharah (1957) and by Corcoran and Alexander (1963).

In nearshore areas, the situation is quite different. Chesher (1974) recorded a phosphate concentration of 15 ppm in a residential canal in the upper Florida Keys and Michel (1973) reported a maximum concentration of 2.46 ug-at/l in the Venetian Shores canal system. The source of the nutrients is unclear but it is quite likely that they derive from runoff from the adjacent land. Fertilizers applied to lawns, leaking septic tanks and detergents are all possible contributors to this nutrient load. Further development in the Florida Keys could result in higher phosphate levels near shore.

Metals:

Metal concentrations in the suspended particulate matter far exceeded those for the bottom sediments (Manker, 1975). Manker found highest concentrations of metals in the four-micron and suspended particulate fractions and warned of the potential for dispersal of this mobile fraction during high winds. High metal concentrations were correlated with proximity to heavily populated areas and the Turkey Point power plant (Figs. 15 to 17). Corals near densely populated areas contained higher metal concentrations than those in more remote areas (Fig. 18). Highest toxic metal concentrations were found in sediments at Tavernier Key which receive effluent from a storm sewer system, the Pennekamp State Park Marina, and Tarpon Basin, a restricted lagoon west of Key Largo. Manker suggested that these metals derive from automobile and boat traffic and poorly maintained sewage disposal systems and stated that pollutants introduced in the northern portions of the study area move southward via longshore drift and countercurrents present at the shelf margin.

A higher concentration of metals in fine particulates is expected because of the greater surface area available for adsorption/absorption phenomena. Chelation of metals by organic matter associated with the suspended particulates may also be a factor. Interestingly there does not appear to be a significant difference between the metal concentrations observed in Biscayne Bay and Card Sound and those observed on the reef tract, but this does not necessarily demonstrate mixing of the respective water masses, as Manker (1975) suggests.

Pesticides:

Both of the insecticides used in the Monroe County Mosquito Control program are organo-phosphates.

Naled (Dibrom) is insoluble in water and is non-persistent. It is quite volatile (McEwen and Stephenson, 1979) and is almost completely hydrolyzed in water within two days at room temperature (Eto, 1974). Mammalian toxicity of Naled is fairly low; oral LD-50 to rats is 430 mg/kg (Eto, 1974).

Fenthion (Baytex) has a water solubility of 54 ppm and is a persistent insecticide (Eto, 1974). McEwen and Stephenson (1979) report a persistence of several months. Its mammalian toxicity is similar to that of Naled; acute oral LD-50 to male rats is 215 mg/kg and to female rats is 615 mg/kg (Eto, 1974). Fenthion is reported to have a 96 hour TL-50 of 3.00 ppb to *Palaemon macrodactylus* (USEPA, 1972).

The U.S. Environmental Protection Agency (USEPA, 1972) reports that Fenthion is not likely to be present in seawater or marine organisms, and that trophic accumulation is also unlikely. The less persistent Naled would be even less likely to be found in seawater samples. It would nevertheless be foolish to ignore these two insecticides as potential pollutants in Marine Sanctuary waters.

CONCLUSION AND RECOMMENDATIONS

In summary, very little water quality data was found for the Florida reef tract. Biologists and geologists have been very active on the reefs, but chemists have not. Chemical oceanographers have been primarily interested in the deep waters of the Florida Current, while other chemists have concentrated their efforts in the nearshore waters of Biscayne Bay and Card Sound where pollution from the Turkey Point power plant, dredge and fill operations and drainage canals has focused public attention on water quality.

The clear waters of the reef tract, in contrast, are relatively pristine and in no immediate danger of gross contamination from human activity, so they have been generally ignored. This neglect is particularly regrettable because these are the only coral reefs within the territorial waters of the continental United States. Subtle, long-term deterioration in water quality, while not as dramatic as the more visible forms of pollution, is just as real and the eventual impact equally devastating. This absence of relevant water quality information for the Sanctuary and adjacent areas adds significance to the development of a comprehensive water quality monitoring program.

Stations:

Water quality stations should be established at the source points of water in the Marine Sanctuary. It can be assumed that once the water is within the boundaries of the Marine Sanctuary, it will not change significantly since there are no sewage outfalls or other point sources of pollution within the boundaries.

Florida Bay, because of its great surface area and shallow depth, and, to a lesser extent, South Biscayne Bay, Card Sound and Barnes Sound, experience wide fluctuations in salinity and temperature (Fig. 76). Since reef corals cannot tolerate such extremes, the very existence of a thriving reef depends on its isolation from these waters (Ginsburg and Shinn, 1964; Marszalek et. al., 1977). The land mass of Key Largo provides an effective barrier between these regions and the Sanctuary. Nevertheless, water flowing out of Biscayne Bay and Card Sound through Broad Creek and Caesar's Creek to the north and water flowing seaward from Florida Bay through Tavernier Creek and Snake Creek to the south can reasonably be expected to influence water quality at the northern and southern extremes of the Sanctuary. This has never been demonstrated, but should be considered in the water quality monitoring program.

With the present inadequacy of our understanding of the current system in the Sanctuary it is impossible to suggest the location and number of permanent sampling stations to be used for a long term monitoring program. A study of the current system in and around the Marine Sanctuary should be conducted prior to the start of the water quality monitoring program or at least concurrent with the initial phase of the program. The following discussion presents the location of temporary stations which could be used to monitor water quality pending completion of such a study.

At least two water quality stations should be located at Elbow Reef (one north and one south of Elbow Reef Tower) since it is centrally located and influenced by water from both sides of the outer reef. The water here is shallow and a sample need only be collected at the surface and bottom. At deeper stations salinity and temperature profiles should be constructed in order to determine the degree of stratification of the water column. The number of samples and their corresponding depths will be based on an analysis of these profiles.

A third station should be located one to two miles southeast of Molasses Reef on the Marine Sanctuary boundary. Here water entering the Marine Sanctuary via the Florida current could be monitored and compared with the Elbow Reef stations. A fourth station should be located in the Molasses Reef Channel (indicated in Fig. 2). This station would monitor water entering the Marine Sanctuary via the deep channel west of the outer reef. At least three water quality stations should be located in Hawk Channel (north of the Sanctuary, South of the Sanctuary and midpoint) to evaluate the quality of water moving through the area west of the Marine Sanctuary. Hawk Channel is heavily trafficked by both commercial and recreational boaters and is an area where periodic point source pollution would most likely occur.

Parameters

Parameters that should be measured routinely are the following: temperature, salinity, turbidity, dissolved oxygen, pH, ortho-phosphate, and total organic carbon. Each water quality station should be sampled at monthly intervals if possible and at least at quarterly intervals. Because of its variability, turbidity will have to be monitored more frequently than once a month if significant trends are to be detected. Daily measurements would be ideal, but weekly determinations of turbidity might provide an acceptable compromise.

At less frequent intervals (semi-annually) samples should be collected and analyzed for pesticides (both chlorinated and organo-phosphate types) and a detailed trace metal scan performed. A detailed trace metal scan is required since it would detect elevated levels of metals which are not normally suspected to be marine pollutants. If elevated levels of a toxic metal are detected a more intensified sampling schedule could be employed. If a particular pesticide or herbicide is regularly found in the general scans then that particular compound should be included in the monthly or quarterly sampling program.

There is one additional source of pollution that could influence water quality in the Marine Sanctuary and should be monitored. That is particulate air pollution. There is enough industry in the south Florida area to cause a measurable deterioration of air quality. This material is washed out of the air by rain and, to a lesser extent, by sea spray and could present a chronic low level source of pollution. At least one air particulate station should be established within the Sanctuary. The best location for this station would be the Elbow Reef light tower since it is centrally located and high enough (36 feet) to protect the station from heavy seas.

Clearly many other parameters could be included in the monitoring program. The suggested parameters have been selected because they directly affect the coral reef biota and they would provide means of detecting those types of pollution that can most reasonably be anticipated.

Water Quality Criteria:

A water quality monitoring program is meaningless unless the data are periodically reviewed to determine whether the measured parameters are within acceptable limits. This, of course, implies that such limits have been established beforehand.

Ideally, water quality criteria for the Sanctuary should be based on the requirements and tolerances of the most sensitive organisms residing there. At present, this information is not available. Biological research on the Florida reefs is still at a very basic stage. The taxonomy and distribution of the major groups are fairly well known but only recently have biologists begun to experiment with responses to physiological stress among local organisms (Shinn, 1966; Antonius, 1977; Thompson, 1979). Much work has been done elsewhere, but the data are not applicable to the Marine Sanctuary. It would be unwise, for example, to establish water quality criteria for the Marine Sanctuary based on studies done with Hawaiian coral species. Even studies done elsewhere in the Caribbean may not be applicable because corals in the Sanctuary are near the northernmost limit of their range and this could influence their susceptibility to stress. Local species must be studied under local conditions if valid data are to be obtained.

The following is an attempt to recommend acceptable limits for the parameters that will be monitored, and to relate these criteria to existing data for the Sanctuary and adjacent waters.

Temperature:

Short periods of temperature extremes are tolerated by corals but prolonged periods (over three consecutive days) of exposure to temperatures above 32°C or below 20°C should be considered hazardous to coral health.

Temperature data from adjacent areas (Table 5) show that temperatures in excess of this range have been reported in nearshore waters and that temperatures below this range have been found both in nearshore waters and in the Florida Straits.

The cool temperatures recorded in the Florida Straits are generally encountered at depths greater than 50 meters. Churgin and Halminski (1974) reported a minimum temperature of 21.63°C at 50 meters for the months of July, August and September and a minimum temperature of 10.90°C at 75 meters for the same period. Since the eastern portion of the Sanctuary includes depths in excess of 75 meters, bottom temperatures should be closely monitored here because cold bottom water could influence coral growth, mortality and/or recruitment. A vertical temperature profile should be recorded each month at the station seaward of Molasses Reef.

Shinn (1966) recorded the most extreme temperatures in inshore areas (Table 5C) and demonstrated their deleterious effects on coral survival. Such extreme conditions are local in nature. They result from the large surface-to-volume ratio of the water-mass due to the shallow depth. These fluctuations are not experienced on the outer reefs because of the influence of the Florida Current but extreme temperatures might be encountered at the Hawk Channel stations.

Salinity

Until more data are available for the salinity tolerances of reef organisms, we recommend that prolonged (over three consecutive days) exposure to salinities below 35 o/oo or above 38 o/oo be considered hazardous to coral health.

Data from adjacent areas (Table 5B) show no salinities in the Florida Current over 38 o/oo. The maximum reported salinity ~~(Table 2)~~ was 37.20 o/oo (Churgin and Halminski, 1974). A minimum value of 34.16 o/oo recorded in surface water probably resulted from a brief dilution by rainwater.

Inshore waters, especially residential canals, experience wide salinity fluctuations. The widest salinity range reported (Table 5C) is that of Griffin (1974, unpublished data). He recorded a minimum of 27.6 o/oo and a maximum of 43.5 o/oo. These salinities do not presently pose any threat to the Sanctuary because the volume of water in the canals is small and even if this water were transported to the reef tract it would undergo considerable mixing along the way.

Dissolved Oxygen:

Dissolved oxygen values of 6.0 to 9.3 ppm have been recorded in the Marine Sanctuary (Table 2). Until further information on dissolved oxygen and its effect on corals becomes available, we recommend that a value of 6.0 ppm or 85% saturation be set as a minimum acceptable limit for this parameter in Sanctuary waters. Supersaturation is a common phenomenon (Table 5) and does not appear to pose any threat to reef organisms.

pH:

No pH data have been found for the Sanctuary. Jones (1963) reported a pH range of 7.0 to 8.3 (estimated from his graphs) for Margot Fish Shoal. Once background data are available for the Sanctuary, we suggest that the EPA (USEPA, 1972) guidelines for pH be used as criteria for the Sanctuary. EPA recommends that ±0.2 pH units beyond the normal pH range be considered acceptable limits but that pH should never exceed 8.5 nor go below 6.5 pH units.

Turbidity:

The large natural variability of this parameter makes it difficult to establish acceptable limits. No lower limit is necessary, but some upper limit must be set, not only because high turbidity affects corals by reducing the light available to zooxanthellae, but because it reduces underwater visibility, thereby rendering the water unfit for recreational diving. It is quite possible that sport divers are more sensitive to increased turbidity than are corals.

Because of the primary importance of water clarity in this Sanctuary, we recommend that any significant increase in turbidity levels be considered unacceptable.

Griffin (1974, unpublished data) recorded turbidity readings of 27.4 mg/l in inshore waters (Table 5C) and in residential canals he found turbidity values of up to 43 mg/l. Chesher (1974) found canals with less than one foot of horizontal visibility. These canals are a potential source of turbid water but it is not yet known whether this water is transported to the reefs. The preliminary current survey of the Sanctuary should address this potential problem.

Phosphates:

Because of the danger that elevated nutrient levels could bring about eutrophication in Sanctuary waters, we recommend that phosphates be closely monitored, especially in the nearshore stations. Total phosphate concentrations greater than 1.0 ug-at/l should be considered an indication that inshore water may be contaminating Sanctuary waters.

Until background phosphate levels in the Sanctuary have been ascertained, we recommend that 1.0 ug-at/l be set as the upper acceptable limit for phosphates.

Total Organic Carbon:

No records of total organic carbon levels are available for either the Sanctuary or adjacent waters. A study conducted by Westrum and Meyers (1978) on the coral reefs at Dry Tortugas indicated a maximum TOC level of 480 $\pm$20 ug C/l. This study was conducted outside the region defined as "adjacent areas," but for lack of any other relevant data and until background data are available for Sanctuary waters, we recommend that 500 ug C/l be the maximum acceptable limit for TOC.

Pesticides:

Pesticide application data have been presented for the Florida Keys (Table 3) but pesticide use is certainly more widespread than indicated by this limited data.

No pesticide records have been identified for reef tract waters or the Florida Current in the vicinity of the Sanctuary. For this reason we recommend that the EPA criteria for pesticide levels (Table 6) be applied to Sanctuary waters until local data become available.

Pesticide concentrations in residential canals in the upper Florida Keys were measured by Chesher (1974). The results (Table 5C) show that maximum levels of the aldrin group (aldrin, dieldrin and heptachlor epoxide) are over twenty times the hazard level established by EPA (103 ppb versus 5 ppb), and DDT concentrations (including o,p'DDE, p,p'DDE, o,p'DDT and p,p'DDT) are over eight times greater than the EPA limit of 50 ppb. These are sediment concentrations, which are normally greater than concentrations in the overlying water, but the presence of these pesticides in the canals is adequate justification for monitoring them. It would also be desireable to determine whether Fenthion or Naled occur in Sanctuary waters since these insecticides are presently being used for mosquito control.

Metals:

For metals, as for pesticides, the EPA recommended criteria (Table 6) are offered for use in the Sanctuary until sufficient local data are available to propose more realistic criteria.

Manker's (1975) trace metal data cannot be compared with the EPA recommended criteria because he measured metal concentrations in sediments and suspended particulates rather than water samples. Dissolved metals were not measured. Manker's data are the only trace metal data available for the reef tract.

The only metal records available for the Florida Current in this region are the measurements of iron, copper and nickel by Alexander and Corcoran (1967) and Corcoran and Alexander (1963, 1964). These data (Table 5B) are all well below the EPA hazardous limits but their copper and nickel maxima exceed the EPA minimal risk levels.

Inshore areas have been investigated by Manker (1975) and the Florida Department of Pollution Control (1973). Again, Manker measured sediment concentrations rather than soluble metal concentrations, so no comparison can be made between his data and the EPA criteria. The data provided by the Florida Department of Pollution Control in numerous canals in the upper Florida Keys show that concentrations of copper, chromium, iron, nickel and lead exceed EPA criteria for environmental hazard while cadmium and manganese are below hazardous levels.

Table 6. EPA recommended water quality criteria (USEPA, 1972).

Substance	Hazard [1]	Minimal Risk[2]	Safety Factor[3]
Aluminimum	1.5 mg/l	0.2 mg/l	0.01
Ammonia	0.4 mg/l	0.01 mg/l	0.1
Antimony	0.2 mg/l	-	0.02
Arsenic	0.05 mg/l	0.01 mg/l	0.01
Barium	1.0 mg/l	0.5 mg/l	0.05
Beryllium	1.5 mg/l	0.1 mg/l	0.01
Boron	5.0 mg/l	5.0 mg/l	0.1
Bromine (free)	0.1 mg/l	-	-
Bromine (ionic as BrO_3)	100 mg/l	-	-
Cadmium	0.01 mg/l	0.2 mg/l	0.01
Chlorine (free residual)	0.01 mg/l	-	-
Chromium	0.1 mg/l	0.05 mg/l	0.01
Copper	0.05 mg/l	0.01 mg/l	0.01
Cyanide	0.01 mg/l	0.005 mg/l	0.1
Fluoride	1.5 mg/l	0.5 mg/l	0.1
Iron	0.3 mg/l	0.05 mg/l	-
Lead	0.05 mg/l	0.01 mg/l	0.02
Manganese	0.1 mg/l	0.02 mg/l	0.01[4]
Mercury	0.1 ug/l	-	0.02
Molybdenum	-	-	0.05
Nickel	0.1 mg/l	0.002 mg/l	0.02
Phosphorus (elemental)	0.001 mg/l	-	0.01
Selenium	0.01 mg/l	0.005 mg/l	0.01
Silver	0.005 mg/l	0.001 mg/l	0.05
Sulfides	0.01 mg/l	0.005 mg/l	0.1
Thallium	0.1 mg/l	0.05 mg/l	0.05[5]
Uranium	0.5 mg/l	0.1 mg/l	0.01
Vanadium	-	-	0.05
Zinc	0.1 mg/l	0.02 mg/l	0.01[6]
Organics[7]:			
PCB	0.5 mg/kg		
DDT[8]	0.05 mg/kg		
Aldrin Group[9]	0.005 mg/kg		
Other Chlorinated Hydrocarbons[10]	0.05 mg/kg		
pH	$\pm$0.2 units[11]		

1 Concentrations in excess of this value pose a hazard to the marine environment.
2 Concentrations below this value pose minimal risk of deleterious effects.
3 Recommended factor for deriving safe concentration from 96 hour LD-50 data.
4 24 hour average concentration.
5 20 day bioassay recommended; test for sublethal effects.
6 Lowered to 0.001 if copper or cadmium present due to synergism.
7 Hazardous levels expressed as mg/kg (wet weight) of a sample of at least 25 whole fish in the size range of fish consumed by birds or mammals.
8 Includes p,p'-DDT, p,p'-DDD, p,p'-DDE and ortho-paraisomers of these.
9 Sum of concentrations of Aldrin, Dieldrin, Endrin and Heptachlor should not exceed this level.
10 Includes lindane, chlordane, endosulfan, methoxychlor, mirex, toxaphene and hexachlorobenzene.
11 Beyond normal pH range. Within normal range $\pm$0.5 units is acceptable. Never to exceed 8.5 or go below 6.5 pH units.

Photography:

A several meter square photographic plot should be established to document the condition of the benthic biota at each station. Quarterly photo-mosaics of these plots would indicate trends in the benthic community structure which might parallel trends observed in various water quality parameters.

Remote Sensing:

Remote sensing is broadly defined as the collection of information about an object without being in physical contact with the object (Sabins, 1978). In practice, the use of the term 'remote sensing' is limited to techniques using electromagnetic energy (heat, light and radio waves) in detecting and measuring target charcteristics. The electromagnetic spectral bands are described in Table 7 with their respective wavelengths. Platforms for remote sensing instrumentation are usually satellites or aircraft. Acoustic remote sensing (from ships) should also be mentioned for its potential for monitoring suspended sediment in the water column (Rona, 1977; Proni and et al., 1976; Proni and Rona, 1975). Remote sensing is categorized as active or passive. Active systems provide an energy source (e.g. radar) whereas passive systems measure naturally radiated or reflected energy.

Remote sensing is useful as a tool for monitoring large areas synoptically and repeatably. To achieve similarly synoptic and large area monitoring coverage using conventional field techniques would require a prohibitively vast network of calibrated instruments.

Remote sensing techniques may be used to monitor surface and subsurface phenomena in the marine environment. Surface information such as temperature, sea surface roughness (waves), and oil films may be monitored using thermal infrared (IR), microwave, and photographic UV techniques. Within the water column techniques are limited to visible wavelengths of electromagnetic energy since water absorbs or reflects all other wavelengths. Depth of penetration is influenced by suspended and dissolved materials in the water column. A summary of remote sensors representative of those used in oceanography is presented in Table 8.

The thermal infrared instrumentation used to measure sea surface temperature measures electromagnetic energy in the 8-15um range. This range, however, is affected by water vapor. Since the oceans average 60% cloud cover, most applications of IR temperature measurements utilize aircraft rather than spacecraft as platforms where the instrument can travel below the clouds (McAlister and McLeish, 1965; Lintz and Simonett, 1976).

Sea state may be remotely sensed by the visual range of electromagnetic energy by sun glitter or by radar techniques (Strong and McClain, 1969; Duntly, 1965; Badgley, 1965; Lintz and Simonett, 1976).

Remote sensing of transparency and color of seawater yields information useful in bathymetric mapping in shallow regions, productivity (by chlorophyll assay), sediment transport, and surface wave action (Ross, 1968, 1979; Yentsch, 1960). Research into the remote sensing of salinity is still under way (Lintz and Simonett, 1976). Oceanic fronts, where two or more water bodies are brought into contact, such as bay water and ocean water, or the Gulf Stream and surrounding waters, are often observable due to a difference in their properties (e.g. temperature, velocity and color) (Cromwell and Reid, 1971; Ewing, 1964).

In developing a monitoring program for the Marine Sanctuary, remote sensing could serve in initial siting of monitoring stations by delineating current and dispersion patterns and providing wave climate background. As part of the monitoring program, remote sensing might be used to obtain synoptic current, temperature, turbidity, and productivity data over the entire Sanctuary.

Table 7. Electromagnetic spectral bands (Sabins, 1978)

Band	Wavelength	Remarks
Gamma ray	0.03 nm	Incoming radiation from the sun is completely absorbed by the upper atmosphere, and is not available for remote sensing. Gamma radiation from radioactive minerals is detected by low-flying aircraft as a prospecting method.
X-ray	0.03 to 3 nm	Incoming radiation is completely absorbed by atmosphere. Not employed in remote sensing.
Ultraviolet, UV	3 nm to 0.4 um	Incoming UV radiation at wavelengths less than 0.3 m is completely absorbed by ozone in upper atmosphere.
Photographic UV	0.3 to 0.4 um	Transmitted through the atmosphere. Detectable with film and photodetectors, but atmospheric scattering is severe.
Visible	0.4 to 0.7 um	Detected with film and photodetectors. Includes earth reflectance peak at about 0.5 m.
Infrared (IR)	0.7 to 300 um	Interaction with matter varies with wavelength. Atmospheric transmission windows are separated by absorption bands.

Table 7 (continued)

Band	Wavelength	Remarks
Reflected IR	0.7 to 3 um	This is primarily reflected solar radiation and contains no information about thermal properties of materials. Radiation from 0.7 to 0.9 m is detectable with film and is called photographic IR radiation.
Thermal IR	3 to 5 um 8 to 14 um	These are the principal atmospheric windows in the thermal region. Imagery at these wavelengths is acquired through the use of optical-mechanical scanners, not by film.
Microwave	0.3 to 300 cm	These longer wavelengths can penetrate clouds and fog. Imagery may be acquired in the active or passive mode.
Radar	0.3 to 300 cm	Active form of microwave remote sensing.

Table 8. Representative Oceanographic Remote Sensors (Lintz and Simonett; 1976)

Sensor	Spectral Band	Resolution (m/^{o}C)
Absorption spectrometer	0.25-0.60 u	70-100/-
Ultraviolet imager	0.29-0.40 u	5/-
Multispectral camera	0.30-1.00 u	30-50/-
Metric camera	0.30-1.00 u	20-30/-
Laser*[a]	0.30-0.90 u	0.15-300/-
Image spectrophotometer	0.40-0.70 u	700/-
Video visual band	0.48-0.84 u	50-500/-
Infrared radiometer	2.00-2.40 u	25/0.1
Absorption spectrometer	2.50-16.0 u	70-100/-
High-resolution IR radiometer	3.40-4.20 u	9000/2.0
Infrared radiometer-spectrometer	8.00-14.0 u	30-300/ 0.1-0.8
Infrared imager	8.00-14.0 u	300-2000/0.5
Microwave radiometer	0.30-30.0 cm	3-30,000/ 0.3-2.0
Microwave imager	3.0 cm	300-10,000/ 0.3-0.7
Scatterometer radar*	4, 10, 21, 75 cm	1-7000/-
Radar imager*	1-19.3 cm	30-1000/-
Magnetometer	20-100k gamma	1

[a]The asterisk indicates an active sensor.

Biological Monitoring:

Water quality cannot be viewed as a simple matter of chemistry and physics. The importance of good water quality lies in its enhancement of the biological communities which depend on it and ultimately, in cases such as the Marine Sanctuary, its role in providing an aesthetically attractive medium for human recreation.

Similarly, the detection of deteriorating water quality cannot be considered only from a chemical/physical viewpoint. Although measurement of parameters such as temperature, salinity, nutrients, etc., is a necessary part of any water quality monitoring program, it is often desirable to supplement this data with a biological monitoring program. Such a program attempts to identify a single species (often referred to as an "indicator species"), a group of species, or a community that responds to changes in the composition of its environment with some easily measurable change in appearance, behavior or composition. Biological monitoring has been used successfully in freshwater systems, usually in connection with specific effluent discharges (ASTM, 1976).

There are several advantages to biological monitoring as a supplement to chemical monitoring. For one thing, living organisms respond to the total environment. In selecting chemical or physical parameters for monitoring, it is always possible that one or more important factors may be omitted. There is also the possibility of synergism, whereby two or more factors combine to produce an effect that is greater than that which would have occurred if the factors had acted separately. Living organisms, unlike the chemist's probe, sense all parameters. They are also in continuous contact with the water, whereas chemical and physical monitoring is usually limited to periodic sampling.

The major drawbacks to effective biological monitoring are cost, the great effort needed to conduct the study and difficulty in interpreting the results.

It must be acknowledged that no single species will serve as a "canary" in a system as complex as a coral reef. There is no such thing as an indicator species on a coral reef. The futility of this approach has been pointed out with respect to freshwater systems (Hart and Fuller, 1974) and certainly also applies to marine systems. The alternative approach is to consider the entire community, using some measure of diversity as a means of monitoring changes in species composition over a period of time. This is where the first disadvantage, cost, comes into play. Community analysis requires a highly-trained team of specialists, including taxonomists, statisticians and ecologists, and large expenditures of time and money for field work, laboratory analysis and computer time. On a coral reef, these problems are compounded by the structure of the reef itself. Nets, dredges and cores, for instance, cannot be used efficiently on a hard, craggy substrate.

Furthermore, at depths greater than ten meters, such as are found on the seaward slope of the outer reef, bottom time limitations exert severe time restraints on the amount of data that can be obtained. These factors, combined with the large area that would have to be studied (approximately 100 square miles) and the diversity of community types found within the Sanctuary (coral reefs, hardgrounds, seagrass beds and sandy areas), would demand a great effort and huge expenditures for any meaningful biological monitoring program.

Another problem area is difficulty in interpreting the data. Even assuming that a single species or community index has been identified as an appropriate monitoring tool and an easily measurable response has been found, it is still not possible to define the cause of any biological response. As was mentioned earlier, living organisms respond to the total environment, not just one or two parameters, and establishing a cause for a particular effect can only be done under carefully controlled experimental conditions.

Shinn (1966) acknowledged the difficulties inherent in interpreting biological responses in his study of growth rates in transplanted corals. Although it appeared that variations in growth rate were due to temperature, he admitted that "Results might have been more fruitful if the abundance of food, oxygen and carbon dioxide saturation, sedimentation and the effects of wave agitation could have been determined".

Antonius (1974b) encountered the same problem in his study of the health of coral colonies in the Sanctuary. He was able to document that 84 percent of the hermatypic corals of Hen and Chickens Reef were dead, but was not able to define the cause of death.

It does not seem appropriate at this time to engage in an extensive biological monitoring program in the Marine Sanctuary. The cost would be great and there is no guarantee that the data obtained would provide the desired information. Instead, basic ecological research on the various communities that comprise the Sanctuary should be encouraged and special emphasis should be placed on funding well-controlled field experiments to determine the effects of temperature, salinity, turbidity, nutrient enrichment, etc., on the flora and fauna. Thompson's (1979) study of the effects of drilling muds on corals is a step in the right direction and similar in situ studies should be encouraged.

Only after this preliminary work has been completed can biological monitoring be effectively conducted and meaningfully interpreted.

Appendix A

SOURCES OF INFORMATION

NOAA Computerized Information Retrieval Services:

- Enviroline
- National Oceanographic Data Center
- National Technical Information Services
- Oceanic Abstracts
- Pollution Abstracts

Libraries:

- Florida Department of Environmental Regulation, Tallahassee, Florida
- Florida State University, Tallahassee, Florida
- NOAA, Virginia Key, Florida
- Nova University, Ft. Lauderdale, Florida
- Rosenstiel School of Marine and Atmospheric Science, Virginia Key, Florida
- Scripps Institute of Oceanography, La Jolla, California
- University of Miami, Coral Gables, Florida

Interviews:

-	Dr. Arnfried Antonius	Florida Reef Foundation, Homestead, Florida
-	Dr. D. A. Atwood	AOML, NOAA, Virginia Key, Florida
-	Ms. Elizabeth Beck	Office of Entomology, Florida Department of Health and Rehabilitative Services, Jacksonville, Florida
-	Dr. James Bohnsack	University of Miami, Florida
-	Dr. Thomas Bright	Texas A & M University, College Station, Texas
-	Dr. Patrick L. Colin	University of Puerto Rico, Mayaguez, Puerto Rico
-	Dr. Eugene Corcoran	RSMAS, University of Miami, Coral Gables, Florida
-	Mr. Gary Davis	Everglades National Park, Florida
-	Dr. Donald DeSylva	RSMAS, University of Miami, Coral Gables, Florida
-	Dr. Phillip Dustan	Scripps Institute of Oceanography, Le Jolla, California
-	Dr. Paul Enos	SUNY, Binghamton, New York
-	Capt. Jack Gillen	John Pennekamp State Park, Key Largo, Florida
-	Dr. Robert Ginsburg	United States Geological Survey, Miami, Florida
-	Dr. George Griffin	University of Florida, Gainesville, Florida
-	Mr. John Halas	Sun Dive Station, Key Largo, Florida (formerly with Harbor Branch)
-	Mr. Richard Helbling	Florida Department of Environmental Regulation, Marathon, Florida
-	Mr. Harold Hudson	United States Geological Survey, Miami, Florida
-	Mr. Walter Jaap	Florida Department of Natural Resources, St. Petersburg, Florida

-	Lt. Steve Jameson	Office of Coastal Zone Management, Washington, D.C.
-	Mr. Doug Jones	Florida Department of Environmental Regulation, Tallahassee, Florida
-	Dr. Robert Jones	Harbor Branch Foundation, Ft. Pierce, Florida
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-	Mr. Paul Priest	Aquachem Co., Miami, Florida
-	Dr. William Richards	NMFS, NOAA, Virginia Key, Florida
-	Ms. Lois M. Ryan	Monroe County Mosquito Control District, Stock Island, Florida
-	Ms. Jennifer Smith	Florida Department of Natural Resources, St. Petersburg, Florida
-	Dr. Dennis Taylor	RSMAS, University of Miami, Coral Gables, Florida
-	Mr. Bob Ting	NOAA library, Virginia Key, Florida
-	Dr. J. Morgan Wells	NOAA Dive Office, Washington, D.C. (formerly with Project FLARE)
-	Dr. Arthur Wiener	Florida Reef Foundation, Homestead, Florida

Appendix B

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Appendix C

KEY WORD INDEX

<u>Acetabularia antillana</u>	MARD75A
<u>Acropora cervicornis</u>	ANTA73A, ANTA77A, DAVG77A, GILM76A, JAAW74A, JAAW74B, KAUL77A, MITH78A, SHIE66A, SHIE72A, THOJ79A
<u>Acropora palmata</u>	ANTA77A, JAAW74A, JAAW74B, JAAW79A, MITH78A, SHIE63A, SHIE77A
<u>Agaricia agaricites</u>	THOJ79A
Ajax Reef	CHER69A, VOSG73A
Algae	COLP78A, CROF70A, DAWC74A, JOSE55A, KAUL77A, MARD75A, PHIR59A, TAYW28A, TAYW60A, WOEW76A
Alligator Reef	CHER69A, DAVJ76A, DAVW67A, EMEA73A, FEDH63A, HURR62A, MCPB68A, ROSP77A, STAW68A, VARG68A
Amphinomidae	EBBN66A
Amphipods	YANW57A
<u>Amphora</u>	MILW77A
Angelfish	FEDH68A
Angelfish Creek	THOE35A
Aphroditidae	EBBN66A
<u>Asteroidea</u>	HESS78A
Barnes Sound	LEET75A, WANH69A
Bathymetry	HURR62A, MALR70A
<u>Beggiatoa</u>	GARP75A

Damage	ANTA73A, ANTA77A, BALM67A, BANA74A, DODR77A, DUSP77A, GARP75A, OTTB72A, PERR68A, WEIM77A
Development	GILM76A, JONJ77A, SHIE77A
Dispersal	GILM76A, SHIE72A
Distribution	DODJ73A, ENOP77A, GINR64B, HOFJ74A, MARD77A, VAUT17A
Health	ANTA73A, ANTA74A, ANTA74B, ANTA77A, ANTA78A, BANA74A, DODR77A, GARP75A, GRIG74C, JONR76A, THOL79A, USDC73A, VOSG73A, WEIM77A
Patch Reefs	BALM67A, EBBN66A, GILM76A, GINR74A, GRIG74A, GRIG74B, JONJ63A, JONJ77A, SPRV62A, STED77A, WIMS75A
Recruitment	DUSP77B
Reviews, Symposia	BATR71A, GORT79A, GREA74A, JOHR72A, JOHR75A, JONO73A, JONO76A, MILJ73A, MUKC72A, MULH69A, STOD78A, UNIV77A, WELJ57A, YONC63A
Stabilization	GILM76A
Topography	AGAA88A, ENOP77A, GORT79A, HOFJ64A, MULH69A, SHIE63A, SHIE77A, THOM74A
Coralliophila abbreviata	OTTB72A
Crocker Reef	DAVJ76A
Currents	AGAA88A, BROD75A, BROI75A, BROS66A, CARP76A, CLAE67A, DAWC74A, GOMD76A, GOOH61A, JONJ63A, LEET72A, LEET75A, LEET75B, LEET77B, LEET77C, MAYD75A, MOOC77A, NIIP73A, OPRD73A, PLAR74A, RICW69A, ROUL76A, SCHW66A, SMIJ68A, STUW71A, TABD58A, VAUT35A, WARG69A
Dairellidae	YANW57A
Damselfish	EMEA73A, KAUL77A
Deuteromycetes	THOT69A
Diatoms	MILW77A, MONR77A
Dichocoenia stokesi	ANTA77A, HEIF75A, JAAW74B, THOJ79A
Dictyosphaeria cavernosa	BANA74A

Flare	HANK72A, USDC73A
Florida Bay	FLEJ62A, GINR56A, GINR64A, GOOH61A, MANJ75A, MATJ74A, ROSP77A, TURW72A
Florida Current	BROD75A, BROI75A, CLAE67A, CORE63A, CORE64A, JONE52A, LEET72A, LEET77A, LEET77B, MAYD75A, MILS53A, MOOC77A, NIIP73A, OBRE67A, OWRH67A, PLAR74A, RICW69A, SCHW66A, SMIJ68A, STUW71A, YANW57A
Florida Current, fluctuations	BROD75A, BSHL57A, LEET72A, LEET75B, LEET77A, LEET77B, LEET77C, MOOC77A, NIIP73A, SMIJ68A
Florida Straits	ALEJ63A, ALEJ67A, BROS66A, CAIS73A, CHUJ74A, DEVT69A, GOMD76A, HURR62A, MALR70A, MANF70A, MILD62A, QUIJ77A, RICW69A, VARG68A, WENM59A
Foraminifera	MOOW57A, ROSP77A, STED77A, WRIR71A
Fowey Rocks	ALEJ67A, BROS66A, BROD75A, BUMD57A, CHER69A, CLAE67A, DEVT69A, DOLR18A, MANJ75A, MOOC77A, OBRE67A, PARA33A, SCHW66A, VARG68A, VAUT18A
French Reef	JONR78A, MCPB68A, MCPB69A, MULH69A
Fungi	THOT69A
Gastropoda	OTTB72A, QUIJ77A, TURW72A
<u>Gorgonia ventalina</u>	SMIJ74A
Gorgonians	CAIS76A, JAAW74B, OPRD73A, SMIJ74A
Grecian Rocks	ALEW75A, ANTA74B
Gulf of Mexico	GALP54A
Gulf Water	JONE52A, MILS53A
<u>Halimeda</u>	MARD75A, WIMS75A
Hawk Channel	GRIG74A, MANJ75A, PERR68A, SHIE66A, VAUT35A
Hen and Chickens Reef	ANTA74A, ANTA74B, ANTA77A, EMIC78A, HEIF75A, HUDJ76A, HUDJ77A, MANJ75A, THOL79A, VOSG73A
Hermit Crabs	HAZB74A
<u>Hermodice carunculata</u>	ANTA73A, ANTA77A, OTTB72A, SHIE76A
Holocanthus	FEDH68A

Pollution	BADR71A, BANA74A, CHAE76A, DEUM77A, FANJ74A, GALJ76A, JOHR72A, JOHR75A, JONR76A, KELM69A, MANF70A, STUH74A, THOL79A, WEIM77A
Polychaetes	EBBN66A, HEIF75A, OTTB72A
Polynoidae	EBBN66A
Pomacentridae	EMEA73A
Pomadasyidae	DAVW67A
Porites astreoides	THOJ79A
Porites divaricata	THOJ79A
Porites furcata	THOJ79A
Porites porites	KISD65A
Pourtales Terrace	GOMD76A, MILD62A
Primary Production	CORE63A
Pseudoplexaura porosa	SMIJ74A
Pseudopterogorgia americana	SMIJ74A
Quinaldine	JAAW74B
Ragged Keys	TABD58A
Red Reef	OPRD73A
Remote Sensing	BADP65A, BARE76A, BELR72A, CARP76A, CROT71A, DEUM77A, DUNS65A, ESTJ74A, EWIG64A, FANJ74A, GALJ76A, GORH74A, GORH75A, JOHR75B, KELM69A, KLEV73A, KLEV73B, KOLM70A, KOZM62A, KRIH74A, LINJ76A, MAUG74A, MCAE65A, PROJ75A, ROND77A, ROSD68A, ROSD79A, ROUL76A, SABF78A, SCHE76A, SPEM73A, STID74A, STRA69A, STUH74A, THOM74A, WARG69A, YENC60A
Rodriquez Key	BOYB72A, GINR64A, GINR74A, MARD75A, ROSP77A, STOK67A, THOE35A, TURR76A, VAUT35A, WRIR71A
Rotenone	JAAW74B
Salinity	ALEJ63A, BSHL57A, CHER74A, CHUJ74A, DAWC74A, DOLR18A, GOOH61A, HOLR78A, JONJ63A, LEET75A, LYNG66A, MICJ73A, MILS53A, OPRD73A, SEGD71A, SMIF50A, TABD58A, VARG68A, VAUT17A, WENM59A

Sambo Reef	JAAW74A, JAAW74B, JAAW79A, KISD77A, MILW77A, MONR77A, SMIJ74A
Sand Key	KISD77A
Sargassum	THOT69A
Scleractinia	See Corals
Sclerospongiae	DUSP76A
Sedimentation	DODR74B, DODR77A, LOYY76A, VAUT17A, THOJ79A
Sediments:	ATWD70A, CHER79A, JOHR75B, MANJ75A, MONR77A, MULH69A, SEGD71A, WIMS75A
Cementation	BOYB72A, HATD78A
Composition	BANJ59A, EARC68A, EBAW75A, ENOP77A, FLEJ62A, GINR56A, GINR64A, GINR74A, GOMD76A, JINV69A, MARD75A, MILD62A, MITH78A, STOK67A, THOE35A, TURR76A, WANH69A
Grain Size Distribution	CHER69A, DODJ73A, LYNG66A, MITH78A
Transport	BALM67A, ENOP77A, MILD62A, PERR68A
Sewage	FLOR74A, WEIM77A
Siderastrea siderea	ANTA77A, JAAW74B, KISD65A
Siderastrea radians	HEIF75A, KISD65A
Snake Creek	MICJ73A
Soldier Key	VOSG55A
Solenastrea hyades	ANTA77A
Sombrero Reef	BUMD57A, CLAE67A, DEVT69A, GINR56A, MILW77A, MONR77A, MOOW57A, OBRE67A, PARA73A, RICW69A
Species Lists	CROF70A, HOFJ64A, LONW41A, PHIR59A, ROBP63A, ROSP77A, STAW68A, TABD58A, TURW72A, USDI76A, VOSG55A, VOSG69A
Spionidae	HEIF75A
Sponges	HEIF75, ADUSP76A
Squids	CAIS73A, VOSG73B
Starfish	HESS78A

Succession	JONJ77A, KAUL77A, VOSG63A
Sugarloaf Key	ATWD70A
Sulfides	CHER69A, CHER74A
Summerland Key	CHER73A, HAZB74A
Suspended Solids	DODR74B, KLEV73A, KLEV73B, kRIH74A, MANF70A, PROJ75A, PROJ76A
Tagging Experiments	DAWC51A, LITE72A, SPRV62A
<u>Temora stylifera</u>	JONE52A
Temperature	ALEJ63A, BSHL57A, BUMD57A, CHUJ74A, CLAE67A, DAWC74A, EMIC78A, EWIG64A, FLOR73A, GOLJ73A, GOMD76A, GOOH61A, HOLR78A, HUDJ76A, JAAW79A, JONJ63A, KOLM70A, LEET77B, LYNG66A, MAYD75A, MICJ73A, MILS53A, OPRD73A, PARA33A, SEGD71A, SHIE66A, SMIF50A, SPRV62A, TABD58A, VARG68A, VAUT17A, VAUT18A, WARG69A, WENM59A
Tennessee Reef	GINR56A
Territoriality	SPRV62A
<u>Thalassia</u>	BRIK78A, GRIG74A, LYNG66A, MILW77A, MONR77A, PERR68A, STED77A
<u>Thalassoma bifasciatum</u>	FEDH63A
Tidal Banks	ATWD70A, EBAW75A, JINV69A
Tides	SMIJ68A, VAUT35A
Toxicity	JAAW74B, THOJ79A
Transmittance	HANK72A
<u>Triceratium</u>	MILW77A
Triumph Reef	CHER69A, GINR56A, KELM69A, MANJ75A, MOOW57A, SMIF50A, THOT69A, VOSG73A
Trochidae	QUIJ77A
Turbidity	BANA74A, BSHL57A, CHER74A, DODR74B, DODR77A, FLOR73A, GRIG74A, GRIG74B, GRIG74C, KLEV73A, KLEV73B, KRIH74A, LOYY76A, MANF70A, MANJ75A, PROJ75A, PROJ76A, ROND77A

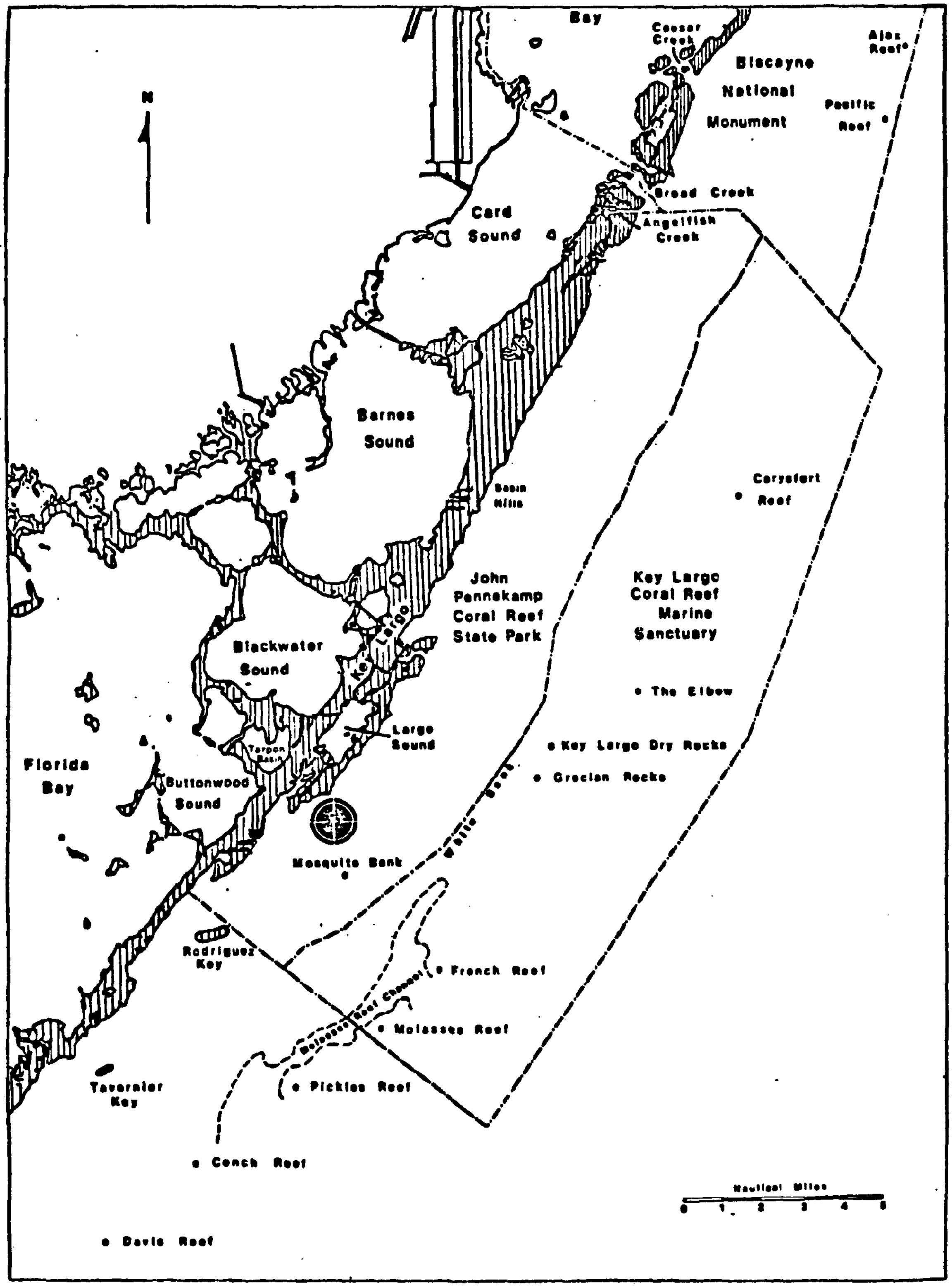
Urbanization	BANA74A, FLOR74A, MITH78A, WEIM77A
Water Quality	ALEJ63A, ALEJ67A, AMER75A, BSHL57A, BUMD57A, CHER73A, CHER74A, DAWC74A, FLOR73A, GOOH61A, GRIG74A, GRIG74B, GRIG74C, HANK72A, HOLR78A, JONJ63A, LYNG66A, MANJ75A, MATJ74A, MICJ73A, MILS53A, NATI72A, OPRD73A, PARA33A, SCHT78A, SEGD71A, SHIE66A, SIMJ73A, SMIF50A, TABD58A, USEP72A, VARG68A, VAUTI8A
Waterspouts	GOLJ73A
White Bank	BALM67A, ENOP77A, HATD78A, PERR68A
Wind	BROD75A, GOOH61A, LEET75A, SMIJ68A
Wrecks	DUSP77A
Yucatan Water	JONE52A, MILS53A
Zonation	CROF70A, KISD77A, MILW77A, MOOW57A, ROSP77A, STET50A, TABD58A, VOSG55A, WIMS75A
Zooplankton	JONE52A, MILS53A, OWRH67A, SMIF50A
Zooxanthellae	JAAW79A

Appendix D

UNPUBLISHED WATER QUALITY DATA

1974 - 1979

FLA. DEPT. ENVIRON. REGUL.



Location of D.E.R. Station 28.04.0975

STATE OF FLORIDA
WATER QUALITY DATA REPORT OF SELECTED STATIONS

DATA REQUESTED BY STEVE LANGLEY FILE 0195
FOR STATION 28.04.0975 09/19/79

STATION	DATE	TIME	DEPTH	AGENCY					STORET DATE
28.04.0975	08/20/74	1115	1.0	S EAST	01	SALT WATER SAMPLE- TOP CLOUD			
28.04.0975	08/20/74	1115	1.0	S EAST	02	COVER-SUN TIDE- HIGH			
28.04.0975	08/20/74	1115	1.0	S EAST		TEMP WATER		31.0	01/20/77
28.04.0975	08/20/74	1115	1.0	S EAST		WIND VELOCITY		12.5	01/20/77
28.04.0975	08/20/74	1115	1.0	S EAST		WIND DIRECTION		120	01/20/77
28.04.0975	08/20/74	1115	1.0	S EAST		DO		5.6	01/20/77
28.04.0975	08/20/74	1115	1.0	S EAST		PH		7.90	01/20/77
28.04.0975	08/20/74	1115	1.0	S EAST		COLI MF	LT	1	01/20/77
28.04.0975	08/20/74	1115	1.0	S EAST		FECAL COLI MF	LT	1	01/20/77
28.04.0975	08/20/74	1115	7.0	S EAST	01	SALT WATER SAMPLE - MID-DEPTH			
28.04.0975	08/20/74	1115	7.0	S EAST		TURBIDITY JCU	LT	25.0	01/20/77
28.04.0975	08/20/74	1115	7.0	S EAST		COLOR		25	01/20/77
28.04.0975	08/20/74	1115	7.0	S EAST		PH LAB		8.1	01/20/77
28.04.0975	08/20/74	1115	7.0	S EAST		ALKALINITY		70	01/20/77
28.04.0975	08/20/74	1115	7.0	S EAST		ACIDITY		5	01/20/77
28.04.0975	08/20/74	1115	7.0	S EAST		N ORGANIC		.410	01/20/77
28.04.0975	08/20/74	1115	7.0	S EAST		NH3 N TOT	LT	.000	01/20/77
28.04.0975	08/20/74	1115	7.0	S EAST		NO2 N		.003	01/20/77
28.04.0975	08/20/74	1115	7.0	S EAST		NO3 N		.040	01/20/77
28.04.0975	08/20/74	1115	7.0	S EAST		P TOT		.020	01/20/77
28.04.0975	08/20/74	1115	7.0	S EAST		C ORG		4.0	01/20/77
28.04.0975	08/20/74	1115	7.0	S EAST		CD SUSP		1	01/20/77
28.04.0975	08/20/74	1115	7.0	S EAST		CU DISS	LT	50	01/20/77
28.04.0975	08/20/74	1115	7.0	S EAST		FE	LT	250	01/20/77
28.04.0975	08/20/74	1115	7.0	S EAST		PB	LT	10	01/20/77
28.04.0975	08/20/74	1115	7.0	S EAST		ZN	LT	100	01/20/77
28.04.0975	08/20/74	1115	7.0	S EAST		P ORTHO		.010	01/20/77
28.04.0975	08/20/74	1115	13.0	S EAST	01	SALT WATER SAMPLE- BOTTOM			
28.04.0975	08/20/74	1115	13.0	S EAST		TEMP WATER		31.0	01/20/77
28.04.0975	08/20/74	1115	13.0	S EAST		DO		5.5	01/20/77
28.04.0975	08/20/74	1115	13.0	S EAST		PH		7.90	01/20/77
28.04.0975	08/20/74	1115	14.0	S EAST	01	SALT WATER			
28.04.0975	08/20/74	1115	14.0	S EAST		C ORG		4.0	01/20/77
28.04.0975	08/20/74	1115	14.0	S EAST		CD SUSP		1	01/20/77
28.04.0975	08/20/74	1115	14.0	S EAST		CU DISS	LT	50	01/20/77
28.04.0975	08/20/74	1115	14.0	S EAST		FE	LT	250	01/20/77
28.04.0975	08/20/74	1115	14.0	S EAST		PB	LT	10	01/20/77
28.04.0975	08/20/74	1115	14.0	S EAST		ZN	LT	100	01/20/77
28.04.0975	09/17/74	1110	1.0	S EAST	01	SALT WATER SAMPLE-TOP CLOUD C			
28.04.0975	09/17/74	1110	1.0	S EAST	02	OVER-SUT			
28.04.0975	09/17/74	1110	1.0	S EAST		TEMP WATER		29.0	01/20/77
28.04.0975	09/17/74	1110	1.0	S EAST		WIND VELOCITY		25.0	01/20/77
28.04.0975	09/17/74	1110	1.0	S EAST		WIND DIRECTION		135	01/20/77
28.04.0975	09/17/74	1110	1.0	S EAST		DO		6.4	01/20/77
28.04.0975	09/17/74	1110	1.0	S EAST		PH		7.60	01/20/77
28.04.0975	09/17/74	1110	1.0	S EAST		COLI MF	LT	1	01/20/77

STATION	DATE	TIME	DEPTH	AGENCY					STORET DATE
28.04.0975	09/17/74	1110	1.0	S EAST		FECAL COLI MF	LT	1	01/20/77
28.04.0975	09/17/74	1110	7.0	S EAST	01	SALT WATER SAMPLE - MID-DEPTH			
28.04.0975	09/17/74	1110	7.0	S EAST		TURBIDITY JCU	LT	25.0	01/20/77
28.04.0975	09/17/74	1110	7.0	S EAST		TURBIDITY FTU		4.0	01/20/77
28.04.0975	09/17/74	1110	7.0	S EAST		COLOR	LT	5	01/20/77
28.04.0975	09/17/74	1110	7.0	S EAST		COND		4900	01/20/77
28.04.0975	09/17/74	1110	7.0	S EAST		PH		6.40	01/20/77
28.04.0975	09/17/74	1110	7.0	S EAST		PH LAB		7.8	01/20/77
28.04.0975	09/17/74	1110	7.0	S EAST		ALKALINITY		101	01/20/77
28.04.0975	09/17/74	1110	7.0	S EAST		ACIDITY		14	01/20/77
28.04.0975	09/17/74	1110	7.0	S EAST		RES SUSP		[illegible]	01/20/77
28.04.0975	09/17/74	1110	7.0	S EAST		N ORGANIC		.960	01/20/77
28.04.0975	09/17/74	1110	7.0	S EAST		NH3 N TOT		.040	01/20/77
28.04.0975	09/17/74	1110	7.0	S EAST		C ORG		2.0	01/20/77
28.04.0975	09/17/74	1110	7.0	S EAST		CD SUSP	LT	1	01/20/77
28.04.0975	09/17/74	1110	7.0	S EAST		CU DISS	LT	50	01/20/77
28.04.0975	09/17/74	1110	7.0	S EAST		FE FERROUS	LT	100	01/20/77
28.04.0975	09/17/74	1110	7.0	S EAST		PB	LT	20	01/20/77
28.04.0975	09/17/74	1110	7.0	S EAST		ZN	LT	100	01/20/77
28.04.0975	09/17/74	1110	13.0	S EAST	01	SALT WATER SAMPLE-BOTTOM			
28.04.0975	09/17/74	1110	13.0	S EAST		TEMP WATER		29.5	01/20/77
28.04.0975	09/17/74	1110	13.0	S EAST		DO		6.2	01/20/77
28.04.0975	09/17/74	1110	13.0	S EAST		PH		7.70	01/20/77
28.04.0975	10/15/74	1050	1.0	S EAST	01	SALT WATER SAMPLE-TOP CLOUD C			
28.04.0975	10/15/74	1050	1.0	S EAST	02	OVER-268			
28.04.0975	10/15/74	1050	1.0	S EAST		TEMP WATER		25.5	01/20/77
28.04.0975	10/15/74	1050	1.0	S EAST		WIND VELOCITY		10.0	01/20/77
28.04.0975	10/15/74	1050	1.0	S EAST		WIND DIRECTION		90	01/20/77
28.04.0975	10/15/74	1050	1.0	S EAST		DO		6.0	01/20/77
28.04.0975	10/15/74	1050	1.0	S EAST		COLI MF	LT	1	01/20/77
28.04.0975	10/15/74	1050	1.0	S EAST		FECAL COLI MF	LT	1	01/20/77
28.04.0975	10/15/74	1050	9.0	S EAST	01	SALT WATER SAMPLE - MID-DEPTH			
28.04.0975	10/15/74	1050	9.0	S EAST		TURBIDITY JCU	LT	25.0	01/20/77
28.04.0975	10/15/74	1050	9.0	S EAST		COLOR		5	01/20/77
28.04.0975	10/15/74	1050	9.0	S EAST		COND		5300	01/20/77
28.04.0975	10/15/74	1050	9.0	S EAST		PH LAB		7.4	01/20/77
28.04.0975	10/15/74	1050	9.0	S EAST		ALKALINITY		131	01/20/77
28.04.0975	10/15/74	1050	9.0	S EAST		ACIDITY		11	01/20/77
28.04.0975	10/15/74	1050	9.0	S EAST		RES SUSP		3	01/20/77
28.04.0975	10/15/74	1050	9.0	S EAST		N ORGANIC		.120	01/20/77
28.04.0975	10/15/74	1050	9.0	S EAST		NH3 N TOT		.150	01/20/77
28.04.0975	10/15/74	1050	9.0	S EAST		NO2 N		.002	01/20/77
28.04.0975	10/15/74	1050	9.0	S EAST		NO3 N		.030	01/20/77
28.04.0975	10/15/74	1050	9.0	S EAST		P TOT		.010	01/20/77
28.04.0975	10/15/74	1050	9.0	S EAST		C ORG		5.0	01/20/77
28.04.0975	10/15/74	1050	9.0	S EAST		CD SUSP	LT	5	01/20/77
28.04.0975	10/15/74	1050	9.0	S EAST		CU DISS	LT	50	01/20/77
28.04.0975	10/15/74	1050	9.0	S EAST		FE		200	01/20/77
28.04.0975	10/15/74	1050	9.0	S EAST		PB	LT	50	01/20/77
28.04.0975	10/15/74	1050	9.0	S EAST		ZN	LT	100	01/20/77
28.04.0975	10/15/74	1050	9.0	S EAST		P ORTHO		.010	01/20/77
28.04.0975	10/15/74	1050	17.0	S EAST	01	SALT WATER SAMPLE-BOTTOM			
28.04.0975	10/15/74	1050	17.0	S EAST		TEMP WATER		25.5	01/20/77

STATION	DATE	TIME	DEPTH	AGENCY					STORET DATE
28.04.0975	10/15/74	1050	17.0	S EAST		DO		6.0	01/20/77
28.04.0975	11/05/74	0915	17.0	S EAST		NO3		5.2	10/28/75
28.04.0975	12/05/74	1030	1.0	S EAST	01	WATER SAMPLE-TOP CLOUD COVER-			
28.04.0975	12/05/74	1030	1.0	S EAST	02	NO3 TIDE-LOW			
28.04.0975	12/05/74	1030	1.0	S EAST		TEMP WATER		18.5	01/20/77
28.04.0975	12/05/74	1030	1.0	S EAST		WIND VELOCITY		12.5	01/20/77
28.04.0975	12/05/74	1030	1.0	S EAST		WIND DIRECTION		90	01/20/77
28.04.0975	12/05/74	1030	1.0	S EAST		COND		575	01/20/77
28.04.0975	12/05/74	1030	1.0	S EAST		DO		8.1	01/20/77
28.04.0975	12/05/74	1030	1.0	S EAST		COLI MF	LT	1	01/20/77
28.04.0975	12/05/74	1030	1.0	S EAST		FECAL COLI MF	LT	1	01/20/77
28.04.0975	12/05/74	1030	6.5	S EAST	01	WATER SAMPLE - MID-DEPTH			
28.04.0975	12/05/74	1030	6.5	S EAST		TURBIDITY JCU	LT	25.0	01/20/77
28.04.0975	12/05/74	1030	6.5	S EAST		COLOR		30	01/20/77
28.04.0975	12/05/74	1030	6.5	S EAST		PH LAB		7.6	01/20/77
28.04.0975	12/05/74	1030	6.5	S EAST		ALKALINITY		1.5	01/20/77
28.04.0975	12/05/74	1030	6.5	S EAST		ACIDITY		17	01/20/77
28.04.0975	12/05/74	1030	6.5	S EAST		N ORGANIC		.020	01/20/77
28.04.0975	12/05/74	1030	6.5	S EAST		NH3 N TOT		.060	01/20/77
28.04.0975	12/05/74	1030	6.5	S EAST		NO2 N	LT	.001	01/20/77
28.04.0975	12/05/74	1030	6.5	S EAST		NO3 N		.250	01/20/77
28.04.0975	12/05/74	1030	6.5	S EAST		P TOT		.060	01/20/77
28.04.0975	12/05/74	1030	6.5	S EAST		C ORG		2.0	01/20/77
28.04.0975	12/05/74	1030	6.5	S EAST		CD SUSP	LT	2	01/20/77
28.04.0975	12/05/74	1030	6.5	S EAST		CU DISS	LT	50	01/20/77
28.04.0975	12/05/74	1030	6.5	S EAST		FE		200	01/20/77
28.04.0975	12/05/74	1030	6.5	S EAST		PB	LT	50	01/20/77
28.04.0975	12/05/74	1030	6.5	S EAST		ZN	LT	100	01/20/77
28.04.0975	12/05/74	1030	6.5	S EAST		P ORTHO	LT	.001	01/20/77
28.04.0975	12/05/74	1030	12.0	S EAST	01	WATER SAMPLE-BOTTOM			
28.04.0975	12/05/74	1030	12.0	S EAST		TEMP WATER		18.5	01/20/77
28.04.0975	12/05/74	1030	12.0	S EAST		DO		8.2	01/20/77
28.04.0975	01/03/75	1220	1.0	S EAST	01	SAMPLE NO. 0975-7			
28.04.0975	01/03/75	1220	1.0	S EAST		TEMP WATER		23.5	01/20/77
28.04.0975	01/03/75	1220	1.0	S EAST		COND		54000	01/20/77
28.04.0975	01/03/75	1220	1.0	S EAST		DO		8.0	01/20/77
28.04.0975	01/03/75	1220	12.0	S EAST	01	SAMPLE NO. 0975-7			
28.04.0975	01/03/75	1220	12.0	S EAST		TEMP WATER		23.5	01/20/77
28.04.0975	01/03/75	1220	12.0	S EAST		COND		54000	01/20/77
28.04.0975	01/03/75	1220	12.0	S EAST		DO		7.4	01/20/77
28.04.0975	01/03/75	1235	6.0	S EAST	01	SAMPLE NO. 0975-7			
28.04.0975	01/03/75	1235	6.0	S EAST	01	WATER SAMPLE - MID-DEPTH			
28.04.0975	01/03/75	1235	6.0	S EAST		AGENCY COLLECT		8093	03/24/76
28.04.0975	01/03/75	1235	6.0	S EAST		TURBIDITY JCU		8.0	01/20/77
28.04.0975	01/03/75	1235	6.0	S EAST		PH LAB		7.5	01/20/77
28.04.0975	01/03/75	1235	6.0	S EAST		ALKALINITY		155	01/20/77
28.04.0975	01/03/75	1235	6.0	S EAST		ACIDITY		30	03/24/76
28.04.0975	01/03/75	1235	6.0	S EAST		RES SUSP		17	01/20/77
28.04.0975	01/03/75	1235	6.0	S EAST		N ORGANIC		.160	01/20/77
28.04.0975	01/03/75	1235	6.0	S EAST		NH3 N TOT	LT	.010	01/20/77
28.04.0975	01/03/75	1235	6.0	S EAST		NO2 N		.001	01/20/77
28.04.0975	01/03/75	1235	6.0	S EAST		NO3 N		.060	01/20/77
28.04.0975	01/03/75	1235	6.0	S EAST		P TOT	LT	.030	01/20/77

STATION	DATE	TIME	DEPTH	AGENCY					STORET DATE
28.04.0975	01/03/75	1235	6.0	S EAST		P ORTHO	LT	.030	01/20/77
28.04.0975	02/06/75	1055	1.0	S EAST	01	SAMPLE 80975-8			
28.04.0975	02/06/75	1055	1.0	S EAST		TEMP WATER		24.0	01/20/77
28.04.0975	02/06/75	1055	1.0	S EAST		COND		51000	01/20/77
28.04.0975	02/06/75	1055	1.0	S EAST		DO		7.1	01/20/77
28.04.0975	02/06/75	1055	1.0	S EAST		PH		7.20	01/20/77
28.04.0975	02/06/75	1055	8.0	S EAST	01	SAMPLE 80975-8			
28.04.0975	02/06/75	1055	8.0	S EAST		TEMP WATER		24.0	01/20/77
28.04.0975	02/06/75	1055	8.0	S EAST		COND		51000	01/20/77
28.04.0975	02/06/75	1055	8.0	S EAST		DO		7.1	01/20/77
28.04.0975	02/06/75	1055	8.0	S EAST		PH		7.20	01/20/77
28.04.0975	02/06/75	1102	5.0	S EAST	01	SAMPLE 80975-8			
28.04.0975	02/06/75	1102	5.0	S EAST		TURBIDITY FTU		3.2	01/20/77
28.04.0975	02/06/75	1102	5.0	S EAST		COLOR		21	01/20/77
28.04.0975	02/06/75	1102	5.0	S EAST		PH LAB		7.5	01/20/77
28.04.0975	02/06/75	1102	5.0	S EAST		ALKALINITY		118	01/20/77
28.04.0975	02/06/75	1102	5.0	S EAST		ACIDITY		29	01/20/77
28.04.0975	02/06/75	1102	5.0	S EAST		RES SUSP		2	01/20/77
28.04.0975	02/06/75	1102	5.0	S EAST		C ORG		4.0	01/20/77
28.04.0975	02/06/75	1102	5.0	S EAST		CD SUSP		1	01/20/77
28.04.0975	02/06/75	1102	5.0	S EAST		CU DISS	LT	25	01/20/77
28.04.0975	02/06/75	1102	5.0	S EAST		FE		200	01/20/77
28.04.0975	02/06/75	1102	5.0	S EAST		PB	LT	20	01/20/77
28.04.0975	02/06/75	1102	5.0	S EAST		ZN		140	01/20/77
28.04.0975	02/06/75	1102	5.0	S EAST		COLI MF	LT	1	01/20/77
28.04.0975	02/06/75	1102	5.0	S EAST		FECAL COLI MF	LT	1	01/20/77
28.04.0975	02/10/75	1000	5.0	S EAST	01	SALT WATER SAMPLE NOTE: 1 SHE			
28.04.0975	02/10/75	1000	5.0	S EAST	02	ET ONLY-FIELD SHEET BY MARATHO			
28.04.0975	02/10/75	1000	5.0	S EAST	03	N NOT RECEIVED (FIELD SAMPLE			
28.04.0975	02/10/75	1000	5.0	S EAST	04	REC'D FROM MARATHON)			
28.04.0975	02/10/75	1000	5.0	S EAST		N ORGANIC		.010	01/20/77
28.04.0975	02/10/75	1000	5.0	S EAST		NH3 N TOT		.010	01/20/77
28.04.0975	02/10/75	1000	5.0	S EAST		NO2 N		.003	01/20/77
28.04.0975	02/10/75	1000	5.0	S EAST		NO3 N	LT	.010	01/20/77
28.04.0975	02/10/75	1000	5.0	S EAST		P TOT		.030	01/20/77
28.04.0975	02/10/75	1000	5.0	S EAST		P ORTHO	LT	.030	01/20/77
28.04.0975	03/07/75	1100	.0	S EAST	01	SAMPLE NO. 0975-9 WIND - 5-10			
28.04.0975	03/07/75	1100	.0	S EAST	02	180 DEGREES TIDE-2.0			
28.04.0975	03/07/75	1100	.0	S EAST		TEMP WATER		22.0	01/20/77
28.04.0975	03/07/75	1100	10.0	S EAST	01	SAMPLE NO. 0975-9 WIND: 10-15			
28.04.0975	03/07/75	1100	10.0	S EAST	02	@ 180 DEGREES TIDE: 2.0			
28.04.0975	03/07/75	1100	10.0	S EAST		TEMP WATER		22.0	01/20/77
28.04.0975	03/07/75	1130	5.0	S EAST	01	SALT WATER SAMPLE NOTE: 1 SHEE			
28.04.0975	03/07/75	1130	5.0	S EAST	01	SAMPLE NO. 0975-9 WIND: 5-10			
28.04.0975	03/07/75	1130	5.0	S EAST	02	HAVEN			
28.04.0975	03/07/75	1130	5.0	S EAST	02	@ 180 DEGREES TIDE: 2.0			
28.04.0975	03/07/75	1130	5.0	S EAST	02	T ONLY-FIELD SHEET NOT REC'D F			
28.04.0975	03/07/75	1130	5.0	S EAST	03	ROM MARATHON (FIELD SAMPLE REC			
28.04.0975	03/07/75	1130	5.0	S EAST	04	'D FROM MARATHON) @ NOT RECE			
28.04.0975	03/07/75	1130	5.0	S EAST	05	IVED			
28.04.0975	03/07/75	1130	5.0	S EAST		AGENCY COLLECT		6093	03/29/76
28.04.0975	03/07/75	1130	5.0	S EAST		TURBIDITY JCU		4.0	01/20/77
28.04.0975	03/07/75	1130	5.0	S EAST		COLOR		25	01/20/77

STATION	DATE	TIME	DEPTH	AGENCY					STORET DATE
28.04.0975	03/07/75	1130	5.0	S EAST		COND		57000	01/20/77
28.04.0975	03/07/75	1130	5.0	S EAST		PH LAB		7.0	01/20/77
28.04.0975	03/07/75	1130	5.0	S EAST		ALKALINITY		143	01/20/77
28.04.0975	03/07/75	1130	5.0	S EAST		ACIDITY		51	01/20/77
28.04.0975	03/07/75	1130	5.0	S EAST		NFS SUSP		1	01/20/77
28.04.0975	03/07/75	1130	5.0	S EAST		N ORGANIC		.020	01/20/77
28.04.0975	03/07/75	1130	5.0	S EAST		NH3 N TOT		.030	01/20/77
28.04.0975	03/07/75	1130	5.0	S EAST		NO2 + NO3 N		.210	03/29/76
28.04.0975	03/07/75	1130	5.0	S EAST		C ORG		4.5	01/20/77
28.04.0975	03/07/75	1130	5.0	S EAST		CU SUSP	LT		01/20/77
28.04.0975	03/07/75	1130	5.0	S EAST		CU DISS	LT	10	01/20/77
28.04.0975	03/07/75	1130	5.0	S EAST		FE		250	01/20/77
28.04.0975	03/07/75	1130	5.0	S EAST		PB	LT	10	01/20/77
28.04.0975	03/07/75	1130	5.0	S EAST		ZN		160	01/20/77
28.04.0975	03/07/75	1130	5.0	S EAST		COLI MF		1	03/29/76
28.04.0975	03/07/75	1130	5.0	S EAST		FECAL COLI MF	LT	1	03/29/76
28.04.0975	04/10/75	1050	.0	S EAST	01	SAMPLE 0975-10 WIND 20-25 135			
28.04.0975	04/10/75	1050	.0	S EAST	02	DEGREES; TIDE-1; CLOUD: 25%			
28.04.0975	04/10/75	1050	.0	S EAST		TEMP WATER		25.0	01/20/77
28.04.0975	04/10/75	1050	.0	S EAST		WIND DIRECTION		135	01/20/77
28.04.0975	04/10/75	1050	.0	S EAST		COND		54000	01/20/77
28.04.0975	04/10/75	1050	.0	S EAST		DO		6.6	01/20/77
28.04.0975	04/10/75	1050	.0	S EAST		PH		8.10	01/20/77
28.04.0975	04/10/75	1050	.0	S EAST		TIDE DIRECTION		1	
28.04.0975	04/10/75	1050	16.0	S EAST	01	SAMPLE 0975-10 WIND: 20-25 1			
28.04.0975	04/10/75	1050	16.0	S EAST	02	35 DEGREES; TIDE 1; CLOUD: 2			
28.04.0975	04/10/75	1050	16.0	S EAST	03	5%			
28.04.0975	04/10/75	1050	16.0	S EAST		TEMP WATER		25.5	01/20/77
28.04.0975	04/10/75	1050	16.0	S EAST		WIND DIRECTION		135	01/20/77
28.04.0975	04/10/75	1050	16.0	S EAST		COND		54000	01/20/77
28.04.0975	04/10/75	1050	16.0	S EAST		DO		6.5	01/20/77
28.04.0975	04/10/75	1050	16.0	S EAST		PH		8.00	01/20/77
28.04.0975	04/10/75	1050	16.0	S EAST		TIDE DIRECTION		1	
28.04.0975	04/10/75	1115	8.5	S EAST	01	SAMPLE #10			
28.04.0975	04/10/75	1115	8.5	S EAST	01	WATER SAMPLE - MID-DEPTH			
28.04.0975	04/10/75	1115	8.5	S EAST	02	35 DEGREES; TIDE: 1; CLOUD: 25			
28.04.0975	04/10/75	1115	8.5	S EAST	03	%			
28.04.0975	04/10/75	1115	8.5	S EAST		AGENCY COLLECT		8093	03/29/76
28.04.0975	04/10/75	1115	8.5	S EAST		WIND DIRECTION		135	01/20/77
28.04.0975	04/10/75	1115	8.5	S EAST		TURBIDITY JCU		2.5	01/20/77
28.04.0975	04/10/75	1115	8.5	S EAST		COLOR		20	01/20/77
28.04.0975	04/10/75	1115	8.5	S EAST		PH LAB		7.9	01/20/77
28.04.0975	04/10/75	1115	8.5	S EAST		ALKALINITY		140	01/20/77
28.04.0975	04/10/75	1115	8.5	S EAST		ACIDITY		23	01/20/77
28.04.0975	04/10/75	1115	8.5	S EAST		N ORGANIC		.760	01/20/77
28.04.0975	04/10/75	1115	8.5	S EAST		NH3 N TOT		.180	01/20/77
28.04.0975	04/10/75	1115	8.5	S EAST		NO2 + NO3 N	LT	.010	03/29/76
28.04.0975	04/10/75	1115	8.5	S EAST		P TOT	LT	.100	01/20/77
28.04.0975	04/10/75	1115	8.5	S EAST		C ORG		3.0	01/20/77
28.04.0975	04/10/75	1115	8.5	S EAST		CU SUSP	LT		01/20/77
28.04.0975	04/10/75	1115	8.5	S EAST		CU DISS	LT	10	01/20/77
28.04.0975	04/10/75	1115	8.5	S EAST		FE		150	01/20/77
28.04.0975	04/10/75	1115	8.5	S EAST		PB		10	01/20/77

STAT	E	ME	PTH	LNC					URL L
28.04.0975	04/10/75	1115	8.5	S EAST		ZN		200	01/20/77
28.04.0975	04/10/75	1115	8.5	S EAST		COLI MF	LT	1	01/20/77
28.04.0975	04/10/75	1115	8.5	S EAST		FECAL COLI MF	LT	1	01/20/77
28.04.0975	04/10/75	1115	8.5	S EAST		P ORTHO	LT	.100	01/20/77
28.04.0975	04/10/75	1115	8.5	S EAST		TIDE DIRECTION		1	
28.04.0975	05/21/75	1042	1.0	S EAST	01	SAMPLE NO. 0975-11			
28.04.0975	05/21/75	1042	1.0	S EAST		TEMP WATER		28.0	01/20/77
28.04.0975	05/21/75	1042	1.0	S EAST		COND		56200	01/20/77
28.04.0975	05/21/75	1042	1.0	S EAST		DO		7.7	01/20/77
28.04.0975	05/21/75	1042	1.0	S EAST		PH		8.10	01/20/77
28.04.0975	05/21/75	1042	6.0	S EAST	01	SAMPLES WERE NON LATE DUE TO H			
28.04.0975	05/21/75	1042	6.0	S EAST	01	WATER SAMPLE - MID-DEPTH			
28.04.0975	05/21/75	1042	6.0	S EAST	02	ENMODELING LAB SAMPLE NO. 0975			
28.04.0975	05/21/75	1042	6.0	S EAST	03	-11			
28.04.0975	05/21/75	1042	6.0	S EAST		AGENCY COLLECT		6093	03/29/78
28.04.0975	05/21/75	1042	6.0	S EAST		TURBIDITY JCU		1.9	01/20/77
28.04.0975	05/21/75	1042	6.0	S EAST		COLOR		21	01/20/77
28.04.0975	05/21/75	1042	6.0	S EAST		PH LAB		7.7	01/20/77
28.04.0975	05/21/75	1042	6.0	S EAST		ALKALINITY		129	01/20/77
28.04.0975	05/21/75	1042	6.0	S EAST		ACIDITY		24	01/20/77
28.04.0975	05/21/75	1042	6.0	S EAST		RES SUSP			01/20/77
28.04.0975	05/21/75	1042	6.0	S EAST		NO2 + NO3 N	LT	.100	03/29/76
28.04.0975	05/21/75	1042	6.0	S EAST		FECAL COLI MF	LT	1	01/20/77
28.04.0975	05/21/75	1042	12.0	S EAST	01	SAMPLE NO. 0975-11			
28.04.0975	05/21/75	1042	12.0	S EAST		TEMP WATER		28.0	01/20/77
28.04.0975	05/21/75	1042	12.0	S EAST		COND		56060	01/20/77
28.04.0975	05/21/75	1042	12.0	S EAST		DO		6.6	01/20/77
28.04.0975	05/21/75	1042	12.0	S EAST		PH		8.00	01/20/77
28.04.0975	05/23/75	1042	6.0	S EAST	01	SALT WATER SAMPLE			
28.04.0975	05/23/75	1042	6.0	S EAST		CD SUSP	LT		01/20/77
28.04.0975	05/23/75	1042	6.0	S EAST		CU DISS	LT	10	01/20/77
28.04.0975	05/23/75	1042	6.0	S EAST		FE		200	01/20/77
28.04.0975	05/23/75	1042	6.0	S EAST		PB	LT	10	01/20/77
28.04.0975	05/23/75	1042	6.0	S EAST		ZN		150	01/20/77
28.04.0975	06/18/75	1030	6.0	S EAST	01	SALINE PESTICIDE SCAN - NON DE			
28.04.0975	06/18/75	1030	6.0	S EAST	02	TECTED. SAMPLE #0975-12			
28.04.0975	06/18/75	1030	6.0	S EAST		CA BOT		162298.90	10/28/75
28.04.0975	06/18/75	1030	6.0	S EAST		MG BOT		4712.60	10/28/75
28.04.0975	06/18/75	1030	6.0	S EAST		CR BOT		2.90	10/28/75
28.04.0975	06/18/75	1030	6.0	S EAST		CU BOT		2.30	10/28/75
28.04.0975	06/18/75	1030	6.0	S EAST		PB BOT		574.70	10/28/75
28.04.0975	06/18/75	1030	6.0	S EAST		ZN BOT		43.10	10/28/75
28.04.0975	06/18/75	1030	6.0	S EAST		FE BOT		20.10	10/28/75
28.04.0975	06/18/75	1030	12.0	S EAST		NO2 + NO3 N BOT	LT	.16	04/09/76
28.04.0975	06/18/75	1030	8000.0	S EAST	01	SALINE SAMPLE #0975-12 SEDIMEN			
28.04.0975	06/18/75	1030	8000.0	S EAST	02	T SAMPLE PESTICIDE SCAN; 8 WAT			
28.04.0975	06/18/75	1030	8000.0	S EAST	03	ER 60°C; 8 WATER 103°C;			
28.04.0975	06/18/75	1030	8000.0	S EAST	04	PESTICIDE SCAN - NOT DETECTE			
28.04.0975	06/18/75	1030	8000.0	S EAST	05	D.			
28.04.0975	07/10/75	1137	1.0	S EAST	01	SAMPLE NO. 0975-13			
28.04.0975	07/10/75	1137	1.0	S EAST		TEMP WATER		30.0	01/20/77
28.04.0975	07/10/75	1137	1.0	S EAST		WIND VELOCITY		18.0	01/20/77
28.04.0975	07/10/75	1137	1.0	S EAST		WIND DIRECTION		157	01/20/77

STATION	DATE	TIME	DEPTH	AGENCY					STORET DATE
28.04.0975	07/10/75	1137	1.0	S EAST		COND		52000	01/20/77
28.04.0975	07/10/75	1137	1.0	S EAST		DO		5.8	01/20/77
28.04.0975	07/10/75	1137	1.0	S EAST		PH		7.00	01/20/77
28.04.0975	07/10/75	1137	1.0	S EAST		TIDE DIRECTION		1	
28.04.0975	07/10/75	1137	1.0	S EAST		TIDE LEVEL	LT	1.0	
28.04.0975	07/10/75	1139	12.0	S EAST	01	SAMPLE NO. 0975-13			
28.04.0975	07/10/75	1139	12.0	S EAST		TEMP WATER		30.0	01/20/77
28.04.0975	07/10/75	1139	12.0	S EAST		WIND VELOCITY		18.0	01/20/77
28.04.0975	07/10/75	1139	12.0	S EAST		WIND DIRECTION		157	01/20/77
28.04.0975	07/10/75	1139	12.0	S EAST		COND		52000	01/20/77
28.04.0975	07/10/75	1139	12.0	S EAST		DO		5.8	01/20/77
28.04.0975	07/10/75	1139	12.0	S EAST		PH		7.00	01/20/77
28.04.0975	07/10/75	1139	12.0	S EAST		TIDE DIRECTION		1	
28.04.0975	07/10/75	1139	12.0	S EAST		TIDE LEVEL	LT	1.0	
28.04.0975	07/10/75	1145	6.0	S EAST	01	SALT WATER SAMPLE			
28.04.0975	07/10/75	1145	6.0	S EAST	01	SAMPLE NO. 0975-13			
28.04.0975	07/10/75	1145	6.0	S EAST		WIND VELOCITY		18.0	01/20/77
28.04.0975	07/10/75	1145	6.0	S EAST		WIND DIRECTION		157	01/20/77
28.04.0975	07/10/75	1145	6.0	S EAST		COLOR		20	01/20/77
28.04.0975	07/10/75	1145	6.0	S EAST		PH LAB		8.0	01/20/77
28.04.0975	07/10/75	1145	6.0	S EAST		ALKALINITY		131	01/20/77
28.04.0975	07/10/75	1145	6.0	S EAST		ACIDITY		5	01/20/77
28.04.0975	07/10/75	1145	6.0	S EAST		RES SUSP		2	01/20/77
28.04.0975	07/10/75	1145	6.0	S EAST		C ORG		1.0	01/20/77
28.04.0975	07/10/75	1145	6.0	S EAST		CD SUSP	LT	1	01/20/77
28.04.0975	07/10/75	1145	6.0	S EAST		CU DISS	LT	10	01/20/77
28.04.0975	07/10/75	1145	6.0	S EAST		FE		200	01/20/77
28.04.0975	07/10/75	1145	6.0	S EAST		PB	LT	10	01/20/77
28.04.0975	07/10/75	1145	6.0	S EAST		ZN		19000	01/20/77
28.04.0975	07/10/75	1145	6.0	S EAST		COLI MF	LT	1	01/20/77
28.04.0975	07/10/75	1145	6.0	S EAST		TIDE DIRECTION		1	
28.04.0975	07/10/75	1145	6.0	S EAST		TIDE LEVEL	LT	1.0	
28.04.0975	08/07/75	1205	1.0	S EAST	01	SAMPLE NO. 0975-14			
28.04.0975	08/07/75	1205	1.0	S EAST		TEMP WATER		30.0	10/28/75
28.04.0975	08/07/75	1205	1.0	S EAST		WIND VELOCITY		15.0	10/28/75
28.04.0975	08/07/75	1205	1.0	S EAST		WIND DIRECTION		157	10/28/75
28.04.0975	08/07/75	1205	1.0	S EAST		DO		7.5	10/28/75
28.04.0975	08/07/75	1205	1.0	S EAST		PH		8.10	10/28/75
28.04.0975	08/07/75	1205	1.0	S EAST		TIDE DIRECTION		1	
28.04.0975	08/07/75	1205	1.0	S EAST		TIDE LEVEL	LT	.8	
28.04.0975	08/07/75	1205	11.0	S EAST	01	SAMPLE NO. 0975-14			
28.04.0975	08/07/75	1205	11.0	S EAST		TEMP WATER		30.5	10/28/75
28.04.0975	08/07/75	1205	11.0	S EAST		WIND VELOCITY		15.0	10/28/75
28.04.0975	08/07/75	1205	11.0	S EAST		WIND DIRECTION		157	10/28/75
28.04.0975	08/07/75	1205	11.0	S EAST		DO		7.6	10/28/75
28.04.0975	08/07/75	1205	11.0	S EAST		PH		8.10	10/28/75
28.04.0975	08/07/75	1205	11.0	S EAST		TIDE DIRECTION		1	
28.04.0975	08/07/75	1205	11.0	S EAST		TIDE LEVEL	LT	.8	
28.04.0975	08/07/75	1215	5.5	S EAST	01	SALT WATER SAMPLE, SAMPLE 0097			
28.04.0975	08/07/75	1215	5.5	S EAST	02	S-14			
28.04.0975	08/07/75	1215	5.5	S EAST		AGENCY COLLECT		0093	03/24/76
28.04.0975	08/07/75	1215	5.5	S EAST		CD SUSP	LT		10/28/75
28.04.0975	08/07/75	1215	5.5	S EAST		CU DISS			03/24/76

STATION	DATE	TIME	DEPTH	AGENCY					SIGNET DATE
28.04.0975	08/07/75	1215	5.5	S EAST		PR	LT	16000	10/28/75
28.04.0975	08/07/75	1218	5.5	S EAST	01	WATER SAMPLE MID-DEPTH			
28.04.0975	08/07/75	1218	5.5	S EAST		TURBIDITY JCU		1.5	10/28/75
28.04.0975	08/07/75	1218	5.5	S EAST		COLOR		25	10/28/75
28.04.0975	08/07/75	1218	5.5	S EAST		PH LAB		7.9	10/28/75
28.04.0975	08/07/75	1218	5.5	S EAST		ALKALINITY		122	10/28/75
28.04.0975	08/07/75	1218	5.5	S EAST		ACIDITY		13	10/28/75
28.04.0975	08/07/75	1218	5.5	S EAST		RES SUSP		27	10/28/75
28.04.0975	08/07/75	1218	5.5	S EAST		N ORGANIC		.380	10/28/75
28.04.0975	08/07/75	1218	5.5	S EAST		NH3 N TOT		.050	10/28/75
28.04.0975	08/07/75	1218	5.5	S EAST		NO2 + NO3 N	LT	.100	10/28/75
28.04.0975	08/07/75	1218	5.5	S EAST		P TOT	LT	.030	10/28/75
28.04.0975	08/07/75	1218	5.5	S EAST		COLI MF		1	10/28/75
28.04.0975	08/07/75	1218	5.5	S EAST		FECAL COLI MF		1	10/28/75
28.04.0975	08/07/75	1218	5.5	S EAST		P ORTHO	LT	.030	10/28/75
28.04.0975	09/04/75	1215	1.0	S EAST	01	SAMPLE NO. 0975-15 SALINE			
28.04.0975	09/04/75	1215	1.0	S EAST		TEMP WATER		29.5	10/28/75
28.04.0975	09/04/75	1215	1.0	S EAST		WIND VELOCITY		11.0	10/28/75
28.04.0975	09/04/75	1215	1.0	S EAST		WIND DIRECTION		135	10/28/75
28.04.0975	09/04/75	1215	1.0	S EAST		COND		55000	10/28/75
28.04.0975	09/04/75	1215	1.0	S EAST		DO		6.0	10/28/75
28.04.0975	09/04/75	1215	1.0	S EAST		PH		7.70	10/28/75
28.04.0975	09/04/75	1215	1.0	S EAST		TIDE DIRECTION		1	
28.04.0975	09/04/75	1215	1.0	S EAST		TIDE LEVEL	LT	.8	
28.04.0975	09/04/75	1215	10.0	S EAST	01	SAMPLE NO. 0975-15 SALINE			
28.04.0975	09/04/75	1215	10.0	S EAST		TEMP WATER		29.5	10/28/75
28.04.0975	09/04/75	1215	10.0	S EAST		WIND VELOCITY		11.0	10/28/75
28.04.0975	09/04/75	1215	10.0	S EAST		WIND DIRECTION		135	10/28/75
28.04.0975	09/04/75	1215	10.0	S EAST		COND		54500	10/28/75
28.04.0975	09/04/75	1215	10.0	S EAST		DO		5.9	10/28/75
28.04.0975	09/04/75	1215	10.0	S EAST		PH		7.80	10/28/75
28.04.0975	09/04/75	1215	10.0	S EAST		TIDE DIRECTION		1	
28.04.0975	09/04/75	1215	10.0	S EAST		TIDE LEVEL	LT	.8	
28.04.0975	09/04/75	1215	12.0	S EAST	01	SEDIMENT SAMPLE %WATER 60°C: 1			
28.04.0975	09/04/75	1215	12.0	S EAST	02	9.09 %WATER 103°C: 43.50			
28.04.0975	09/04/75	1215	12.0	S EAST		NO2 N DISS	LT	.150	04/09/76
28.04.0975	09/04/75	1215	12.0	S EAST		NO2 + NO3 N		2.080	04/09/76
28.04.0975	09/04/75	1225	5.0	S EAST	01	WATER SAMPLE 0975			
28.04.0975	09/04/75	1225	5.0	S EAST		AGENCY COLLECT		8093	03/24/76
28.04.0975	09/04/75	1225	5.0	S EAST		TURBIDITY JCU		1.3	10/28/75
28.04.0975	09/04/75	1225	5.0	S EAST		ALKALINITY		133	10/28/75
28.04.0975	09/04/75	1225	5.0	S EAST		RES SUSP		2	10/28/75
28.04.0975	09/04/75	1225	5.0	S EAST		N ORGANIC		.320	04/09/76
28.04.0975	09/04/75	1225	5.0	S EAST		NH3 N TOT		.060	04/09/76
28.04.0975	09/04/75	1225	5.0	S EAST		NO2 + NO3 N	LT	.010	04/09/76
28.04.0975	09/04/75	1225	5.0	S EAST		P TOT	LT	.300	04/09/76
28.04.0975	09/04/75	1225	5.0	S EAST		CD SUSP	LT		04/09/76
28.04.0975	09/04/75	1225	5.0	S EAST		CD DISS			03/24/76
28.04.0975	09/04/75	1225	5.0	S EAST		PB	LT	5000	04/09/76
28.04.0975	09/04/75	1225	5.0	S EAST		COLI MF	LT	1	10/28/75
28.04.0975	09/04/75	1225	5.0	S EAST		FECAL COLI MF	LT	1	10/28/75
28.04.0975	09/04/75	1225	5.0	S EAST		P ORTHO	LT	.300	04/09/76
28.04.0975	09/04/75	1225	10.0	SU		CA BOT		53453.90	12/21/76

STATION	DATE	TIME	DEPTH	AGENCY					STORET DATE
28.04.0975	09/04/75	1225	10.0	50		MG TOT		3700.70	12/21/76
28.04.0975	09/04/75	1225	10.0	50		NA TOT		6634.90	12/21/76
28.04.0975	09/04/75	1225	10.0	50		K TOT		411.20	12/21/76
28.04.0975	09/04/75	1225	10.0	50		AS TOT		.69	12/21/76
28.04.0975	09/04/75	1225	10.0	50		CD TOT		1.43	12/21/76
28.04.0975	09/04/75	1225	10.0	50		CR TOT	LT	1.60	12/21/76
28.04.0975	09/04/75	1225	10.0	50		CO TOT		6.60	12/21/76
28.04.0975	09/04/75	1225	10.0	50		CU TOT		1.80	12/21/76
28.04.0975	09/04/75	1225	10.0	50		PB TOT		2.60	12/21/76
28.04.0975	09/04/75	1225	10.0	50		MN TOT		3.30	12/21/76
28.04.0975	09/04/75	1225	10.0	50		NI TOT		9.90	12/21/76
28.04.0975	09/04/75	1225	10.0	50		ZN TOT		8.20	12/21/76
28.04.0975	09/04/75	1225	10.0	50		FE TOT		32.90	12/21/76
28.04.0975	10/02/75	1050	6.0	S EAST	01	NUTRIENTS HELD 90 HRS WATER SA			
28.04.0975	10/02/75	1050	6.0	S EAST	02	MPLE 0975-16			
28.04.0975	10/02/75	1050	6.0	S EAST		AGENCY COLLECT		8093	03/24/76
28.04.0975	10/02/75	1050	6.0	S EAST		TURBIDITY JCU		2.3	03/24/76
28.04.0975	10/02/75	1050	6.0	S EAST		COLOR		18	03/24/76
28.04.0975	10/02/75	1050	6.0	S EAST		PH		7.50	03/24/76
28.04.0975	10/02/75	1050	6.0	S EAST		ALKALINITY		135	03/24/76
28.04.0975	10/02/75	1050	6.0	S EAST		ACIDITY		36	03/24/76
28.04.0975	10/02/75	1050	6.0	S EAST		RES SUSP		1	03/24/76
28.04.0975	10/02/75	1050	6.0	S EAST		N ORGANIC		.360	04/01/77
28.04.0975	10/02/75	1050	6.0	S EAST		NH3 N TOT	LT	.010	04/01/77
28.04.0975	10/02/75	1050	6.0	S EAST		NO2 + NO3 N		.010	04/01/77
28.04.0975	10/02/75	1050	6.0	S EAST		P TOT	LT	.010	04/01/77
28.04.0975	10/02/75	1050	6.0	S EAST		FECAL COLI MF	LT	1	03/24/76
28.04.0975	10/02/75	1050	6.0	S EAST		P ORTHO	LT	.010	04/01/77
28.04.0975	10/02/75	1100	1.0	S EAST	01	SAMPLE NO. 0975-16 SALINE TOP			
28.04.0975	10/02/75	1100	1.0	S EAST		TEMP WATER		29.5	04/09/76
28.04.0975	10/02/75	1100	1.0	S EAST		COND		35000	04/09/76
28.04.0975	10/02/75	1100	1.0	S EAST		DO		5.6	04/09/76
28.04.0975	10/02/75	1100	1.0	S EAST		PH		7.70	04/09/76
28.04.0975	10/02/75	1100	1.0	S EAST		CL		12000	04/09/76
28.04.0975	10/02/75	1100	1.0	S EAST		TIDE LEVEL	LT	1.5	
28.04.0975	10/02/75	1103	10.0	S EAST	01	SAMPLE NO. 0975-16 SALINE BOTT			
28.04.0975	10/02/75	1103	10.0	S EAST	02	OM-			
28.04.0975	10/02/75	1103	10.0	S EAST		TEMP WATER		29.5	04/09/76
28.04.0975	10/02/75	1103	10.0	S EAST		COND		43	04/09/76
28.04.0975	10/02/75	1103	10.0	S EAST		DO		5.6	04/09/76
28.04.0975	10/02/75	1103	10.0	S EAST		CL		16200	04/09/76
28.04.0975	10/02/75	1103	10.0	S EAST		TIDE LEVEL	LT	1.5	
28.04.0975	11/13/75	1200	1.0	S EAST	01	SAMPLE NO. 0975-17 SALINE			
28.04.0975	11/13/75	1200	1.0	S EAST		WIND VELOCITY		10.0	04/09/76
28.04.0975	11/13/75	1200	1.0	S EAST		WIND DIRECTION		135	04/09/76
28.04.0975	11/13/75	1200	1.0	S EAST		COND		51000	04/09/76
28.04.0975	11/13/75	1200	1.0	S EAST		DO		6.4	04/09/76
28.04.0975	11/13/75	1200	1.0	S EAST		PH		7.90	04/09/76
28.04.0975	11/13/75	1200	1.0	S EAST		TIDE DIRECTION		2	
28.04.0975	11/13/75	1200	1.0	S EAST		TIDE LEVEL	LT	1.0	
28.04.0975	11/13/75	1200	5.0	50		CD			12/21/76
28.04.0975	11/13/75	1200	5.0	50		CU			12/21/76
28.04.0975	11/13/75	1200	5.0	50		PB	LT		12/21/76

ST[redacted]	[redacted]TE	[redacted]ME	[redacted]PTH	[redacted]GEN[redacted]					STORET DATE
28.04.0975	11/13/75	1200	5.0	S EAST	01	SAMPLE NO. 0975-17 SALINE MID			
28.04.0975	11/13/75	1200	5.0	S EAST	02	DEPTH			
28.04.0975	11/13/75	1200	5.0	S EAST		TURBIDITY JCU		3.3	04/09/76
28.04.0975	11/13/75	1200	5.0	S EAST		ALKALINITY		134	04/09/76
28.04.0975	11/13/75	1200	5.0	S EAST		RES SUSP		7	04/09/76
28.04.0975	11/13/75	1200	5.0	S EAST		FECAL COLI MF	LT	1	04/09/76
28.04.0975	11/13/75	1200	11.0	S EAST	01	SAMPLE NO. 0975-17 SALINE			
28.04.0975	11/13/75	1200	11.0	S EAST		WIND VELOCITY		10.0	04/09/76
28.04.0975	11/13/75	1200	11.0	S EAST		WIND DIRECTION		135	04/09/76
28.04.0975	11/13/75	1200	11.0	S EAST		COND		57	04/09/76
28.04.0975	11/13/75	1200	11.0	S EAST		DO		6.2	04/09/76
28.04.0975	11/13/75	1200	11.0	S EAST		PH		7.90	04/09/76
28.04.0975	11/13/75	1200	11.0	S EAST		TIDE DIRECTION		2	
28.04.0975	11/13/75	1200	11.0	S EAST		TIDE LEVEL	LT	1.0	
28.04.0975	11/13/75	1300	6.0	S EAST	01	REC'D FT PIERCE 1300 11/18/75			
28.04.0975	11/13/75	1300	6.0	S EAST		N ORGANIC		.510	04/09/76
28.04.0975	11/13/75	1300	6.0	S EAST		NH3 N TOT		.060	04/09/76
28.04.0975	11/13/75	1300	6.0	S EAST		NO2 + NO3 N		.020	04/09/76
28.04.0975	11/13/75	1300	6.0	S EAST		P TOT		.040	04/09/76
28.04.0975	11/13/75	1300	6.0	S EAST		P ORTHO		.033	04/09/76
28.04.0975	12/08/75	1030	6.0	S EAST	01	SAMPLES HELD 72 HRS BEFORE ANA			
28.04.0975	12/08/75	1030	6.0	S EAST	02	LYSIS.			
28.04.0975	12/08/75	1030	6.0	S EAST		N ORGANIC		.360	09/29/76
28.04.0975	12/08/75	1030	6.0	S EAST		NH3 N TOT	LT	.010	09/29/76
28.04.0975	12/08/75	1030	6.0	S EAST		P TOT	LT	.010	09/29/76
28.04.0975	12/08/75	1030	6.0	S EAST		P ORTHO	LT	.010	09/29/76
28.04.0975	12/08/75	1230	6.0	50		C ORG		7.0	12/21/76
28.04.0975	12/08/75	1230	6.0	50		FE			12/21/76
28.04.0975	01/12/76	1120	5.0	50	01	P.N.S. SAMPLE #0975-18			
28.04.0975	01/12/76	1120	5.0	50		N ORGANIC		.360	12/21/76
28.04.0975	01/12/76	1120	5.0	50		NH3 N TOT		.020	12/21/76
28.04.0975	01/12/76	1120	5.0	50		NO2 + NO3 N		.010	12/21/76
28.04.0975	01/12/76	1120	5.0	50		P TOT		.019	12/21/76
28.04.0975	01/12/76	1120	5.0	50		P ORTHO		.001	12/21/76
28.04.0975	02/09/76	1500	1.0	50	01	P.A.S. SAMPLE #0975-20 SALINE-			
28.04.0975	02/09/76	1500	1.0	50	02	TOP			
28.04.0975	02/09/76	1500	1.0	50		TEMP WATER		16.5	12/21/76
28.04.0975	02/09/76	1500	1.0	50		WIND VELOCITY		338.0	12/21/76
28.04.0975	02/09/76	1500	1.0	50		WIND DIRECTION		15	12/21/76
28.04.0975	02/09/76	1500	1.0	50		COND FIELD		56000	12/21/76
28.04.0975	02/09/76	1500	1.0	50		DO PROBE		6.9	12/21/76
28.04.0975	02/09/76	1500	1.0	50		PH		7.00	12/21/76
28.04.0975	02/09/76	1500	1.0	50		TIDE DIRECTION		1	
28.04.0975	02/09/76	1500	1.0	50		TIDE LEVEL		1.0	
28.04.0975	02/09/76	1505	11.5	50	01	P.A.S. SAMPLE #0975-20 SALINE-			
28.04.0975	02/09/76	1505	11.5	50	02	BOTTOM			
28.04.0975	02/09/76	1505	11.5	50		TEMP WATER		16.5	12/21/76
28.04.0975	02/09/76	1505	11.5	50		WIND VELOCITY		338.0	12/21/76
28.04.0975	02/09/76	1505	11.5	50		WIND DIRECTION		15	12/21/76
28.04.0975	02/09/76	1505	11.5	50		COND FIELD		56500	12/21/76
28.04.0975	02/09/76	1505	11.5	50		DO PROBE		6.8	12/21/76
28.04.0975	02/09/76	1505	11.5	50		PH		6.80	12/21/76
28.04.0975	02/09/76	1505	11.5	50		TIDE DIRECTION		1	

STATION	DATE	TIME	DEPTH	AGENCY					STORET DATE
28.04.0975	02/09/76	1505	11.5	50		TIDE LEVEL	-	1.0	
28.04.0975	02/09/76	1510	5.0	50	01	P.W.S. SAMPLE #0975-20			
28.04.0975	02/09/76	1510	5.0	50		N ORGANIC		.260	12/21/76
28.04.0975	02/09/76	1510	5.0	50		NH3 N TOT		.090	12/21/76
28.04.0975	02/09/76	1510	5.0	50		NO2 + NO3 N		.010	12/21/76
28.04.0975	02/09/76	1510	5.0	50		P TOT		.009	12/21/76
28.04.0975	02/09/76	1510	5.5	50	01	P.W.S. SAMPLE #0975-20 SALINE-			
28.04.0975	02/09/76	1510	5.5	50	02	MIDDEPTH			
28.04.0975	02/09/76	1510	5.5	50		TURBIDITY FTU		2.5	12/21/76
28.04.0975	02/09/76	1510	5.5	50		COLOR		20	12/21/76
28.04.0975	02/09/76	1510	5.5	50		PH LAB		8.1	12/21/76
28.04.0975	02/09/76	1510	5.5	50		ALKALINITY		143	12/21/76
28.04.0975	02/09/76	1510	5.5	50		ACIDITY		11	12/21/76
28.04.0975	02/09/76	1510	5.5	50		NFS SUSP		3	12/21/76
28.04.0975	02/09/76	1510	5.5	50		COLI MF			12/21/76
28.04.0975	02/09/76	1510	5.5	50		FECAL COLI MF			12/21/76
28.04.0975	03/08/76	1250	1.0	50	01	P.W.S. SAMPLE #0975-21			
28.04.0975	03/08/76	1250	1.0	50		TEMP WATER		25.0	12/21/76
28.04.0975	03/08/76	1250	1.0	50		WIND VELOCITY		135.0	12/21/76
28.04.0975	03/08/76	1250	1.0	50		WIND DIRECTION		10	12/21/76
28.04.0975	03/08/76	1250	1.0	50		TIDE STAGE		4200	12/21/76
28.04.0975	03/08/76	1250	1.0	50		COND FIELD		56000	12/21/76
28.04.0975	03/08/76	1250	1.0	50		DO PROBE		6.5	12/21/76
28.04.0975	03/08/76	1250	1.0	50		PH		8.00	12/21/76
28.04.0975	03/08/76	1250	1.0	50		TIDE DIRECTION		1	
28.04.0975	03/08/76	1250	1.0	50		TIDE LEVEL		1.5	
28.04.0975	03/08/76	1255	11.0	50	01	P.W.S. SAMPLE #0975-21			
28.04.0975	03/08/76	1255	11.0	50		TEMP WATER		25.0	12/21/76
28.04.0975	03/08/76	1255	11.0	50		WIND VELOCITY		135.0	12/21/76
28.04.0975	03/08/76	1255	11.0	50		WIND DIRECTION		10	12/21/76
28.04.0975	03/08/76	1255	11.0	50		TIDE STAGE		4200	12/21/76
28.04.0975	03/08/76	1255	11.0	50		COND FIELD		55000	12/21/76
28.04.0975	03/08/76	1255	11.0	50		DO PROBE		6.5	12/21/76
28.04.0975	03/08/76	1255	11.0	50		PH		8.10	12/21/76
28.04.0975	03/08/76	1255	11.0	50		TIDE DIRECTION		1	
28.04.0975	03/08/76	1255	11.0	50		TIDE LEVEL		1.5	
28.04.0975	03/08/76	1300	6.0	50	01	P.W.S. SAMPLE #0975-21			
28.04.0975	03/08/76	1300	6.0	50		TURBIDITY FTU		1.3	12/21/76
28.04.0975	03/08/76	1300	6.0	50		COLOR		10	12/21/76
28.04.0975	03/08/76	1300	6.0	50		PH LAB		8.2	12/21/76
28.04.0975	03/08/76	1300	6.0	50		ALKALINITY		140	12/21/76
28.04.0975	03/08/76	1300	6.0	50		ACIDITY		5	12/21/76
28.04.0975	03/08/76	1300	6.0	50		NFS SUSP		1	12/21/76
28.04.0975	03/09/76	1300	6.0	50	01	P.W.S.-PENNEKAMP ST. PK. SAMPL			
28.04.0975	03/09/76	1300	6.0	50	02	CNO. #0975-21			
28.04.0975	03/09/76	1300	6.0	50		NH3 N TOT	LT	.010	12/21/76
28.04.0975	03/09/76	1300	6.0	50		N KJEL		.210	12/21/76
28.04.0975	03/09/76	1300	6.0	50		NO2 + NO3 N		.019	12/21/76
28.04.0975	03/09/76	1300	6.0	50		P TOT		.058	12/21/76
28.04.0975	03/09/76	1300	6.0	50		P ORTHO		.000	12/21/76
28.04.0975	04/12/76	1500	1.0	50	01	SALINE SAMPLE NO. 0975-22			
28.04.0975	04/12/76	1500	1.0	50		TEMP WATER		26.5	12/21/76
28.04.0975	04/12/76	1500	1.0	50		COND		56000	12/21/76

STATION	DATE	TIME	DEPTH	AGENCY					STORET DATE
28.04.0975	04/12/76	1500	1.0	50		DO		7.0	12/21/76
28.04.0975	04/12/76	1500	6.0	50	01	P.N.S. SAMPLE #0975-			
28.04.0975	04/12/76	1500	6.0	50		N ORGANIC		.160	12/21/76
28.04.0975	04/12/76	1500	6.0	50		NH3 N TOT		.010	12/21/76
28.04.0975	04/12/76	1500	6.0	51		AGENCY COLLECT		#051	03/29/76
28.04.0975	04/12/76	1500	6.0	51		NO2 + NO3 N		.002	12/21/76
28.04.0975	04/12/76	1500	6.0	51		P TOT		.020	12/21/76
28.04.0975	04/12/76	1500	6.0	51		P ORTHO		.020	03/29/76
28.04.0975	04/12/76	1510	10.0	50	01	SALINE SAMPLE NO. 0975-22			
28.04.0975	04/12/76	1510	10.0	50		TEMP WATER		26.5	12/21/76
28.04.0975	04/12/76	1510	10.0	50		COND		56000	12/21/76
28.04.0975	04/12/76	1510	10.0	50		DO		7.0	12/21/76
28.04.0975	04/12/76	1515	5.0	50	01	SALINE SAMPLE NO. 0975-22			
28.04.0975	04/12/76	1515	5.0	50		CLOUD COVER		10	12/21/76
28.04.0975	04/12/76	1515	5.0	50		WIND VELOCITY		135.0	12/21/76
28.04.0975	04/12/76	1515	5.0	50		WIND DIRECTION		3	12/21/76
28.04.0975	04/12/76	1515	5.0	50		TURBIDITY FTU		2.5	12/21/76
28.04.0975	04/12/76	1515	5.0	50		COLOR			12/21/76
28.04.0975	04/12/76	1515	5.0	50		PH LAB		7.6	12/21/76
28.04.0975	04/12/76	1515	5.0	50		ALKALINITY		125	12/21/76
28.04.0975	04/12/76	1515	5.0	50		ACIDITY		7	12/21/76
28.04.0975	04/12/76	1515	5.0	50		RES SUSP		4	12/21/76
28.04.0975	04/12/76	1515	5.0	50		COLI MF	LT	1	12/21/76
28.04.0975	04/12/76	1515	5.0	50		FECAL COLI MF	LT	1	12/21/76
28.04.0975	04/12/76	1515	5.0	50		TIDE LEVEL		1.0	
28.04.0975	05/10/76	1200	1.0	50	01	PENNEKAMP ST.PK. - PNS SALINE			
28.04.0975	05/10/76	1200	1.0	50	02	- SAMPLE #0975-23			
28.04.0975	05/10/76	1200	1.0	50		TEMP WATER		27.0	12/21/76
28.04.0975	05/10/76	1200	1.0	50		COND FIELD		55100	12/21/76
28.04.0975	05/10/76	1200	1.0	50		DO PROBE		7.7	12/21/76
28.04.0975	05/10/76	1200	1.0	50		PH		8.40	12/21/76
28.04.0975	05/10/76	1205	9.0	50	01	PENNEKAMP ST. PK. - PNS SALINE			
28.04.0975	05/10/76	1205	9.0	50	02	- SAMPLE #0975-23			
28.04.0975	05/10/76	1205	9.0	50		TEMP WATER		27.5	12/21/76
28.04.0975	05/10/76	1205	9.0	50		COND FIELD		55100	12/21/76
28.04.0975	05/10/76	1205	9.0	50		DO PROBE		7.5	12/21/76
28.04.0975	05/10/76	1205	9.0	50		PH		8.40	12/21/76
28.04.0975	05/10/76	1215	4.0	50	01	PENNEKAMP ST. PK. - PNS SALINE			
28.04.0975	05/10/76	1215	4.0	50	02	- SAMPLE #0975-23			
28.04.0975	05/10/76	1215	4.0	50		TURBIDITY FTU		1.5	12/21/76
28.04.0975	05/10/76	1215	4.0	50		COLOR		20	12/21/76
28.04.0975	05/10/76	1215	4.0	50		PH LAB		8.2	12/21/76
28.04.0975	05/10/76	1215	4.0	50		ALKALINITY		122	12/21/76
28.04.0975	05/10/76	1215	4.0	50		ACIDITY		8	12/21/76
28.04.0975	05/10/76	1215	4.0	50		RES SUSP		2	12/21/76
28.04.0975	05/10/76	1215	4.0	50		AS BOT		.00 mg/kg	12/21/76
28.04.0975	05/10/76	1215	4.0	50		CD BOT		1.70 "	12/21/76
28.04.0975	05/10/76	1215	4.0	50		CR BOT	LT	3.40 mg/kg	12/21/76
28.04.0975	05/10/76	1215	4.0	50		CO BOT		10.30	12/21/76
28.04.0975	05/10/76	1215	4.0	50		CU BOT		2.60	12/21/76
28.04.0975	05/10/76	1215	4.0	50		PB BOT	LT	17.20	12/21/76
28.04.0975	05/10/76	1215	4.0	50		MN BOT		6.00	12/21/76
28.04.0975	05/10/76	1215	4.0	50		NI BOT		13.80	12/21/76

sediment

STATION	DATE	TIME	DEPTH	AGENCY					STORET DATE
28.04.0975	05/10/76	1215	4.0	50		ZN TOT		69.00	12/21/76
28.04.0975	05/10/76	1215	4.0	50		FE TOT		17.20	12/21/76
28.04.0975	05/10/76	1215	4.0	50		COLI MF	LT	1	12/21/76
28.04.0975	05/10/76	1215	4.0	50		FECAL COLI MF	LT	1	12/21/76
28.04.0975	05/10/76	1215	4.0	50		HG TOT		.0	12/21/76
28.04.0975	05/10/76	1215	5.0	50	01	[illegible] ST. PK - PHS SALINE			
28.04.0975	05/10/76	1215	5.0	50	02	HOLDING TIME NO2-NO3 EXCEEDED			
28.04.0975	05/10/76	1215	5.0	50	03	72 HRS GG			
28.04.0975	05/10/76	1215	5.0	50		N ORGANIC		.310	12/21/76
28.04.0975	05/10/76	1215	5.0	50		NH3 N TOT		.040	12/21/76
28.04.0975	05/10/76	1215	5.0	50		NO2 + NO3 N		.026	12/21/76
28.04.0975	05/10/76	1215	5.0	50		P TOT		.020	12/21/76
28.04.0975	06/07/76	1130	1.0	50	01	PHS SAMPLE 80975-24 SALINE			
28.04.0975	06/07/76	1130	1.0	50		TEMP WATER		26.3	12/21/76
28.04.0975	06/07/76	1130	1.0	50		COND FIELD		51000	12/21/76
28.04.0975	06/07/76	1130	1.0	50		DO PROBE		7.4	12/21/76
28.04.0975	06/07/76	1130	1.0	50		PH		8.20	12/21/76
28.04.0975	06/07/76	1135	10.0	50	01	PHS SAMPLE 80975-24 SALINE			
28.04.0975	06/07/76	1135	10.0	50		TEMP WATER		26.0	12/21/76
28.04.0975	06/07/76	1135	10.0	50		COND FIELD		53000	12/21/76
28.04.0975	06/07/76	1135	10.0	50		DO PROBE		7.3	12/21/76
28.04.0975	06/07/76	1135	10.0	50		PH		8.30	12/21/76
28.04.0975	06/07/76	1140	5.0	51	01	NO2 + NO3 N AND NH3-N ANALYZED			
28.04.0975	06/07/76	1140	5.0	51	02	6 28 29 WAS BEYOND RECOMMENDED			
28.04.0975	06/07/76	1140	5.0	51	03	HOLDING TIME.GG			
28.04.0975	06/07/76	1140	5.0	51		AGENCY COLLECT		6051	12/21/76
28.04.0975	06/07/76	1140	5.0	51		AGENCY ANALYZE		6051	12/21/76
28.04.0975	06/07/76	1140	5.0	51		N ORGANIC		.290	12/21/76
28.04.0975	06/07/76	1140	5.0	51		NH3 N TOT		.070	12/21/76
28.04.0975	06/07/76	1140	5.0	51		NO2 + NO3 N		.013	12/21/76
28.04.0975	06/07/76	1140	5.0	51		P TOT		.023	12/21/76
28.04.0975	06/07/76	1142	5.0	50	01	PHS SAMPLE 80975-24			
28.04.0975	06/07/76	1142	5.0	50		WIND VELOCITY		135.0	12/21/76
28.04.0975	06/07/76	1142	5.0	50		WIND DIRECTION		3	12/21/76
28.04.0975	06/07/76	1142	5.0	50		TURBIDITY FTU		1.8	12/21/76
28.04.0975	06/07/76	1142	5.0	50		COLOR		15	12/21/76
28.04.0975	06/07/76	1142	5.0	50		PH LAB		8.2	12/21/76
28.04.0975	06/07/76	1142	5.0	50		ALKALINITY		119	12/21/76
28.04.0975	06/07/76	1142	5.0	50		ACIDITY		3	12/21/76
28.04.0975	06/07/76	1142	5.0	50		COLI MF	LT	1	12/21/76
28.04.0975	06/07/76	1142	5.0	50		FECAL COLI MF	LT	1	12/21/76
28.04.0975	06/07/76	1142	5.0	50		TIDE LEVEL	LT	1.0	
28.04.0975	07/26/76	1205	1.0	50	01	PHS SAMPLE 80975-25 SALINE			
28.04.0975	07/26/76	1205	1.0	50		TEMP WATER		30.0	12/21/76
28.04.0975	07/26/76	1205	1.0	50		COND FIELD		57000	12/21/76
28.04.0975	07/26/76	1205	1.0	50		DO PROBE		7.3	12/21/76
28.04.0975	07/26/76	1205	1.0	50		PH		8.30	12/21/76
28.04.0975	07/26/76	1210	10.0	50	01	PHS SAMPLE 80975-25 SALINE			
28.04.0975	07/26/76	1210	10.0	50		TEMP WATER		29.8	12/21/76
28.04.0975	07/26/76	1210	10.0	50		COND FIELD		55000	12/21/76
28.04.0975	07/26/76	1210	10.0	50		DO PROBE		7.0	12/21/76
28.04.0975	07/26/76	1210	10.0	50		PH		8.30	12/21/76
28.04.0975	07/26/76	1215	6.0	50	01	PHS SAMPLE 80975-25 SALINE			

STATION	DATE	TIME	DEPTH	AGENCY					STORET DATE
28.04.0975	07/26/76	1215	6.0	50		WIND VELOCITY		135.0	12/21/76
28.04.0975	07/26/76	1215	6.0	50		WIND DIRECTION		10	12/21/76
28.04.0975	07/26/76	1215	6.0	50		TIDE STAGE		2000	12/21/76
28.04.0975	07/26/76	1215	6.0	50		TURBIDITY FTU		3.6	12/21/76
28.04.0975	07/26/76	1215	6.0	50		COLOR			12/21/76
28.04.0975	07/26/76	1215	6.0	50		ALKALINITY		116	12/21/76
28.04.0975	07/26/76	1215	6.0	50		ACIDITY		10	12/21/76
28.04.0975	07/26/76	1215	6.0	50		RES SUSP		3	12/21/76
28.04.0975	07/26/76	1215	6.0	50		C ORG		4.0	12/21/76
28.04.0975	07/26/76	1215	6.0	50		FE		300	12/21/76
28.04.0975	07/26/76	1215	6.0	50		COLI MF	LT	1	12/21/76
28.04.0975	07/26/76	1215	6.0	50		FECAL COLI MF	LT	1	12/21/76
28.04.0975	07/26/76	1215	6.0	50		TIDE DIRECTION		2	
28.04.0975	07/26/76	1215	6.0	50		TIDE LEVEL		1.5	
28.04.0975	09/15/76	1220	1.0	52	01	PERMANENT NETWORK SYSTEM SAMPL			
28.04.0975	09/15/76	1220	1.0	52	02	E 40975-27			
28.04.0975	09/15/76	1220	1.0	52		TEMP WATER		28.5	01/20/77
28.04.0975	09/15/76	1220	1.0	52		AGENCY COLLECT		4052	07/18/77
28.04.0975	09/15/76	1220	1.0	52		AGENCY ANALYZE		52	01/20/77
28.04.0975	09/15/76	1220	1.0	52		CLOUD COVER		50	01/20/77
28.04.0975	09/15/76	1220	1.0	52		WIND VELOCITY		23.0	07/18/77
28.04.0975	09/15/76	1220	1.0	52		WIND DIRECTION		135	07/18/77
28.04.0975	09/15/76	1220	1.0	52		TIDE STAGE		4000	01/20/77
28.04.0975	09/15/76	1220	1.0	52		TURBIDITY FTU		1.6	01/20/77
28.04.0975	09/15/76	1220	1.0	52		COLOR		9	01/20/77
28.04.0975	09/15/76	1220	1.0	52		COND FIELD		53000	01/20/77
28.04.0975	09/15/76	1220	1.0	52		DO PROBE		5.9	01/20/77
28.04.0975	09/15/76	1220	1.0	52		PH		8.20	01/20/77
28.04.0975	09/15/76	1220	1.0	52		ALKALINITY		133	01/20/77
28.04.0975	09/15/76	1220	1.0	52		ACIDITY		10	01/20/77
28.04.0975	09/15/76	1220	1.0	52		RES SUSP		1	01/20/77
28.04.0975	09/15/76	1220	1.0	52		COLI MF	LT	1	01/20/77
28.04.0975	09/15/76	1220	1.0	52		FECAL COLI MF	LT	1	01/20/77
28.04.0975	09/15/76	1220	1.0	52		TIDE DIRECTION		2	
28.04.0975	09/15/76	1220	1.0	52		TIDE LEVEL		1.0	
28.04.0975	09/15/76	1226	6.0	50	01	PERMANENT NETWORK SYSTEM			
28.04.0975	09/15/76	1226	6.0	50		N ORGANIC		.330	12/21/76
28.04.0975	09/15/76	1226	6.0	50		NH3 N TOT	LT	.010	12/21/76
28.04.0975	09/15/76	1226	6.0	50		NO2 + NO3 N		.004	12/21/76
28.04.0975	09/15/76	1226	6.0	50		P TOT		.020	12/21/76
28.04.0975	09/15/76	1226	6.0	52	01	PNS; METALS DO SPECIFY TESTS T			
28.04.0975	09/15/76	1226	6.0	52	02	O BE RUN.			
28.04.0975	09/15/76	1226	6.0	52	02	TS TO BE RUN.			
28.04.0975	09/15/76	1226	6.0	52		AGENCY COLLECT		4052	03/24/78
28.04.0975	09/15/76	1226	6.0	52		AGENCY ANALYZE		4066	03/24/78
28.04.0975	09/15/76	1226	6.0	52		CD	LT		03/24/78
28.04.0975	09/15/76	1226	6.0	52		CU		10	03/24/78
28.04.0975	09/15/76	1226	6.0	52		FE		100	03/24/78
28.04.0975	09/15/76	1226	6.0	52		PB	LT	10	03/24/78
28.04.0975	09/15/76	1226	6.0	52		ZN		180	03/24/78
28.04.0975	09/15/76	1226	11.0	52	01	PERMANENT NETWORK SYSTEM SAMPL			
28.04.0975	09/15/76	1226	11.0	52	02	E 4 0975-27			
28.04.0975	09/15/76	1226	11.0	52		TEMP WATER		28.5	01/20/77

STATION	DATE	TIME	DEPTH	AGENCY					STORET DATE
28.04.0975	09/15/76	1226	11.0	52		AGENCY COLLECT		6052	07/18/77
28.04.0975	09/15/76	1226	11.0	52		AGENCY ANALYZE		52	01/20/77
28.04.0975	09/15/76	1226	11.0	52		CLOUD COVER		50	01/20/77
28.04.0975	09/15/76	1226	11.0	52		WIND VELOCITY		23.0	07/18/77
28.04.0975	09/15/76	1226	11.0	52		WIND DIRECTION		135	07/18/77
28.04.0975	09/15/76	1226	11.0	52		TIDE STAGE		4000	01/20/77
28.04.0975	09/15/76	1226	11.0	52		COND FIELD		52500	01/20/77
28.04.0975	09/15/76	1226	11.0	52		DO PROBE		5.7	01/20/77
28.04.0975	09/15/76	1226	11.0	52		PH		8.20	01/20/77
28.04.0975	09/15/76	1226	11.0	52		TIDE DIRECTION		2	
28.04.0975	09/15/76	1226	11.0	52		TIDE LEVEL		1.0	
28.04.0975	10/12/76	1120	6.0	52	01	P.R.N.S. SAMPLE #0975-28 SALINE			
28.04.0975	10/12/76	1120	6.0	52		AGENCY COLLECT		6052	03/29/78
28.04.0975	10/12/76	1120	6.0	52		C ORG		10.0	03/29/78
28.04.0975	10/12/76	1120	6.0	52		FE		250	03/29/78
28.04.0975	10/12/76	1125	6.0	52	01	P.R.N.S. SAMPLE NO. 0975-28 SALI			
28.04.0975	10/12/76	1125	6.0	52	02	[illegible]			
28.04.0975	10/12/76	1125	6.0	52		AGENCY COLLECT		6052	04/01/77
28.04.0975	10/12/76	1125	6.0	52		N ORGANIC		.060	04/01/77
28.04.0975	10/12/76	1125	6.0	52		NH3 N TOT	LT	.050	04/01/77
28.04.0975	10/12/76	1125	6.0	52		P TOT	LT	.010	04/01/77
28.04.0975	10/20/76	1110	1.0	52	01	P.R.N.S. SAMPLE # 0975-28 SALINE			
28.04.0975	10/20/76	1110	1.0	52		TEMP WATER		26.7	01/20/77
28.04.0975	10/20/76	1110	1.0	52		AGENCY COLLECT		6052	01/20/77
28.04.0975	10/20/76	1110	1.0	52		WIND VELOCITY		45.0	01/20/77
28.04.0975	10/20/76	1110	1.0	52		WIND DIRECTION		17	01/20/77
28.04.0975	10/20/76	1110	1.0	52		TIDE STAGE		2000	01/20/77
28.04.0975	10/20/76	1110	1.0	52		COND FIELD		53000	01/20/77
28.04.0975	10/20/76	1110	1.0	52		DO PROBE		5.5	01/20/77
28.04.0975	10/20/76	1110	1.0	52		PH		8.50	01/20/77
28.04.0975	10/20/76	1110	1.0	52		FECAL COLI MF	LT	1	01/20/77
28.04.0975	10/20/76	1110	1.0	52		TIDE DIRECTION		2	
28.04.0975	10/20/76	1110	1.0	52		TIDE LEVEL		2.0	
28.04.0975	10/20/76	1115	10.0	52	01	P.R.N.S. SAMPLE # 0975-28 SALINE			
28.04.0975	10/20/76	1115	10.0	52		TEMP WATER		26.7	01/20/77
28.04.0975	10/20/76	1115	10.0	52		AGENCY COLLECT		6052	01/20/77
28.04.0975	10/20/76	1115	10.0	52		WIND VELOCITY		45.0	01/20/77
28.04.0975	10/20/76	1115	10.0	52		WIND DIRECTION		12	01/20/77
28.04.0975	10/20/76	1115	10.0	52		TIDE STAGE		2000	01/20/77
28.04.0975	10/20/76	1115	10.0	52		COND FIELD		53000	01/20/77
28.04.0975	10/20/76	1115	10.0	52		DO PROBE		5.8	01/20/77
28.04.0975	10/20/76	1115	10.0	52		PH		8.60	01/20/77
28.04.0975	10/20/76	1115	10.0	52		TIDE DIRECTION		2	
28.04.0975	10/20/76	1115	10.0	52		TIDE LEVEL		2.0	
28.04.0975	10/20/76	1125	6.0	52	01	P.R.N.S. SAMPLE # 0975-28 SALINE			
28.04.0975	10/20/76	1125	6.0	52		AGENCY COLLECT		6052	01/20/77
28.04.0975	10/20/76	1125	6.0	52		TURBIDITY FTU		2.1	01/20/77
28.04.0975	10/20/76	1125	6.0	52		COLOR		7	01/20/77
28.04.0975	10/20/76	1125	6.0	52		PH LAB		8.2	01/20/77
28.04.0975	10/20/76	1125	6.0	52		ALKALINITY		186	01/20/77
28.04.0975	10/20/76	1125	6.0	52		ACIDITY		7	01/20/77
28.04.0975	10/20/76	1125	6.0	52		RES SUSP		1	01/20/77
28.04.0975	10/20/76	1125	6.0	52		COLI MF	LT	1	01/20/77

STA	L	ME	TH	ENC					STORET DATE
28.04.0975	10/20/76	1125	6.0	52		FECAL COLI MF	LT	1	01/20/77
28.04.0975	11/15/76	1125	1.0	52	01	P.N.S. SAMPLE #0975-29 SALINE			
28.04.0975	11/15/76	1125	1.0	52		TEMP WATER		24.0	04/01/77
28.04.0975	11/15/76	1125	1.0	52		AGENCY COLLECT		8052	04/01/77
28.04.0975	11/15/76	1125	1.0	52		COND FIELD		52000	04/01/77
28.04.0975	11/15/76	1125	1.0	52		DO PROBE		6.0	04/01/77
28.04.0975	11/15/76	1125	1.0	52		PH		8.10	04/01/77
28.04.0975	11/15/76	1130	11.0	52	01	P.N.S. SAMPLE #0975-29 SALINE			
28.04.0975	11/15/76	1130	11.0	52		TEMP WATER		23.5	04/01/77
28.04.0975	11/15/76	1130	11.0	52		AGENCY COLLECT		8052	04/01/77
28.04.0975	11/15/76	1130	11.0	52		COND FIELD		52000	04/01/77
28.04.0975	11/15/76	1130	11.0	52		DO PROBE		7.0	04/01/77
28.04.0975	11/15/76	1130	11.0	52		PH		8.20	04/01/77
28.04.0975	11/15/76	1200	6.0	52	01	P.N.S. SAMPLE NO. 0975-SALINE			
28.04.0975	11/15/76	1200	6.0	52		AGENCY COLLECT		8052	04/01/77
28.04.0975	11/15/76	1200	6.0	52		N ORGANIC		.100	04/01/77
28.04.0975	11/15/76	1200	6.0	52		NH3 N TOT		.020	04/01/77
28.04.0975	11/15/76	1200	6.0	52		P TOT		.020	04/01/77
28.04.0975	11/15/76	1200	6.0	52		CHL A		.00	04/01/77
28.04.0975	11/15/76	1200	6.0	52		CHL B		.00	04/01/77
28.04.0975	11/15/76	1200	6.0	52		CHL C		.00	04/01/77
28.04.0975	11/15/76	1210	6.0	50	01	P.N.S. SAMPLE #0975-29 SALINE			
28.04.0975	11/15/76	1210	6.0	50		WIND VELOCITY		135.0	04/01/77
28.04.0975	11/15/76	1210	6.0	50		WIND DIRECTION		3	04/01/77
28.04.0975	11/15/76	1210	6.0	50		TIDE STAGE		4200	04/01/77
28.04.0975	11/15/76	1210	6.0	50		TURBIDITY FTU		1.5	04/01/77
28.04.0975	11/15/76	1210	6.0	50		COLOR		3	04/01/77
28.04.0975	11/15/76	1210	6.0	50		PH LAB		8.0	04/01/77
28.04.0975	11/15/76	1210	6.0	50		RES SUSP		1	04/01/77
28.04.0975	11/15/76	1210	6.0	50		COLI MF	LT	1	04/01/77
28.04.0975	11/15/76	1210	6.0	50		FECAL COLI MF	LT	1	04/01/77
28.04.0975	11/15/76	1210	6.0	50		TIDE DIRECTION		1	
28.04.0975	11/15/76	1210	6.0	50		TIDE LEVEL		1.0	
28.04.0975	11/15/76	1210	6.0	52	01	P.N.S. SAMPLE #0975-29 SALINE			
28.04.0975	11/15/76	1210	6.0	52		AGENCY COLLECT		8052	03/24/78
28.04.0975	11/15/76	1210	6.0	52		C ORG		4.0	03/24/78
28.04.0975	11/15/76	1210	6.0	52		FE		220	03/24/78
28.04.0975	12/20/76	1130	1.0	52	01	P.N.S. SAMPLE # 0975-30 SALINE			
28.04.0975	12/20/76	1130	1.0	52		TEMP WATER		23.0	04/01/77
28.04.0975	12/20/76	1130	1.0	52		AGENCY COLLECT		8052	04/01/77
28.04.0975	12/20/76	1130	1.0	52		COND FIELD		54000	04/01/77
28.04.0975	12/20/76	1130	1.0	52		DO PROBE		6.2	04/01/77
28.04.0975,	12/20/76	1135	10.0	52	01	P.N.S. SAMPLE NO. 0975-30 SALI			
28.04.0975	12/20/76	1135	10.0	52	02	NE			
28.04.0975	12/20/76	1135	10.0	52		TEMP WATER		22.5	04/01/77
28.04.0975	12/20/76	1135	10.0	52		AGENCY COLLECT		8052	04/01/77
28.04.0975	12/20/76	1135	10.0	52		COND FIELD		55000	04/01/77
28.04.0975	12/20/76	1135	10.0	52		DO PROBE		6.4	04/01/77
28.04.0975	12/20/76	1140	6.0	52	01	P.N.S. SAMPLE NO. 0975-30 SALI			
28.04.0975	12/20/76	1140	6.0	52	02	NE			
28.04.0975	12/20/76	1140	6.0	52		AGENCY COLLECT		8052	04/01/77
28.04.0975	12/20/76	1140	6.0	52		P TOT		.010	04/01/77
28.04.0975	12/20/76	1140	6.0	52		CHL B		.00	04/01/77

STATION	DATE	TIME	DEPTH	AGENCY					STORET DATE
28.04.0975	12/20/76	1140	6.0	52		CHL C		.00	04/01/77
28.04.0975	12/20/76	1140	6.0	52		P ORTHO		.010	04/01/77
28.04.0975	12/20/76	1145	6.0	52	01	P.N.S. SAMPLE # 0975-30 SALINE			
28.04.0975	12/20/76	1145	6.0	52		AGENCY COLLECT		8052	07/18/77
28.04.0975	12/20/76	1145	6.0	52		WIND VELOCITY		3.0	07/18/77
28.04.0975	12/20/76	1145	6.0	52		WIND DIRECTION		135	07/18/77
28.04.0975	12/20/76	1145	6.0	52		TIDE STAGE		4300	04/01/77
28.04.0975	12/20/76	1145	6.0	52		TURBIDITY FTU		1.4	04/01/77
28.04.0975	12/20/76	1145	6.0	52		COLOR		4	04/01/77
28.04.0975	12/20/76	1145	6.0	52		PH LAB		8.2	04/01/77
28.04.0975	12/20/76	1145	6.0	52		ALKALINITY		1	04/01/77
28.04.0975	12/20/76	1145	6.0	52		ACIDITY		131	04/01/77
28.04.0975	12/20/76	1145	6.0	52		RES SUSP		3	04/01/77
28.04.0975	12/20/76	1145	6.0	52		NO2 + NO3 N		.030	04/01/77
28.04.0975	12/20/76	1145	6.0	52		C ORG		5.0	04/01/77
28.04.0975	12/20/76	1145	6.0	52		FE		150	04/01/77
28.04.0975	12/20/76	1145	6.0	52		COLI MF	LT	1	04/01/77
28.04.0975	12/20/76	1145	6.0	52		FECAL COLI MF	LT	1	04/01/77
28.04.0975	12/20/76	1145	6.0	52		TIDE DIRECTION		1	
28.04.0975	12/20/76	1145	6.0	52		TIDE LEVEL		1.0	
28.04.0975	01/10/77	1120	1.0	52	01	PENNEKAMP ST.PK. P.N.N. SALINE			
28.04.0975	01/10/77	1120	1.0	52	02	-SAMPLE NO.0975-31			
28.04.0975	01/10/77	1120	1.0	52		TEMP WATER		21.5	04/01/77
28.04.0975	01/10/77	1120	1.0	52		AGENCY COLLECT		8052	04/01/77
28.04.0975	01/10/77	1120	1.0	52		COND FIELD		52000	04/01/77
28.04.0975	01/10/77	1120	1.0	52		DO PROBE		6.9	04/01/77
28.04.0975	01/10/77	1120	1.0	52		PH		8.60	04/01/77
28.04.0975	01/10/77	1125	6.0	52	01	P.N.S. SAMPLE #0975-31 SALINE			
28.04.0975	01/10/77	1125	6.0	52		TEMP WATER		21.0	04/01/77
28.04.0975	01/10/77	1125	6.0	52		AGENCY COLLECT		8052	04/01/77
28.04.0975	01/10/77	1125	6.0	52		COND FIELD		53000	04/01/77
28.04.0975	01/10/77	1125	6.0	52		DO PROBE		7.0	04/01/77
28.04.0975	01/10/77	1125	6.0	52		PH		8.60	04/01/77
28.04.0975	01/10/77	1130	6.0	52	01	P.N.S. SAMPLE NO. 0975-31 SALI			
28.04.0975	01/10/77	1130	6.0	52	02	NE			
28.04.0975	01/10/77	1130	6.0	52		AGENCY COLLECT		8052	04/01/77
28.04.0975	01/10/77	1130	6.0	52		N ORGANIC		.060	04/01/77
28.04.0975	01/10/77	1130	6.0	52		NH3 N TOT	LT	.030	04/01/77
28.04.0975	01/10/77	1130	6.0	52		P TOT	LT	.010	04/01/77
28.04.0975	01/10/77	1130	6.0	52		CHL A		.00	04/01/77
28.04.0975	01/10/77	1130	6.0	52		CHL B		.00	04/01/77
28.04.0975	01/10/77	1130	6.0	52		CHL C		.00	04/01/77
28.04.0975	01/10/77	1135	6.0	50	01	P.N.S. SAMPLE #0975-31 SALINE			
28.04.0975	01/10/77	1135	6.0	50		WIND VELOCITY		18.0	07/18/77
28.04.0975	01/10/77	1135	6.0	50		WIND DIRECTION		135	07/18/77
28.04.0975	01/10/77	1135	6.0	50		TIDE STAGE		4200	04/01/77
28.04.0975	01/10/77	1135	6.0	50		TURBIDITY FTU		3.3	04/01/77
28.04.0975	01/10/77	1135	6.0	50		COLOR		11	04/01/77
28.04.0975	01/10/77	1135	6.0	50		PH LAB		8.3	04/01/77
28.04.0975	01/10/77	1135	6.0	50		ALKALINITY		132	04/01/77
28.04.0975	01/10/77	1135	6.0	50		ACIDITY			04/01/77
28.04.0975	01/10/77	1135	6.0	50		RES SUSP		1	04/01/77
28.04.0975	01/10/77	1135	6.0	50		NO2 + NO3 N		.030	04/01/77

STATION	DATE	TIME	DEPTH	AGENCY					STORET DATE
28.04.0975	01/10/77	1135	6.0	50		COLI MF	LT	1	04/01/77
28.04.0975	01/10/77	1135	6.0	50		FECAL COLI MF	LT	1	04/01/77
28.04.0975	01/10/77	1135	6.0	50		TIDE LEVEL		1.0	
28.04.0975	01/10/77	1135	6.0	52	01	CORRECTION FOR DATA ON UPDATE			
28.04.0975	01/10/77	1135	6.0	52	01	P.N.S. SAMPLE 0975-31 SALINE			
28.04.0975	01/10/77	1135	6.0	52	02	SHEET.			
28.04.0975	01/10/77	1135	6.0	52		AGENCY COLLECT		8052	03/24/76
28.04.0975	01/10/77	1135	6.0	52		WIND VELOCITY		10.0	03/24/76
28.04.0975	01/10/77	1135	6.0	52		WIND DIRECTION		135	03/24/76
28.04.0975	01/10/77	1135	6.0	52		C ORG		2.0	04/01/77
28.04.0975	01/10/77	1135	6.0	52		FC		150	04/01/77
28.04.0975	03/22/77	1210	1.0	52	01	PENNEKAMP ST. PK. -PKS SALINE			
28.04.0975	03/22/77	1210	1.0	52	02	SAMPLE NO. 0975-32			
28.04.0975	03/22/77	1210	1.0	52		TEMP WATER		27.5	07/18/77
28.04.0975	03/22/77	1210	1.0	52		AGENCY COLLECT		8052	07/18/77
28.04.0975	03/22/77	1210	1.0	52		COND FIELD		53560	07/18/77
28.04.0975	03/22/77	1210	1.0	52		DO PROBE		6.3	07/18/77
28.04.0975	03/22/77	1210	1.0	52		PH		8.50	07/18/77
28.04.0975	03/22/77	1215	10.5	52	01	PENNEKAMP ST. PK. -PKS SALINE			
28.04.0975	03/22/77	1215	10.5	52	02	SAMPLE NO. 0975-32			
28.04.0975	03/22/77	1215	10.5	52		TEMP WATER		27.5	07/18/77
28.04.0975	03/22/77	1215	10.5	52		AGENCY COLLECT		8052	07/18/77
28.04.0975	03/22/77	1215	10.5	52		COND FIELD		52500	07/18/77
28.04.0975	03/22/77	1215	10.5	52		DO PROBE		6.3	07/18/77
28.04.0975	03/22/77	1215	10.5	52		PH		8.50	07/18/77
28.04.0975	03/22/77	1220	6.0	50	01	P.N.S. SAMPLE 80975-32 SALINE			
28.04.0975	03/22/77	1220	6.0	50		NH3 N TOT		.090	07/18/77
28.04.0975	03/22/77	1220	6.0	50		P TOT		.010	07/18/77
28.04.0975	03/22/77	1220	6.0	50		CHL A		.00	07/18/77
28.04.0975	03/22/77	1220	6.0	50		CHL B		.00	07/18/77
28.04.0975	03/22/77	1220	6.0	50		CHL C		.00	07/18/77
28.04.0975	03/22/77	1230	6.0	50	01	P.N.S. SAMPLE 80975-32 SALINE			
28.04.0975	03/22/77	1230	6.0	50		WIND VELOCITY		10.0	07/18/77
28.04.0975	03/22/77	1230	6.0	50		WIND DIRECTION		135	07/18/77
28.04.0975	03/22/77	1230	6.0	50		TIDE STAGE		9300	07/18/77
28.04.0975	03/22/77	1230	6.0	50		TURBIDITY FTU		1.6	07/18/77
28.04.0975	03/22/77	1230	6.0	50		COLOR		6	07/18/77
28.04.0975	03/22/77	1230	6.0	50		PH LAB		8.1	07/18/77
28.04.0975	03/22/77	1230	6.0	50		ALKALINITY		127	07/18/77
28.04.0975	03/22/77	1230	6.0	50		ACIDITY		3	07/18/77
28.04.0975	03/22/77	1230	6.0	50		RES SUSP		1	07/18/77
28.04.0975	03/22/77	1230	6.0	50		TIDE DIRECTION		1	
28.04.0975	03/22/77	1230	6.0	50		TIDE LEVEL		1.0	
28.04.0975	04/25/77	1200	6.0	52	C1	P.N.S. SAMPLE NO. 0975-33 SALI			
28.04.0975	04/25/77	1200	6.0	52	C2	NE			
28.04.0975	04/25/77	1200	6.0	52		AGENCY COLLECT		8058	03/24/76
28.04.0975	04/25/77	1200	6.0	52		AGENCY COLLECT		8052	03/24/76
28.04.0975	04/25/77	1200	6.0	52		AGENCY COLLECT		8052	03/24/76
28.04.0975	04/25/77	1200	6.0	52		AGENCY ANALYZE		8066	03/24/76
28.04.0975	04/25/77	1200	6.0	52		N ORGANIC		.000	03/24/76
28.04.0975	04/25/77	1200	6.0	52		NH3 N TOT		.160	03/24/76
28.04.0975	04/25/77	1200	6.0	52		P TOT		.010	03/24/76
28.04.0975	04/25/77	1200	6.0	52		FC		150	03/24/76

STATION	DATE	TIME	DEPTH	AGENCY					STORET DATE
28.04.0975	04/25/77	1200	6.0	52		CHL A	LT	.10	03/24/78
28.04.0975	04/25/77	1200	6.0	52		CHL B	LT	.10	03/24/78
28.04.0975	04/25/77	1200	6.0	52		CHL C	LT	.10	03/24/78
28.04.0975	04/25/77	1220	1.0	52	01	JOHN PENNEKAMP ST. PK. P.N.S.			
28.04.0975	04/25/77	1220	1.0	52	02	SAMPLE #0975-33 SALINE			
28.04.0975	04/25/77	1220	1.0	52		TEMP WATER		24.8	05/05/78
28.04.0975	04/25/77	1220	1.0	52		AGENCY COLLECT		0052	03/24/78
28.04.0975	04/25/77	1220	1.0	52		COND FIELD		55500	03/24/78
28.04.0975	04/25/77	1220	1.0	52		DO PROBE		5.2	03/24/78
28.04.0975	04/25/77	1220	1.0	52		PH		8.50	03/24/78
28.04.0975	04/25/77	1225	11.0	52	01	JOHN PENNEKAMP ST. PK. P.N.S.			
28.04.0975	04/25/77	1225	11.0	52	02	SAMPLE #0975-33 SALINE			
28.04.0975	04/25/77	1225	11.0	52		TEMP WATER		24.5	05/05/78
28.04.0975	04/25/77	1225	11.0	52		AGENCY COLLECT		0052	03/24/78
28.04.0975	04/25/77	1225	11.0	52		COND FIELD		56000	03/24/78
28.04.0975	04/25/77	1225	11.0	52		DO PROBE		5.7	03/24/78
28.04.0975	04/25/77	1225	11.0	52		PH		8.60	03/24/78
28.04.0975	04/25/77	1235	6.0	52	01	JOHN PENNEKAMP ST PK PERMANENT			
28.04.0975	04/25/77	1235	6.0	52	02	NETWORK SYSTEM SAMPLE #0975-3			
28.04.0975	04/25/77	1235	6.0	52	03	3 SALINE			
28.04.0975	04/25/77	1235	6.0	52		TEMP WATER		24.6	05/05/78
28.04.0975	04/25/77	1235	6.0	52		AGENCY COLLECT		0052	03/24/78
28.04.0975	04/25/77	1235	6.0	52		AGENCY ANALYZE		52	03/24/78
28.04.0975	04/25/77	1235	6.0	52		CLOUD COVER		25	03/24/78
28.04.0975	04/25/77	1235	6.0	52		WIND VELOCITY		135.0	03/24/78
28.04.0975	04/25/77	1235	6.0	52		WIND DIRECTION		18	03/24/78
28.04.0975	04/25/77	1235	6.0	52		TURBIDITY FTU		3.0	03/24/78
28.04.0975	04/25/77	1235	6.0	52		COLOR		15	03/24/78
28.04.0975	04/25/77	1235	6.0	52		ALKALINITY		113	03/24/78
28.04.0975	04/25/77	1235	6.0	52		RES SUSP		6	03/24/78
28.04.0975	04/25/77	1235	6.0	52		FECAL COLI MF	LT	1	03/24/78
28.04.0975	04/25/77	1235	6.0	52		CURRENT DIR		215	03/24/78
28.04.0975	05/24/77	1245	6.0	52	01	P.N.S. SAMPLE #0975-34 SALINE			
28.04.0975	05/24/77	1245	6.0	52		AGENCY COLLECT		0052	03/24/78
28.04.0975	05/24/77	1245	6.0	52		N ORGANIC		1.060	03/24/78
28.04.0975	05/24/77	1245	6.0	52		NH3 N TOT		.160	03/24/78
28.04.0975	05/24/77	1245	6.0	52		CHL A	LT	.10	03/24/78
28.04.0975	05/24/77	1245	6.0	52		CHL B	LT	.10	03/24/78
28.04.0975	05/24/77	1245	6.0	52		CHL C	LT	.10	03/24/78
28.04.0975	05/24/77	1250	6.0	52	01	P.N.S. SAMPLE #0975-34 SALINE			
28.04.0975	05/24/77	1250	6.0	52	01	SALINE PERMANENT NETWORK SYSTE			
28.04.0975	05/24/77	1250	6.0	52	02	MNO3			
28.04.0975	05/24/77	1250	6.0	52	02	N			
28.04.0975	05/24/77	1250	6.0	52		AGENCY COLLECT		0052	03/24/78
28.04.0975	05/24/77	1250	6.0	52		AGENCY ANALYZE		0052	03/24/78
28.04.0975	05/24/77	1250	6.0	52		SAMPLE NUMBER		97534	03/24/78
28.04.0975	05/24/77	1250	6.0	52		CLOUD COVER		15	03/24/78
28.04.0975	05/24/77	1250	6.0	52		WIND VELOCITY		135.0	03/24/78
28.04.0975	05/24/77	1250	6.0	52		WIND DIRECTION		5	03/24/78
28.04.0975	05/24/77	1250	6.0	52		TIDE STAGE		5000	03/24/78
28.04.0975	05/24/77	1250	6.0	52		TURBIDITY FTU		1.8	03/24/78
28.04.0975	05/24/77	1250	6.0	52		COLOR		5	03/24/78
28.04.0975	05/24/77	1250	6.0	52		PH LAB		8.3	03/24/78

STATION	DATE	TIME	DEPTH	AGENCY					SIGNET DATE
28.04.0975	05/24/77	1250	6.0	52		ALKALINITY		118	03/24/78
28.04.0975	05/24/77	1250	6.0	52		ACIDITY			03/24/78
28.04.0975	05/24/77	1250	6.0	52		NFS SUSP		1	03/24/78
28.04.0975	05/24/77	1250	6.0	52		NO2 + NO3 N		.035	03/24/78
28.04.0975	05/24/77	1250	6.0	52		FE	LT	100	03/24/78
28.04.0975	05/24/77	1250	6.0	52		COLI MF	LT	1	03/24/78
28.04.0975	05/24/77	1250	6.0	52		FECAL COLI MF	LT	1	03/24/78
28.04.0975	05/24/77	1250	6.0	52		TIDE DIRECTION		1	
28.04.0975	05/24/77	1300	1.0	52	01	SALINE PERMANENT NETWORK SYSTE			
28.04.0975	05/24/77	1300	1.0	52	02	M			
28.04.0975	05/24/77	1300	1.0	52		TEMP WATER		26.5	05/05/78
28.04.0975	05/24/77	1300	1.0	52		AGENCY COLLECT		8052	03/24/78
28.04.0975	05/24/77	1300	1.0	52		AGENCY ANALYZE		8052	03/24/78
28.04.0975	05/24/77	1300	1.0	52		SAMPLE NUMBER		97534	03/24/78
28.04.0975	05/24/77	1300	1.0	52		CLOUD COVER		15	03/24/78
28.04.0975	05/24/77	1300	1.0	52		WIND VELOCITY		135.0	03/24/78
28.04.0975	05/24/77	1300	1.0	52		WIND DIRECTION		5	03/24/78
28.04.0975	05/24/77	1300	1.0	52		COND FIELD		53500	03/24/78
28.04.0975	05/24/77	1300	1.0	52		DO PROBE		6.2	03/24/78
28.04.0975	05/24/77	1300	1.0	52		PH		8.60	03/24/78
28.04.0975	05/24/77	1310	11.0	52	01	SALINE PERMANENT NETWORK SYSTE			
28.04.0975	05/24/77	1310	11.0	52	02	M			
28.04.0975	05/24/77	1310	11.0	52		TEMP WATER		26.0	05/05/78
28.04.0975	05/24/77	1310	11.0	52		AGENCY COLLECT		8052	03/24/78
28.04.0975	05/24/77	1310	11.0	52		AGENCY ANALYZE		8052	03/24/78
28.04.0975	05/24/77	1310	11.0	52		SAMPLE NUMBER		97534	03/24/78
28.04.0975	05/24/77	1310	11.0	52		CLOUD COVER		15	03/24/78
28.04.0975	05/24/77	1310	11.0	52		WIND VELOCITY		135.0	03/24/78
28.04.0975	05/24/77	1310	11.0	52		WIND DIRECTION		5	03/24/78
28.04.0975	05/24/77	1310	11.0	52		COND FIELD		54000	03/24/78
28.04.0975	05/24/77	1310	11.0	52		DO PROBE		7.5	03/24/78
28.04.0975	05/24/77	1310	11.0	52		PH		8.70	03/24/78
28.04.0975	06/06/77	1105	1.0	52	01	JOHN PENNEKAMP ST. PK. P.N.S.			
28.04.0975	06/06/77	1105	1.0	52	02	SALINE			
28.04.0975	06/06/77	1105	1.0	52		TEMP WATER		27.7	05/05/78
28.04.0975	06/06/77	1105	1.0	52		AGENCY COLLECT		8052	03/24/78
28.04.0975	06/06/77	1105	1.0	52		AGENCY ANALYZE		8052	03/24/78
28.04.0975	06/06/77	1105	1.0	52		SAMPLE NUMBER		97535	03/24/78
28.04.0975	06/06/77	1105	1.0	52		COND FIELD		49800	03/24/78
28.04.0975	06/06/77	1105	1.0	52		DO PROBE		5.6	03/24/78
28.04.0975	06/06/77	1105	1.0	52		PH		8.60	03/24/78
28.04.0975	06/06/77	1105	1.0	52		SALINITY COND		32.7	03/24/78
28.04.0975	06/06/77	1110	11.0	52	01	JOHN PENNEKAMP ST. PK. P.N.S S			
28.04.0975	06/06/77	1110	11.0	52	02	ALINE			
28.04.0975	06/06/77	1110	11.0	52		TEMP WATER		27.7	05/05/78
28.04.0975	06/06/77	1110	11.0	52		AGENCY COLLECT		8052	03/24/78
28.04.0975	06/06/77	1110	11.0	52		AGENCY ANALYZE		8052	03/24/78
28.04.0975	06/06/77	1110	11.0	52		SAMPLE NUMBER		97535	03/24/78
28.04.0975	06/06/77	1110	11.0	52		COND FIELD		51000	03/24/78
28.04.0975	06/06/77	1110	11.0	52		DO PROBE		6.0	03/24/78
28.04.0975	06/06/77	1110	11.0	52		PH		8.70	03/24/78
28.04.0975	06/06/77	1110	11.0	52		SALINITY COND		33.5	03/24/78
28.04.0975	06/06/77	1120	6.0	52	01	0975-35 SALINE			

STATION	DATE	TIME	DEPTH	AGENCY					STORET DATE
28.04.0975	06/06/77	1120	6.0	52	01	JOHN PENNEKAMP ST. PK. P.N.S S			
28.04.0975	06/06/77	1120	6.0	52	01	P.N.S. SAMPLE NO. G975-35 SALI			
28.04.0975	06/06/77	1120	6.0	52	02	ALINE			
28.04.0975	06/06/77	1120	6.0	52	02	NE			
28.04.0975	06/06/77	1120	6.0	52		AGENCY COLLECT		8052	03/24/78
28.04.0975	06/06/77	1120	6.0	52		AGENCY ANALYZE		8052	03/24/78
28.04.0975	06/06/77	1120	6.0	52		SAMPLE NUMBER		97535	03/24/78
28.04.0975	06/06/77	1120	6.0	52		TIDE STAGE		2000	03/24/78
28.04.0975	06/06/77	1120	6.0	52		TURBIDITY FTU		1.8	03/24/78
28.04.0975	06/06/77	1120	6.0	52		COLOR		5	03/24/78
28.04.0975	06/06/77	1120	6.0	52		PH LAB		8.2	03/24/78
28.04.0975	06/06/77	1120	6.0	52		ALKALINITY		111	03/24/78
28.04.0975	06/06/77	1120	6.0	52		ACIDITY		3	03/24/78
28.04.0975	06/06/77	1120	6.0	52		RES SUSP		14	03/24/78
28.04.0975	06/06/77	1120	6.0	52		N ORGANIC		.060	03/24/78
28.04.0975	06/06/77	1120	6.0	52		NH3 N TOT		.000	03/24/78
28.04.0975	06/06/77	1120	6.0	52		P TOT		.020	03/24/78
28.04.0975	06/06/77	1120	6.0	52		C ORG		.5	03/24/78
28.04.0975	06/06/77	1120	6.0	52		FE	LT	160	03/24/78
28.04.0975	06/06/77	1120	6.0	52		CHL A	LT	.10	03/24/78
28.04.0975	06/06/77	1120	6.0	52		CHL B	LT	.10	03/24/78
28.04.0975	06/06/77	1120	6.0	52		CHL C	LT	.10	03/24/78
28.04.0975	06/06/77	1120	6.0	52		TIDE DIRECTION		2	
28.04.0975	06/06/77	1120	6.0	52		TIDE LEVEL		1.0	
28.04.0975	06/06/77	1300	6.0	52	01	P.N.S. SAMPLE NO. G975-35 SALI			
28.04.0975	06/06/77	1300	6.0	52	02	NE			
28.04.0975	06/06/77	1300	6.0	52		AGENCY COLLECT		8052	03/24/78
28.04.0975	06/06/77	1300	6.0	52		CHL A	LT	.10	03/24/78
28.04.0975	06/06/77	1300	6.0	52		CHL B	LT	.10	03/24/78
28.04.0975	06/06/77	1300	6.0	52		CHL C	LT	.10	03/24/78
28.04.0975	07/11/77	1210	1.0	52	01	PENNEKAMP ST.PK. PNS SALINE SA			
28.04.0975	07/11/77	1210	1.0	52	02	MPLE NO. G975-36			
28.04.0975	07/11/77	1210	1.0	52		TEMP WATER		30.2	05/05/78
28.04.0975	07/11/77	1210	1.0	52		AGENCY COLLECT		8052	03/24/78
28.04.0975	07/11/77	1210	1.0	52		COND FIELD		53500	03/24/78
28.04.0975	07/11/77	1210	1.0	52		DO PROBE		5.5	03/24/78
28.04.0975	07/11/77	1210	1.0	52		PH		8.10	03/24/78
28.04.0975	07/11/77	1215	9.0	52	01	PENNEKAMP ST. PK.-PNS SALINE S			
28.04.0975	07/11/77	1215	9.0	52	02	AMPLE NO.-G975-36			
28.04.0975	07/11/77	1215	9.0	52		TEMP WATER		30.2	05/05/78
28.04.0975	07/11/77	1215	9.0	52		AGENCY COLLECT		8052	03/24/78
28.04.0975	07/11/77	1215	9.0	52		COND FIELD		53000	03/24/78
28.04.0975	07/11/77	1215	9.0	52		DO PROBE		5.3	03/24/78
28.04.0975	07/11/77	1215	9.0	52		PH		8.26	03/24/78
28.04.0975	07/11/77	1225	6.0	52	01	P.N.S. SAMPLE #G975-36 SALINE			
28.04.0975	07/11/77	1225	6.0	52	01	PENNEKAMP ST. PK. PNS SALINE S			
28.04.0975	07/11/77	1225	6.0	52	02	AMPLE NO. G975-36			
28.04.0975	07/11/77	1225	6.0	52		AGENCY COLLECT		8052	03/24/78
28.04.0975	07/11/77	1225	6.0	52		WIND VELOCITY		10.0	03/24/78
28.04.0975	07/11/77	1225	6.0	52		WIND DIRECTION		160	03/24/78
28.04.0975	07/11/77	1225	6.0	52		TIDE STAGE		2000	03/24/78
28.04.0975	07/11/77	1225	6.0	52		TURBIDITY FTU		1.5	03/24/78
28.04.0975	07/11/77	1225	6.0	52		COLOR		1	03/24/78

STATION	DATE	TIME	DEPTH	AGENCY					STORET DATE
28.04.0975	07/11/77	1225	6.0	52		PH LAB		8.4	03/24/78
28.04.0975	07/11/77	1225	6.0	52		ALKALINITY		111	03/24/78
28.04.0975	07/11/77	1225	6.0	52		ACIDITY			03/24/78
28.04.0975	07/11/77	1225	6.0	52		RES SUSP		1	03/24/78
28.04.0975	07/11/77	1225	6.0	52		N ORGANIC		.590	03/24/78
28.04.0975	07/11/77	1225	6.0	52		NH3 N TOT		.060	03/24/78
28.04.0975	07/11/77	1225	6.0	52		P TOT		.000	03/24/78
28.04.0975	07/11/77	1225	6.0	52		COLI MF	LT	1	03/24/78
28.04.0975	07/11/77	1225	6.0	52		FECAL COLI MF	LT	1	03/24/78
28.04.0975	07/11/77	1225	6.0	52		CHL A	LT	.10	03/24/78
28.04.0975	07/11/77	1225	6.0	52		CHL B	LT	.10	03/24/78
28.04.0975	07/11/77	1225	6.0	52		CHL C	LT	.10	03/24/78
28.04.0975	07/11/77	1225	6.0	52		TIDE DIRECTION		2	
28.04.0975	07/11/77	1225	6.0	52		TIDE LEVEL		1.5	
28.04.0975	07/12/77	1255	1.5	52	01	PNSY METALS AND NUTRIENTS NO S			
28.04.0975	07/12/77	1255	1.5	52	02	PECIFY TESTS TO BE MADE.			
28.04.0975	07/12/77	1255	1.5	52		AGENCY COLLECT		8052	03/24/78
28.04.0975	07/12/77	1255	1.5	52		AGENCY ANALYZE		8066	03/24/78
28.04.0975	07/12/77	1255	1.5	52		N ORGANIC		.050	03/24/78
28.04.0975	07/12/77	1255	1.5	52		NH3 N TOT		.000	03/24/78
28.04.0975	07/12/77	1255	1.5	52		P TOT		.130	03/24/78
28.04.0975	07/12/77	1255	1.5	52		CHL A	LT	.10	03/24/78
28.04.0975	07/12/77	1255	1.5	52		CHL B	LT	.10	03/24/78
28.04.0975	07/12/77	1255	1.5	52		CHL C	LT	.10	03/24/78
28.04.0975	08/22/77	1110	1.0	52	01	P.N.S. STATION SALINE			
28.04.0975	08/22/77	1110	1.0	52		TEMP WATER		29.5	05/05/78
28.04.0975	08/22/77	1110	1.0	52		AGENCY COLLECT		8052	03/24/78
28.04.0975	08/22/77	1110	1.0	52		AGENCY ANALYZE		8052	03/24/78
28.04.0975	08/22/77	1110	1.0	52		COND FIELD		53	03/24/78
28.04.0975	08/22/77	1110	1.0	52		DO PROBE		6.0	03/24/78
28.04.0975	08/22/77	1110	1.0	52		PH		8.20	03/24/78
28.04.0975	08/22/77	1115	6.0	52	01	PNS STATION SALINE			
28.04.0975	08/22/77	1115	6.0	52		TEMP WATER		30.0	05/05/78
28.04.0975	08/22/77	1115	6.0	52		AGENCY COLLECT		8052	03/24/78
28.04.0975	08/22/77	1115	6.0	52		AGENCY ANALYZE		8052	03/24/78
28.04.0975	08/22/77	1115	6.0	52		COND FIELD		53	03/24/78
28.04.0975	08/22/77	1115	6.0	52		DO PROBE		6.1	03/24/78
28.04.0975	08/22/77	1115	6.0	52		PH		8.30	03/24/78
28.04.0975	08/22/77	1120	6.0	52	01	P.N.S. SAMPLE SAMPLE NO. C975-			
28.04.0975	08/22/77	1120	6.0	52	02	37 SALINE			
28.04.0975	08/22/77	1120	6.0	52		AGENCY COLLECT		8052	05/05/78
28.04.0975	08/22/77	1120	6.0	52		N ORGANIC		.050	05/05/78
28.04.0975	08/22/77	1120	6.0	52		NH3 N TOT		.040	05/05/78
28.04.0975	08/22/77	1120	6.0	52		NO3 N	LT	1.000	05/05/78
28.04.0975	08/22/77	1120	6.0	52		P TOT		.060	05/05/78
28.04.0975	08/22/77	1120	6.0	52		CHL A	LT	.10	05/05/78
28.04.0975	08/22/77	1120	6.0	52		CHL B	LT	.10	05/05/78
28.04.0975	08/22/77	1120	6.0	52		CHL C	LT	.10	05/05/78
28.04.0975	08/22/77	1125	6.0	52	01	PNS SAMPLE SALINE			
28.04.0975	08/22/77	1125	6.0	52		AGENCY COLLECT		8052	03/24/78
28.04.0975	08/22/77	1125	6.0	52		AGENCY ANALYZE		8052	03/24/78
28.04.0975	08/22/77	1125	6.0	52		TURBIDITY FTU		.8	03/24/78
28.04.0975	08/22/77	1125	6.0	52		COLOR	LT	10	03/24/78

STATION	DATE	TIME	DEPTH	AGENCY					STORET DATE
28.04.0975	08/22/77	1125	6.0	52		PH LAB		8.1	03/24/78
28.04.0975	08/22/77	1125	6.0	52		ALKALINITY		117	03/24/78
28.04.0975	08/22/77	1125	6.0	52		ACIDITY		6	03/24/78
28.04.0975	08/22/77	1125	6.0	52		NO2 + NO3 N		.030	03/24/78
28.04.0975	11/29/77	1140	1.0	52	01	PNS SAMPLE #0975-39 SALINE			
28.04.0975	11/29/77	1140	1.0	52		TEMP WATER		23.2	05/05/78
28.04.0975	11/29/77	1140	1.0	52		AGENCY COLLECT		8052	05/05/78
28.04.0975	11/29/77	1140	1.0	52		COND FIELD		55	05/05/78
28.04.0975	11/29/77	1140	1.0	52		DO PROBE		6.0	05/05/78
28.04.0975	11/29/77	1147	13.0	52	01	P.N.S. SAMPLE #0975-39 SALINE			
28.04.0975	11/29/77	1147	13.0	52		TEMP WATER		23.0	05/05/78
28.04.0975	11/29/77	1147	13.0	52		AGENCY COLLECT		8052	05/05/78
28.04.0975	11/29/77	1147	13.0	52		COND FIELD		54000	05/05/78
28.04.0975	11/29/77	1147	13.0	52		DO PROBE		6.1	05/05/78
28.04.0975	11/29/77	1155	6.0	52	01	P.N.S. SAMPLE #0975- SALINE SA			
28.04.0975	11/29/77	1155	6.0	52	02	MPLE #0975-39			
28.04.0975	11/29/77	1155	6.0	52		AGENCY COLLECT		8052	05/05/78
28.04.0975	11/29/77	1155	6.0	52		N ORGANIC		.040	05/05/78
28.04.0975	11/29/77	1155	6.0	52		NH3 N TOT		.030	05/05/78
28.04.0975	11/29/77	1155	6.0	52		NO2 + NO3 N		.000	05/05/78
28.04.0975	11/29/77	1155	6.0	52		P TOT	LT	.010	05/05/78
28.04.0975	11/29/77	1155	6.0	52		CHL A	LT	.10	05/05/78
28.04.0975	11/29/77	1155	6.0	52		CHL B	LT	.10	05/05/78
28.04.0975	11/29/77	1155	6.0	52		CHL C	LT	.10	05/05/78
28.04.0975	11/29/77	1200	6.0	52	01	PNS SAMPLE #0975-39 SALINE			
28.04.0975	11/29/77	1200	6.0	52		AGENCY COLLECT		8052	06/04/78
28.04.0975	11/29/77	1200	6.0	52		CLOUD COVER		20	05/05/78
28.04.0975	11/29/77	1200	6.0	52		WIND VELOCITY		20.0	05/05/78
28.04.0975	11/29/77	1200	6.0	52		WIND DIRECTION		150	05/05/78
28.04.0975	11/29/77	1200	6.0	52		TIDE STAGE		2300	06/04/78
28.04.0975	11/29/77	1200	6.0	52		TURBIDITY FTU		76.0	05/05/78
28.04.0975	11/29/77	1200	6.0	52		PH LAB		8.1	05/05/78
28.04.0975	11/29/77	1200	6.0	52		ALKALINITY		138	05/05/78
28.04.0975	11/29/77	1200	6.0	52		ACIDITY		2	05/05/78
28.04.0975	11/29/77	1200	6.0	52		RES SUSP		15	05/05/78
28.04.0975	11/29/77	1200	6.0	52		TIDE DIRECTION		2	
28.04.0975	11/29/77	1200	6.0	52		TIDE LEVEL		.5	
28.04.0975	11/29/77	1205	6.0	52	01	PNS SAMPLE #0965-39 SALINE			
28.04.0975	11/29/77	1205	6.0	52		AGENCY COLLECT		8052	05/05/78
28.04.0975	11/29/77	1205	6.0	52		AGENCY ANALYZE		8066	05/05/78
28.04.0975	11/29/77	1205	6.0	52		C ORG		2.0	05/05/78
28.04.0975	12/05/77	1225	1.0	52	01	PNS SAMPLE #0975-40 SALINE			
28.04.0975	12/05/77	1225	1.0	52		TEMP WATER		25.2	05/05/78
28.04.0975	12/05/77	1225	1.0	52		AGENCY COLLECT		8052	05/05/78
28.04.0975	12/05/77	1225	1.0	52		COND FIELD		55000	05/05/78
28.04.0975	12/05/77	1225	1.0	52		DO PROBE		6.0	05/05/78
28.04.0975	12/05/77	1225	6.0	52	01	P.N.S. SAMPLE #0975-40 SALINE			
28.04.0975	12/05/77	1225	6.0	52		AGENCY COLLECT		8052	05/05/78
28.04.0975	12/05/77	1225	6.0	52		AGENCY ANALYZE		8066	03/24/78
28.04.0975	12/05/77	1225	6.0	52		N ORGANIC		.190	05/05/78
28.04.0975	12/05/77	1225	6.0	52		NH3 N TOT		.040	05/05/78
28.04.0975	12/05/77	1225	6.0	52		NH3 N TOT		.000	05/05/78
28.04.0975	12/05/77	1225	6.0	52		N KJEL		.230	05/05/78

STATION	DATE	TIME	DEPTH	AGENCY					SUBMIT DATE
28.04.0975	12/05/77	1225	6.0	52		P TOT		.010	05/05/78
28.04.0975	12/05/77	1225	6.0	52		C ORG		2.2	03/24/78
28.04.0975	12/05/77	1225	6.0	52		CHL A	LT	.01	05/05/78
28.04.0975	12/05/77	1225	6.0	52		CHL B	LT	.01	05/05/78
28.04.0975	12/05/77	1225	6.0	52		CHL C	LT	.01	05/05/78
28.04.0975	12/05/77	1235	11.0	52	01	PNS SAMPLE #0975-40 SALINE			
28.04.0975	12/05/77	1235	11.0	52		TEMP WATER		25.0	05/05/78
28.04.0975	12/05/77	1235	11.0	52		AGENCY COLLECT		6052	05/05/78
28.04.0975	12/05/77	1235	11.0	52		COND FIELD		55000	05/05/78
28.04.0975	12/05/77	1235	11.0	52		DO PROBE		6.2	05/05/78
28.04.0975	12/05/77	1250	6.0	52	01	PNS SAMPLE #0975-40 SALINE			
28.04.0975	12/05/77	1250	6.0	52		AGENCY COLLECT		6052	05/05/78
28.04.0975	12/05/77	1250	6.0	52		WIND VELOCITY		18.0	05/05/78
28.04.0975	12/05/77	1250	6.0	52		WIND DIRECTION		150	05/05/78
28.04.0975	12/05/77	1250	6.0	52		PH LAB		8.2	05/05/78
28.04.0975	12/05/77	1250	6.0	52		ALKALINITY		124	05/05/78
28.04.0975	12/05/77	1250	6.0	52		ACIDITY		1	05/05/78
28.04.0975	12/05/77	1250	6.0	52		RES SUSP		3	05/05/78
28.04.0975	01/05/78	1150	1.0	52	01	PNS SAMPLE #0975-41 SALINE			
28.04.0975	01/05/78	1150	1.0	52		TEMP WATER		19.0	05/05/78
28.04.0975	01/05/78	1150	1.0	52		AGENCY COLLECT		6052	05/05/78
28.04.0975	01/05/78	1150	1.0	52		COND FIELD		55000	05/05/78
28.04.0975	01/05/78	1150	1.0	52		DO PROBE		6.5	05/05/78
28.04.0975	01/05/78	1159	10.0	52	01	P.N.S. SAMPLE #0975-41 SALINE			
28.04.0975	01/05/78	1159	10.0	52		TEMP WATER		19.0	05/05/78
28.04.0975	01/05/78	1159	10.0	52		AGENCY COLLECT		6052	05/05/78
28.04.0975	01/05/78	1159	10.0	52		COND FIELD		55000	05/05/78
28.04.0975	01/05/78	1159	10.0	52		DO PROBE		6.6	05/05/78
28.04.0975	01/05/78	1215	6.0	52	01	P.N.S. SAMPLE NO. 0975-41 SALI			
28.04.0975	01/05/78	1215	6.0	52	02	NE			
28.04.0975	01/05/78	1215	6.0	52		AGENCY COLLECT		6052	05/05/78
28.04.0975	01/05/78	1215	6.0	52		N ORGANIC		.050	05/05/78
28.04.0975	01/05/78	1215	6.0	52		NH3 N TOT		.010	05/05/78
28.04.0975	01/05/78	1215	6.0	52		P TOT		.020	05/05/78
28.04.0975	01/05/78	1215	6.0	52		CHL A	LT	.10	05/05/78
28.04.0975	01/05/78	1215	6.0	52		CHL B	LT	.10	05/05/78
28.04.0975	01/05/78	1215	6.0	52		CHL C	LT	.10	05/05/78
28.04.0975	01/05/78	1220	6.0	52	01	PNS SAMPLE #0975-41 SALINE			
28.04.0975	01/05/78	1220	6.0	52		AGENCY COLLECT		6052	08/04/78
28.04.0975	01/05/78	1220	6.0	52		TIDE STAGE		4300	08/04/78
28.04.0975	01/05/78	1220	6.0	52		TURBIDITY FTU		17.0	05/05/78
28.04.0975	01/05/78	1220	6.0	52		PH LAB		8.1	05/05/78
28.04.0975	01/05/78	1220	6.0	52		ALKALINITY		136	05/05/78
28.04.0975	01/05/78	1220	6.0	52		ACIDITY		5	05/05/78
28.04.0975	01/05/78	1220	6.0	52		NO2 + NO3 N	LT	.010	05/05/78
28.04.0975	01/05/78	1220	6.0	52		TIDE DIRECTION		2	
28.04.0975	01/05/78	1220	6.0	52		TIDE LEVEL		2.0	
28.04.0975	02/15/78	1140	1.0	52	01	P.N.S. SAMPLE #0975-42 SALINE			
28.04.0975	02/15/78	1140	1.0	52		TEMP WATER		19.5	08/04/78
28.04.0975	02/15/78	1140	1.0	52		AGENCY COLLECT		6052	08/04/78
28.04.0975	02/15/78	1140	1.0	52		COND FIELD		55000	08/04/78
28.04.0975	02/15/78	1140	1.0	52		DO PROBE		7.8	08/04/78
28.04.0975	02/15/78	1140	1.0	52		PH		8.30	08/04/78

STATION	DATE	TIME	DEPTH	AGENCY					STORET DATE
28.04.0975	02/15/78	1145	10.5	52	01	P.N.S. SAMPLE 80975-02 SALINE			
28.04.0975	02/15/78	1145	10.5	52		TEMP WATER		19.0	06/04/78
28.04.0975	02/15/78	1145	10.5	52		AGENCY COLLECT		8052	06/04/78
28.04.0975	02/15/78	1145	10.5	52		COND FIELD		55000	06/04/78
28.04.0975	02/15/78	1145	10.5	52		DO PROBE		7.7	06/04/78
28.04.0975	02/15/78	1145	10.5	52		PH		8.30	06/04/78
28.04.0975	02/15/78	1150	6.0	52	01	PNS SAMPLE 80975-02 SALINE			
28.04.0975	02/15/78	1150	6.0	52		AGENCY COLLECT		8052	06/04/78
28.04.0975	02/15/78	1150	6.0	52		TURBIDITY FTU		1.0	06/04/78
28.04.0975	02/15/78	1150	6.0	52		SECCHI M		3.8	06/04/78
28.04.0975	02/15/78	1150	6.0	52		ALKALINITY		130	06/04/78
28.04.0975	02/15/78	1150	6.0	52		ACIDITY		2	06/04/78
28.04.0975	02/15/78	1150	6.0	52		RES SUSP		2	06/04/78
28.04.0975	02/15/78	1150	6.0	52		COLI MF	LT	1	06/04/78
28.04.0975	02/15/78	1150	6.0	52		FECAL COLI MF	LT	1	06/04/78
28.04.0975	02/15/78	1150	6.0	52		SALINITY COND		20.0	06/04/78
28.04.0975	02/15/78	1200	6.0	52		AGENCY COLLECT		8052	06/04/78
28.04.0975	02/15/78	1200	6.0	52		N ORGANIC		.100	06/04/78
28.04.0975	02/15/78	1200	6.0	52		NH3 N TOT		.030	06/04/78
28.04.0975	02/15/78	1200	6.0	52		N KJEL		.130	06/04/78
28.04.0975	02/15/78	1200	6.0	52		P TOT		.010	06/04/78
28.04.0975	02/15/78	1200	6.0	52		CHL A	LT	.10	06/04/78
28.04.0975	02/15/78	1200	6.0	52		CHL B	LT	.16	06/04/78
28.04.0975	02/15/78	1200	6.0	52		CHL C	LT	.10	06/04/78
28.04.0975	03/14/78	1050	1.0	52	01	PNS SAMPLE 80975-03 SALINE			
28.04.0975	03/14/78	1050	1.0	52		TEMP WATER		23.0	08/04/78
28.04.0975	03/14/78	1050	1.0	52		AGENCY COLLECT		8052	06/04/78
28.04.0975	03/14/78	1050	1.0	52		COND FIELD		54000	08/04/78
28.04.0975	03/14/78	1050	1.0	52		DO PROBE		6.6	06/04/78
28.04.0975	03/14/78	1050	1.0	52		PH		8.00	06/04/78
28.04.0975	03/14/78	1105	6.0	52	01	PNS SAMPLE 80975-03 SALINE			
28.04.0975	03/14/78	1105	6.0	52		AGENCY COLLECT		8052	09/14/78
28.04.0975	03/14/78	1105	6.0	52		N ORGANIC		.100	09/14/78
28.04.0975	03/14/78	1105	6.0	52		N KJEL		.130	09/14/78
28.04.0975	03/14/78	1105	6.0	52		P TOT		.000	09/14/78
28.04.0975	03/14/78	1105	6.0	52		C ORG		4.0	06/04/78
28.04.0975	03/14/78	1105	6.0	52		CHL A		.00	09/14/78
28.04.0975	03/14/78	1105	6.0	52		CHL B		.00	09/14/78
28.04.0975	03/14/78	1105	6.0	52		CHL C		.00	09/14/78
28.04.0975	03/16/78	1055	11.0	52	01	PNS SAMPLE 80975-03			
28.04.0975	03/16/78	1055	11.0	52		TEMP WATER		22.5	06/04/78
28.04.0975	03/16/78	1055	11.0	52		AGENCY COLLECT		8052	06/04/78
28.04.0975	03/16/78	1055	11.0	52		COND FIELD		54000	06/04/78
28.04.0975	03/16/78	1055	11.0	52		DO PROBE		6.7	06/04/78
28.04.0975	03/16/78	1055	11.0	52		PH		8.00	06/04/78
28.04.0975	03/16/78	1105	6.0	52	01	PNS SAMPLE 80975-03 SALINE COR			
28.04.0975	03/16/78	1105	6.0	52	02	MCHANT DROPPINGS IN COLI PROBA			
28.04.0975	03/16/78	1105	6.0	52	03	BLE			
28.04.0975	03/16/78	1105	6.0	52		AGENCY COLLECT		8052	08/04/78
28.04.0975	03/16/78	1105	6.0	52		CLOUD COVER		40	06/04/78
28.04.0975	03/16/78	1105	6.0	52		WIND VELOCITY		10.0	06/04/78
28.04.0975	03/16/78	1105	6.0	52		WIND DIRECTION		150	06/04/78
28.04.0975	03/16/78	1105	6.0	52		SECCHI M		3.0	06/04/78

STATION	DATE	TIME	DEPTH	AGENCY					STORET DATE
28.04.0975	05/08/78	1215	6.0	52		RES SUSP		3	08/04/78
28.04.0975	05/08/78	1215	6.0	52		NO2 + NO3 N		.020	08/04/78
28.04.0975	05/08/78	1215	6.0	52		FECAL COLI MF	LT	1	08/04/78
28.04.0975	06/12/78	1135	1.0	52		TEMP WATER		31.0	09/14/78
28.04.0975	06/12/78	1135	1.0	52		AGENCY COLLECT		8052	09/14/78
28.04.0975	06/12/78	1135	1.0	52		DO PROBE		5.5	09/14/78
28.04.0975	06/12/78	1135	1.0	52		PH		8.20	09/14/78
28.04.0975	06/12/78	1140	11.0	52		TEMP WATER		31.0	09/14/78
28.04.0975	06/12/78	1140	11.0	52		AGENCY COLLECT		8052	09/14/78
28.04.0975	06/12/78	1140	11.0	52		DO PROBE		5.2	09/14/78
28.04.0975	06/12/78	1140	11.0	52		PH		8.20	09/14/78
28.04.0975	06/12/78	1145	.6	52		AGENCY COLLECT		8052	09/14/78
28.04.0975	06/12/78	1145	.6	52		AGENCY ANALYZE		8066	09/14/78
28.04.0975	06/12/78	1145	.6	52		N ORGANIC		.070	09/14/78
28.04.0975	06/12/78	1145	.6	52		N KJEL		.060	09/14/78
28.04.0975	06/12/78	1145	.6	52		P TOT		.000	09/14/78
28.04.0975	06/12/78	1145	.6	52		CHL A		.00	09/14/78
28.04.0975	06/12/78	1145	.6	52		CHL B		.00	09/14/78
28.04.0975	06/12/78	1145	.6	52		CHL C		.00	09/14/78
28.04.0975	06/12/78	1150	6.0	52		AGENCY COLLECT		8052	09/14/78
28.04.0975	06/12/78	1150	6.0	52		WIND VELOCITY		5.0	09/14/78
28.04.0975	06/12/78	1150	6.0	52		WIND DIRECTION		135	09/14/78
28.04.0975	06/12/78	1150	6.0	52		TURBIDITY FTU		1.5	09/14/78
28.04.0975	06/12/78	1150	6.0	52		SECCHI M		3.7	09/14/78
28.04.0975	06/12/78	1150	6.0	52		COND FIELD		57000	09/14/78
28.04.0975	06/12/78	1150	6.0	52		NO2 + NO3 N		.040	09/14/78
28.04.0975	06/12/78	1150	6.0	52		CL		21000	09/14/78
28.04.0975	06/12/78	1150	6.0	52		COLI MF	LT	1	09/14/78
28.04.0975	06/12/78	1150	6.0	52		FECAL COLI MF	LT	1	09/14/78
28.04.0975	06/12/78	1150	6.0	52		TIDE DIRECTION		1	
28.04.0975	07/28/78	1100	1.0	52	01	PNS SAMPLE #0975-47 SALINE			
28.04.0975	07/28/78	1100	1.0	52		TEMP WATER		29.0	11/21/78
28.04.0975	07/28/78	1100	1.0	52		AGENCY COLLECT		8052	11/21/78
28.04.0975	07/28/78	1100	1.0	52		COND FIELD		53000	11/21/78
28.04.0975	07/28/78	1100	1.0	52		DO PROBE		5.5	11/21/78
28.04.0975	07/28/78	1100	1.0	52		PH		8.30	11/21/78
28.04.0975	07/28/78	1100	1.0	52		SALINITY PPT		19.4	11/21/78
28.04.0975	07/28/78	1101	6.0	52	01	PNS SAMPLE # 0975-47 SALINE			
28.04.0975	07/28/78	1101	6.0	52		AGENCY COLLECT		8052	11/21/78
28.04.0975	07/28/78	1101	6.0	52		CHL A		.00	11/21/78
28.04.0975	07/28/78	1101	6.0	52		CHL B		.00	11/21/78
28.04.0975	07/28/78	1101	6.0	52		CHL C		.00	11/21/78
28.04.0975	07/28/78	1105	9.0	52	01	PNS SAMPLE #0975-47 SALINE			
28.04.0975	07/28/78	1105	9.0	52		TEMP WATER		29.0	11/21/78
28.04.0975	07/28/78	1105	9.0	52		AGENCY COLLECT		8052	11/21/78
28.04.0975	07/28/78	1105	9.0	52		SECCHI M		3.0	11/21/78
28.04.0975	07/28/78	1105	9.0	52		COND FIELD		54000	11/21/78
28.04.0975	07/28/78	1105	9.0	52		DO PROBE		5.4	11/21/78
28.04.0975	07/28/78	1105	9.0	52		PH		8.30	11/21/78
28.04.0975	07/28/78	1105	9.0	52		NO2 + NO3 N	LT	.010	11/21/78
28.04.0975	07/28/78	1110	6.0	52	01	PNS SAMPLE #0975-47 SALINE			
28.04.0975	07/28/78	1110	6.0	52		AGENCY COLLECT		8052	09/14/78
28.04.0975	07/28/78	1110	6.0	52		N ORGANIC		.210	09/14/78

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28.04.0975	07/28/78	1110	6.0	52		N KJEL		.330	09/14/78
28.04.0975	07/28/78	1110	6.0	52		P TOT		.000	09/14/78
28.04.0975	07/29/78	1112	6.0	52	01	PNS SAMPLE #0975-47 SALINE PNS			
28.04.0975	07/29/78	1112	6.0	52	02	: METALS AND NUTRIENTS DO SPEC			
28.04.0975	07/29/78	1112	6.0	52	02	S AND NUTRIENTS DO SPECIFY TES			
28.04.0975	07/29/78	1112	6.0	52	03	IFY TESTS TO BE RUN.			
28.04.0975	07/29/78	1112	6.0	52	03	TS TO BE RUN.			
28.04.0975	07/29/78	1112	6.0	52		AGENCY COLLECT		8052	11/21/78
28.04.0975	07/29/78	1112	6.0	52		AGENCY ANALYZE		8066	11/21/78
28.04.0975	07/29/78	1112	6.0	52		C ORG		1.0	11/21/78
28.04.0975	08/28/78	1106	6.0	52	01	PNS SAMPLE #0975-46 SALINE PNS			
28.04.0975	08/28/78	1106	6.0	52	01	PNS SAMPLE # 0975-48 SALINE			
28.04.0975	08/28/78	1106	6.0	52	02	: METALS AND NUTRIENTS DO SPEC			
28.04.0975	08/28/78	1106	6.0	52	02	S: METALS AND NUTRIENTS DO SPE			
28.04.0975	08/28/78	1106	6.0	52	03	CIFY TESTS TO BE RUN.			
28.04.0975	08/28/78	1106	6.0	52	03	IFY TESTS TO BE RUN.			
28.04.0975	08/28/78	1106	6.0	52		AGENCY COLLECT		8052	11/21/78
28.04.0975	08/28/78	1106	6.0	52		AGENCY ANALYZE		8066	11/21/78
28.04.0975	08/28/78	1106	6.0	52		NH3 N TOT		.040	11/21/78
28.04.0975	08/28/78	1106	6.0	52		P TOT		.000	11/21/78
28.04.0975	08/28/78	1106	6.0	52		C ORG		1.0	11/21/78
28.04.0975	08/28/78	1106	6.0	52		CHL A		.00	11/21/78
28.04.0975	08/28/78	1106	6.0	52		CHL B		.00	11/21/78
28.04.0975	08/28/78	1106	6.0	52		CHL C		.00	11/21/78
28.04.0975	08/28/78	1114	1.0	52	01	PNS SAMPLE # 0975-48 SALINE			
28.04.0975	08/28/78	1114	1.0	52		TEMP WATER		29.0	11/21/78
28.04.0975	08/28/78	1114	1.0	52		AGENCY COLLECT		8052	11/21/78
28.04.0975	08/28/78	1114	1.0	52		TURBIDITY FTU		2.1	11/21/78
28.04.0975	08/28/78	1114	1.0	52		COND FIELD		54500	11/21/78
28.04.0975	08/28/78	1114	1.0	52		DO PROBE		5.9	11/21/78
28.04.0975	08/28/78	1114	1.0	52		PH		7.90	11/21/78
28.04.0975	08/28/78	1114	1.0	52		SALINITY PPT		20.0	11/21/78
28.04.0975	08/28/78	1115	9.5	52	01	PNS SAMPLE # 0975-48 SALINE			
28.04.0975	08/28/78	1115	9.5	52		TEMP WATER		29.0	11/21/78
28.04.0975	08/28/78	1115	9.5	52		AGENCY COLLECT		8052	11/21/78
28.04.0975	08/28/78	1115	9.5	52		SECCHI M		3.2	11/21/78
28.04.0975	08/28/78	1115	9.5	52		COND FIELD		55000	11/21/78
28.04.0975	08/28/78	1115	9.5	52		DO PROBE		6.0	11/21/78
28.04.0975	08/28/78	1115	9.5	52		PH		7.80	11/21/78
28.04.0975	08/28/78	1115	9.5	52		NO2 + NO3 N	LT	.010	11/21/78
28.04.0975	09/07/78	1100	1.0	52	01	PNS SAMPLE #0975-49 SALINE			
28.04.0975	09/07/78	1100	1.0	52		TEMP WATER		29.3	11/21/78
28.04.0975	09/07/78	1100	1.0	52		AGENCY COLLECT		8052	11/21/78
28.04.0975	09/07/78	1100	1.0	52		COND FIELD		53000	11/21/78
28.04.0975	09/07/78	1100	1.0	52		DO PROBE		5.4	11/21/78
28.04.0975	09/07/78	1100	1.0	52		PH		8.10	11/21/78
28.04.0975	09/07/78	1101	10.5	52		TEMP WATER		29.3	11/21/78
28.04.0975	09/07/78	1101	10.5	52		AGENCY COLLECT		8052	11/21/78
28.04.0975	09/07/78	1101	10.5	52		SECCHI M		3.6	11/21/78
28.04.0975	09/07/78	1101	10.5	52		COND FIELD		55000	11/21/78
28.04.0975	09/07/78	1101	10.5	52		DO PROBE		5.2	11/21/78
28.04.0975	09/07/78	1101	10.5	52		PH		8.10	11/21/78
28.04.0975	09/07/78	1111	6.0	52	01	P.N.S. SAMPLE #0975-50 SALINE			

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28.04.0975	09/07/78	1111	6.0	52		AGENCY COLLECT		8052	03/09/79
28.04.0975	09/07/78	1111	6.0	52		CHL A		.00	03/09/79
28.04.0975	09/07/78	1111	6.0	52		CHL B		.00	03/09/79
28.04.0975	09/07/78	1111	6.0	52		CHL C		.00	03/09/79
28.04.0975	09/07/78	1112	6.0	52	01	PNS SAMPLE #U975-49 SALINE PRE			
28.04.0975	09/07/78	1112	6.0	52	01	WATER: METALS AND PESTICIDES			
28.04.0975	09/07/78	1112	6.0	52	02	SERVED H2SO4 WATER: METALS AN			
28.04.0975	09/07/78	1112	6.0	52	03	D PESTICIDES			
28.04.0975	09/07/78	1112	6.0	52		AGENCY COLLECT		8052	03/09/79
28.04.0975	09/07/78	1112	6.0	52		AGENCY ANALYZE		8066	03/09/79
28.04.0975	09/07/78	1112	6.0	52		C ORG		1.0	03/09/79
28.04.0975	10/26/78	1045	1.0	52	01	PNS SAMPLE #U975-50 SALINE			
28.04.0975	10/26/78	1045	1.0	52		TEMP WATER		25.0	03/09/79
28.04.0975	10/26/78	1045	1.0	52		AGENCY COLLECT		8052	03/09/79
28.04.0975	10/26/78	1045	1.0	52		TIDE STAGE		4310	03/09/79
28.04.0975	10/26/78	1045	1.0	52		COND FIELD		51	03/09/79
28.04.0975	10/26/78	1045	1.0	52		DO PROBE		5.9	03/09/79
28.04.0975	10/26/78	1045	1.0	52		PH		8.00	03/09/79
28.04.0975	10/26/78	1045	1.0	52		TIDE DIRECTION		1	
28.04.0975	10/26/78	1045	1.0	52		TIDE LEVEL		.9	
28.04.0975	10/26/78	1050	10.5	52	01	PNS SAMPLE #U975-50 SALINE			
28.04.0975	10/26/78	1050	10.5	52		TEMP WATER		25.0	03/09/79
28.04.0975	10/26/78	1050	10.5	52		AGENCY COLLECT		8052	03/09/79
28.04.0975	10/26/78	1050	10.5	52		COND FIELD		51500	03/09/79
28.04.0975	10/26/78	1050	10.5	52		DO PROBE		6.0	03/09/79
28.04.0975	10/26/78	1050	10.5	52		PH		8.00	03/09/79
28.04.0975	10/26/78	1100	6.0	52	01	PNS SAMPLE #U975-50 WATER SALI			
28.04.0975	10/26/78	1100	6.0	52	02	NE METALS AND PESTICIDES			
28.04.0975	10/26/78	1100	6.0	52		AGENCY COLLECT		8052	03/09/79
28.04.0975	10/26/78	1100	6.0	52		AGENCY ANALYZE		8066	03/09/79
28.04.0975	10/26/78	1100	6.0	52		C ORG		.0	03/09/79
28.04.0975	10/26/78	1110	6.0	52		AGENCY COLLECT		8052	03/09/79
28.04.0975	10/26/78	1110	6.0	52		N ORGANIC		.150	03/09/79
28.04.0975	10/26/78	1110	6.0	52		NH3 N TOT		.070	03/09/79
28.04.0975	10/26/78	1110	6.0	52		N KJEL		.220	03/09/79
28.04.0975	10/26/78	1110	6.0	52		P TOT		.010	03/09/79
28.04.0975	10/26/78	1110	6.0	52		CHL A		.00	03/09/79
28.04.0975	10/26/78	1110	6.0	52		CHL B		.00	03/09/79
28.04.0975	10/26/78	1110	6.0	52		CHL C		.00	03/09/79
28.04.0975	10/26/78	1111	6.0	52		AGENCY COLLECT		8052	03/09/79
28.04.0975	10/26/78	1111	6.0	52		TURBIDITY FTU		6.1	03/09/79
28.04.0975	10/26/78	1111	6.0	52		SECCHI M		2.0	03/09/79
28.04.0975	10/26/78	1111	6.0	52		RES SUSP		6	03/09/79
28.04.0975	10/26/78	1111	6.0	52		NO2 + NO3 N		.026	03/09/79
28.04.0975	10/26/78	1111	6.0	52		CL		18800	03/09/79
28.04.0975	10/26/78	1111	6.0	52		COLI MF	LT	1	03/09/79
28.04.0975	10/26/78	1111	6.0	52		FECAL COLI MF	LT	1	03/09/79
28.04.0975	11/14/78	1200	1.0	52		TEMP WATER		25.0	03/09/79
28.04.0975	11/14/78	1200	1.0	52		AGENCY COLLECT		8052	03/09/79
28.04.0975	11/14/78	1200	1.0	52		COND FIELD		51500	03/09/79
28.04.0975	11/14/78	1200	1.0	52		DO PROBE		6.4	03/09/79
28.04.0975	11/14/78	1200	1.0	52		PH		8.10	03/09/79
28.04.0975	11/14/78	1205	12.0	52		TEMP WATER		25.0	03/09/79

STATION	DATE	TIME	DEPTH	AGENCY					STORET DATE
28.04.0975	11/14/78	1205	12.0	52		AGENCY COLLECT		6052	03/09/79
28.04.0975	11/14/78	1205	12.0	52		COND FIELD		52060	03/09/79
28.04.0975	11/14/78	1205	12.0	52		DO PROBE		5.4	03/09/79
28.04.0975	11/14/78	1205	12.0	52		PH		8.10	03/09/79
28.04.0975	11/14/78	1215	6.0	52		AGENCY COLLECT		6052	03/09/79
28.04.0975	11/14/78	1215	6.0	52		TIDE STAGE		4110	03/09/79
28.04.0975	11/14/78	1215	6.0	52		SECCHI M		1.5	03/09/79
28.04.0975	11/14/78	1215	6.0	52		RES SUSP		1	03/09/79
28.04.0975	11/14/78	1215	6.0	52		CL		19000	03/09/79
28.04.0975	11/14/78	1215	6.0	52		COLI MF	LT	1	03/09/79
28.04.0975	11/14/78	1215	6.0	52		FECAL COLI MF	LT	1	03/09/79
28.04.0975	11/14/78	1215	6.0	52		TIDE DIRECTION		1	
28.04.0975	11/14/78	1215	6.0	52		TIDE LEVEL		2.2	
28.04.0975	11/21/78	1312	6.0	52	01	PNS SAMPLE #0975-51 SALINE			
28.04.0975	11/21/78	1312	6.0	52		AGENCY COLLECT		6052	03/09/79
28.04.0975	11/21/78	1312	6.0	52		N ORGANIC		.270	03/09/79
28.04.0975	11/21/78	1312	6.0	52		NH3 N TOT		.020	03/09/79
28.04.0975	11/21/78	1312	6.0	52		N KJEL		.290	03/09/79
28.04.0975	11/21/78	1312	6.0	52		P TOT	LT	.010	03/09/79
28.04.0975	11/21/78	1312	6.0	52		CHL A		.00	03/09/79
28.04.0975	11/21/78	1312	6.0	52		CHL B		.00	03/09/79
28.04.0975	11/21/78	1312	6.0	52		CHL C		.00	03/09/79
28.04.0975	12/20/78	1015	1.0	52	01	SALINE			
28.04.0975	12/20/78	1015	1.0	52		TEMP WATER		24.5	03/09/79
28.04.0975	12/20/78	1015	1.0	52		AGENCY COLLECT		6052	03/09/79
28.04.0975	12/20/78	1015	1.0	52		COND FIELD		53500	03/09/79
28.04.0975	12/20/78	1015	1.0	52		DO PROBE		7.5	03/09/79
28.04.0975	12/20/78	1015	1.0	52		PH		7.50	03/09/79
28.04.0975	12/20/78	1015	6.0	52		AGENCY COLLECT		6052	03/09/79
28.04.0975	12/20/78	1015	6.0	52		N ORGANIC		.000	03/09/79
28.04.0975	12/20/78	1015	6.0	52		NH3 N TOT		.030	03/09/79
28.04.0975	12/20/78	1015	6.0	52		NO3 N		.000	03/09/79
28.04.0975	12/20/78	1015	6.0	52		N KJEL		.030	03/09/79
28.04.0975	12/20/78	1015	6.0	52		P TOT		.010	03/09/79
28.04.0975	12/20/78	1015	6.0	52		CHL A		.00	03/09/79
28.04.0975	12/20/78	1015	6.0	52		CHL B		.00	03/09/79
28.04.0975	12/20/78	1015	6.0	52		CHL C		.00	03/09/79
28.04.0975	12/20/78	1020	11.0	52		TEMP WATER		23.0	03/09/79
28.04.0975	12/20/78	1020	11.0	52		AGENCY COLLECT		6052	03/09/79
28.04.0975	12/20/78	1020	11.0	52		COND FIELD		54000	03/09/79
28.04.0975	12/20/78	1020	11.0	52		DO PROBE		7.0	03/09/79
28.04.0975	12/20/78	1020	11.0	52		PH		7.60	03/09/79
28.04.0975	12/20/78	1035	6.0	52		AGENCY COLLECT		6052	03/09/79
28.04.0975	12/20/78	1035	6.0	52		TURBIDITY FTU		1.5	03/09/79
28.04.0975	12/20/78	1035	6.0	52		SECCHI M		3.0	03/09/79
28.04.0975	12/20/78	1035	6.0	52		RES SUSP		1	03/09/79
28.04.0975	12/20/78	1035	6.0	52		CL		19600	03/09/79
28.04.0975	12/20/78	1035	6.0	52		COLI MF	LT	1	03/09/79
28.04.0975	12/20/78	1035	6.0	52		FECAL COLI MF	LT	1	03/09/79
28.04.0975	01/22/79	1045	6.0	52		AGENCY COLLECT		6052	04/10/79
28.04.0975	01/22/79	1045	6.0	52		AGENCY ANALYZE		6052	04/10/79
28.04.0975	01/22/79	1045	6.0	52		TURBIDITY FTU		1.5	04/10/79
28.04.0975	01/22/79	1045	6.0	52		SECCHI P		3.0 (m)	04/10/79

STATION	DATE	TIME	DEPTH	AGENCY					STORET DATE
28.04.0975	01/22/79	1045	6.0	52		RES SUSP			09/10/79
28.04.0975	01/22/79	1045	6.0	52		NO2 + NO3 N		.040	09/10/79
28.04.0975	01/22/79	1045	6.0	52		CL		19000	09/10/79
28.04.0975	01/22/79	1045	6.0	52		COLI MF		1	09/10/79
28.04.0975	01/22/79	1045	6.0	52		FECAL COLI MF		1	09/10/79
28.04.0975	01/22/79	1047	6.0	52	01	RMARKS: METALS AND PESTICIDES			
28.04.0975	01/22/79	1047	6.0	52		AGENCY COLLECT		6052	09/10/79
28.04.0975	01/22/79	1047	6.0	52		AGENCY ANALYZE		8066	09/10/79
28.04.0975	01/22/79	1047	6.0	52		C ORG		1.0	09/10/79
28.04.0975	01/22/79	1110	1.0	52		TEMP WATER		20.0	09/10/79
28.04.0975	01/22/79	1110	1.0	52		AGENCY COLLECT		6052	09/10/79
28.04.0975	01/22/79	1110	1.0	52		AGENCY ANALYZE		8052	09/10/79
28.04.0975	01/22/79	1110	1.0	52		COND FIELD		52000	09/10/79
28.04.0975	01/22/79	1110	1.0	52		DO PROBE		7.1	09/10/79
28.04.0975	01/22/79	1110	1.0	52		PH		8.30	09/10/79
28.04.0975	01/22/79	1115	10.0	52		TEMP WATER		20.5	09/10/79
28.04.0975	01/22/79	1115	10.0	52		AGENCY COLLECT		6052	09/10/79
28.04.0975	01/22/79	1115	10.0	52		AGENCY ANALYZE		6052	09/10/79
28.04.0975	01/22/79	1115	10.0	52		COND FIELD		52500	09/10/79
28.04.0975	01/22/79	1115	10.0	52		DO PROBE		6.9	09/10/79
28.04.0975	01/22/79	1115	10.0	52		PH		8.20	09/10/79
28.04.0975	03/06/79	1020	1.0	52		TEMP WATER		22.5	09/10/79
28.04.0975	03/06/79	1020	1.0	52		AGENCY COLLECT		6052	09/10/79
28.04.0975	03/06/79	1020	1.0	52		AGENCY ANALYZE		6052	09/10/79
28.04.0975	03/06/79	1020	1.0	52		COND FIELD		54000	09/10/79
28.04.0975	03/06/79	1020	1.0	52		DO PROBE		6.7	09/10/79
28.04.0975	03/06/79	1020	1.0	52		PH		8.00	09/10/79
28.04.0975	03/06/79	1025	10.0	52		TEMP WATER		22.5	09/10/79
28.04.0975	03/06/79	1025	10.0	52		AGENCY COLLECT		6052	09/10/79
28.04.0975	03/06/79	1025	10.0	52		AGENCY ANALYZE		6052	09/10/79
28.04.0975	03/06/79	1025	10.0	52		COND FIELD		54000	09/10/79
28.04.0975	03/06/79	1025	10.0	52		DO PROBE		6.8	09/10/79
28.04.0975	03/06/79	1025	10.0	52		PH		8.10	09/10/79
28.04.0975	03/06/79	1045	6.0	52		AGENCY COLLECT		6052	09/10/79
28.04.0975	03/06/79	1045	6.0	52		AGENCY ANALYZE		8052	09/10/79
28.04.0975	03/06/79	1045	6.0	52		TURBIDITY FTU		2.5	09/10/79
28.04.0975	03/06/79	1045	6.0	52		SECCHI M		2.0	09/10/79
28.04.0975	03/06/79	1045	6.0	52		RES SUSP	LT	1	09/10/79
28.04.0975	03/06/79	1045	6.0	52		CL		19700	09/10/79
28.04.0975	03/06/79	1045	6.0	52		COLI MF	LT	1	09/10/79
28.04.0975	03/06/79	1045	6.0	52		FECAL COLI MF	LT	1	09/10/79
28.04.0975	06/16/79	1150	5.0	52	01	PNS SAMPLE # 0975- SALINE			
28.04.0975	06/16/79	1150	5.0	52		N KJEL		.210	09/12/79
28.04.0975	06/16/79	1150	5.0	52		P TOT		.010	09/12/79
28.04.0975	06/16/79	1152	5.0	52	01	PNS SAMPLE # SALINE PNS: METAL			
28.04.0975	06/16/79	1152	5.0	52	02	S AND NUTRIENTS DO SPECIFY TES			
28.04.0975	06/16/79	1152	5.0	52	03	TS TO BE RUN.			
28.04.0975	06/16/79	1152	5.0	52		AGENCY ANALYZE		6066	09/12/79
28.04.0975	06/16/79	1152	5.0	52		C ORG		1.0	09/12/79
28.04.0975	06/16/79	1152	5.0	52		FE		270	09/12/79

Appendix E

FIGURES

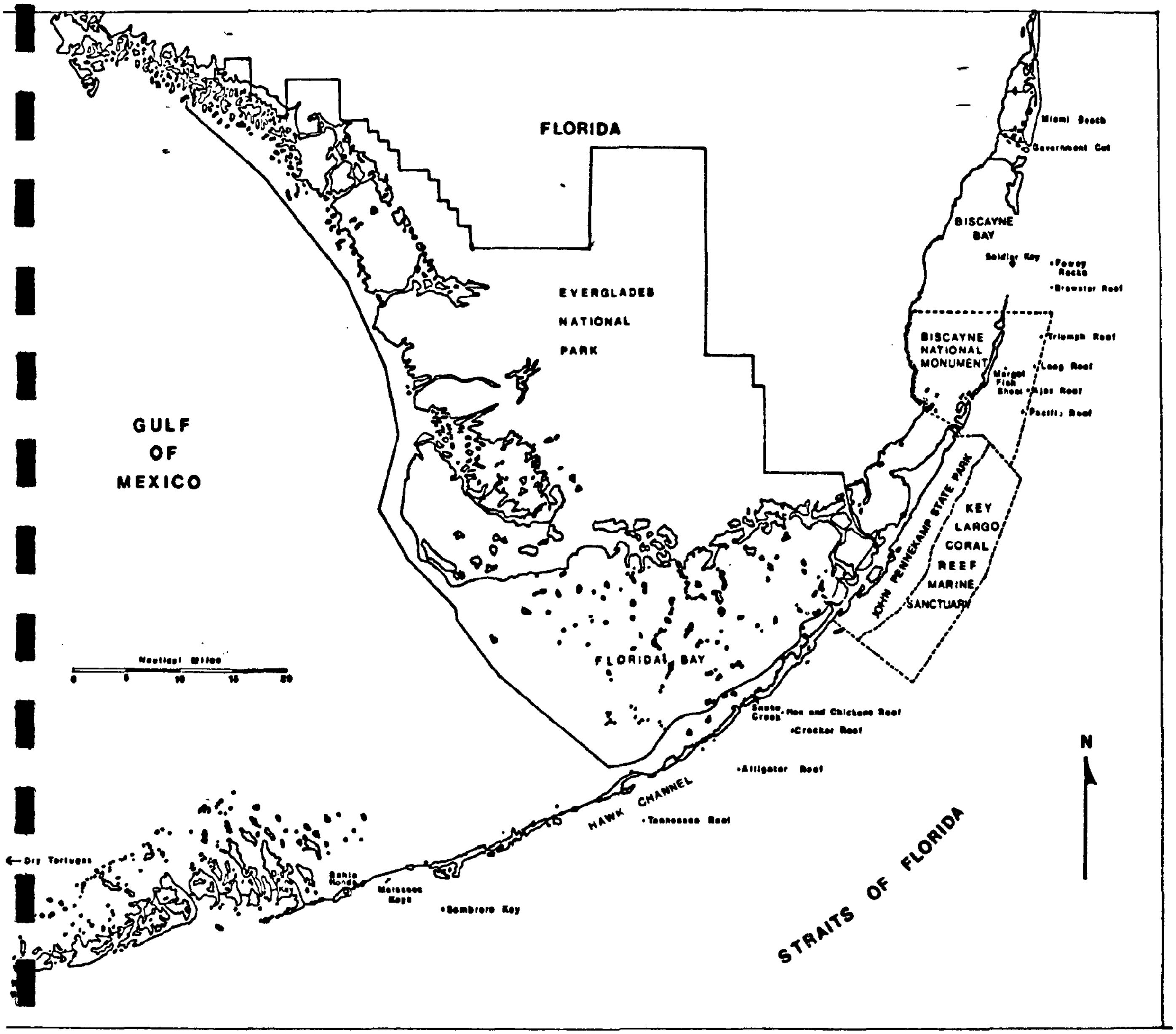


Fig. 1 Locator map, south Florida and the Florida Keys

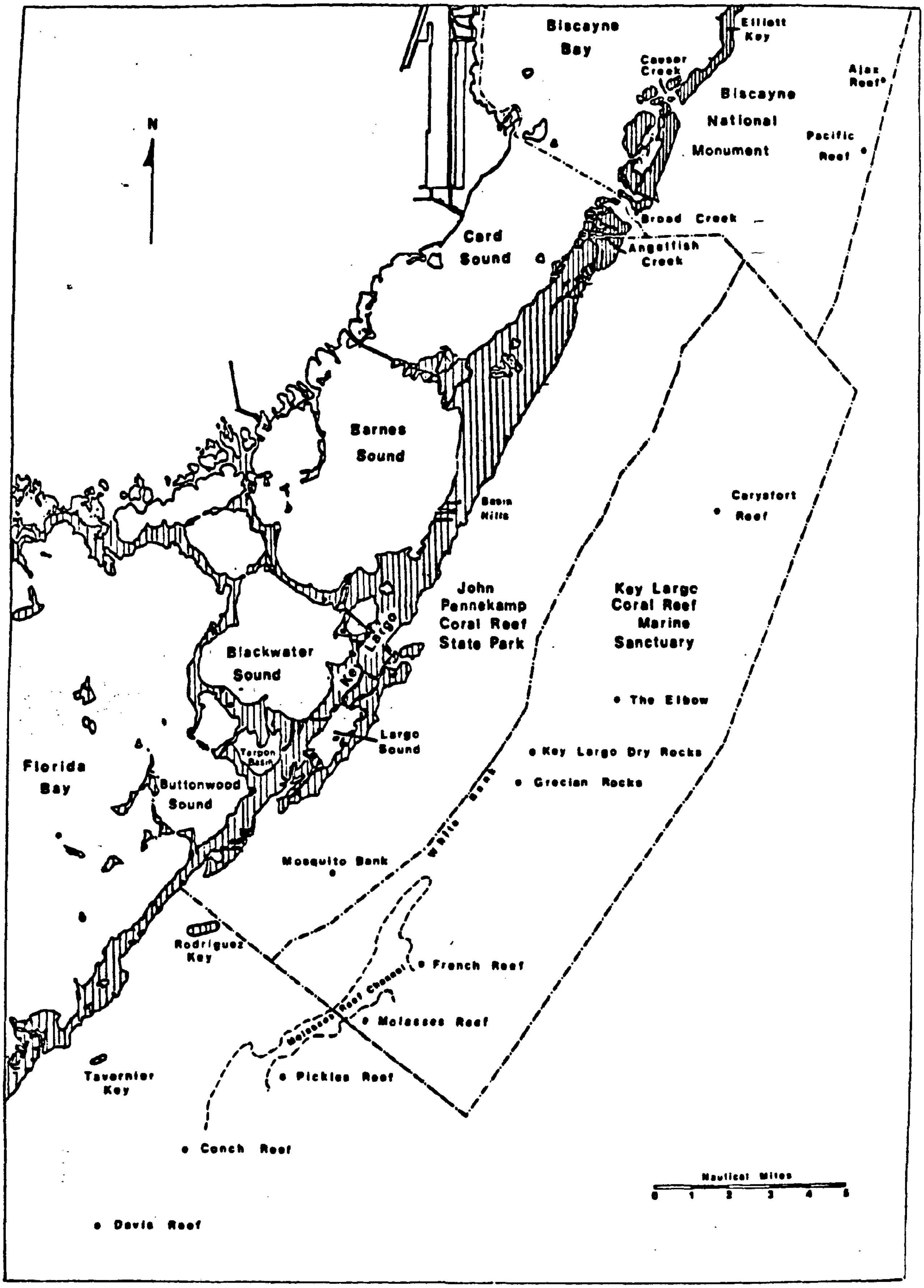


Fig. 2 Locator map, Key Largo Coral Reef Marine Sanctuary

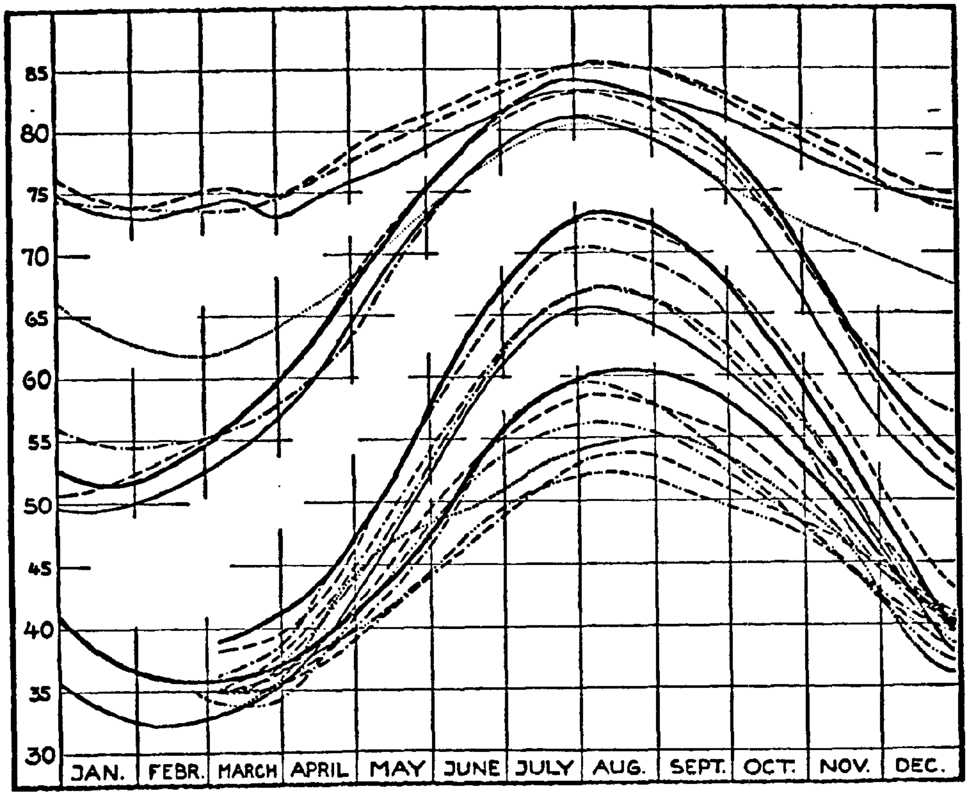
CARYSFORT REEF, FLORIDA.

Date.	1878	1879	1880	1881	1882	1883	1884	1885	1886	1887	1888	1889	1890	Mean.	Max.	Min.
	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.
Jan. 10	....	20.1	24.7	24.0	24.8	23.6	23.4	24.1	22.2	22.4	24.2	21.5	22.6	23.2	24.8	20.1
20	....	20.4	24.5	24.1	25.9	22.9	24.3	23.9	20.9	22.1	24.1	22.8	23.4	23.3	25.9	20.4
30	....	22.1	24.5	24.1	24.8	22.4	23.2	23.6	21.4	21.9	24.1	23.1	23.4	23.2	24.8	21.4
Feb. 9	....	22.9	24.4	24.3	24.5	21.9	24.3	22.2	20.6	23.5	23.6	21.8	23.5	23.1	24.5	20.6
19	....	22.7	24.4	23.6	23.9	23.4	24.8	22.1	21.8	23.7	23.5	23.1	23.5	23.4	24.8	21.8
Mar. 1	....	22.3	24.0	23.4	23.6	23.5	24.7	22.3	22.5	23.8	23.5	23.3	23.2	23.4	24.7	22.3
11	....	22.3	24.4	22.8	24.2	....	24.8	22.9	22.5	23.5	23.2	23.7	21.5	23.3	24.8	21.5
21	....	23.3	25.3	23.3	24.3	....	25.1	23.2	22.4	22.4	22.5	23.6	21.7	23.4	25.3	21.7
31	....	24.1	25.6	22.8	24.3	....	25.0	22.7	23.0	22.3	23.4	22.8	23.2	23.5	25.6	22.3
Apr. 10	....	22.8	25.3	22.9	24.2	24.0	24.8	24.6	23.1	22.9	24.9	23.0	23.3	23.8	25.3	22.8
20	....	23.0	25.5	24.7	24.2	25.1	25.3	24.5	24.0	23.7	24.9	23.7	23.5	24.4	25.5	23.0
30	....	22.6	26.4	24.8	25.1	25.7	24.7	25.0	24.9	25.3	24.7	24.8	23.4	24.8	26.4	22.6
May 10	....	25.8	26.8	26.0	26.1	26.5	25.7	26.5	25.7	25.4	25.1	25.3	24.0	25.8	26.8	24.0
20	....	26.5	26.5	26.5	26.0	26.4	27.0	26.8	26.8	25.5	25.7	26.5	24.0	26.2	27.0	24.0
30	....	26.6	26.3	26.8	26.1	26.9	27.9	26.8	26.8	26.4	26.4	26.6	25.1	26.5	27.9	25.1
June 9	....	27.2	27.1	28.4	27.2	27.7	27.9	26.8	27.4	26.4	27.0	27.8	25.9	27.2	28.4	25.9
19	....	28.1	28.2	29.4	27.9	28.5	28.8	27.8	28.1	26.5	27.3	27.9	26.8	28.0	29.4	26.5
29	....	27.7	28.7	28.7	28.2	29.1	28.4	28.4	28.4	28.1	28.4	28.2	27.0	28.3	29.1	27.0
July 9	....	27.8	28.8	....	28.7	28.7	29.1	28.6	28.5	28.3	28.7	27.9	27.1	28.4	29.1	27.1
19	....	29.0	29.0	....	29.0	29.4	29.7	29.4	28.6	29.6	29.2	28.2	27.1	29.0	29.7	27.1
29	....	29.4	29.5	....	28.5	29.4	29.1	29.4	28.7	29.6	29.5	28.7	27.3	29.1	29.6	27.3
Aug. 8	....	29.3	29.6	....	28.8	29.3	28.9	30.2	29.1	29.5	30.3	28.8	26.5	29.2	30.3	26.5
18	....	29.8	29.1	....	29.0	29.3	29.2	30.2	28.7	30.0	30.1	28.6	27.3	29.3	30.2	27.3
28	....	29.6	29.3	....	28.6	29.5	29.0	30.3	28.5	29.7	29.5	28.4	27.3	29.1	30.3	27.3
Sept. 7	....	29.0	28.4	....	28.9	29.1	29.3	30.1	28.4	29.3	29.3	28.1	27.5	28.9	30.1	27.5
17	28.6	29.3	29.1	....	28.9	29.1	28.9	29.9	28.4	29.5	29.1	28.3	27.2	28.9	29.9	27.2
27	28.0	29.4	29.2	....	28.6	28.7	28.6	29.5	28.2	28.4	29.3	27.9	27.1	28.6	29.5	27.1
Oct. 7	27.5	28.1	28.7	26.3	27.7	29.0	28.1	29.1	28.2	28.1	28.5	27.4	27.0	28.1	29.1	26.3
17	27.2	27.3	28.2	26.8	28.2	28.5	28.2	27.6	27.7	27.3	26.9	26.5	27.1	27.5	28.5	26.5
27	25.9	27.6	27.1	27.1	27.0	28.1	26.9	27.1	26.8	27.4	27.2	25.5	26.9	27.1	28.1	25.5
Nov. 6	24.4	27.0	27.2	26.5	26.0	26.9	26.9	25.0	24.3	26.4	27.1	26.0	24.4	26.2	27.2	24.3
16	25.1	26.4	26.7	26.8	24.7	27.7	25.8	25.1	24.4	25.7	26.7	27.3	25.1	26.0	27.7	24.4
26	25.0	26.0	26.2	25.9	24.4	27.7	26.0	24.1	24.5	24.6	25.8	26.0	24.4	25.4	28.7	24.1
Dec. 6	23.5	24.8	26.4	25.8	23.3	27.3	25.2	22.3	23.5	23.9	....	25.4	24.0	24.7	27.3	22.3
16	23.4	24.9	24.8	24.5	24.4	26.0	24.6	22.8	22.7	24.4	....	23.5	22.4	24.1	26.0	22.4
31	22.2	25.2	24.1	24.0	23.2	25.1	24.6	21.9	22.5	23.6	....	22.2	21.0	23.4	25.2	21.0

Fig. 3 Surface temperature, 10 day means from 1878 to 1890, Carysfort Reef (from Vaughan, 1918)

Date.	1891	1892	1893	1894	1895	1896	1897	1898	1899	Mean.	Max.	Min.
	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.
Jan. 10	20.5	21.8	18.7	23.5	22.8	22.0	22.7	22.8	21.1	21.8	23.5	18.7
20	19.9	22.3	18.2	21.8	22.1	22.2	23.8	24.1	21.5	21.8	24.1	18.2
30	20.4	22.0	19.8	22.1	21.8	22.8	22.1	24.1	21.0	21.8	24.1	19.8
Feb. 9	22.8	22.2	22.9	22.7	21.7	22.6	22.4	22.2	24.6	22.6	24.6	21.7
19	23.2	22.1	23.5	23.2	21.3	22.6	22.5	21.9	24.2	22.7	24.2	21.3
Mar. 1	22.1	22.3	23.2	23.2	21.1	21.9	23.6	22.5	24.4	22.7	24.4	21.1
11	22.5	22.4	22.9	22.5	22.0	22.0	23.6	22.0	24.3	22.7	24.3	22.0
21	22.3	22.5	22.6	23.7	22.7	22.2	24.4	22.6	24.4	23.1	24.4	22.2
31	22.0	22.1	22.4	22.4	22.2	22.5	23.7	23.5	25.2	22.9	25.2	22.0
Apr. 10	22.4	23.2	22.5	22.8	22.6	23.6	25.3	23.5	23.5	23.3	25.3	22.4
20	23.0	24.1	24.2	23.4	23.1	24.3	24.2	24.1	24.6	23.9	24.6	23.0
30	23.7	24.1	24.9	23.6	23.5	26.1	24.4	24.8	25.3	24.5	26.1	23.5
May 10	23.7	24.4	26.2	23.8	24.7	24.2	24.7	24.6	24.7	24.5	26.2	23.7
20	23.3	25.0	25.7	24.3	25.7	26.5	25.2	25.8	26.3	25.2	26.5	23.3
30	24.2	26.0	26.0	24.7	27.1	26.4	25.9	25.9	26.7	25.2	27.1	24.2
June 9	25.4	25.9	26.8	25.4	27.0	27.0	26.6	26.9	26.3	26.4	27.0	25.4
19	26.3	25.9	28.0	26.8	27.5	27.1	27.8	27.4	26.6	27.1	28.0	25.9
29	27.4	26.0	28.1	27.4	28.3	29.1	29.2	28.1	27.0	27.9	29.2	26.0
July 9	27.9	27.5	28.1	28.0	29.2	28.6	29.6	28.2	28.4	28.4	29.6	27.5
19	27.2	28.1	29.0	29.0	30.2	28.5	29.4	29.6	29.3	29.0	30.2	27.2
29	27.3	28.1	29.3	28.4	29.5	29.2	29.2	29.5	28.7	28.8	29.5	27.3
Aug. 8	28.0	28.1	29.1	29.0	29.4	29.2	29.4	29.5	29.0	29.0	29.5	28.0
18	28.0	28.3	29.6	29.6	28.3	29.0	29.8	29.5	29.6	29.1	29.8	28.0
28	27.7	28.5	29.0	30.0	29.4	29.6	29.8	29.4	29.8	28.1	30.0	27.7
Sept. 7	27.7	28.4	28.7	29.6	29.3	29.3	29.5	29.7	29.4	29.1	29.7	27.7
17	28.1	28.6	28.9	29.8	29.3	28.5	28.6	29.6	29.3	29.0	29.8	28.1
27	27.2	28.1	28.4	28.0	28.5	28.4	28.6	29.7	29.3	28.4	29.3	27.2
Oct. 7	26.1	27.3	27.8	27.5	27.9	28.1	27.6	28.5	28.6	27.7	28.6	26.1
17	25.5	27.4	26.3	26.4	28.5	26.8	28.5	28.2	27.3	27.2	28.5	25.5
27	23.8	26.2	26.0	25.2	26.4	27.0	27.2	25.8	26.8	26.0	27.2	23.8
Nov. 6	24.1	26.1	25.7	25.7	26.7	27.0	25.8	25.6	26.0	25.8	27.0	24.1
16	23.7	24.7	24.7	24.3	25.9	26.4	25.2	24.9	24.0	24.8	26.4	23.7
26	23.6	23.0	25.1	25.7	23.3	25.8	24.6	24.8	23.9	24.4	25.8	23.0
Dec. 6	24.0	22.5	24.4	24.6	23.8	25.3	25.4	25.2	24.1	24.3	25.4	22.5
16	24.4	24.5	24.4	25.0	22.6	24.4	24.8	22.9	24.0	24.1	25.0	22.6
31	23.2	23.1	23.5	22.6	22.7	24.2	24.4	22.3	23.6	23.3	24.4	22.3

Fig. 4 Surface temperature, 10 day means from 1891 to 1899, Carysfort Reef (from Vaughan, 1918)



Average annual surface temperature curves for the five-year period 1881-85, calculated from Rathbun's temperature charts (Rathbun, 1887). First group from the top (*Florida Keys*): Solid line (———): Dry Tortugas. Broken line (— —): Carysfort Reef. Dot and dash (— · —): Fowey Rocks. Second group from the top (*Southern Atlantic section*): heavy solid line (———): Martins Industry. Broken line (— —): Rattlesnake Shoal. Dot and dash (— · —): Frying Pan Shoals. Thin solid line (———): Cape Lookout Lighthouse. Third group from the top (*Middle Atlantic section*): heavy solid line (———): Winter quarter. Broken line (— —): Five-Fathom Bank. Dot and dash (— · —): Sandy Hook. Two dots and dash (· · —): Block Island. Dot and two dashes (· — —): Brenton Reef. Thin solid line (———): Vineyard Sound. Fourth group from the top (*Nantucket Shoals, Gulf of Maine*): heavy solid line (———): Nantucket. Broken line (— —): Pollock Rip. Dot and dash (— · —): Boon Island. Two dots and dash (· · —): Sequin. Dot and two dashes (· — —): Matinicus. Three dots and two dashes (· · · — —): Mount Desert. Dots (· · · · · ·): Petit Manan. The dotted line in the second group from the top represents the average curve for Diamond Shoals Lightship during 1928-30, for comparison with the others.

Fig. 5 Annual average surface temperature curves, including data from Carysfort Reef and Fowey Rocks (from Parr, 1933)

Monthly and Annual Mean Surface Water Temperatures, °F

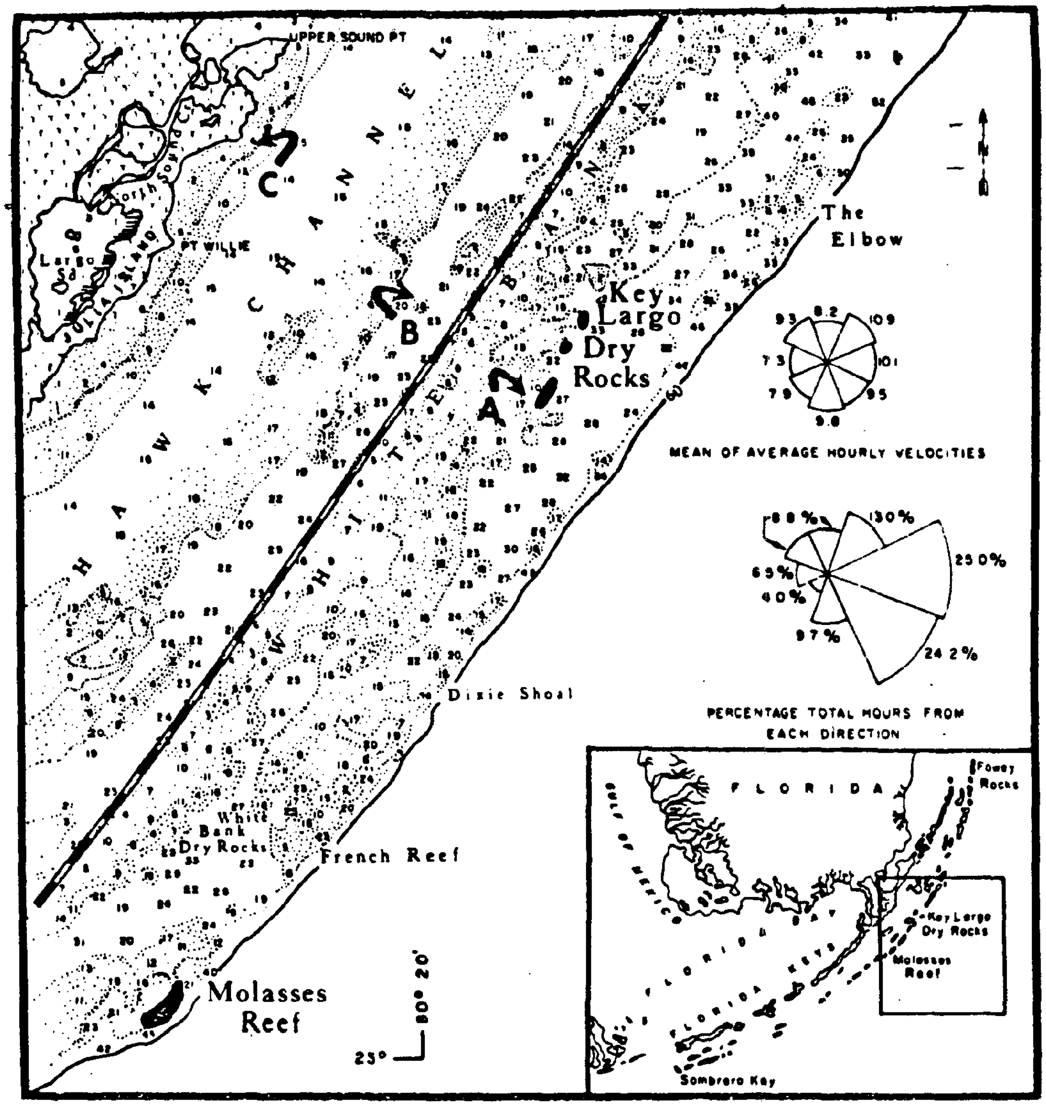
CARYSFORT REEF LIGHTHOUSE 25°13'15"N. 80°12'42"W.—

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Ann.
1878	-	-	-	-	-	-	-	-	-	79.7	76.7	73.1	-
79	69.7	72.7	73.8	73.0	79.4	81.8	83.8	85.0	84.6	81.7	79.0	77.0	78.4
1880	76.2	75.7	77.1	78.4	79.8	82.5	84.6	84.6	84.1	82.0	79.9	76.7	80.1
1881	75.3	74.9	73.3	75.8	79.6	84.0	-	-	-	80.1	79.4	76.1	(79.3)
82	77.4	75.1	75.7	76.2	78.9	82.0	83.6	84.0	83.8	81.4	76.3	74.6	79.1
83	73.5	73.3	-	76.8	80.0	83.3	84.5	84.9	84.1	83.2	81.0	78.7	(78.8)
84	74.1	76.4	76.9	76.9	80.3	83.2	84.8	84.3	84.0	81.5	79.1	76.3	79.8
1885	74.9	72.0	73.3	76.5	80.1	81.8	84.7	86.4	85.8	81.4	76.3	71.8	78.8
1886	70.6	70.9	72.8	75.2	79.6	82.6	83.6	83.8	82.9	81.3	75.6	73.2	77.7
87	71.9	74.8	73.0	75.1	78.5	80.7	84.7	85.6	84.2	81.5	77.0	75.3	78.5
88	75.4	74.4	73.6	76.8	78.4	81.8	84.6	85.9	84.7	81.2	78.7	74.5	79.2
89	72.5	72.8	74.1	75.0	79.1	82.4	83.0	83.5	82.4	79.2	79.9	73.5	78.1
1890	73.8	74.3	-	-	-	-	-	-	-	-	-	-	-
1891	-	-	-	-	-	-	-	-	-	-	-	-	-
92	-	-	-	-	-	-	-	83.0	82.8	80.0	75.3	73.6	-
93	-	74.0	72.7	75.0	79.1	81.7	84.0	84.6	83.6	79.5	77.2	75.2	(78.3)
94	72.5	73.3	73.2	74.1	76.1	79.9	82.9	85.4	84.0	78.9	77.1	74.8	77.7
1895	71.9	70.4	72.1	73.5	78.5	81.8	85.5	84.3	84.2	81.5	76.8	73.1	77.8
1896	72.2	72.3	72.0	76.4	79.0	82.0	84.0	84.8	83.4	81.2	79.2	75.0	78.4
97	73.3	73.0	75.1	76.4	77.4	82.4	84.9	85.5	83.9	81.8	77.0	76.5	78.9
98	74.6	72.0	72.8	75.5	77.4	81.5	84.4	85.2	85.4	81.2	76.9	73.5	78.4
99	70.1	76.2	76.5	76.1	78.6	80.0	84.0	85.2	84.7	81.0	76.0	74.8	78.6
1900	73.2	-	-	-	-	-	-	-	-	-	-	-	-
	(19)	(19)	(17)	(18)	(18)	(18)	(17)	(18)	(18)	(20)	(20)	(20)	
Mean	73.3	73.6	74.0	75.7	78.9	82.0	84.2	84.8	84.0	81.0	77.7	74.9	78.7

Readings at first high water and first low water after 7 a.m.

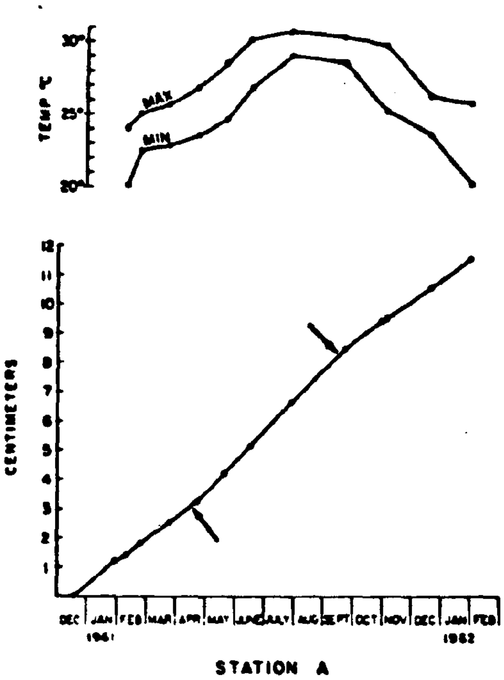
Source - USC77

Fig. 6 Monthly and annual mean surface temperature data for Carysfort Reef, 1878 to 1900 (from Bumpus, 1957)

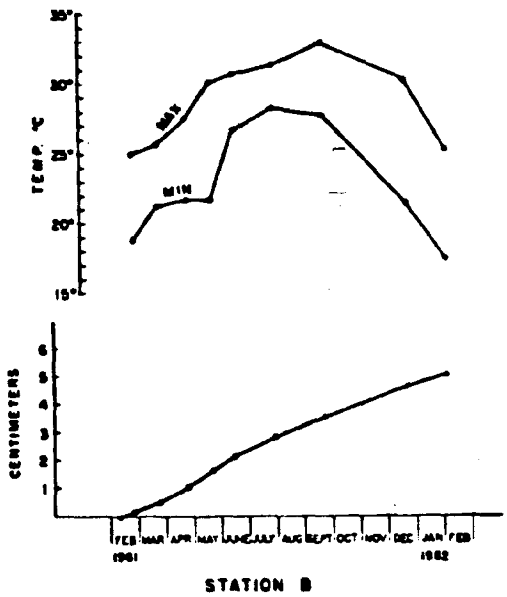


Map showing locations of growth-rate stations. Water depth is indicated in feet. Wind roses show strength and direction of prevailing winds. Dashed line marks approximate shoreward limit of naturally growing *Acropora cervicornis*.

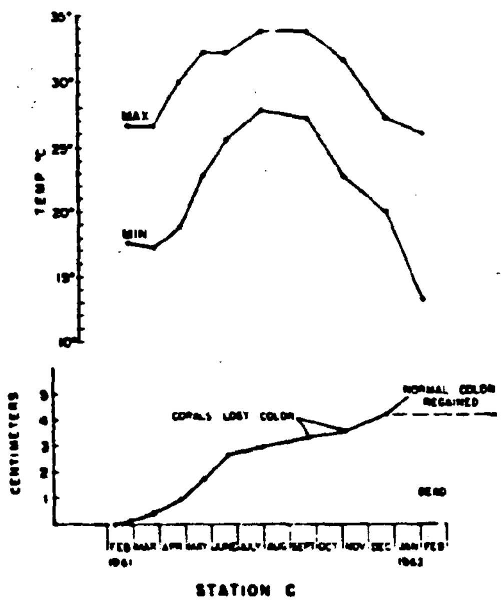
Fig. 7 Shinn's (1966) station locations (from Shinn, 1966)



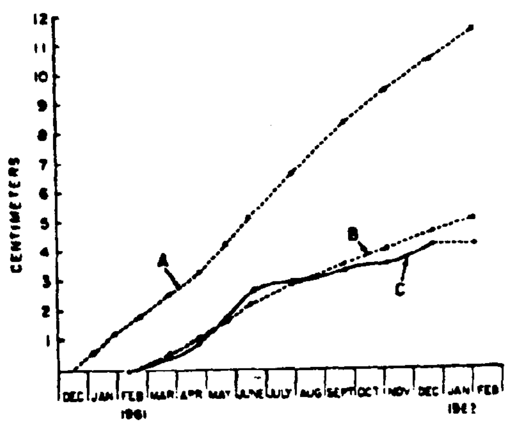
–Cumulative growth-curve and temperature maxima and minima at Station A. Arrows show inflections in growth-rate.



–Cumulative growth-curve and temperature maxima and minima at transplant Station B.



–Cumulative growth-curve and temperature maxima and minima at transplant Station C. Note relationship of death to sudden drop of minimum temperature.



–Cumulative growth-curves of all growth-stations. Growth at Station C was equal to growth at Station A during the months of May and June.

Fig. 8 Maximum/minimum temperature and coral growth data, Key Largo Dry Rocks and inshore stations (from Shinn, 1966). Station locations shown in Fig. 7

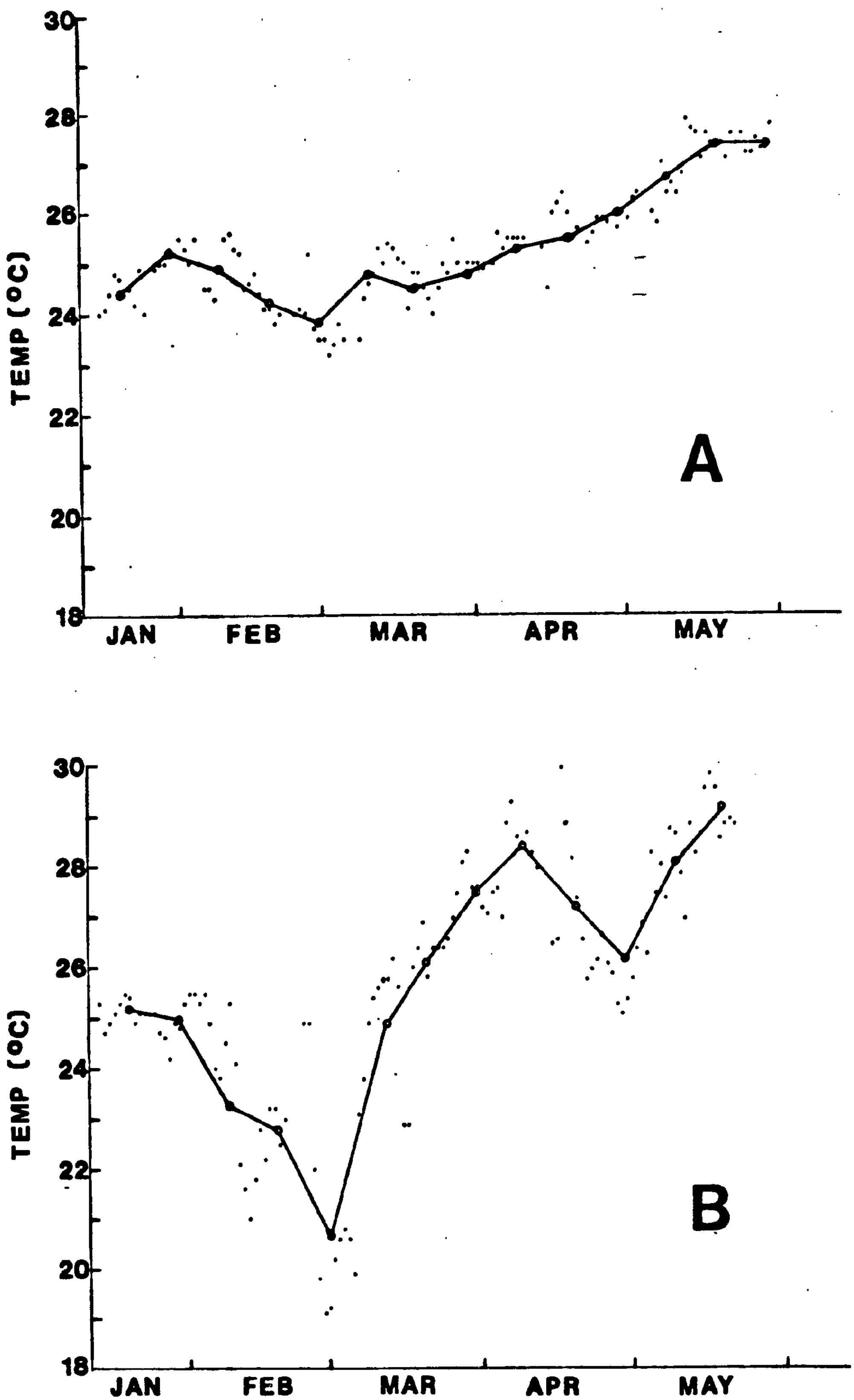


Fig. 9 Bottom temperatures during the period January to May 1974 at Molasses Reef (A) and Mosquito Bank (B). Dots indicate average daily temperature (readings taken at three hour intervals). Circles indicate 10-day means (from unpublished data, G. Griffin, Univ. of Florida, Gainesville)

TIDAL CREEKS

Whale Harbor Bridge
Snake Creek Bridge
Tavernier Creek Bridge
South Sound Creek "4"
South Sound Creek "19 & 20"
Caesar Creek at Christmas Point

HAWK CHANNEL

off north Key Largo
off Tavernier Creek
channel to Tavernier Creek
Snake Creek "2" & "4"
off Snake Creek
Tavernier Creek "2" & "4"
Markers "19, 20, 21, 29, 33 & 41"
South Sound Creek "2"
Garden Cove Wreck
0.25 mi NW of "31BH"
off dock near Radome
Ocean Reef Club "2"
Angelfish Creek "2"

INNER REEFS

Hen and Chickens Reef
west of Pickles Reef
Triangles Reef
Mosquito Bank
Basin Hills patch reef
Basin Hills Shoals
* Turtle Rocks "3"
* White Bank

OUTER REEFS

Alligator Reef
Crocker Reef
* Molasses Reef
* French Reef
* Dixie Shoal
* Grecian Rocks
* Key Largo Dry Rocks
* Elbow Reef
* Carysfort Reef
Pacific Reef

ATLANTIC OCEAN

* 0.25 mi SE of Elbow Reef
* 0.5 mi SE of Elbow Reef
* 0.7 mi SE of Elbow Reef
* 1.0 mi SE of Elbow Reef
* 1.5 mi SE of Elbow Reef
* NNE of Carysfort Reef
* WHIS R "2" N of Carysfort Reef
* 200 yd SE of Carysfort Reef
* 0.5 mi SE of Carysfort Reef
* org buoy at Molasses Reef
* 0.25 mi SE of Molasses Reef
* 0.33 mi SE of Molasses Reef
* 0.5 mi SE of Molasses Reef
0.3 mi SE of Pacific Reef
0.5 mi SE of Pacific Reef
2 mi SE of Pacific Reef
0.25 mi SE of Crocker Reef
0.6 mi SE of Crocker Reef
2 mi SE of Crocker Reef
0.25 mi SE of "4DS"
0.25 mi SE of Bendwood
0.25 mi SE of Pickles Reef
0.25 mi SE of Conch Reef

Fig. 10 Station Locations used by Griffin(unpublished data, 1974) in his survey of water quality in the Marine Sanctuary. Asterisks indicate stations located within the Key Largo Coral Reef Marine Sanctuary.

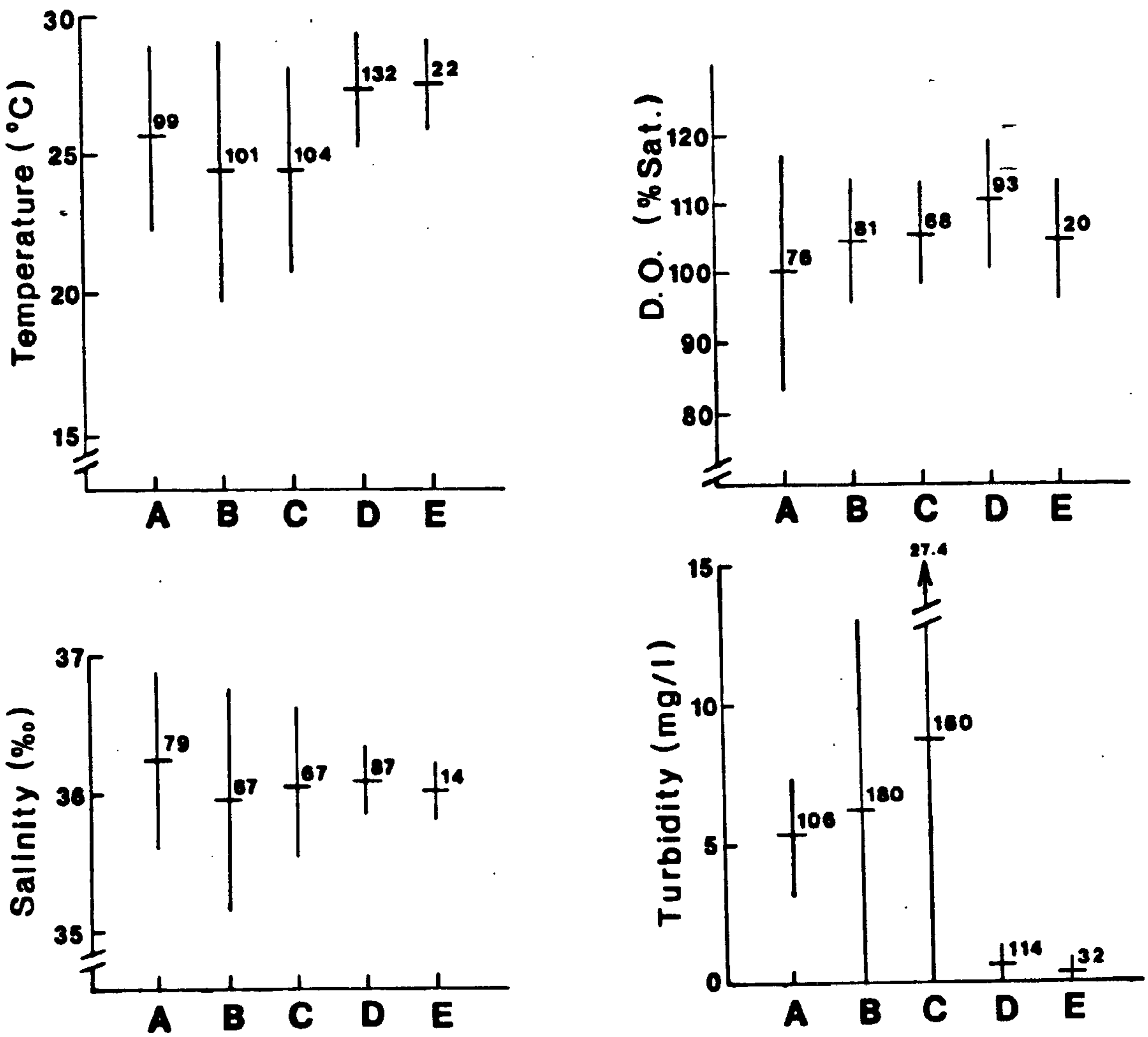
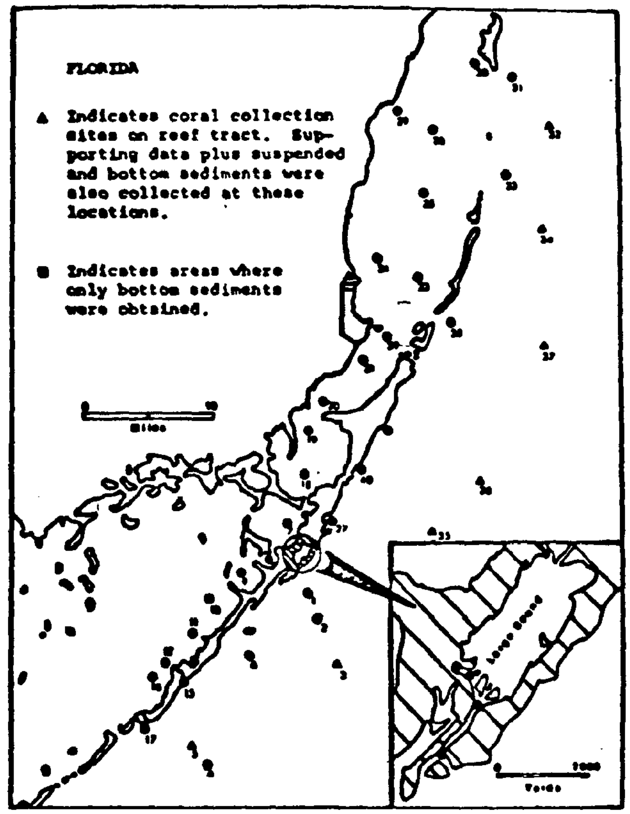
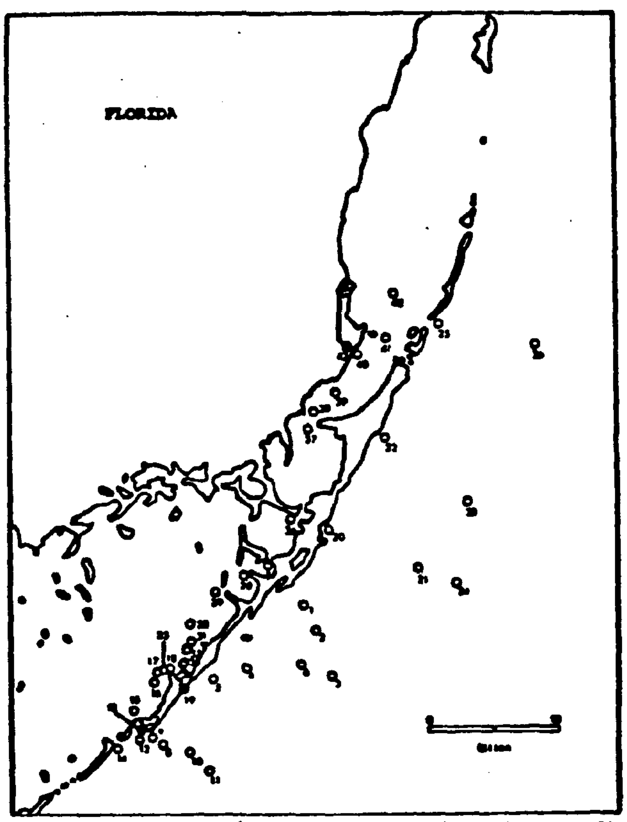


Fig. 11 Temperature, salinity, dissolved oxygen and turbidity. (A). Tidal creeks; (B) Hawk Channel; (C) Inner Reefs; (D) Outer Reefs; (E) Atlantic Ocean. From unpublished data of Griffin, 1974. Horizontal bars indicate means; vertical bars, standard deviation; numbers above means, sample size. See Fig. 10 for station locations.



Data/sample collection stations (1974). See Appendix B for accompanying data.



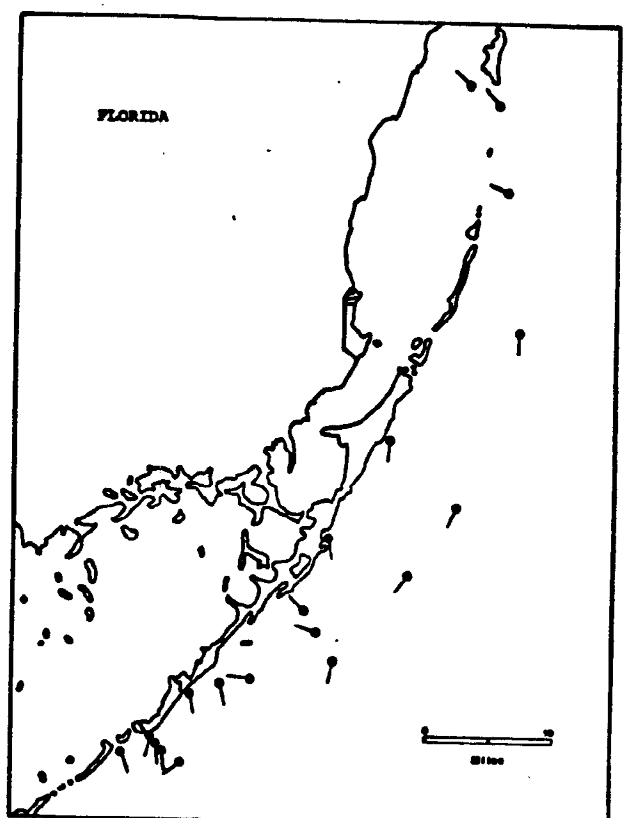
Data acquisition stations (1973). See Appendix A for accompanying data.

Fig. 12 Manker's station locations (from Manker, 1975)

Sta.	Mon-Day-Yr-Time	T°C	Turb. (mg/l)	Dis. oxy. (ppm)	Wind (from) in kts	Sal. (°/oo)	Curr. (to) in kts
1	06-11-73-1105	27.0	2.12	-	100/18	-	000/.5
1	06-15-73-0925	29.0	3.51	6.1	000/5	-	060/.2
1	07-19-73-1236	30.8	3.70	6.2	100/7	-	290/.3
1	08-15-73-1417	31.0	1.95	6.9	180/4	-	-
2	06-11-73-1145	28.0	4.51	-	120/10	-	030/.4
2	06-15-73-1007	29.0	3.14	6.4	000/5	-	270/.2
2	07-19-73-1305	30.9	4.51	6.2	120/8	-	320/.2
2	08-15-73-1455	30.3	3.51	6.9	180/4	-	-
3	06-11-73-1300	28.0	0.60	-	100/17	-	070/.6
3	06-15-73-1118	28.5	0.54	6.9	000/3	-	045/.2
3	07-19-73-1531	30.8	0.79	6.6	135/10	-	350/.4
3	08-15-73-1557	30.1	1.68	6.2	180/4	-	270/-
4	06-11-73-1425	29.0	3.51	-	120/15	-	300/.4
4	06-15-73-1301	30.0	1.68	7.0	000/7	-	240/.3
4	07-19-73-1535	31.0	3.51	6.4	120/-	-	300/.3
4	08-15-73-1719	30.1	1.19	6.3	170/6	-	-
5	06-11-73-1515	30.0	3.51	-	120/18	-	220/.2
5	06-15-73-1351	31.0	-	6.8	300/6	-	240/.3
5	07-19-73-1718	31.0	2.30	6.2	110/10	-	100/.2
5	08-15-73-1811	31.0	2.12	8.5	115/7	-	-
6	06-12-73-1010	28.0	1.42	6.2	100/12	-	-
7	06-12-73-1120	28.0	3.93	5.6	110/14	-	180/.7
7	07-20-73-1310	31.0	1.95	6.7	120/14	-	310/.9
8	06-12-73-1445	30.0	4.90	6.9	090/22	-	180/.2
9	06-12-73-1455	30.0	4.30	7.0	090/22	-	150/.7
10	06-12-73-1220	29.0	0.98	6.8	130/14	-	060/.5
10	07-20-73-1355	30.5	0.98	6.3	100/10	-	270/.5
10	08-16-73-1306	29.8	2.44	6.5	120/15	-	-
11	06-12-73-1305	27.0	1.08	6.8	-	-	-
11	07-20-73-1435	30.5	1.08	6.2	120/15	-	-
11	08-16-73-1350	30.2	1.42	-	090/15	-	-
12	06-12-73-1345	31.0	10.20	9.5	090/12	-	-
13	06-12-73-1405	30.0	3.70	5.4	090/12	-	-
	5'	27.0	7.80	0.9	-	-	-
13	07-20-73-1243	30.5	3.93	5.5	120/15	-	-
14	06-12-73-1430	29.5	4.10	6.3	090/15	-	130/.9
15	06-12-73-1507	30.0	2.95	6.5	090/12	-	150/.6
16	06-12-73-1530	30.0	3.70	7.8	090/22	-	300/.4
16	06-25-73-1240	30.5	4.90	6.2	280/6	-	170/.2
17	06-12-73-1540	30.0	3.35	9.6	090/18	-	-
17	06-25-73-1230	30.0	2.97	7.0	260/5	-	180/.3
18	06-12-73-1550	30.0	4.90	7.6	090/9	-	-
18	06-25-73-1200	30.0	7.30	6.6	270/6	-	135/.1
19	06-12-73-1600	31.0	3.70	6.9	-	-	180/.6

Sta.	Mon-Day-Yr-Time	T°C	Turb. (mg/l)	Dis. oxy. (ppm)	Wind (from) in kts	Sal. (°/oo)	Curr. (to) in kts
20	06-14-73-0955	28.0	1.42	6.1	180/10	-	182/.4
20	07-19-73-0955	30.5	2.60	5.7	090/8	-	330/.2
20	08-15-73-1055	29.6	1.19	6.3	115/8	-	-
21	06-14-73-1200	28.0	0.32	7.9	140/7	-	045/.3
21	07-19-73-1126	29.5	0.38	6.3	120/6	-	180/.3
21	08-15-73-1235	29.9	1.30	7.0	120/7	-	-
22	06-14-73-1254	29.3	1.42	7.6	175/10	-	210/.2
22	07-18-73-1418	32.0	2.44	5.9	090/10	-	-
22	08-14-73-1430	31.2	2.60	7.7	150/7	-	-
23	06-14-73-1431	29.5	0.54	8.6	120/5	-	090/.2
23	07-18-73-1544	30.0	0.79	6.4	120/10	-	000/.3
23	08-14-73-1600	30.0	1.68	6.3	150/7	-	-
24	07-18-73-1143	29.5	0.45	6.2	085/8	-	-
24	08-15-73-1318	30.1	1.55	6.5	-	-	-
25	06-14-73-1534	29.5	3.51	6.7	120/6	-	150/1
25	07-18-73-1152	31.0	5.10	6.2	150/9	-	300/.8
25	08-14-73-1144	29.6	4.10	5.9	150/13	-	-
26	06-14-73-1708	29.0	0.54	7.4	150/7	-	270/.4
26	07-18-73-1323	30.0	0.38	6.3	160/20	-	225/.6
27	06-25-73-1035	29.5	1.95	5.7	240/6	-	090/.1
28	06-25-73-1055	29.5	1.80	5.6	290/6	-	-
29	06-25-73-1105	29.5	4.75	6.0	270/5	-	150/.1
30	06-25-73-1120	29.5	4.30	6.7	250/6	-	090/.1
31	06-25-73-1130	30.0	5.75	7.0	220/4	-	090/.1
32	06-25-73-1135	30.0	5.95	6.8	210/6	-	110/.2
33	06-25-73-1144	30.0	5.60	6.9	270/6	-	090/.1
34	06-25-73-1153	30.0	5.10	6.2	270/5	-	-
35	06-25-73-1210	30.0	2.95	6.2	-	-	135/.1
36	06-26-73-0955	31.0	5.10	6.0	225/7	-	340/.1
37	06-26-73-1020	29.0	7.70	5.3	240/8	-	000/-
38	06-26-73-1031	28.5	4.90	5.4	210/4	-	030/.3
39	06-26-73-1045	28.0	3.93	5.7	230/6	-	060/.2
40	06-26-73-1100	29.0	6.10	1.9	220/8	-	090/.2
			3'	4.4			
41	06-26-73-1128	28.5	3.51	5.7	200/5	-	030/.4
42	06-26-73-1157	28.5	3.93	6.0	210/6	-	050/.3
43	08-13-73-1251	30.6	-	5.8	120/5	30.96	-
	18'	29.1	-	6.0	-	33.20	-

Sta.	Mon-Day-Yr-Time	T°C	Turb. (mg/l)	Dis. oxy. (ppm)	Wind (from) in kts	Sal. (°/oo)	Curr. (to) in kts
1	05-14-74-1010	-	0.77	-	120/11	-	285/-
2	05-14-74-1040	28.0	0.54	-	130/11	36.7	-
3	05-14-74-1110	26.5	0.41	-	135/11	36.6	300/-
4	05-14-74-1310	27.0	0.24	-	150/-	37.7	-
5	05-14-74-1345	28.3	0.29	-	150/-	36.6	250/-
6	05-14-74-1525	28.4	0.28	-	185/-	36.3	330/-
7	05-15-74-1025	29.1	1.01	-	150/-	-	315/-
8	05-15-74-1405	29.3	0.44	-	150/-	-	315/-
9	05-15-74-1108	28.9	1.38	-	150/-	-	315/-
10	05-15-74-1130	28.8	1.90	-	150/-	-	315/-
11	05-15-74-1153	29.2	2.20	-	150/-	-	330/-
12	05-15-74-1200	29.5	1.38	-	150/-	-	-
15	05-15-74-1225	29.5	0.46	-	-	-	180/-
16	05-15-74-1245	29.5	1.70	-	150/-	-	315/-
17	05-15-74-1305	29.5	1.04	-	-	-	180/-
18	05-16-74-1055	28.5	2.63	-	135/15	-	300/-
19	05-16-74-1112	28.6	3.13	-	135/15	-	300/-
20	05-16-74-1130	28.5	1.84	-	135/15	-	300/-
21	05-16-74-1200	28.5	1.24	-	135/15	-	-
39	05-16-74-1217	28.7	1.43	-	135/15	-	300/-
23	05-20-74-0945	27.0	1.17	-	120/16	-	290/-
24	05-20-74-1010	26.9	1.09	-	120/16	-	290/-
25	05-20-74-1032	27.0	1.34	-	120/-	-	290/-
28	05-25-74-0845	27.8	0.64	-	120/7	-	-
29	05-25-74-0903	28.2	0.67	-	240/6	-	315/-
30	05-25-74-0925	27.9	2.30	-	240/10	-	300/-
31	05-25-74-0948	27.7	0.74	-	240/8	-	330/-
32	05-25-74-1006	25.7	0.56	-	240/7	36.7	-
33	05-25-74-1050	27.2	0.19	-	240/5	36.7	300/-
34	05-25-74-1115	26.3	0.36	-	240/4	36.8	-
27	05-26-74-0812	29.1	0.55	-	180/10	-	150/-
35	05-26-74-0832	26.7	0.29	-	180/9	36.9	210/-
36	05-26-74-0902	27.1	0.46	-	180/10	36.9	180/-
37	05-26-74-0955	26.8	0.30	-	180/10	36.7	090/-
38	05-26-74-1023	28.6	0.95	-	180/-	37.0	-
40	05-26-74-1112	28.9	0.38	-	180/10	-	180/-
41	05-26-74-1130	-	0.90	-	-	-	-



Current directions in reef tract area. Data collected during May-August 1973-74.

Fig. 13 Current directions in reef tract and supplementary data (temperature, salinity, dissolved oxygen, turbidity, wind and currents) (from Manker, 1975)

Concentration (ppm) of Hg, Co, and Cr in suspended particulates per stations plotted in Figure 5.

Station	Hg	Co	Cr
1	12	3	99
2	24	7	214
3	-	9	141
4	-	7	175
5	[illegible]	6	172
6	32	8	206
7	30	4	156
8	92	15	270
9	4	9	87
10	6	11	68
11	6	3	117
12	9	4	167
15	31	22	252
16	270	8	168
17	21	4	135
18	15	2	100
19	9	3	25
20	21	4	90
21	13	5	123
23	18	10	136
24	21	3	97
25	7	3	65
27	32	3	80
28	9	8	122
29	-	8	167
30	5	3	29
31	4	9	86
32	31	1	48
33	44	12	345
34	-	-	101
35	-	3	-
36	22	3	141
37	21	12	37
38	11	5	38
39	37	6	195
40	-	1	-
41	10	1	-
Mean	28	7	137

Concentration (ppm) of Hg, Cr, Co, Zn, and Pb in bottom sediments per stations plotted in Figure 5.

Station	Hg	Cr	Co	Zn	Pb
1	0.3	6	0.2	1	29
2	0.3	5	0.1	2	28
3	0.3	5	0.1	2	24
4	0.2	6	0.1	1	30
5	0.6	7	0.2	4	35
6	0.2	3	0.2	2	22
7	0.3	20	0.5	1	28
8	1.2	23	0.6	-	27
9	0.3	19	0.5	2	28
10	0.2	14	-	-	36
11	0.3	10	0.3	1	30
12	0.2	11	0.2	-	28
16	0.5	7	0.2	1	33
17	0.7	4	0.1	3	33
18	0.3	14	0.4	2	19
19	1.7	13	0.4	2	25
21	0.2	8	0.2	1	22
23	0.1	5	0.1	22	14
24	0.1	7	0.2	1	25
25	0.2	7	0.1	-	30
27	0.6	-	0.3	11	19
28	0.2	6	0.2	16	12
30	0.3	7	0.1	1	25
31	0.3	11	0.2	21	14
32	0.2	5	0.2	4	34
33	0.4	5	0.1	2	31
34	0.4	6	0.1	2	16
36	0.3	5	0.1	2	17
40	0.8	3	0.1	4	25
Mean	0.4	9	0.2	4	26

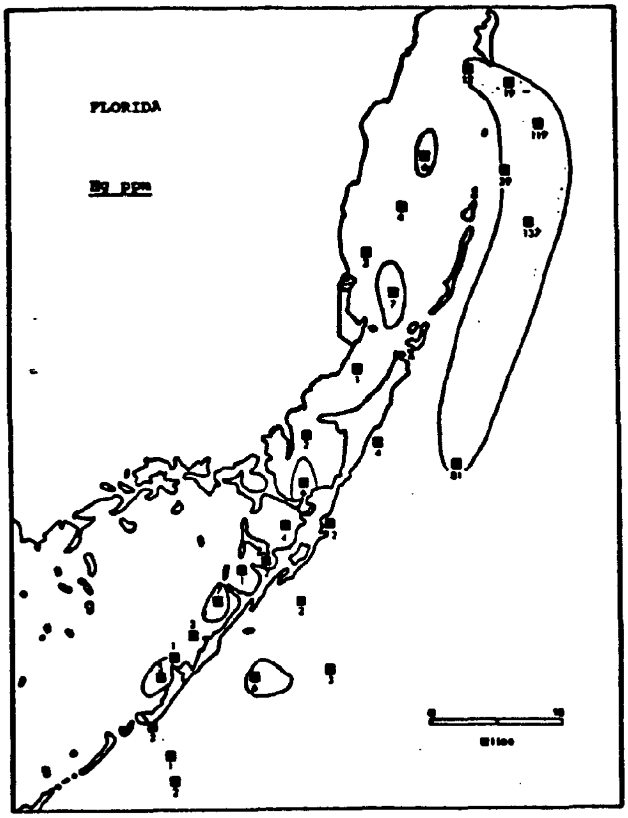
Concentration (ppb) of Hg, Cr, Co, and Zn in corals from the study area. See Figure 17 for location of reefs.

Location	Hg	Cr	Co	Zn
Fowey Rocks	549	361	882	1343
Triumph Reef	77	482	124	1285
Pacific Reef	52	678	84	929
Carysfort Reef	36	1381	58	1153
Elbow Reef	104	1272	168	891
Molasses Reef	46	496	73	2329
Hen and Chickens Reef (alive)	37	767	60	2949
Hen and Chickens Reef (dead)	114	694	183	4767

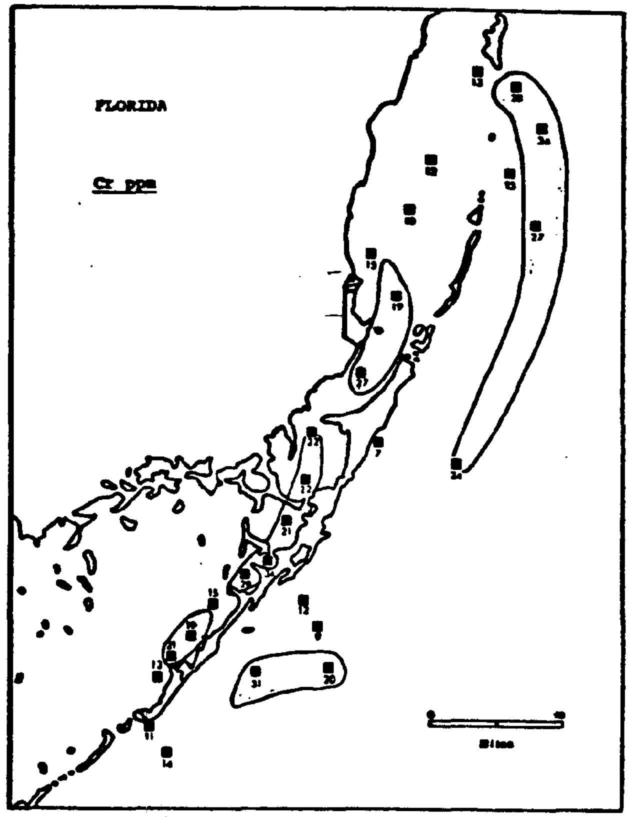
Concentration (ppm) of Hg, Cr, Co, and Zn in 4μ fraction of bottom sediments per stations plotted in Figure 5.

Station	Hg	Cr	Co	Zn
1	2	12	4	25
2	-	9	4	8
3	3	20	3	77
4	2	-	1	52
5	1	14	1	53
6	6	31	1	22
7	4	21	2	2
8	2	34	2	8
9	1	28	21	12
10	7	15	1	-
11	2	19	2	3
12	1	21	1	1
16	5	13	11	2
17	2	11	52	53
18	6	22	5	5
19	2	22	7	12
21	1	27	9	-
23	7	19	20	6
24	3	15	5	-
25	4	10	7	-
27	2	-	3	-
28	6	12	8	11
30	12	13	16	6
31	19	28	26	25
32	119	34	161	141
33	39	13	52	16
34	137	27	178	31
36	81	24	109	20
40	4	7	5	19
Mean	17	19	25	25

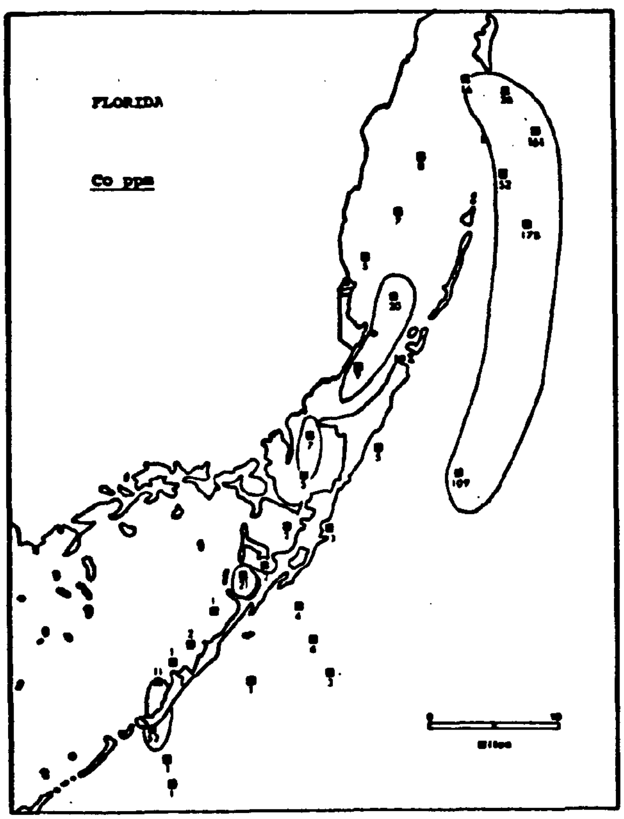
Fig. 14 Concentration of toxic metals in suspended particulate fraction, four micron fraction, bulk bottom sediments and corals in northern Florida Keys (from Manker, 1975)



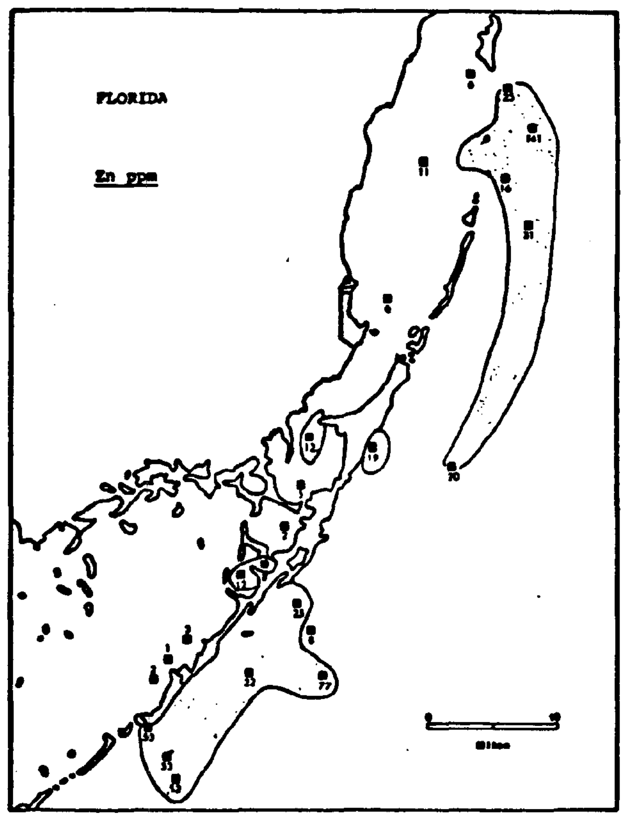
Distribution/concentration of Hg in 4μ fraction of bottom sediments. Areas of highest concentration shown in red.



Distribution/concentration of Cr in 4μ fraction of bottom sediments. Areas of highest concentration shown in red.

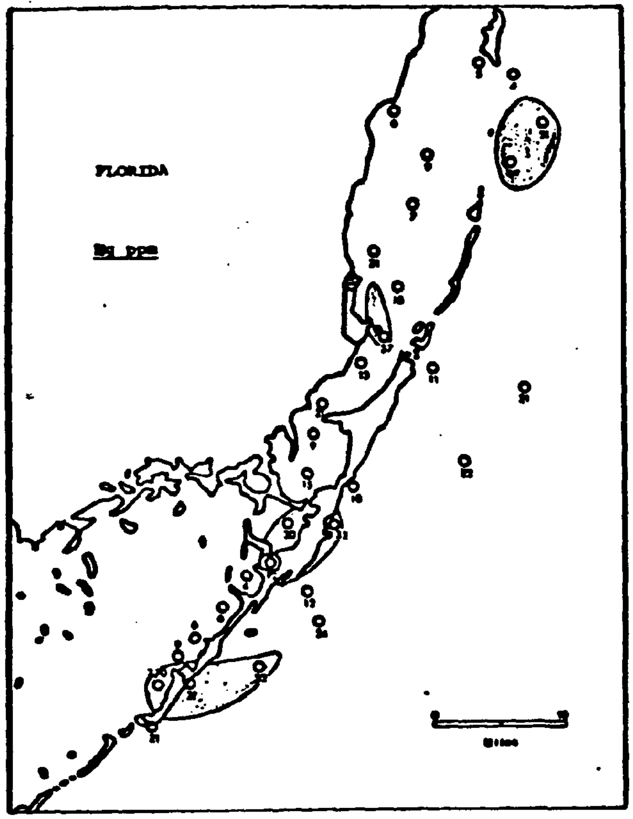


Distribution/concentration of Co in 4μ fraction of bottom sediments. Areas of highest concentration shown in red.

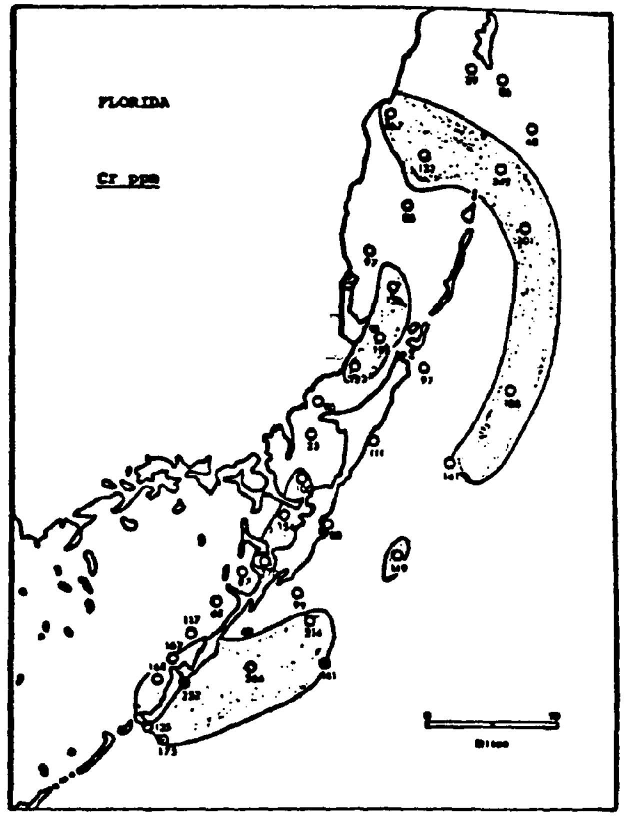


Distribution/concentration of Zn in 4μ fraction of bottom sediments. Areas of highest concentration shown in red.

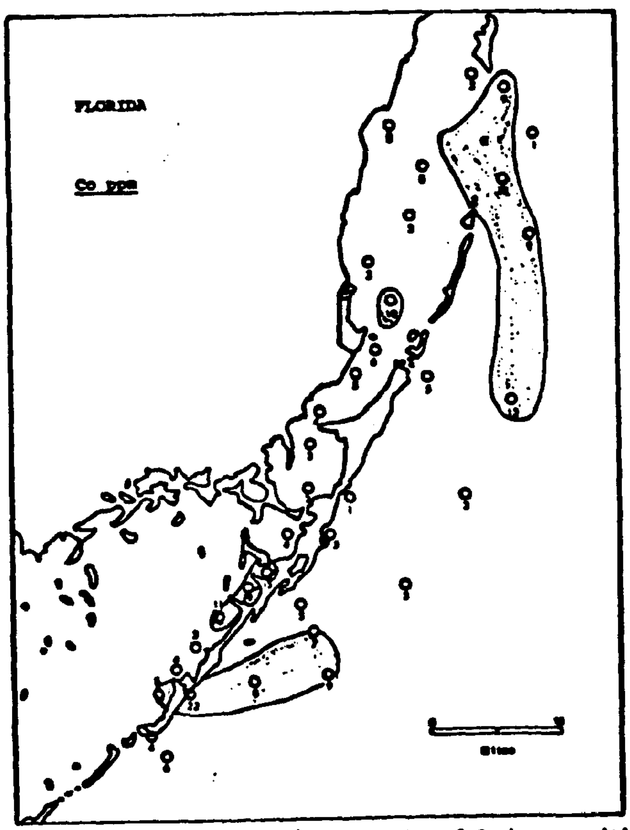
Fig. 15 Distribution of mercury, chromium, cobalt and zinc in the four micron fraction of bottom sediments, upper Florida Keys (from Manker, 1975)



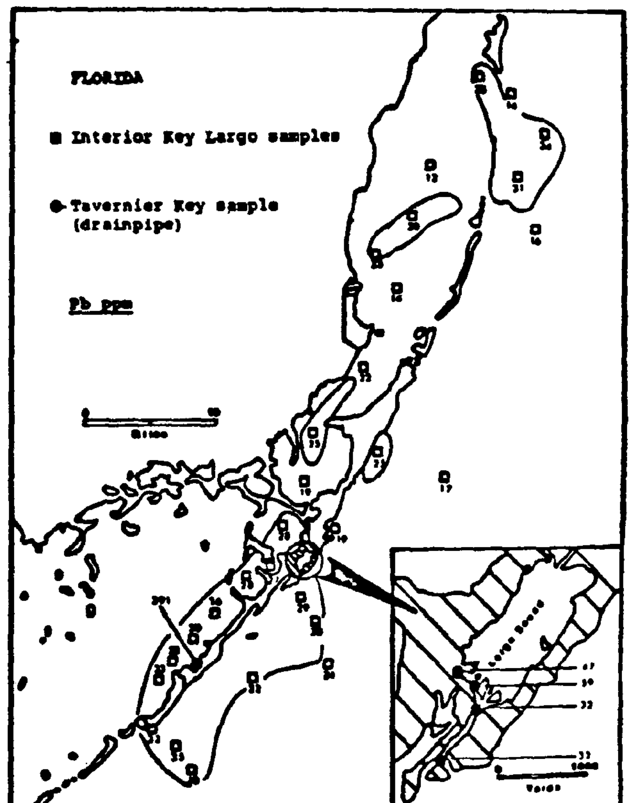
Distribution/concentration of Hg in suspended particulates. Areas of highest concentration shown in blue.



Distribution/concentration of Cr in suspended particulates. Areas of highest concentration shown in blue.

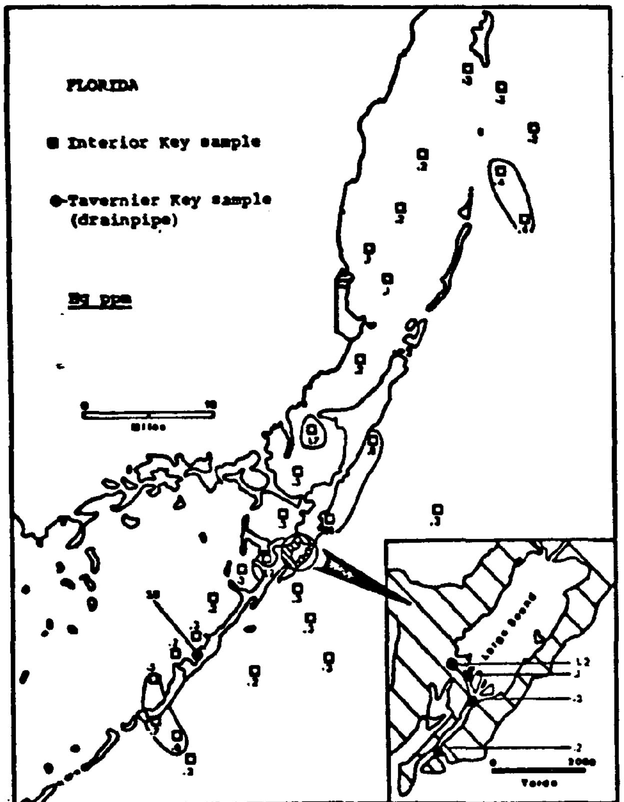


Distribution/concentration of Co in suspended particulates. Areas of highest concentration shown in blue.

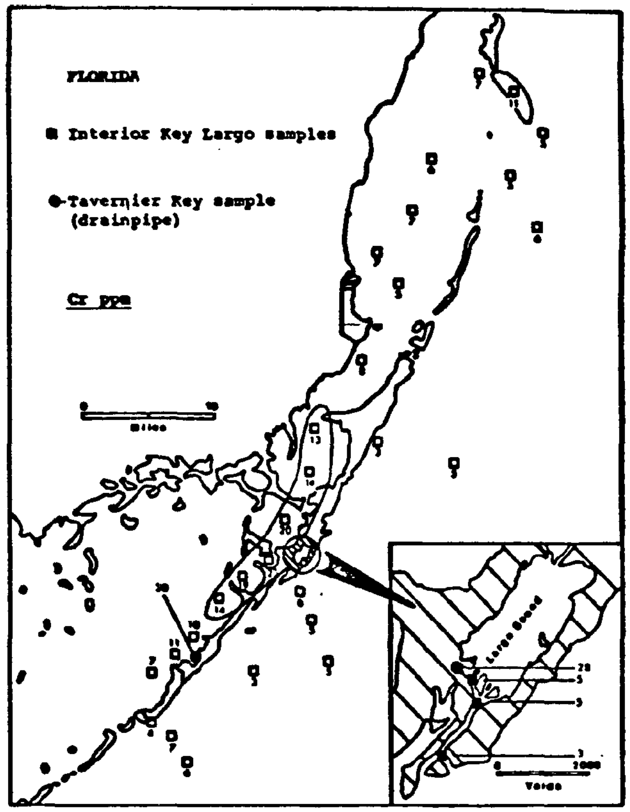


Distribution/concentration of Pb in bottom bulk sediments. Areas of highest concentration shown in yellow.

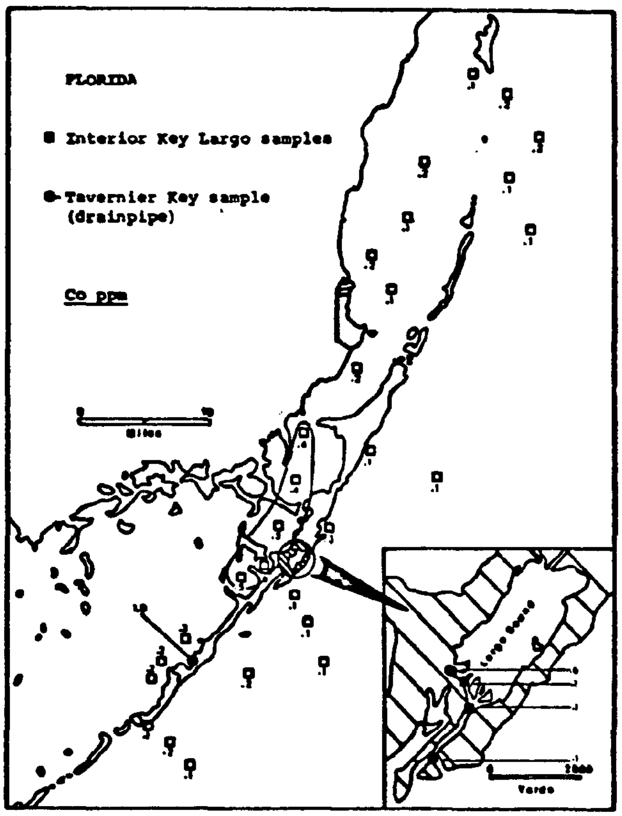
Fig. 16 Distribution of mercury, chromium and cobalt in suspended particulates and lead in bulk sediments of upper Florida Keys (from Manker, 1975)



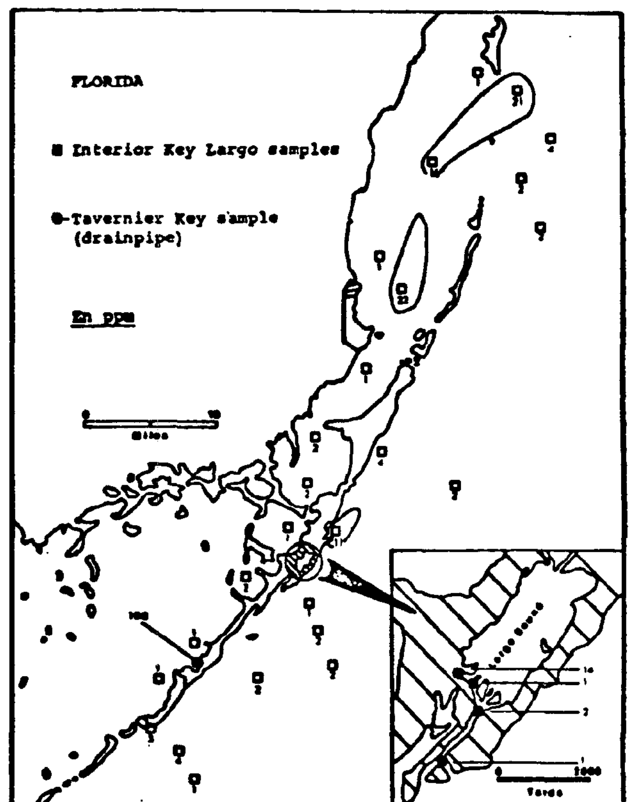
Distribution/concentration of Hg in bottom bulk sediments. Areas of highest concentration shown in yellow.



Distribution/concentration of Cr in bottom bulk sediments. Areas of highest concentration shown in yellow.

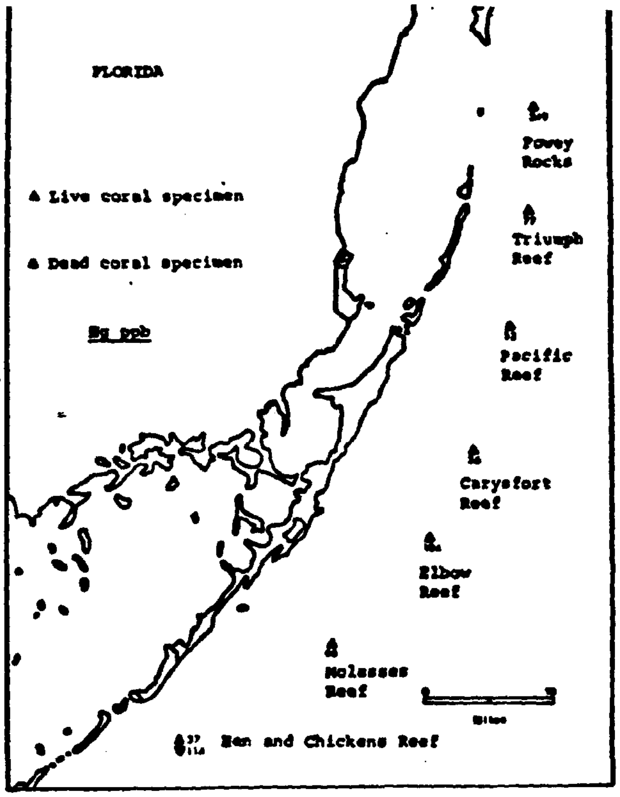


Distribution/concentration of Co in bottom bulk sediments. Areas of highest concentration shown in yellow.

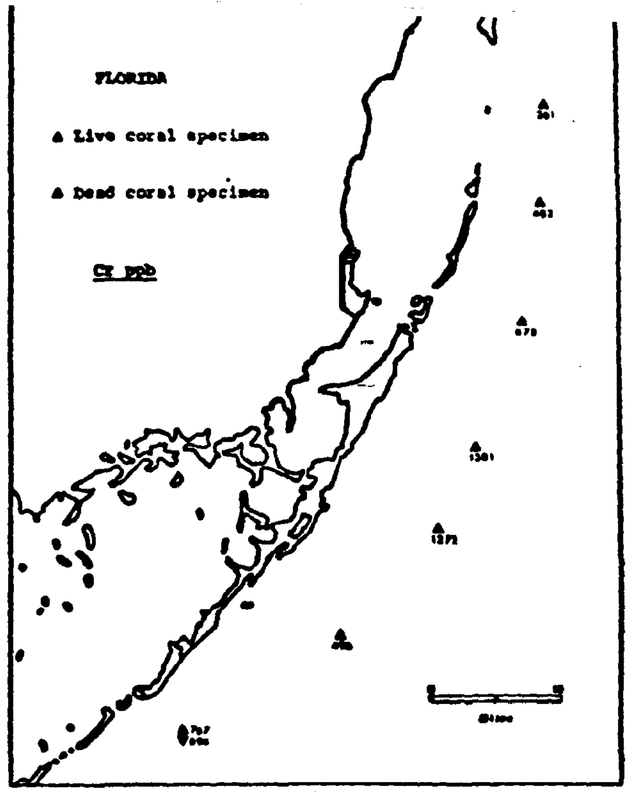


Distribution/concentration of Zn in bottom bulk sediments. Areas of highest concentration shown in yellow.

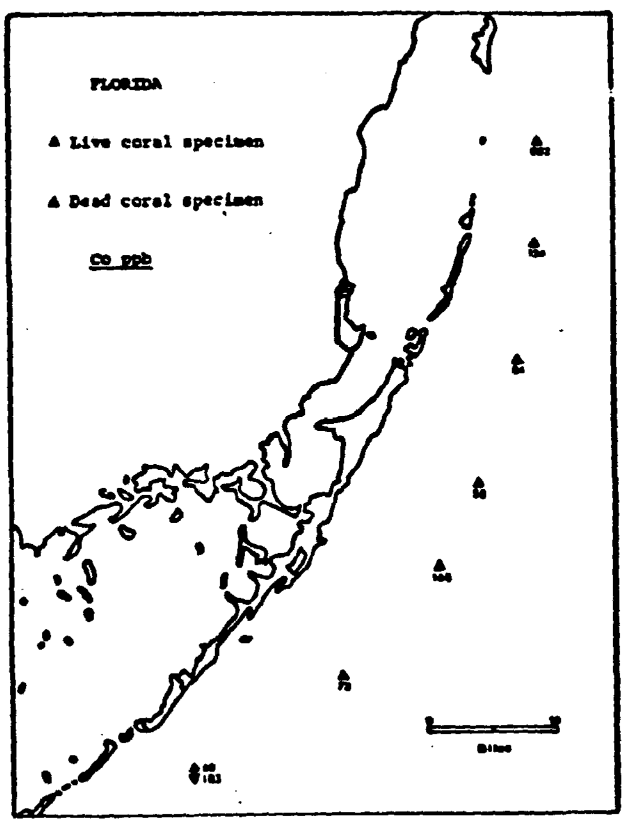
Fig. 17 Distribution of mercury, chromium, cobalt and zinc in bulk sediments of upper Florida Keys (from Manker, 1975)



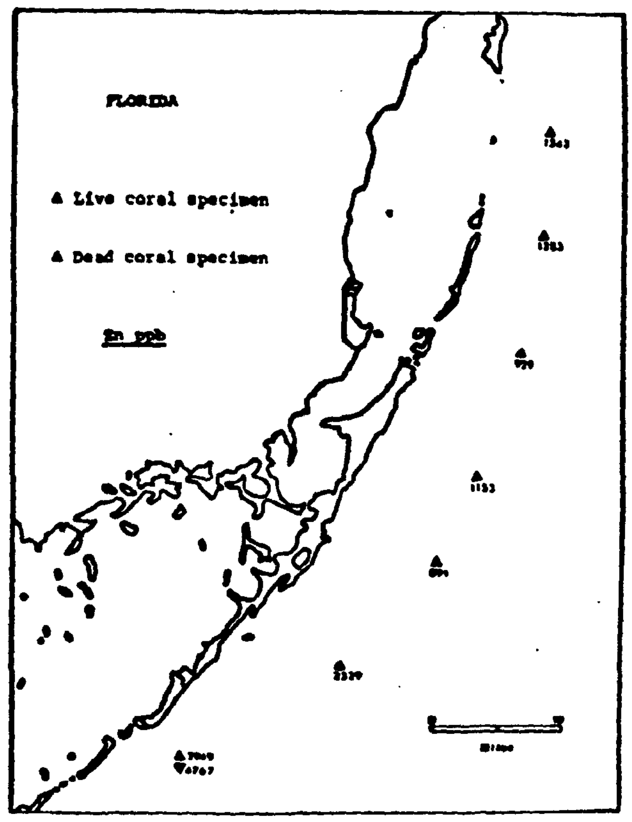
Concentration of Hg in coral specimens (Siderastrea sidera).



Concentration of Cr in coral specimens (Siderastrea sidera).



Concentration of Co in coral specimens (Siderastrea sidera).



Concentration of Zn in coral specimens (Siderastrea sidera).

Fig. 18 Concentration of mercury, chromium, cobalt and zinc in coral specimens (Siderastrea siderea) from northern Florida reef tract (from Manker, 1975)

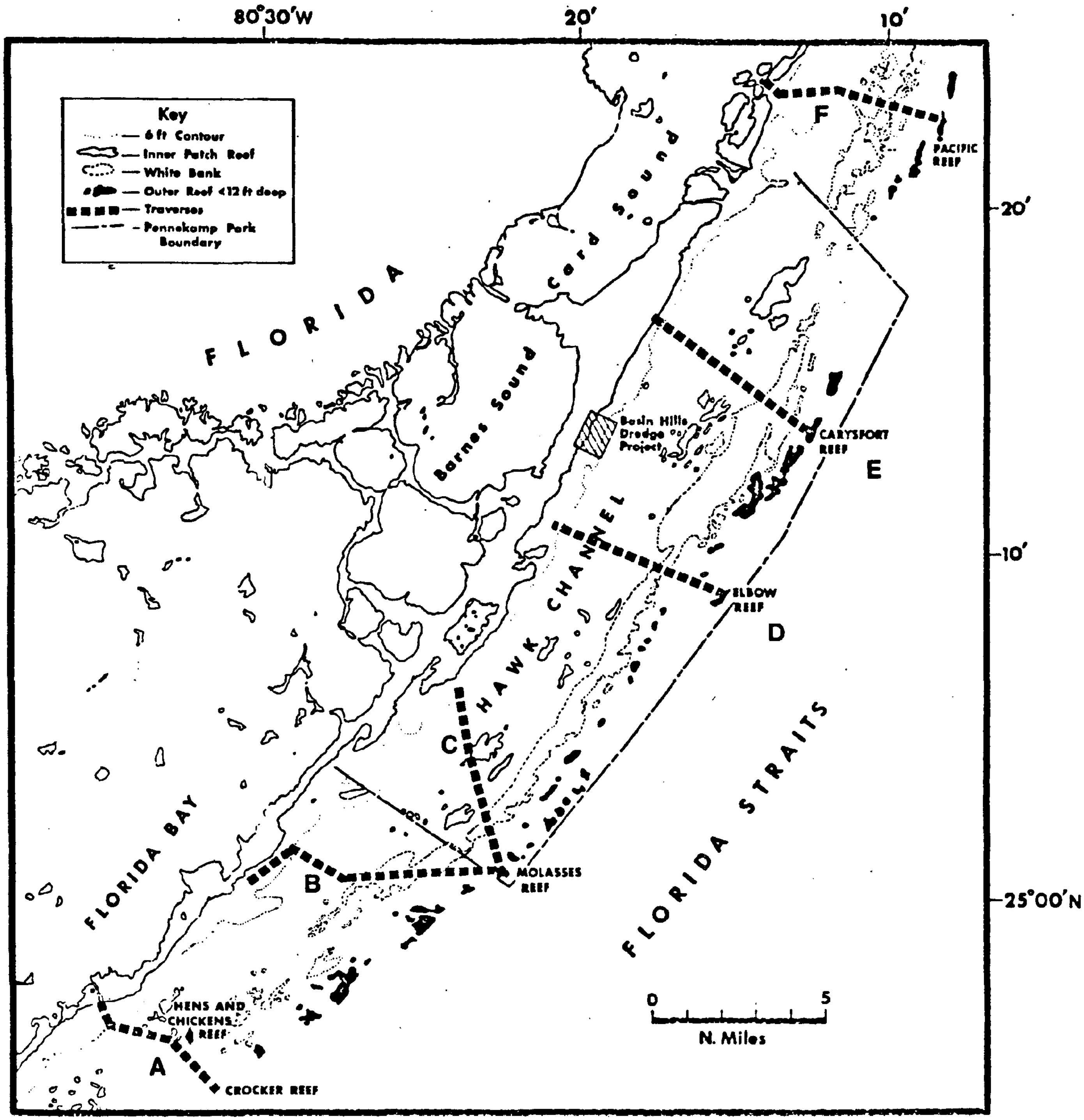


Fig. 19 Map showing monthly transmissometer traverse lines used to measure ambient turbidity levels (from Griffin, 1974b)

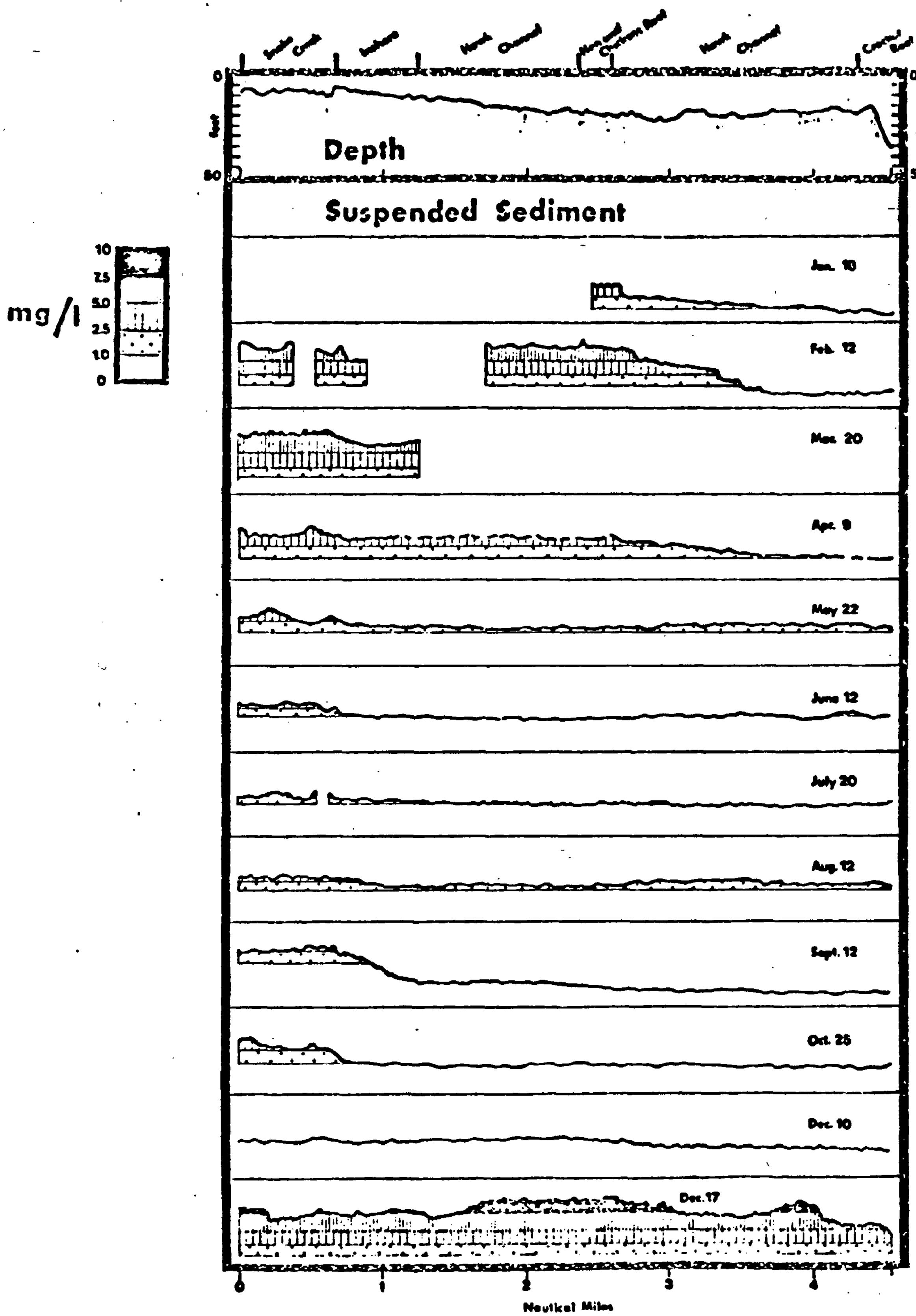


Fig.20 Monthly turbidity levels along traverse "A" (see Fig.19). From Griffin, unpublished data, 1974.

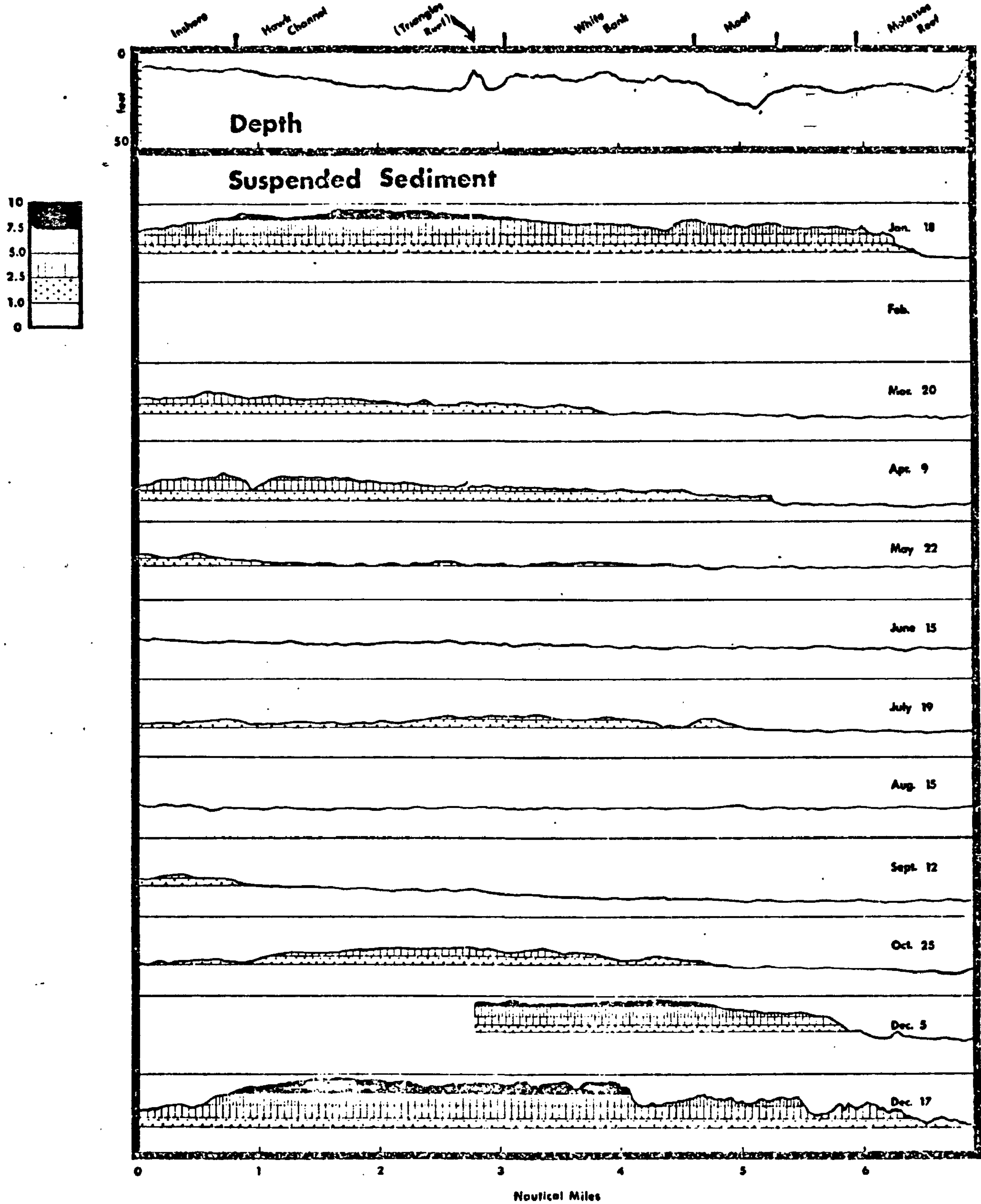


Fig. 21 Monthly turbidity levels along traverse "B" (see Fig.19). From Griffin, unpublished data, 1974.

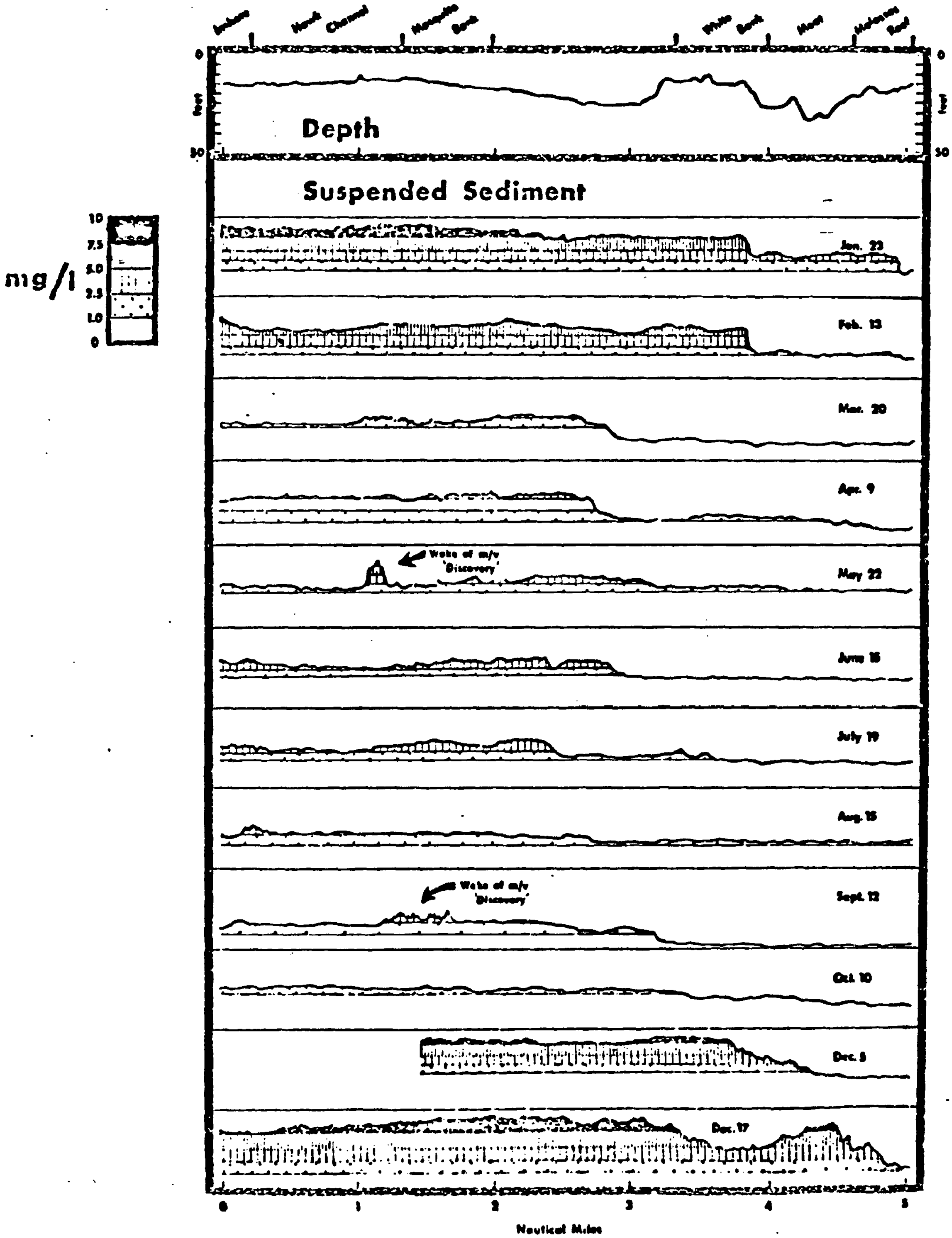


Fig. 22 Monthly turbidity levels along traverse "C" (see Fig.19). From Griffin, unpublished data, 1974.

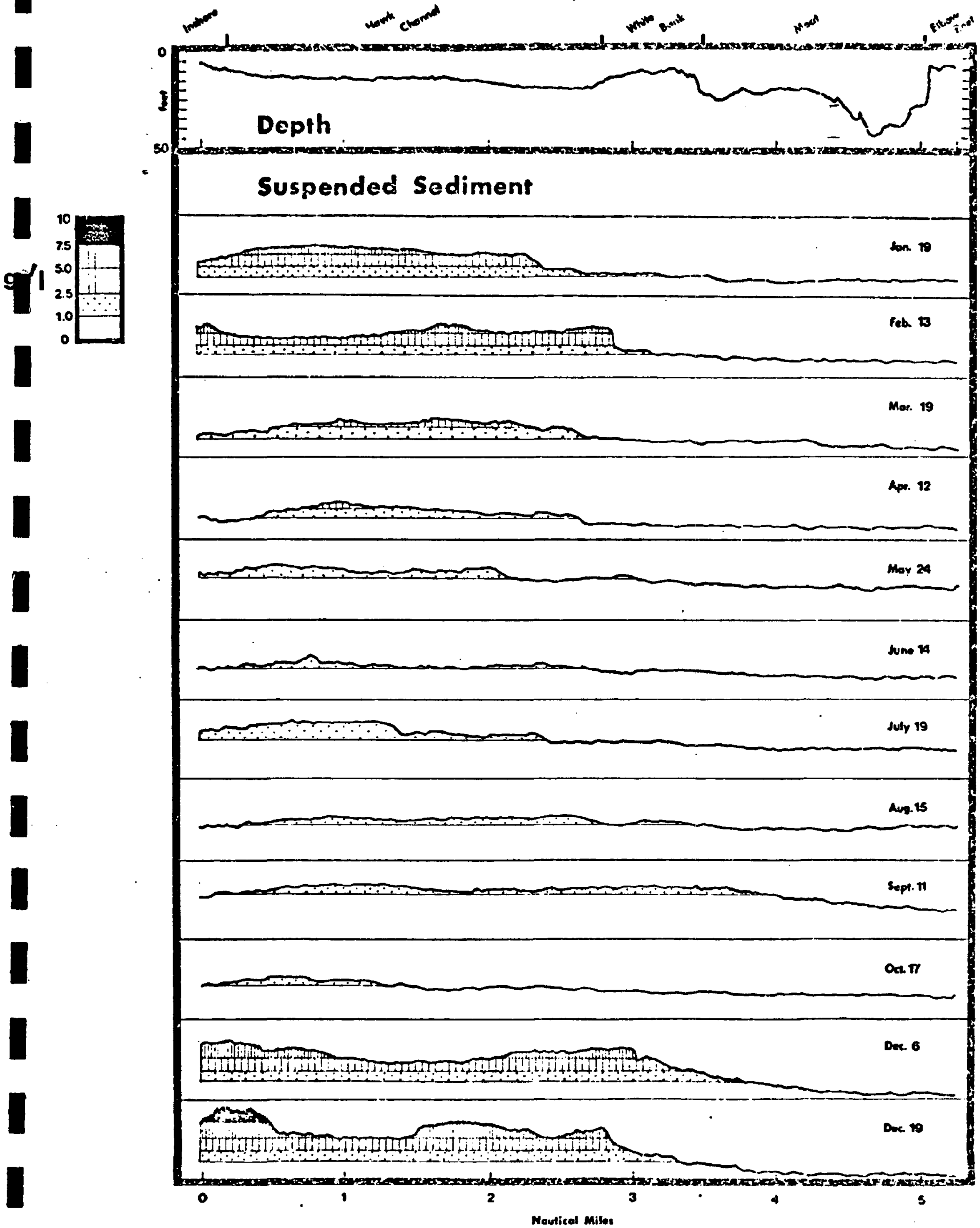


Fig. 23 Monthly turbidity levels along traverse "D" (see Fig.19). From Griffin, unpublished data, 1974.

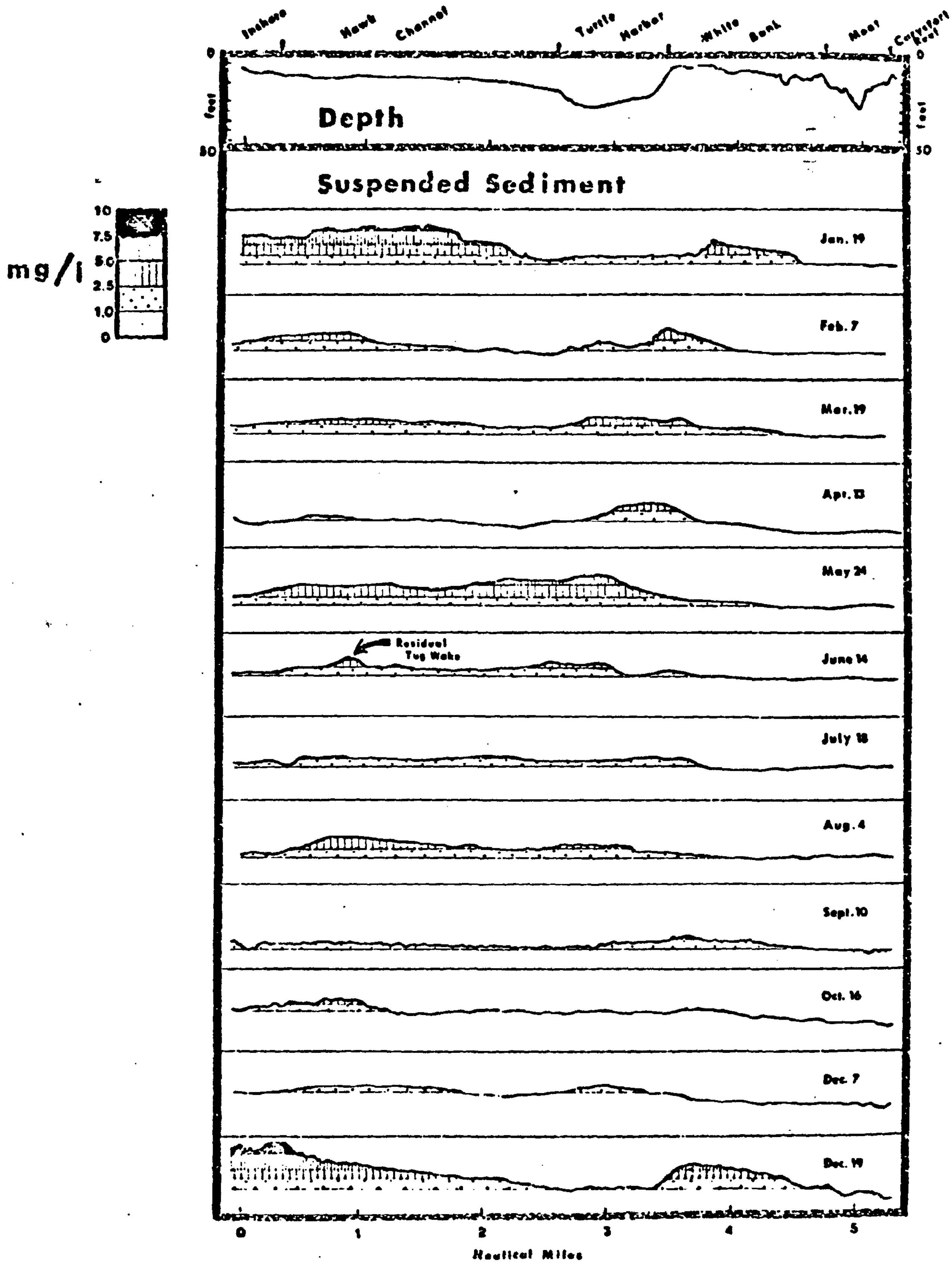


Fig. 24 Monthly turbidity levels along traverse "E" (see Fig.1 9). From Griffin, unpublished data, 1974.

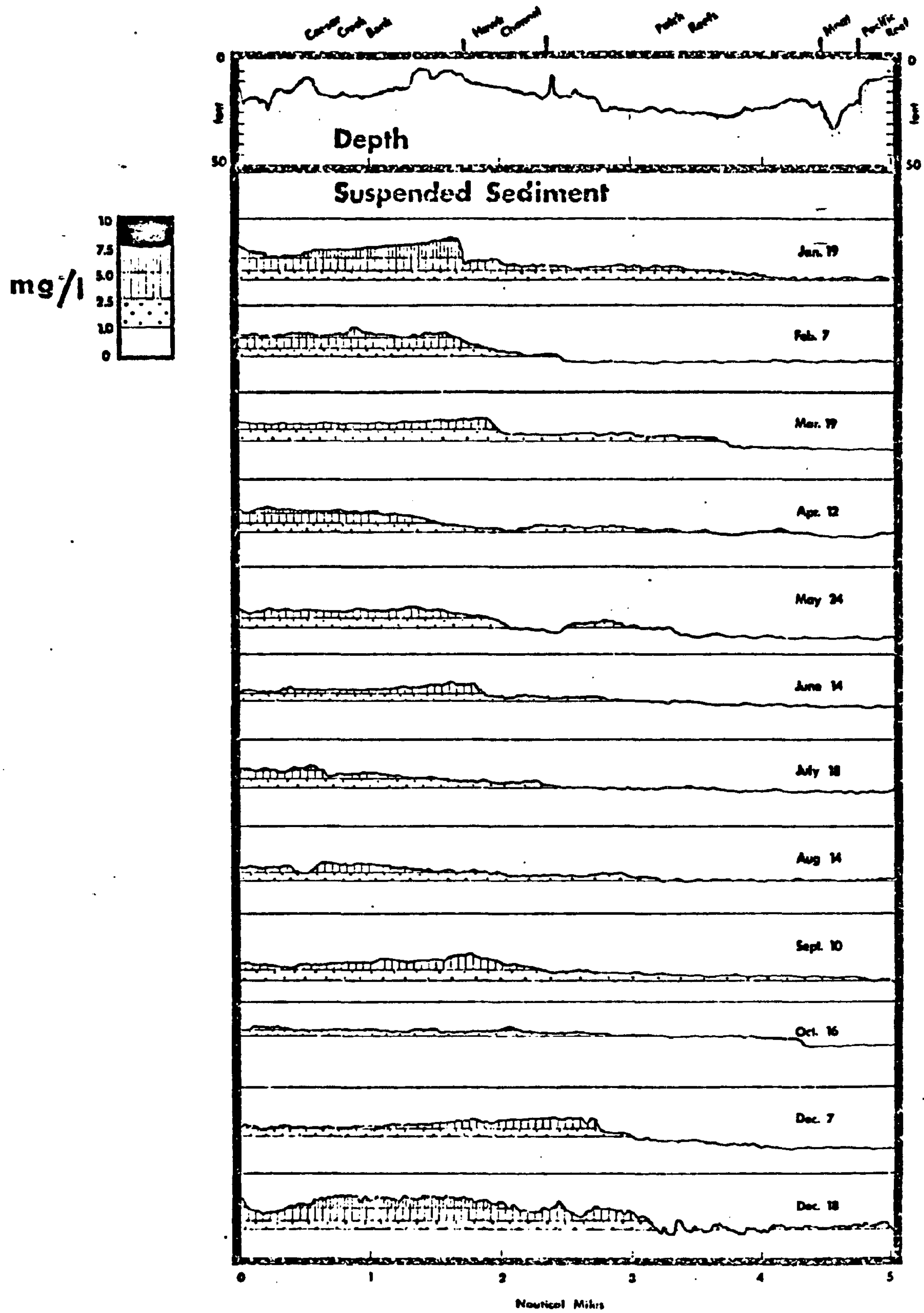
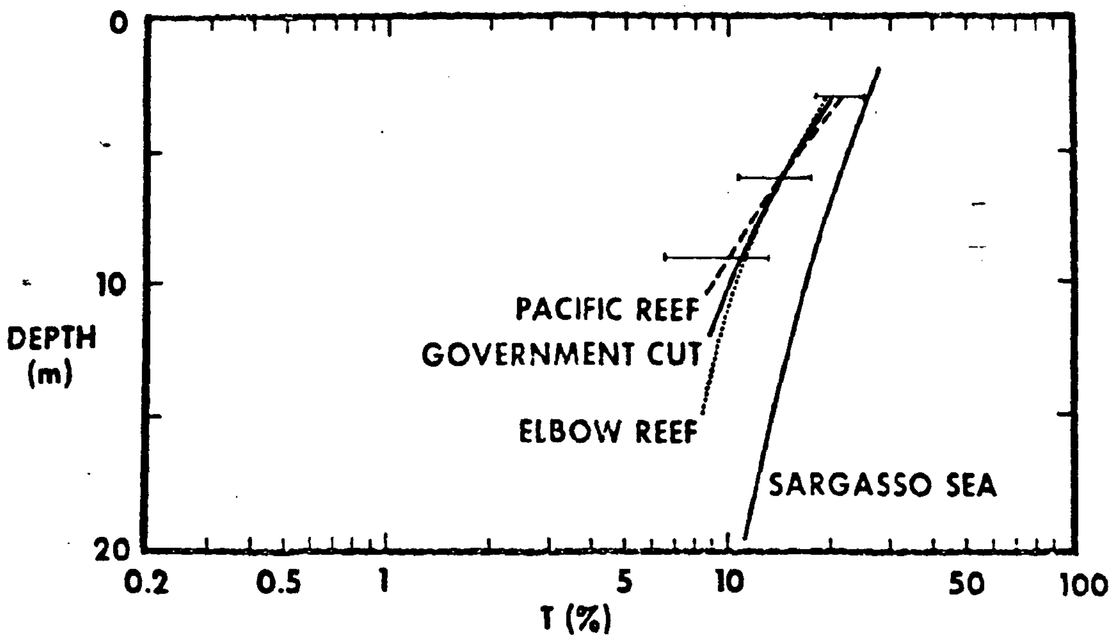


Fig. 25 Monthly turbidity levels along traverse "F" (see Fig. 9). From Griffin, unpublished data, 1974.



Mean transmittance profiles by sites in comparison to that for the Sargasso Sea. The brackets indicate the standard deviation of the daily transmittance values at three levels at Pacific Reef.

Solar Radiation Profile Measurements - Elbow Reef

	APRIL											
	3	4	4	5	6	7	8	8	9	9		
Time(GMT)	1430	1652	1710	1523	1858	1700	1629	1654	1616	1740	Avg	Stand. Devia-tion
Depth (m)	Transmittance											
3.0	.203	.214	.229	.159	.264	.259	.170	.161	.197	.106	.196	.049
6.1	-	.167	.179	-	.189	-	.128	.117	.128	.095	.143	.035
9.1	-	.144	.134	-	.160	-	.105	.107	.098	.077	.115	.025
12.2	-	.119	.124	-	.108	-	.080	.076	.084	.073	.095	.022
15.2	-	.108	.108	-	.091	-	.070	.071	.074	.054	.083	.020

Fig. 26 Transmittance profiles for Pacific Reef, Government Cut and Elbow Reef and solar radiation profile measurements at Elbow Reef (from Hanson and Poindexter, 1972).

Solar Radiation Profile Measurements - Government Cut

		FEB.					
	22	22	23	23	23		
Time(GMT)	1742	1954	1559	1634	1830	Avg.	Standard Deviation
Depth (m)	Transmittance						
3.0	.207	.249	.164	-	.180	.210	.032
6.1	.186	.138	.125	.128	.137	.140	.016
9.1	.139	.142	.098	.099	.105	.117	.019
12.2	.122	-	.073	.097	.067	.090	.020
13.1	.110	.062	-	-	-	.086	.021

Solar Radiation Profile Measurements - Pacific Reef

				FEB.					MAR					APRIL							
	27	27	28	28	28	28	29	29	1	13	14	14	14	15	15	15	16	16	16		
TIME(GMT)	1758	2010	1523	1551	1801	1836	1523	1851	1526	1816	1537	1714	1920	1558	1718	1918	1541	1710	1901	Avg	Standard Deviation
Depth (m)	TRANSMITTANCE																				
3.0	.253	.263 .310	.273 .149	.199 .184	.201 .189	.168 .153	.238	.262 .237	.253	.234 .241	.226	.237 .227	.241 .242	.195 .193	.182 .178	.182 .184	.210 .198	.162 .208	.196	.216	.035
6.1	.178	.185	.080	.096	.095	.089	.185	.169	.184	.151	.156	.166	.157	.160	.132	.103	.133	.143	.136	.161	.036
9.1	.138	.136	.032	.066	.057	.065	.119	.118	.134	.112	.113	.123	.105	.102	.095	.067	.102	.106	.100	.098	.033
10.7	-	-	-	-	-	-	-	-	-	.088	.098	.104	.086	.088	.075	.051	.089	.091	.082	.085	.016
12.2	.116	.127	-	-	-	-	-	.098	.099	-	-	-	-	-	-	-	-	-	-	-	-

Mean Transmittance by Sites (based on fixed depth pyranometer)

		Mean Transmittance		
Site	Depth (m)	At Indicated Depth	Normalized to Depth of 13 Meters	Standard Deviation
Government Cut	14.3	.061	.070	
Pacific Reef	10.7	.068	.055	.012
Elbow Reef	15.2	.067	.081	.021

Fig. 27 Solar radiation profiles for Government Cut and Pacific Reef. Comparison of mean transmittance at Government Cut, Pacific Reef and Elbow Reef (from Hanson and Poindexter, 1972).

SUMMARY OF WATER QUALITY DATA

NORTHERN REEF TRACT

SOURCE — REEF TRACT	Temp.	Salin.	D.O.	PO_4	NO_2	NO_3	NH_4	H_2S	pH	SO_4	Metals	Pestic.	Curr.	Turbid.	Pigm.	Plankt.	Colif.	LOCATION(S)
Bumpus (1957)	■																	Fowey, Carysfort, Sombrero Reefs
Dole & Chambers (1918)		■																Fowey Rocks
Griffin (unpublished)	■	■	■										■	■				Carysfort, Molasses, Elbow Reefs
Hanson & Poindexter (1973)														■				Elbow Reef, Pacific Reef, Gov't Cut
Hudson (unpublished)	■																	Hen and Chickens Reef
Jones (1963)	■	■	■	■					■				■					Margot Fish Shoal
Manker (1975)	■	■									■		■	■				Carysfort, Molasses, Elbow et al.
Parr (1933)	■																	Fowey, Carysfort
Shinn (1966)	■																	Key Largo Dry Rocks
Simmons (1973)				■	■	■	■											Brewster Reef
Smith et al. (1950)	■	■	■	■	■													Triumph Reef
Springer & McFarlean (1962)	■																	Mosquito Bank, Molasses Reef
Vaughan (1918)	■																	Fowey, Carysfort, Sombrero Reefs

SOURCE — INSHORE AREAS	Temp.	Salin.	D.O.	PO_4	NO_2	NO_3	NH_4	H_2S	pH	SO_4	Metals	Pestic.	Curr.	Turbid.	Pigm.	Plankt.	Colif.	LOCATION(S)
Chesher (1973)		■	■	■		■		■	■	■				■				Canals (Summerland Key)
Chesher (1974)	■	■	■	■		■		■	■	■	■	■		■				Canals (Key Largo)
Dawes et al. (1974)	■			■	■	■			■									Molasses & Bahia Honda Keys
Florida Dept. Envir. Regulation (unpub.)	■	■	■	■	■	■	■		■		■			■	■		■	Pennekamp State Park (channel)
Florida Dept. Pollution Control (1973)	■	■	■	■		■	■		■		■							Canals (Key Largo)
Griffin (1974b)	■													■				Basin Hills (Key Largo)
Hein (1978)	■	■							■				■					Old Rhodes Key Lagoon
Hudson (unpublished)	■																	Snake Creek
Michel (1973)	■	■	■	■	■	■												Canals (Plantation Key)
Vaughan (1935)													■					Hawk Channel

SOURCE — FLORIDA CURRENT	Temp.	Salin.	D.O.	PO_4	NO_2	NO_3	NH_4	H_2S	pH	SO_4	Metals	Pestic.	Curr.	Turbid.	Pigm.	Plankt.	Colif.	LOCATION(S)
Alexander & Corcoran (1963)				■											■			Miami to Cape Canaveral
Alexander & Corcoran (1967)											■				■			Fowey Rocks to Cat Cay
Bsharah (1957)	■	■	■	■		■												40 Mile Station
Churgin & Halminski (1974)	■	■	■	■														Key West
Corcoran & Alexander (1963)	■			■			■				■				■			40 Mile Station
Corcoran & Alexander (1964)											■							40 Mile Station
Gomberg (1976)	■		■	■														Key West to Cuba
Miller et al. (1953)	■	■		■		■									■	■		10 Mile Station
Vargo (1968)	■	■														■		Fowey Rocks, Alligator Reef

Fig. 28 Summary of available water quality data for the northern Florida Reef Tract, Florida Keys and Florida Current.

FOWEY ROCKS, OFF COCOANUT GROVE, FLORIDA.

Date.	1879	1880	1881	1882	1883	1884	1885	1886	1887	1888	1889	1890	Mean.	Max.	Min.
	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.
Jan. 10	....	....	23.4	22.9	24.0	23.0	23.7	22.5	20.9	24.0	22.9	23.3	23.1	24.0	20.9
20	....	....	23.2	23.4	23.4	23.3	24.0	21.0	22.0	23.7	23.6	23.9	23.2	24.0	21.0
30	....	....	22.5	23.5	23.5	22.9	23.7	21.2	22.3	23.6	22.0	23.7	23.0	23.7	21.2
Feb. 9	....	23.3	23.0	23.6	23.9	23.7	22.3	20.3	23.7	24.1	21.6	24.3	23.1	24.3	20.3
19	....	24.1	23.2	23.6	24.5	24.0	21.9	21.6	24.2	23.1	22.4	24.2	23.3	24.5	21.6
Mar. 1	22.8	23.5	23.9	22.6	24.2	23.1	22.0	22.3	24.5	22.5	23.0	24.0	23.2	24.5	22.0
11	22.5	24.4	22.5	23.8	23.5	22.7	21.2	22.3	23.7	22.8	22.2	22.5	22.9	24.4	21.2
21	22.9	23.5	22.9	24.2	23.4	24.1	21.8	22.7	22.6	22.4	22.9	23.0	23.1	24.2	21.8
31	23.6	22.8	21.3	24.4	23.2	24.0	22.6	23.0	22.3	23.0	23.3	24.3	23.2	24.4	21.3
Apr. 10	26.7	23.8	22.0	24.8	24.8	23.8	24.5	22.9	23.1	24.3	23.2	24.6	24.1	26.7	22.0
20	26.9	24.3	23.6	25.7	25.2	24.5	25.1	23.7	24.3	24.4	24.0	24.0	24.6	26.9	23.6
30	26.8	25.1	25.3	26.0	25.6	24.6	24.8	24.7	25.3	23.8	23.6	24.3	25.0	26.8	23.6
May 10	26.6	25.1	25.8	25.2	25.6	25.2	25.8	25.7	25.3	24.2	25.4	26.1	25.5	26.6	24.2
20	27.6	25.3	26.2	26.0	26.1	25.8	27.2	26.9	25.3	24.3	26.0	25.8	26.1	27.6	24.3
30	27.4	25.8	26.8	26.3	25.7	26.5	27.0	26.8	26.3	24.6	26.7	26.9	26.4	27.4	24.6
June 9	27.2	26.6	27.8	27.7	26.8	26.5	26.8	27.5	27.0	25.5	27.3	27.6	27.1	27.8	25.5
19	27.4	27.5	28.9	28.0	28.3	27.0	27.6	28.4	27.1	26.8	27.4	28.5	27.7	28.9	26.8
29	27.3	28.5	28.0	28.8	28.5	27.3	27.7	28.9	27.7	29.1	28.5	28.9	28.3	29.1	27.3
July 9	25.4	28.9	29.1	29.4	28.4	28.0	28.5	29.1	28.4	29.4	28.3	28.7	28.5	29.4	25.4
19	24.6	29.0	29.2	29.4	29.1	28.5	29.3	28.5	29.3	30.2	29.0	28.6	28.7	30.2	24.6
29	24.3	29.3	28.6	29.0	29.5	29.3	29.3	28.5	29.8	30.3	29.3	29.3	29.0	30.3	24.3
Aug. 8	24.8	29.6	29.3	28.6	29.2	29.1	30.1	29.0	29.8	30.9	29.4	29.2	29.1	30.9	24.8
18	25.0	29.1	29.1	29.4	29.3	29.1	30.2	28.7	29.8	29.8	29.1	29.3	29.0	30.2	25.0
28	24.8	28.2	28.8	29.0	29.8	28.8	29.7	28.6	29.6	29.3	28.8	29.6	28.7	29.8	24.8
Sept. 7	25.2	28.1	28.7	28.7	28.7	29.3	29.4	28.7	28.7	28.5	28.4	29.3	28.5	29.4	25.2
17	24.6	28.5	28.7	28.5	28.8	28.8	29.7	29.3	29.0	28.5	28.1	29.3	28.5	29.7	24.6
27	24.4	28.6	28.2	28.4	29.3	28.6	29.7	28.3	28.3	27.2	28.0	28.8	28.2	29.7	24.4
Oct. 7	....	28.3	27.9	28.1	29.0	28.0	28.7	27.7	28.4	26.6	27.4	28.4	28.1	29.0	26.6
17	....	28.9	26.8	28.1	27.9	27.0	27.2	27.5	28.2	26.3	26.9	28.5	27.5	28.9	26.3
27	....	25.8	27.1	27.3	26.6	26.5	26.4	26.8	27.5	26.3	26.5	27.3	26.8	27.5	25.8
Nov. 6	....	26.0	26.1	26.2	26.4	25.7	25.3	25.6	26.2	26.5	26.1	25.8	26.0	26.5	25.3
16	....	26.5	25.9	25.3	25.5	25.4	24.8	25.0	25.3	26.9	26.1	25.7	25.7	26.9	24.8
26	....	25.7	25.9	24.3	25.4	25.2	23.1	24.4	24.5	24.1	25.2	25.5	24.8	25.9	23.1
Dec. 6	....	26.2	25.5	23.6	24.6	24.4	21.8	23.4	24.5	23.0	24.4	24.3	24.2	26.2	21.8
16	....	24.1	25.2	24.2	24.2	24.3	23.0	21.9	24.2	23.5	24.1	23.6	23.8	25.2	21.9
31	....	23.0	23.8	23.3	24.2	24.1	22.2	22.5	23.7	22.2	24.1	22.1	23.2	24.2	22.1

Fig. 29 Surface temperature, 10 day means from 1878 to 1890, Fowey Rocks (from Vaughan, 1918)

FOWEY ROCKS, COCOANUT GROVE, FLORIDA—Continued.

Date.	1891	1892	1893	1894	1895	1896	1897	1898	1899	1900	1901	1902	Mean.	Max.	Min.
	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.
Jan. 10	....	22.9	22.6	23.3	22.3	19.6	20.1	20.8	20.7	18.0	21.9	18.2	21.0	23.3	18.0
20	....	23.3	20.8	23.4	22.7	19.3	22.4	22.4	23.3	20.8	21.2	15.8	21.4	23.4	15.8
30	....	23.0	22.0	23.1	23.2	23.0	20.2	22.6	21.8	20.2	20.3	19.9	21.8	23.2	19.9
Feb. 9	24.3	22.4	23.5	23.1	21.1	22.9	21.2	21.2	23.0	....	18.7	22.0	22.1	24.3	18.7
19	24.5	23.0	23.9	23.1	20.2	21.0	22.3	22.3	15.6	....	21.4	20.4	21.5	24.5	15.6
Mar. 1	23.9	22.6	23.6	23.4	19.9	20.2	22.1	21.0	22.1	....	18.7	19.5	21.5	23.9	18.7
11	23.6	22.9	23.6	23.1	23.3	22.4	22.4	21.4	21.9	....	21.2	20.5	22.4	23.6	20.5
21	24.0	22.6	23.7	23.4	22.9	21.1	23.6	23.0	23.0	....	19.6	21.3	22.5	24.0	19.6
31	23.8	23.0	23.3	23.0	22.8	23.4	23.3	23.2	23.3	....	22.7	22.1	23.1	23.8	22.1
Apr. 10	23.7	23.5	23.6	23.7	24.0	23.1	23.2	26.3	24.2	21.5	24.1	21.0	23.5	26.4	21.0
20	25.3	24.1	24.3	23.9	23.5	24.1	22.3	25.2	24.7	21.9	24.3	22.5	23.8	25.3	21.9
30	25.4	25.0	25.0	24.3	23.8	24.6	23.2	24.0	25.8	23.6	24.2	23.0	24.3	25.8	23.0
May 10	25.3	24.9	25.5	24.3	25.3	25.3	23.6	24.2	24.7	23.9	23.3	23.5	24.4	25.5	22.3
20	25.7	25.3	25.6	24.7	25.9	26.3	23.5	24.5	27.6	23.4	24.0	23.6	25.0	27.6	23.4
30	26.3	26.3	26.0	25.3	25.9	27.6	25.7	26.8	28.2	23.8	23.4	23.3	25.7	28.2	23.3
June 9	26.6	26.3	28.4	26.2	25.9	27.9	26.7	26.8	27.6	24.8	22.7	23.3	26.0	27.9	22.7
19	27.5	25.9	27.8	26.2	26.2	27.6	27.9	27.5	27.7	24.7	23.3	23.4	26.3	27.9	23.3
29	28.4	27.2	29.3	27.4	26.8	28.8	29.2	28.3	28.1	25.7	24.1	23.6	27.2	29.3	23.6
July 9	29.3	28.0	29.5	28.0	27.3	28.8	29.8	28.5	28.3	27.1	23.5	24.5	27.7	29.8	23.5
19	29.1	28.4	29.7	28.1	28.4	30.0	29.5	29.1	28.0	27.6	24.5	24.4	28.1	30.0	24.4
29	29.5	28.7	29.6	28.8	28.7	30.7	29.3	29.5	28.3	28.2	23.5	24.6	28.2	30.7	23.5
Aug. 8	29.6	29.0	29.8	29.7	28.8	30.7	30.0	29.4	28.7	27.6	28.2	23.6	28.7	30.7	23.6
18	29.1	28.9	29.7	29.9	28.7	30.1	31.2	29.5	28.2	27.2	27.3	23.7	28.6	31.2	23.7
28	29.3	29.1	29.1	29.8	28.6	30.2	30.8	29.2	29.4	27.5	27.9	23.5	28.6	30.8	23.5
Sept. 7	29.0	29.0	29.2	29.5	28.8	30.4	28.7	30.1	28.3	27.0	27.8	22.9	28.4	30.4	22.9
17	28.6	29.0	29.3	29.1	29.3	30.1	28.3	30.7	27.6	27.2	27.4	23.5	28.3	30.7	23.5
27	28.4	28.6	28.2	29.0	29.6	29.7	27.8	29.5	28.2	27.6	27.3	24.0	28.2	29.7	24.0
Oct. 7	27.7	27.5	27.8	28.1	28.2	29.3	25.9	29.1	26.8	26.0	27.0	24.2	27.3	29.3	24.2
17	26.7	27.3	27.1	25.9	26.5	28.1	25.8	28.5	27.3	25.8	27.5	23.6	26.6	28.5	23.6
27	24.7	26.8	26.1	24.7	23.4	26.5	25.9	26.1	26.6	26.3	26.0	22.5	25.4	26.8	22.5
Nov. 6	24.2	24.6	25.4	24.6	24.1	28.0	25.2	24.4	26.4	26.3	25.1	23.3	25.2	28.0	23.3
16	24.3	23.7	24.4	23.5	25.3	28.4	24.1	23.5	25.1	22.1	22.2	24.6	24.3	28.4	22.1
26	24.4	23.4	24.7	24.2	23.6	27.0	23.7	23.5	25.3	23.1	20.0	24.7	24.0	27.0	20.0
Dec. 6	24.6	23.7	24.5	23.5	22.8	24.4	24.0	22.2	23.5	22.4	21.0	24.2	23.4	24.6	21.0
16	24.6	24.2	23.6	24.0	18.5	21.9	23.5	15.8	23.0	21.6	21.4	24.9	22.2	24.9	15.8
31	23.3	23.3	23.3	22.2	24.7	21.4	23.1	18.3	21.1	21.4	18.2	21.8	21.9	24.7	18.2

Fig. 30 Surface temperature, 10 day means from 1891 to 1902, Fowey Rocks (from Vaughan, 1918)

FOWEY ROCKS, COCOANUT GROVE, FLORIDA—Continued.

Date.	1903	1904	1905	1906	1907	1908	1909	1910	1911	1912	Mean.	Max.	Min.
	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.
Jan. 10	21.0	21.4	21.4	22.2	22.8	22.4	25.3	21.6	20.1	24.3	22.2	25.3	20.1
20	21.5	20.7	20.2	20.7	23.1	21.1	26.2	21.5	23.0	24.1	22.2	26.2	20.2
30	22.2	20.3	21.2	20.6	22.1	21.7	23.3	21.9	24.1	24.8	22.2	24.8	20.3
Feb. 9	26.4	19.8	24.8	21.2	22.5	22.2	21.8	20.5	23.4	21.9	22.5	26.4	19.8
19	25.2	21.2	25.2	21.4	20.8	23.6	22.4	21.1	23.9	21.4	22.6	25.2	20.8
Mar. 1	21.9	21.4	22.5	21.5	22.5	20.9	22.1	22.4	23.2	23.1	22.1	23.2	21.0
11	22.2	21.1	24.1	21.9	26.3	26.0	25.2	23.2	22.3	22.5	23.4	26.3	21.1
21	22.6	21.0	25.3	23.6	24.4	24.4	27.4	22.1	22.1	24.1	23.6	27.4	21.0
31	21.4	21.3	25.9	24.2	24.5	23.7	26.9	22.7	24.2	25.1	24.0	26.9	21.3
Apr. 10	23.7	21.5	25.3	23.6	21.5	24.0	27.2	23.7	25.5	24.3	24.0	27.2	21.4
20	23.7	22.3	25.0	25.3	23.3	24.7	27.1	24.2	24.6	26.7	24.6	27.1	22.3
30	24.0	22.5	26.3	27.1	24.3	26.1	29.4	24.3	24.6	26.8	25.5	29.4	22.5
May 10	22.2	22.4	26.7	27.4	28.1	28.2	29.4	23.4	25.0	26.1	25.9	29.4	22.2
20	22.5	21.4	28.4	24.2	27.5	28.4	28.4	24.5	24.9	27.0	25.8	28.4	21.4
30	24.1	21.5	28.3	26.6	28.1	29.2	28.6	25.7	25.1	27.3	26.4	29.2	21.5
June 9	24.6	21.5	27.5	28.1	27.0	28.4	28.0	27.8	28.1	26.9	26.8	28.4	21.5
19	24.9	22.0	27.7	28.6	27.5	29.3	28.3	29.5	27.6	28.2	27.4	29.5	22.0
29	23.7	24.4	29.4	29.0	27.6	29.6	28.2	28.8	28.4	27.9	27.7	29.6	23.7
July 9	23.4	26.5	29.5	28.2	27.7	29.5	28.9	28.7	28.0	27.7	27.9	29.5	23.4
19	24.1	27.3	29.5	30.1	27.8	30.9	29.2	28.5	28.1	28.2	28.4	30.9	24.1
29	24.8	27.3	30.0	28.5	28.2	30.8	29.4	28.7	28.5	28.5	28.5	30.8	24.8
Aug. 8	23.6	27.8	29.1	27.8	29.0	29.9	30.0	29.0	28.9	28.5	28.4	30.0	23.6
18	23.5	27.6	29.6	29.4	30.3	29.5	29.0	29.8	28.9	28.3	28.6	30.3	23.5
28	25.1	27.4	29.4	29.3	29.5	29.1	29.4	30.0	28.6	28.1	28.6	30.0	25.1
Sept. 7	25.4	27.5	29.4	29.8	29.4	28.6	28.5	29.6	28.0	28.8	28.5	29.8	25.4
17	23.8	27.7	29.0	29.7	28.6	28.3	28.3	27.6	29.0	28.9	28.1	29.7	23.8
27	24.3	27.6	28.8	29.5	28.7	29.0	28.2	27.8	28.5	29.1	28.2	29.5	24.3
Oct. 7	23.6	27.6	26.8	28.3	28.3	27.9	27.2	27.2	28.3	28.6	27.4	28.6	23.6
17	23.6	26.8	26.6	27.1	27.4	26.8	27.5	26.7	28.2	28.8	27.0	28.8	23.6
27	22.3	24.0	26.9	26.9	26.5	25.3	28.0	27.5	27.9	29.4	26.5	29.4	22.3
Nov. 6	22.5	24.6	26.8	26.8	25.7	24.2	27.0	23.4	27.7	26.5	25.4	27.7	22.5
16	22.2	25.1	26.0	25.0	25.3	27.4	25.0	23.4	27.4	26.0	25.3	27.4	22.2
26	21.6	24.4	23.8	25.7	24.4	26.3	23.0	23.0	26.2	26.4	24.5	26.4	21.6
Dec. 6	21.2	24.3	24.0	23.8	23.5	27.9	22.8	22.4	24.9	23.8	23.8	27.9	21.2
16	21.8	21.8	22.0	23.1	24.4	24.8	23.5	20.9	24.7	24.4	23.2	24.8	20.9
31	21.5	22.0	22.5	21.1	25.1	24.9	19.6	20.4	25.3	24.3	22.6	25.3	19.6

Fig. 31 Surface temperature, 10 day means from 1903 to 1912, Fowey Rocks (from Vaughan, 1918)

Monthly and Annual Mean Surface Water Temperatures, °F

FOWEY ROCKS LIGHTHOUSE, FLORIDA — 25°35'25"N. 80°05'43"W.

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Ann.
1879	-	-	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	-	-	-	-
1880	-	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	-
1881	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
82	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
83	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
84	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1885	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1886	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
87	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
88	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
89	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1890	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1891	-	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	-
92	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
93	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
94	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1895	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1896	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
97	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
98	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
99	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1900	[illegible]	-	-	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	-
1901	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
02	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
03	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
04	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1905	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1906	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
07	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
08	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
09	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1910	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1911	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
12	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
13	[illegible]	[illegible]	-		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	-
14	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1915	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1916	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
17	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
18	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
19	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1920	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1921	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
22	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
23	-	-	-	-	-	-	-	-	-	-	-	-	-
24	-	-	-	-	-	-	-	-	-	-	-	-	-
1925	-	-	-	-	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	-
1926	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
27	-	-	-	-	-	-	-	-	-	-	-	-	-
28	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	-	[illegible]	[illegible]	[illegible]	-
29	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1930	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1931	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
32	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
33	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
34	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	(49)	(50)	(50)	(51)	(53)	(53)	(53)	(53)	(52)	(52)	(52)	(52)	
Mean	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Readings at first high water and first low water after 7 a.m., through 1922. 1925-1934, readings at 8 a.m. and 6 p.m.

Source - [illegible]

SOMBRERO KEY, FLORIDA — 24°37.5'N. 81°07'W.

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Ann.
1925	-	-	-	-	-	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	-
1926	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	-	-	-	-	-	-	-
27	-	-	-	-	-	-	-	-	-	-	-	-	-
28	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
29	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	-	-	-	-
1930	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1931	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
32	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
33	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
34	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	(8)	(8)	(8)	(8)	(8)	(9)	(8)	(8)	(8)	(7)	(7)	(7)	
Mean	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Readings at 8 a.m. and 6 p.m.

Source - [illegible]

Fig. 32 Monthly and annual mean surface temperature data for Fowey Rocks, 1879 to 1934, and Sombrero Key, 1925 to 1934 (from Bumpus, 1957)

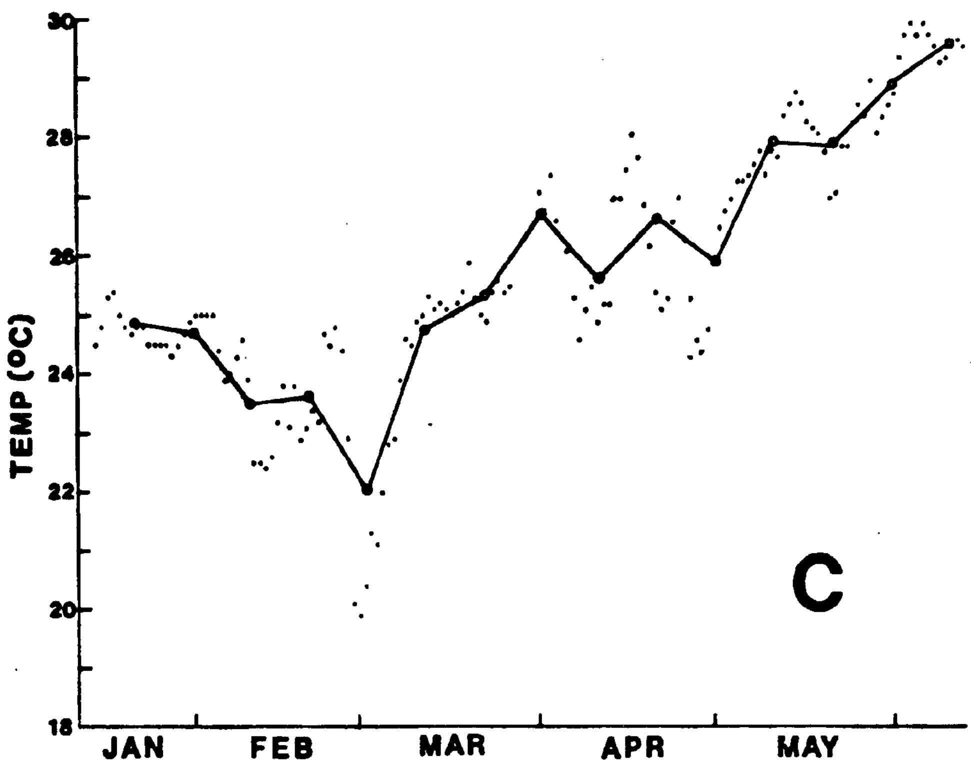


Fig. 33 Bottom temperatures during the period January to May 1974 at Hen and Chickens Reef. Dots indicate average daily temperature (readings taken at three hour intervals). Circles indicate 10-day means. (from unpublished data, G. Griffin, Univ. of Florida, Gainesville).

Sea water temperatures at the surface
Degrees Centigrade

Date	Stations										
	1 Beach Boat Slips	2 N. E. 18th Street, Miami	3 N. of Hurricane Harbor	4 In Hurricane Harbor	5 Biscayne Channel	6 Featherbed Bank	7 West Elliott Key	8 East Elliott Key	9 Triumph Reef	10 Soldier Key	11 Chicken Key
7-7-45	30.2	31.2	31.3	32.0	31.3	32.0	32.0	32.3	29.4	31.7	—
8-4-45	29.7	29.8	29.7	30.7	30.1	30.5	30.5	30.5	29.8	30.5	30.5
10-27-45	24.62	24.88	24.93	25.30	25.00	26.87	27.90	27.68	26.68	24.70	26.80
12-2-45	20.55	21.94	20.20	19.93	21.50	18.25	19.06	19.15	24.35	19.58	18.35
1-6-46	21.80	22.00	21.18	21.10	21.70	21.30	21.80	—	—	21.79	22.47
2-3-46	22.70	22.70	21.93	22.70	22.45	23.15	22.85	22.78	25.00	23.23	24.08
4-28-46	26.12	27.00	24.68	25.28	25.60	24.67	24.91	24.12	25.25	25.13	28.57
6-6-46	28.58	27.82	28.28	29.35	28.00	29.12	28.90	29.05	27.60	28.13	29.78

Sea water salinities at the surface
Grams per kilogram

Date	Stations										
	1 Beach Boat Slips	2 N. E. 18th Street, Miami	3 N. of Hurricane Harbor	4 In Hurricane Harbor	5 Biscayne Channel	6 Featherbed Bank	7 West Elliott Key	8 East Elliott Key	9 Triumph Reef	10 Soldier Key	11 Chicken Key
7-7-45	37.35	37.52	38.04	38.69	37.35	39.09	38.97	37.40	36.36	37.11	—
8-4-45	36.38	36.21	37.71	37.83	36.97	38.08	39.26	36.82	35.62	36.67	35.47
10-27-45	29.67	27.36	30.95	30.90	32.41	35.61	35.19	35.52	35.25	33.06	29.85
12-2-45	32.41	27.01	31.69	31.11	31.41	33.71	34.09	34.43	36.04	33.91	29.34
1-6-46	29.31	24.92	34.67	33.13	35.14	35.41	35.37	—	—	36.22	28.97
2-3-46	34.25	28.66	34.63	34.47	35.59	36.58	36.56	36.65	36.02	36.26	33.19
4-28-46	36.80	35.63	38.24	38.26	36.96	38.32	38.06	37.25	36.50	36.86	38.22
6-6-46	34.29	30.17	35.10	35.23	35.50	37.39	36.36	36.22	36.08	35.70	32.14

Dissolved oxygen in sea water at the surface
Milligram atoms per liter

Date	Stations										
	1 Beach Boat Slips	2 N. E. 18th Street, Miami	3 N. of Hurricane Harbor	4 In Hurricane Harbor	5 Biscayne Channel	6 Featherbed Bank	7 West Elliott Key	8 East Elliott Key	9 Triumph Reef	10 Soldier Key	11 Chicken Key
7-7-45	.319	.355	.380	.351	.394	.441	.297	.377	.375	.408	—
8-4-45	.313	.386	.350	.258	.390	.445	.342	.405	.430	.451	.403
10-27-45	.342	.412	.351	.397	.426	.394	.401	.488	.416	.453	.347
12-2-45	.428	.401	.467	.421	.453	.465	.493	.525	.434	.436	.428
1-6-46	.383	.356	.438	.354	.258	.443	.438	—	—	.416	.410
2-3-46	.384	.287	.432	.356	.363	.456	.448	.480	.424	.492	.445
4-28-46	.416	.381	.448	.456	.458	.492	.446	.491	.447	.478	.517
6-6-46	.307	.178	.369	.336	.394	.431	.374	.303	.408	.400	.452

Dissolved oxygen in sea water at the surface
Per cent of saturation

Date	Stations										
	1 Beach Boat Slips	2 N. E. 18th Street, Miami	3 N. of Hurricane Harbor	4 In Hurricane Harbor	5 Biscayne Channel	6 Featherbed Bank	7 West Elliott Key	8 East Elliott Key	9 Triumph Reef	10 Soldier Key	11 Chicken Key
7-7-45	85.5	91.7	98.6	92.3	101.6	116.5	78.3	98.6	93.3	105.8	—
8-4-45	78.3	96.6	88.6	74.2	96.0	111.6	88.7	103.0	106.7	114.7	101.5
10-27-45	74.7	67.5	77.7	88.5	95.3	93.2	96.3	117.0	97.5	101.1	78.6
12-2-45	89.0	82.2	96.0	85.7	96.9	93.6	101.0	107.9	98.5	89.9	84.0
1-6-46	79.6	78.4	93.1	74.5	55.6	95.1	93.9	—	—	90.5	86.1
2-3-46	84.4	60.2	92.9	77.5	79.6	101.8	100.0	106.6	97.5	109.8	98.5
4-28-46	98.3	90.3	104.6	107.9	105.0	115.2	104.6	112.4	103.4	112.1	128.8
6-6-46	74.2	41.2	89.2	82.9	95.0	107.6	92.1	97.1	98.3	96.7	109.7

Phosphate-phosphorus in sea water at the surface
Microgram atoms per liter

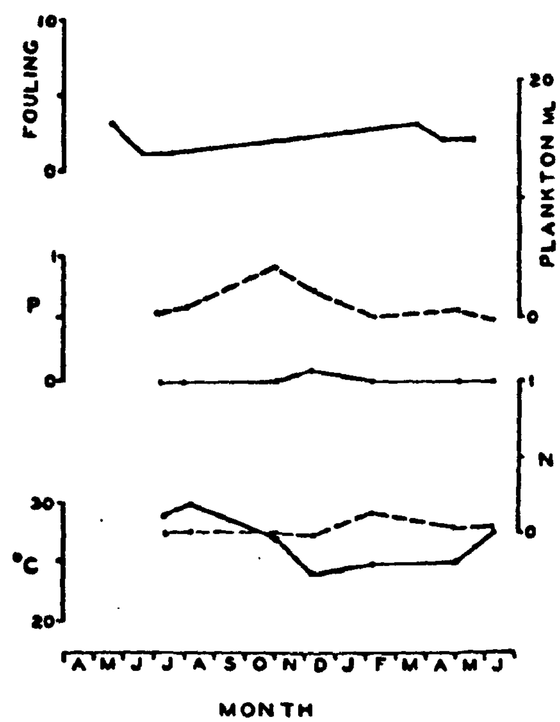
Date	Stations										
	1 Beach Boat Slips	2 N. E. 18th Street, Miami	3 N. of Hurricane Harbor	4 In Hurricane Harbor	5 Biscayne Channel	6 Featherbed Bank	7 West Elliott Key	8 East Elliott Key	9 Triumph Reef	10 Soldier Key	11 Chicken Key
7-7-45	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	—
8-4-45	<.03	.03	<.03	<.03	.00	.00	.00	.00	.00	.00	.00
10-27-45	<.03	.12	.00	.00	.00	.00	<.03	<.03	.00	<.03	.00
12-2-45	.00	1.20	.00	.00	.03	.00	.00	<.03	.10	.00	.00
1-6-46	.00	.00	.00	<.03	<.03	.00	.00	—	—	.00	.00
2-3-46	.00	1.5	.00	.00	.00	<.03	<.03	.00	.00	.00	<.03
4-28-46	.03	.72	.00	.00	<.03	.03	.06	<.03	.00	.00	.00
6-6-46	.06	2.4	.03	.03	<.03	.00	<.03	<.03	.00	<.03	<.03

Nitrite-nitrogen in sea water at the surface
Microgram atoms per liter

Date	Stations										
	1 Beach Boat Slips	2 N. E. 18th Street, Miami	3 N. of Hurricane Harbor	4 In Hurricane Harbor	5 Biscayne Channel	6 Featherbed Bank	7 West Elliott Key	8 East Elliott Key	9 Triumph Reef	10 Soldier Key	11 Chicken Key
7-7-45	0.1	0.3	0.1	0.15	0.1	0.1	0.1	<0.1	0.0	0.1	—
8-4-45	.2	.25	.1	.1	.05	.1	.1	.0	.0	.0	.1
10-27-45	.3	1.6	.3	.25	.3	.15	<.1	.0	.0	.15	.2
12-2-45	.46	.8	.15	.1	.0	.0	.0	.0	.0	.0	.0
1-6-46	.8	1.0	.2	.1	.1	.1	.2	—	—	.2	.1
2-3-46	.4	2.0	.4	.4	.4	.1	.2	1.6	.2	.2	.4
4-28-46	.2	.2	.15	.2	<.1	<.1	.1	<.1	<.1	.1	<.1
6-6-46	.6	1.0	.15	.2	.2	.15	.15	.1	<.1	.1	.25

Plankton volumes in milliliters

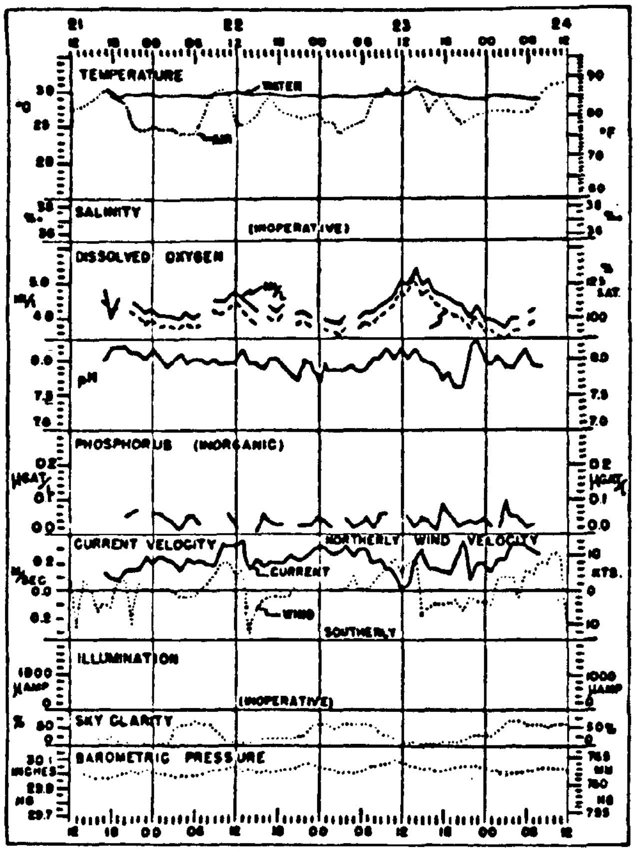
Date	Stations										
	1 Beach Boat Slips	2 N. E. 18th Street, Miami	3 N. of Hurricane Harbor	4 In Hurricane Harbor	5 Biscayne Channel	6 Featherbed Bank	7 West Elliott Key	8 East Elliott Key	9 Triumph Reef	10 Soldier Key	11 Chicken Key
7-7-45	12.8	22.0	11.0	21.1	6.4	2.8	<1.0	<1.0	<0.5	0.5	—
8-4-45	2.0	3.0	0.5	0.5	<0.5	0.5	2.0	0.5	1.0	1.0	<0.5
10-27-45	1.0	<1.0	3.5	5.5	0.5	trash	3.0	4.0	4.5	5.0	5.0
12-2-45	<0.5	2.5	15.0	7.5	2.0	2.5	<0.5	2.5	2.5	2.5	5.5
1-6-46	13.0	5.0	2.0	2.0	1.0	—	—	—	—	—	—
2-3-46	1.0	2.0	5.0	4.0	2.0	0.75	0.5	0.5	0.5	0.5	1.5
4-28-46	0.75	1.0	1.0	1.0	0.5	0.5	1.5	0.5	1.0	0.5	1.0
6-6-46	10.0	4.5	1.0	0.5	0.5	0.75	0.25	0.5	0.25	1.0	1.0



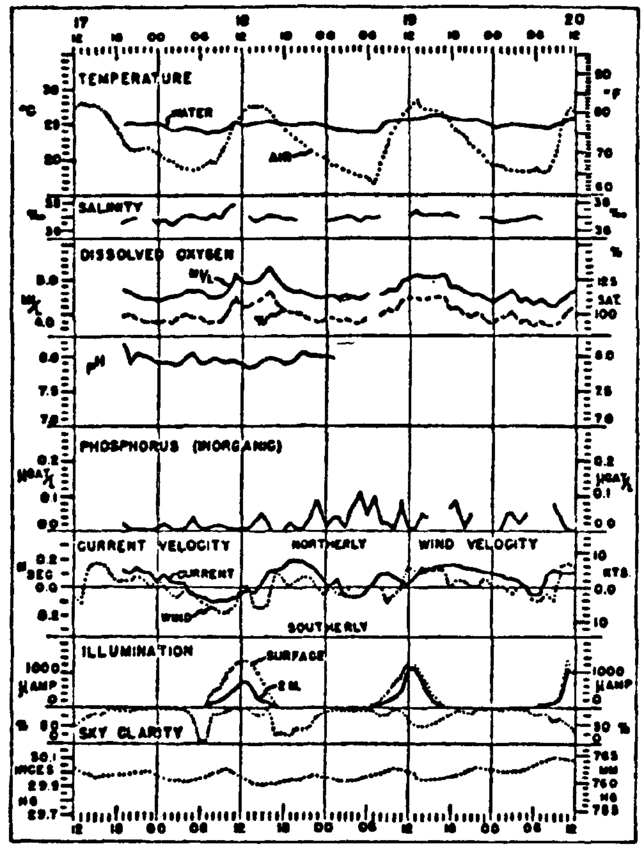
Quantitative observations at station 9 on Triumph Reef.

N: nitrite nitrogen, P: phosphate phosphorus both expressed in microgram atoms per liter. Fouling expressed in tenths of panel covered after one month of exposure. Plankton expressed in milliliters per standard sample.

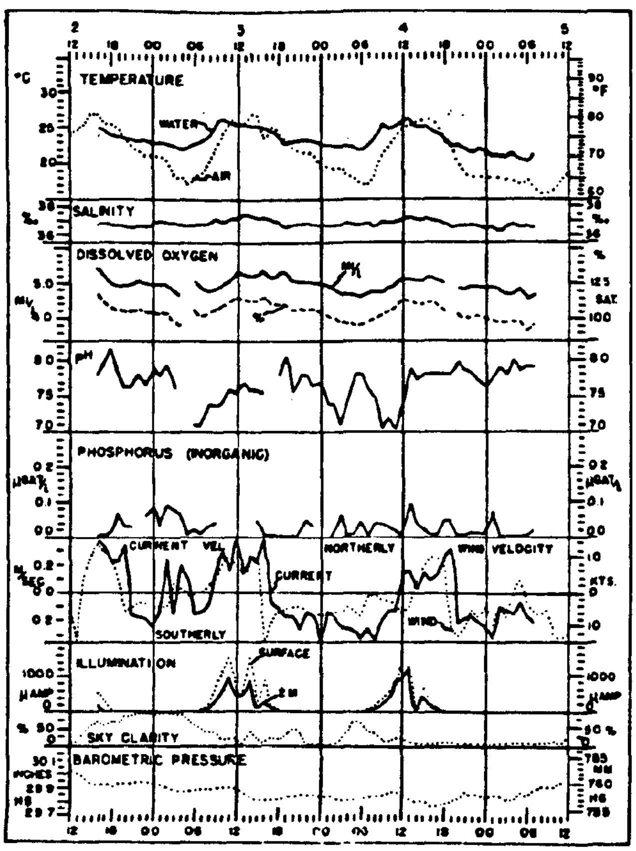
Fig. 34 Water quality data, including Triumph Reef and Soldier Key (from Smith et al., 1950)



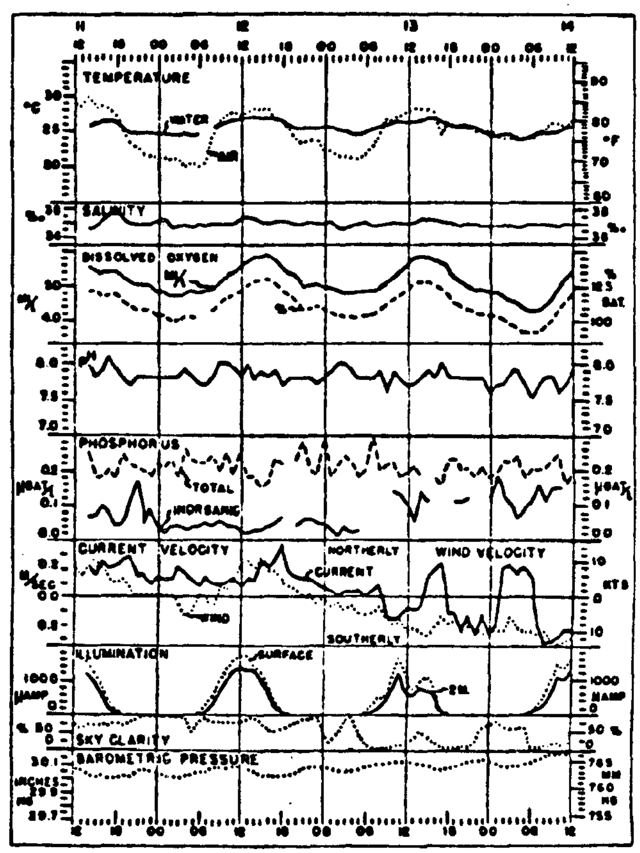
Observed physical and chemical features of the patch reef environment from 21 to 24 August 1961.



Observed physical and chemical features of the patch reef environment from 17 to 20 November 1961.

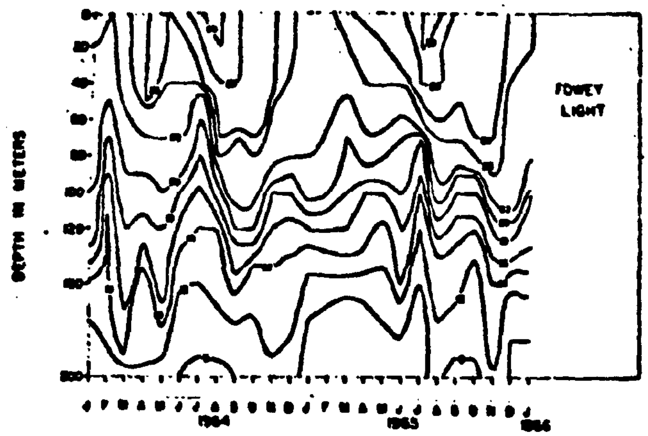


Observed physical and chemical features of the patch reef environment from 2 to 5 March 1962.

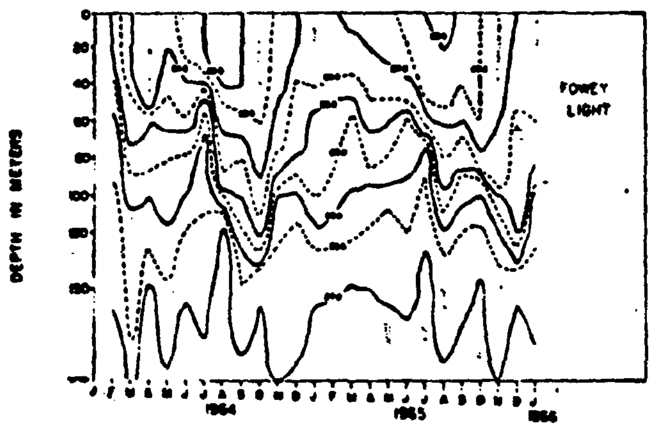


Observed physical and chemical features of the patch reef environment from 11 to 14 May 1962.

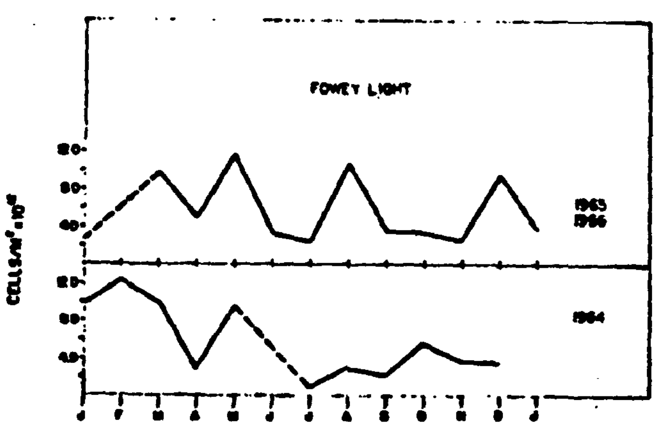
Fig. 35 Climatological and water quality data, Margot Fish Shoal (from Jones, 1963)



Vertical and seasonal variations in temperature at Fowey Light, from January, 1964, to January, 1966.

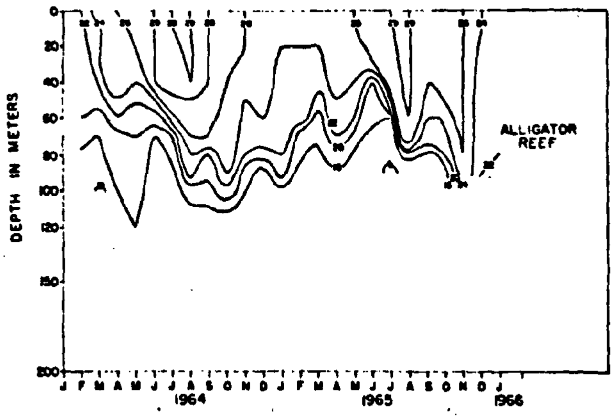


Vertical and seasonal variations in σ_t at Fowey Light, from January, 1964, to January, 1966. Deep surface mixing and subsurface pockets of mixed water indicated by hatched areas.

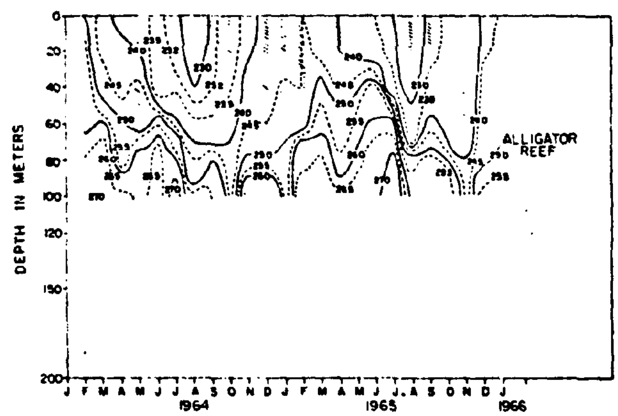


Seasonal variation in standing crop of phytoplankton during 1964-1966, at Fowey Light.

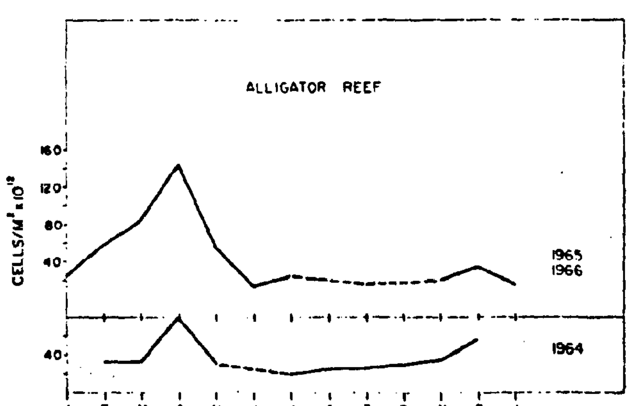
Fig. 36 Seasonal variation in temperature, sigma-t and phytoplankton standing crop, Fowey Rocks (from Vargo, 1968)



Vertical and seasonal variations in temperature at Alligator Reef from January, 1964, to January, 1966.

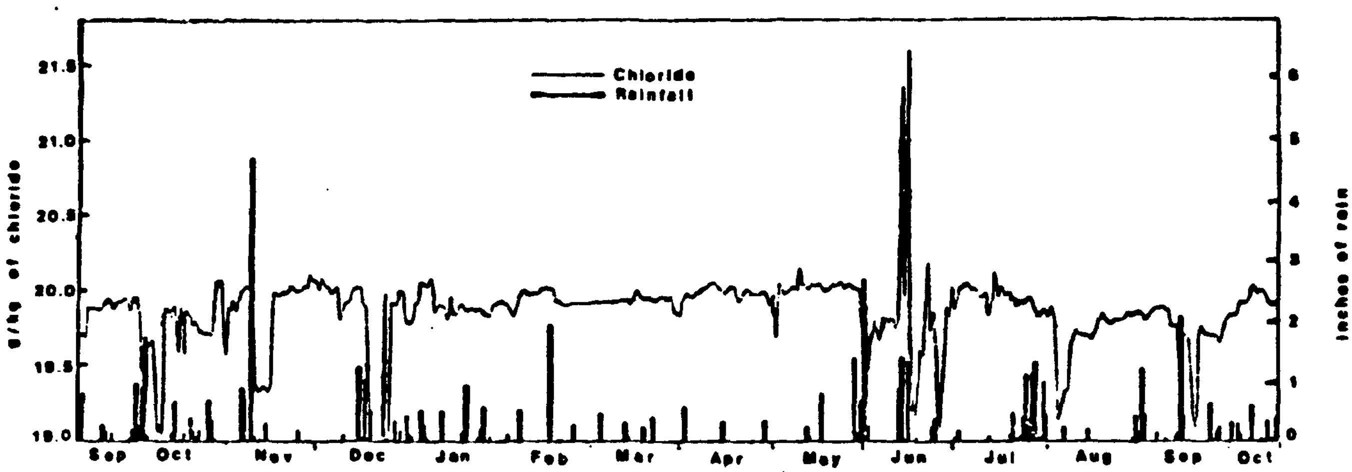


Vertical and seasonal variations in σ_t at Alligator Reef, from January, 1964, to January, 1966. Deep surface mixing and subsurface pockets of mixed water indicated by hatched areas.



Seasonal variation in standing crop of phytoplankton during 1964-1966, at Alligator Reef.

Fig. 37 Seasonal variation in temperature, sigma-t and phytoplankton standing crop, Alligator Reef (from Vargo, 1968)



Graph showing daily content of chloride of sea-water at Fowey Rocks and daily precipitation at Miami, Florida, September 12, 1914, to October 17, 1915.

Fig. 38 Salinity data for Fowey Rocks (chloride content) and precipitation data for Miami, 1914 to 1915 (from Dole and Chambers, 1918)

Summary Nutrient Data From Water And Core Samples

Taken From Stations 1-5

STATION 1

Date		Inorganic PO_4^{3-} (µg at P/L)	Total PO_4^{3-} (µg at P/L)	NO_2^-	NO_3^- (µg at N/L)	NH_4^+
8/29/72	N	0.04	1.01	0.01	0.16	1.10
	C	1.57	1.21	0.15	3.69	1.52
9/8/72	N	-	1.00	0.02	0.12	1.21
	C	-	2.29	0.12	3.96	1.52
11/7/72	N	0.16	1.04	-	-	-
	C	2.44	3.82	-	-	-
1/23/73	N	0.15	1.11	0.05	1.51	2.34
	C	4.71	6.75	-	-	-
3/13/73	N	0.02	1.15	0.04	1.95	1.53
	C	2.17	3.59	0.21	-	2.29
5/19/73	N	0.21	1.04	0.13	1.96	3.01
	C	4.42	8.58	0.75	-	2.82

Symbol designation

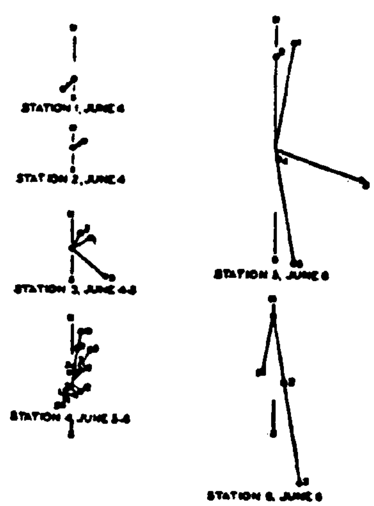
N - water sample
C - core sample

Fig. 39 Nutrient data, Brewster Reef (from Simmons, 1973)

—*Currents at stations Nos. 1, 2 and 3.*

(*For the positions of stations, see current records on following pages.*)

Date	Station No.	Time	Velocity cm. per second	Direction from which current flows	Tide
1914		A. m. A. m.			
June 4	1	8 30-8 45 a. m.	10.82	S. 50° W.	Ebb
	2	1 23-1 53 p. m.	9.74	N. 60° E.	Flow
	3	2 15-2 45	15.98	N. 60° E.	Flow
	3	5 30-6 00	12.98	N. 30° E.	Ebb
June 5	3	6 40-6 55 a. m.	33.86	S. 50° E.	Ebb



—Current rosettes for stations 1, 2, 3, 4, 5, and 6. Currents are represented as flowing toward station. Sequence of readings, which were hourly, is shown by numbers beginning with 1. Velocity is indicated by the length of line, scale: 1 mm.=6 cm. per second. 1 cm. per second=0.0194 knots per hour.

—*Current records, Florida reef tract.*

Date, June 1916	Time of day	Current			Wind	Tide
		Velocity		Direction		
		Cm. per second	Knots per hour			
Station No. 1, off Soldier's Key, red buoy No. 2, Hawk Channel Lat. 25° 33.3', Long. 80° 7.5' (see U. S. C. & G. S. chart 166)						
4	A. m. A. m. 8 30-8 45 a. m.	10.82	0.211	S. 50° W.	S.E. light	Ebbing
Station No. 2, Caesar's Creek Point, Hawk Channel Lat. 25° 23.3', Long. 80° 11.3' (see U. S. C. & G. S. chart 166)						
4	A. m. A. m. 1 23-1 53 p. m.	9.74	0.180	N. 60° E.	E. light	Flowing
Station No. 3, off mouth of Caesar's Creek, north side Caesar's Creek Bank (see U. S. C. & G. S. chart 166)						
	A. m. A. m.					
4	2 15-2 45 p. m.	15.98	0.310	N. 60° E.	E. light	Flowing
4	5 30-6 00	12.98	.252	N. 30° E.	E. light	Ebbing
5	6 40-6 55 a. m.	33.86	.657	S. 50° E.	S.E. light	Ebbing
Station No. 4, off Rodriguez Key, Hawk Channel, depth 12 ft. Lat. 25° 02.2' N., Long. 80° 26.3' W. (see U. S. C. & G. S. chart 167)						
	A. m. A. m.					
5	10 55-11 10 a. m.	13.10	0.254	S. 20° W.	S.E. light	Ebbing
5	2 15- 2 30 p. m.	4.82	.094	S. 20° W.	S.E. almost calm	Nearly slack
5	2 40- 2 55	6.28	.122	S.	S.E. almost calm	Flowing
5	3 15- 3 30	6.98	.135	S. 10° E.	S.E. almost calm	Flowing
5	4 00- 4 15	11.42	.222	N. 10° E.	E. light	Flowing
5	5 10- 5 15	14.18	.275	N. 40° E.	E. light	Flowing
5	6 00- 6 15	14.16	.275	N. 30° E.	E. light	Flowing
5	7 00- 7 15	14.10	.275	N. 10° E.	E. light	Flowing
5	8 00- 8 15	14.16	.275	N. 30° E.	E. light	Flowing
5	9 00- 9 15	13.12	.254	N. 10° E.	E. light	Flowing
5	10 00-10 15	8.04	.156	N. 20° E.	E. light	Flowing
5	11 00-11 15	9.86	.191	S. 60° E.	E. light	Ebbing
6	6 10- 6 15 a. m.	7.10	.138	S. 10° W.	S.E. light	Ebbing

Fig. 40 Current data, Hawk Channel and Rodriguez Key (from Vaughan, 1935)

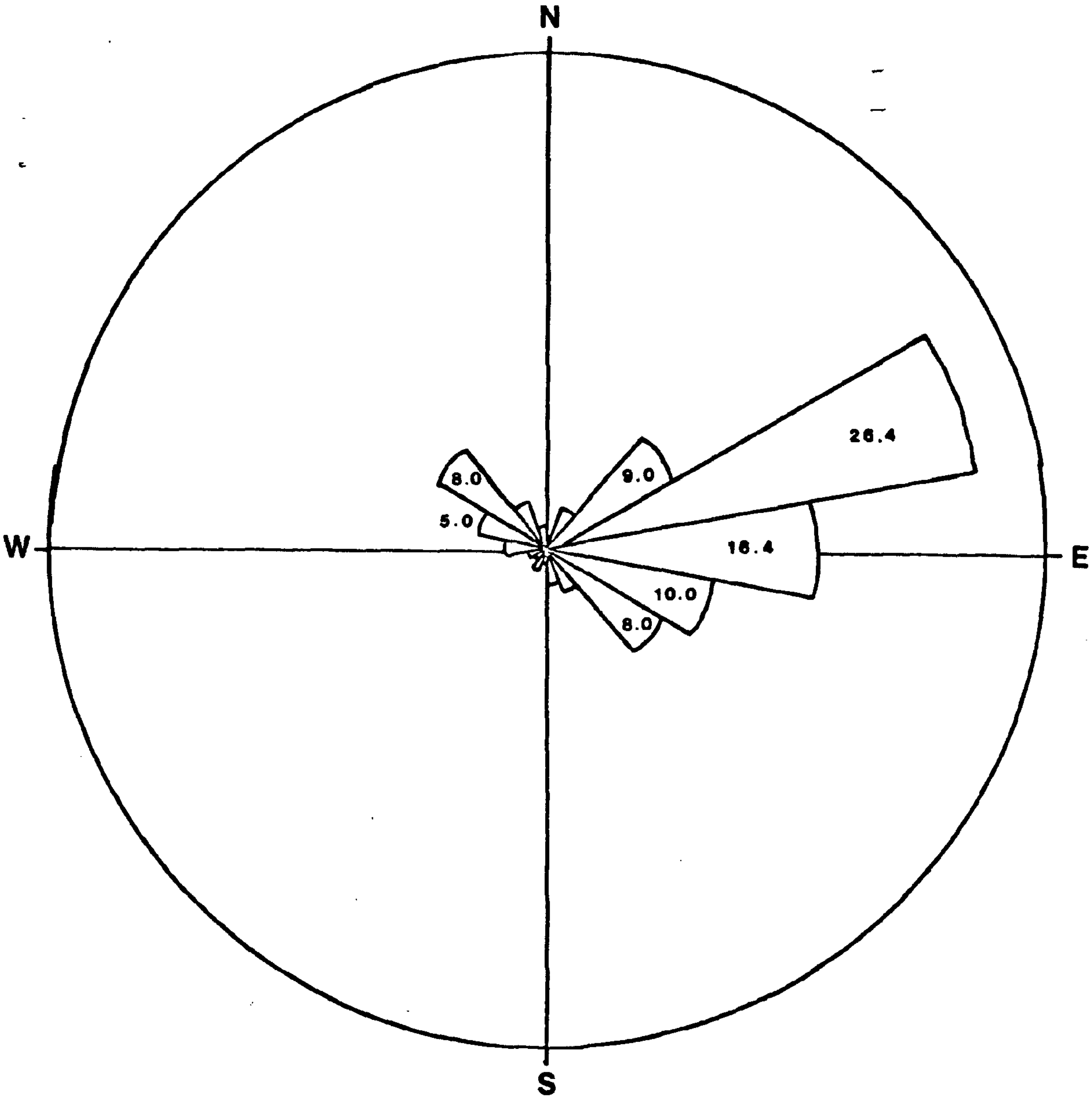


Fig. 41 Current rose showing percent frequency of current direction (toward) at Hen and Chickens Reef. Readings taken every three hours during the period of February 15 1974 to March 15 1974 (201 readings total). Data from Griffin (unpublished, 1974).

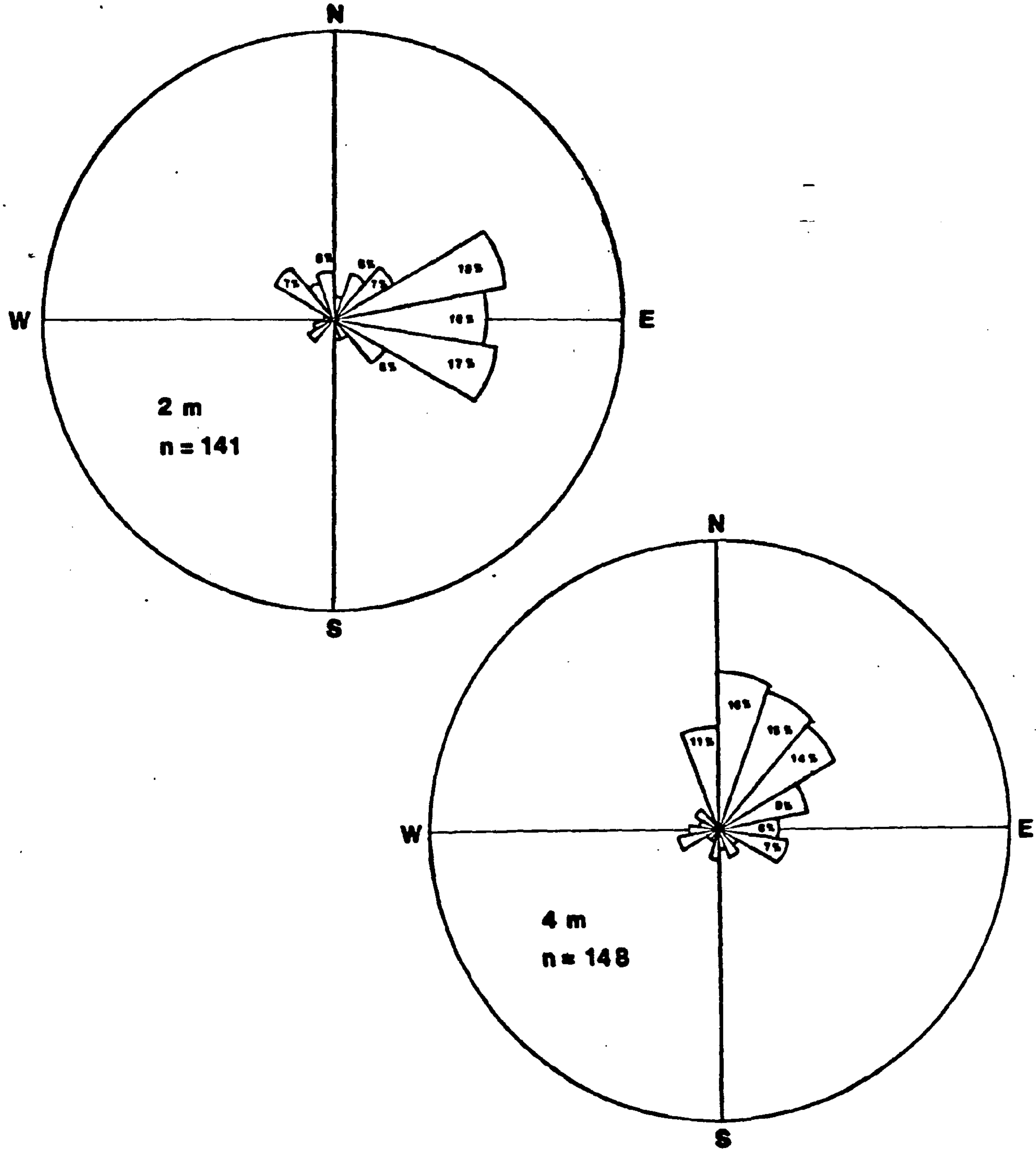
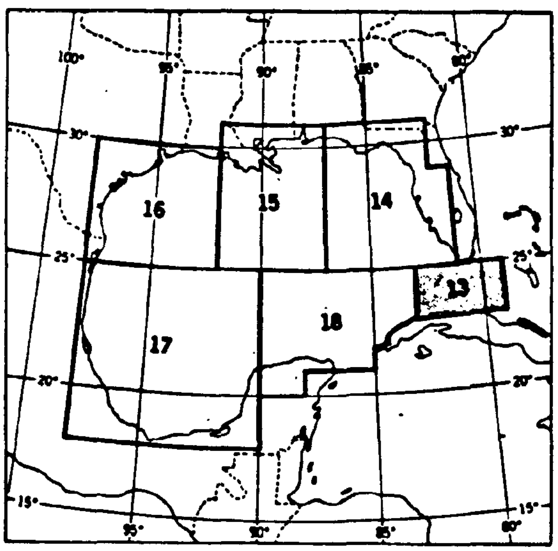
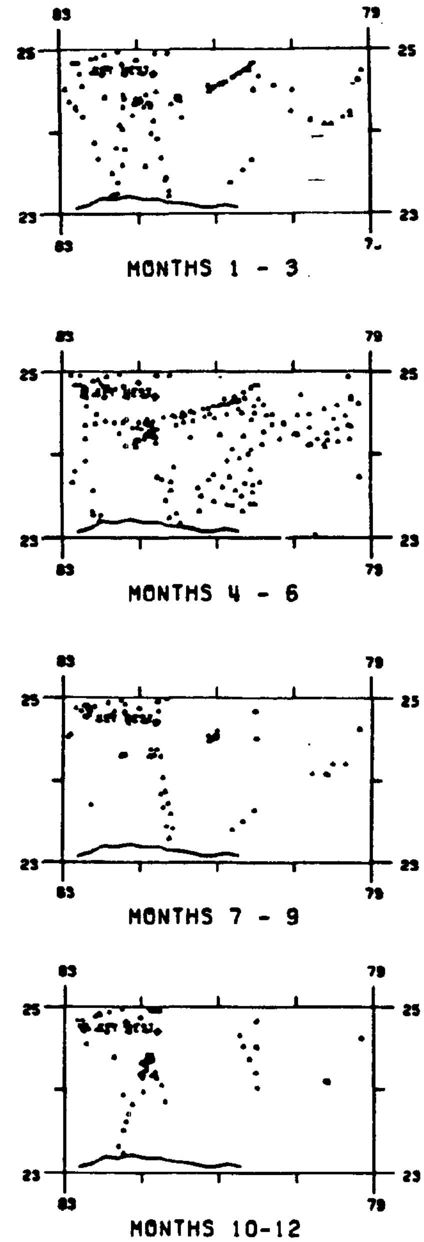


Fig. 42 Current roses showing predominating currents (percent frequency toward) in Hawk Channel between Soldier Key and Fowey Rocks at depths of 2 and 4 meters. (unpublished data, National Ocean Survey Station J-22, hourly readings, February 10 to February 14, 1963)





Distribution of stations reporting sea-surface temperature values.

Fig. 43 Station locations, Key West region of Florida Current (from Churgin and Halminski, 1974)

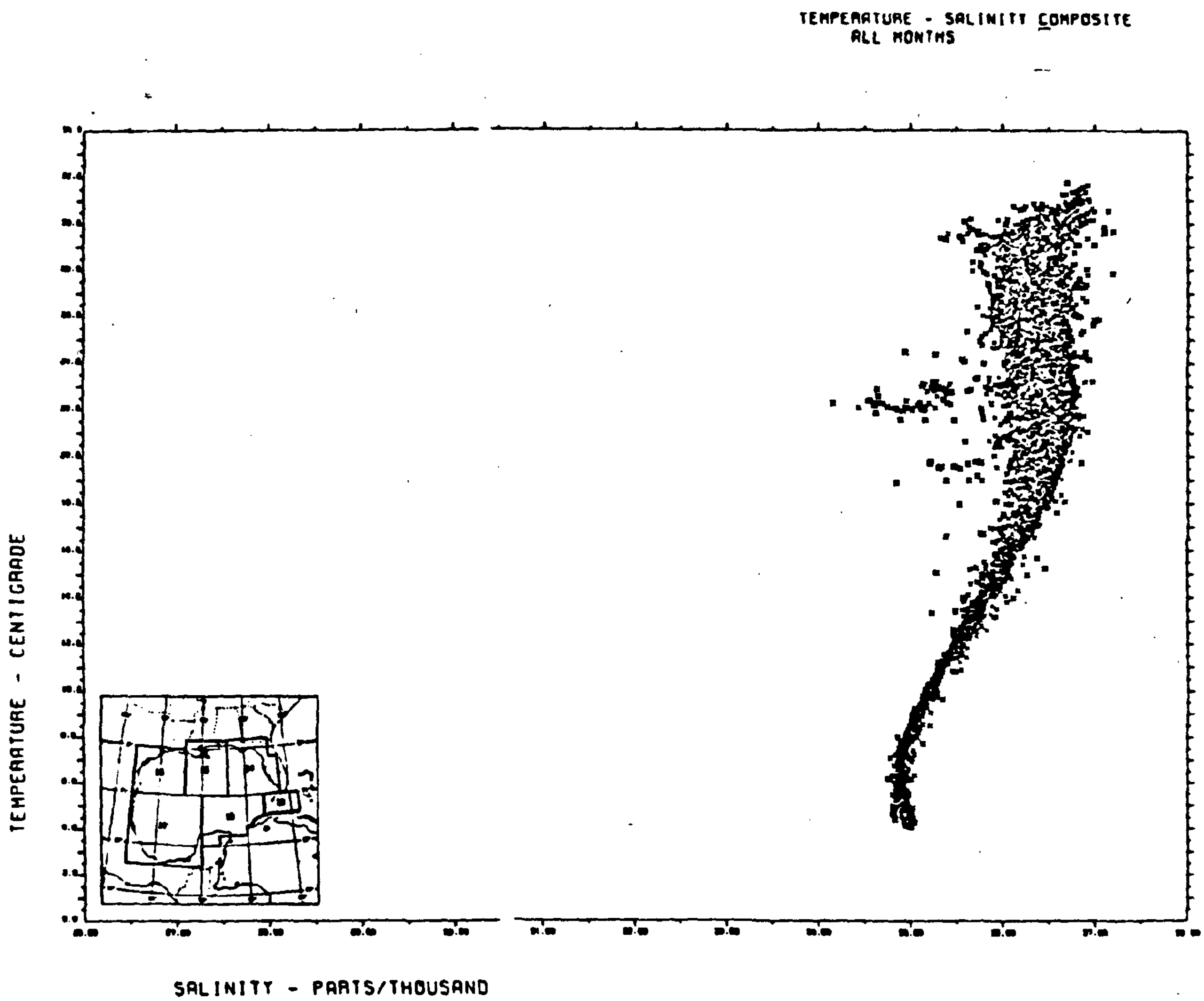


Fig. 44 Temperature - salinity composite, Key West region of Florida Current (from Churgin and Halminski, 1974)

AREA 13 KEYWEST

23-25N 79-83W

TEMPERATURE

MONTHS 1 - 3 MONTHS PRESENT 1, 2, 3

DEPTH	MAX	AVG	MIN	OBS	SDEV
0	26.10	22.70	18.90	225	1.76
10	26.02	22.40	19.00	219	1.79
20	26.01	22.20	18.70	195	1.91
30	25.98	22.28	18.98	145	2.12
50	26.02	21.74	17.05	120	2.69
75	25.87	20.51	15.09	119	3.42
100	25.81	19.36	12.93	110	4.16
125	25.22	18.03	11.92	106	4.71
150	24.80	17.63	11.25	90	4.89
200	24.22	16.51	11.03	51	3.32
250	20.02	16.61	9.95	41	3.11
300	16.34	14.93	9.07	40	3.11

MONTHS 4 - 6 MONTHS PRESENT 4, 5, 6

DEPTH	MAX	AVG	MIN	OBS	SDEV
0	30.90	26.41	21.80	387	1.85
10	29.73	25.90	21.78	375	1.73
20	29.72	25.29	20.67	336	1.81
30	28.88	24.92	19.81	221	2.06
50	27.93	23.93	18.21	172	2.68
75	26.93	22.56	13.70	166	3.31
100	26.98	21.24	12.24	154	4.13
125	25.81	20.47	12.04	137	4.26
150	25.20	19.50	10.95	127	4.31
200	22.59	18.35	10.00	101	3.31
250	20.68	17.18	10.43	87	2.58
300	19.47	15.63	9.97	83	2.62

MONTHS 7 - 9 MONTHS PRESENT 7, 8, 9

DEPTH	MAX	AVG	MIN	OBS	SDEV
0	31.67	29.83	27.64	212	0.77
10	31.02	29.06	25.69	202	1.19
20	30.84	28.13	21.64	164	2.17
30	29.49	27.51	20.37	92	1.56
50	29.35	25.81	21.63	49	2.61
75	28.50	22.71	10.90	49	4.57
100	27.45	21.26	13.44	43	5.24
125	26.84	20.51	11.46	39	5.23
150	25.95	15.82	11.41	34	5.35
200	22.39	15.94	12.62	17	2.62
250	19.53	17.62	10.92	12	2.65
300	17.96	17.23	15.61	10	0.76

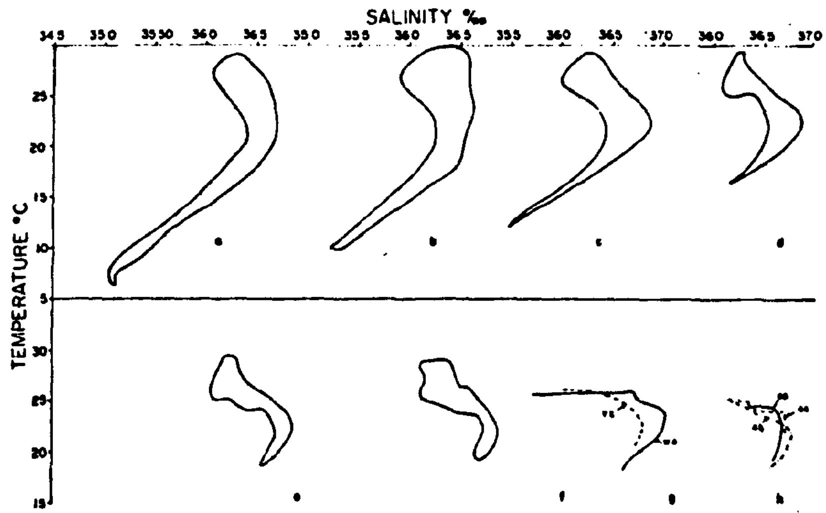
MONTHS 10 - 12 MONTHS PRESENT 10,11,12

DEPTH	MAX	AVG	MIN	OBS	SDEV
0	29.54	25.39	21.60	176	2.30
10	29.45	25.61	21.60	146	2.16
20	29.35	26.10	22.25	122	1.88
30	29.26	26.50	22.92	72	1.54
50	29.07	26.34	23.24	43	1.45
75	28.50	24.71	14.08	41	3.20
100	27.53	23.64	13.24	32	3.32
125	26.07	22.16	12.41	31	3.61
150	25.34	20.72	11.74	30	3.49
200	23.59	18.81	10.89	24	2.87
250	21.46	15.75	10.03	12	3.58
300	18.94	13.96	9.28	11	3.23

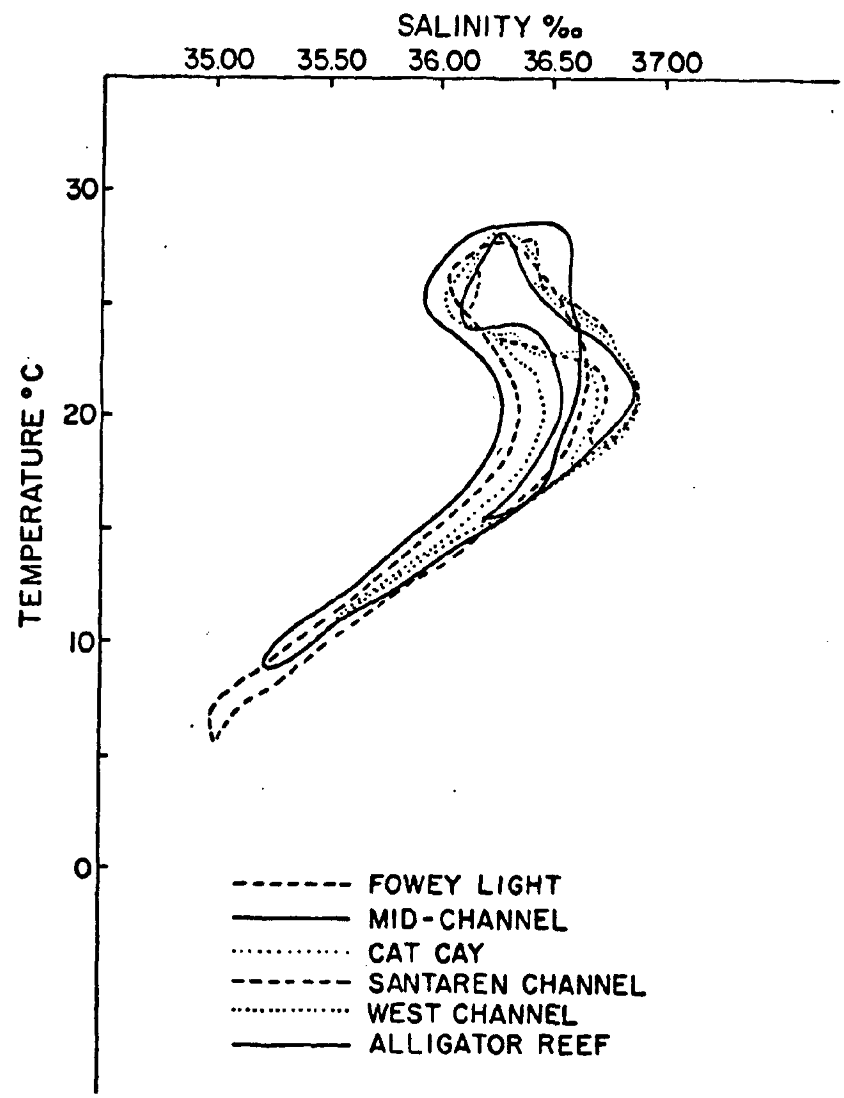
MONTHS 1 - 12 MONTHS PRESENT 2, 3, 4, 5, 6, 8, 9,10,11

DEPTH	MAX	AVG	MIN	OBS	SDEV
400	17.11	12.70	7.58	130	2.57
500	15.49	10.50	6.52	122	1.97
600	12.63	8.63	5.73	114	1.45
700	9.10	7.27	4.92	91	0.90
800	7.31	6.23	4.65	75	0.56
900	7.00	5.58	4.77	62	0.39
1000	5.77	5.00	4.50	40	0.29
1100	5.66	4.71	4.26	26	0.29
1200	5.52	4.53	4.25	18	0.37
1300	5.30	4.42	4.17	13	0.31
1400	5.02	4.37	4.09	7	0.33
1500	4.68	4.30	4.09	6	0.21

Fig. 45 Temperature data, Key West region of Florida Current (from Churgin and Halminski, 1974)

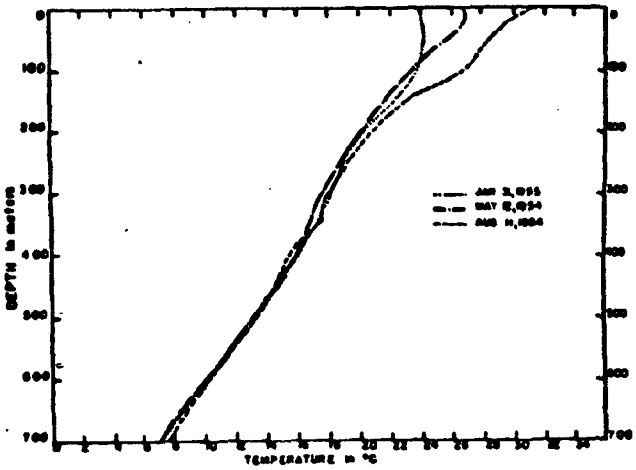


a-f, Temperature-salinity envelopes for the Straits of Florida resulting from data collected from January 1, 1964, to January, 1966: a, Fowey Light; b, Alligator Reef; c, West Channel; d, Midchannel; e, Cat Cay; f, Santaren Channel.—g-h, T-S curves: g, for Western Atlantic water (W. A.), and Yucatan Channel water (Y. C.); h, for three GERDA stations in Santaren Channel for cruise G-6103.

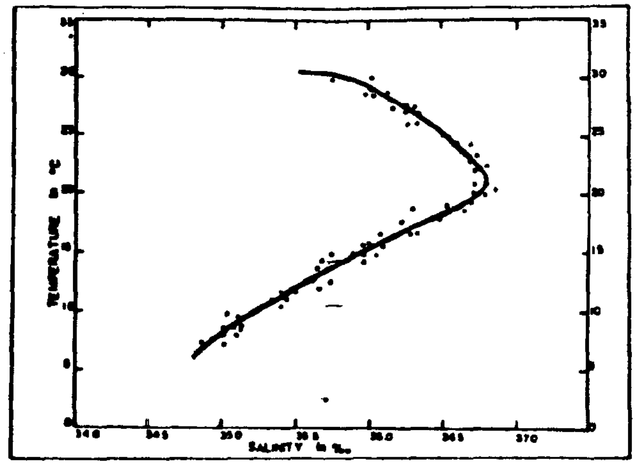


Superimposed T-S envelopes for six stations in the Straits of Florida.

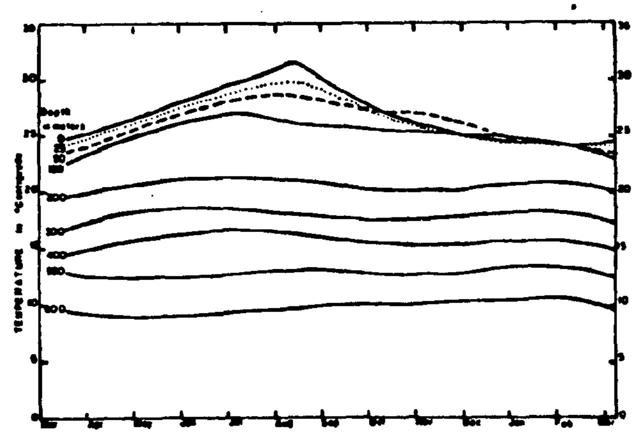
Fig. 46 Temperature-salinity envelopes, Florida Straits (from Vargo, 1968)



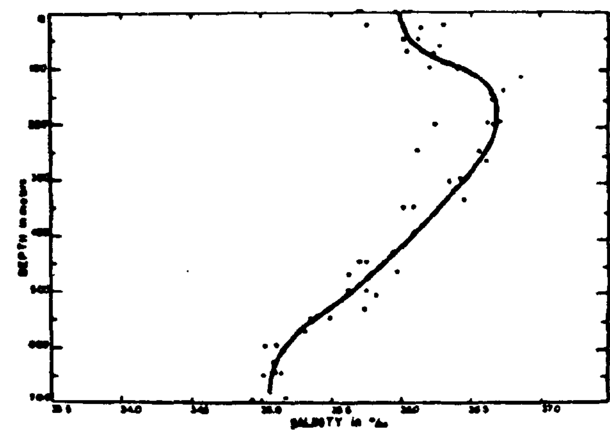
Typical vertical distribution of temperature encountered in the Florida Current, showing the extreme fluctuations.



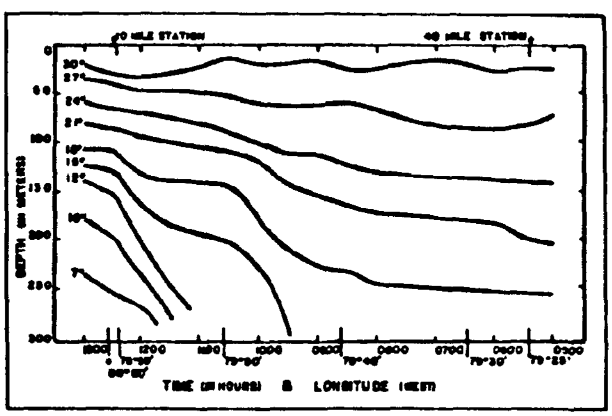
Temperature-salinity relationship of the water forming the Florida Current.



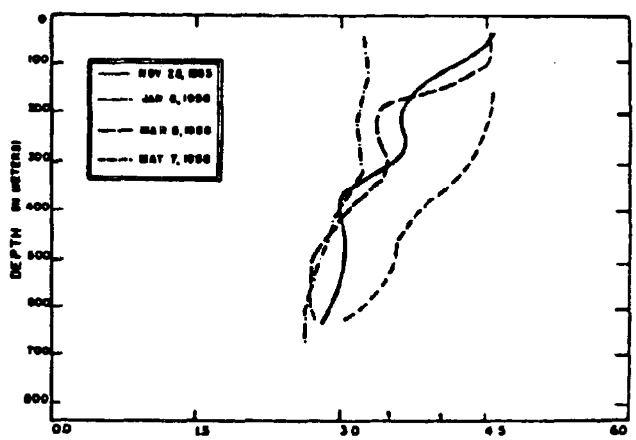
Seasonal variation of temperatures at constant depths.



Salinity-depth relationship of typical Florida Current water.

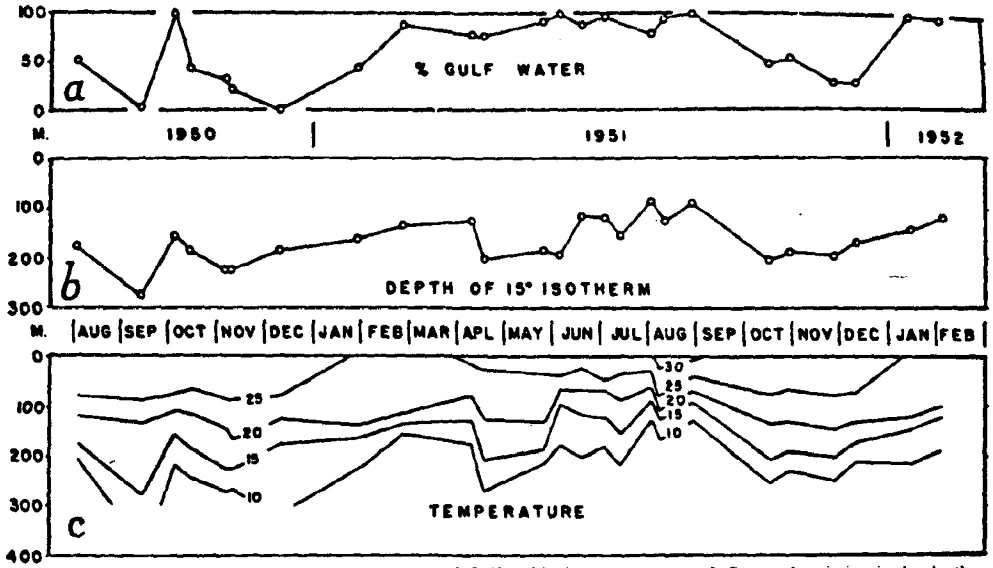


Temperature profiles across the Florida Current, at 25°33′ N. Lat., during the summer months.

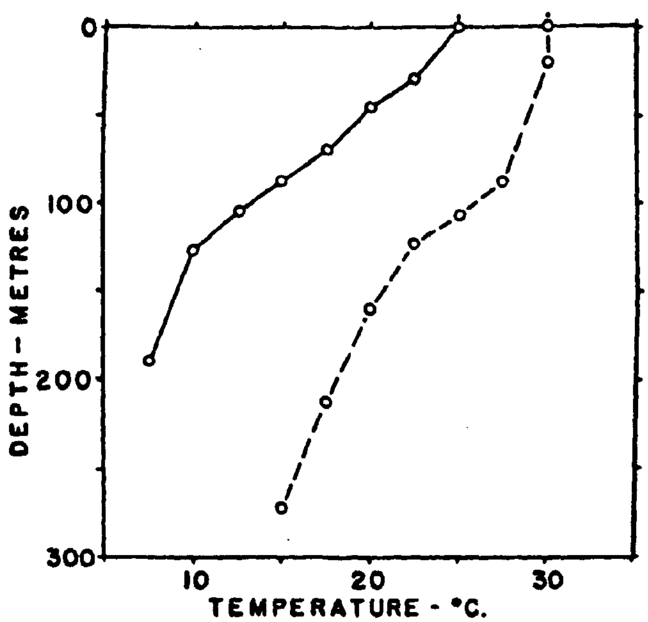


Typical vertical distributions of oxygen in the Florida Current.

Fig. 47 Temperature, salinity and dissolved oxygen data for the Florida Current at 40 Mile Station (from Bsharah, 1957)

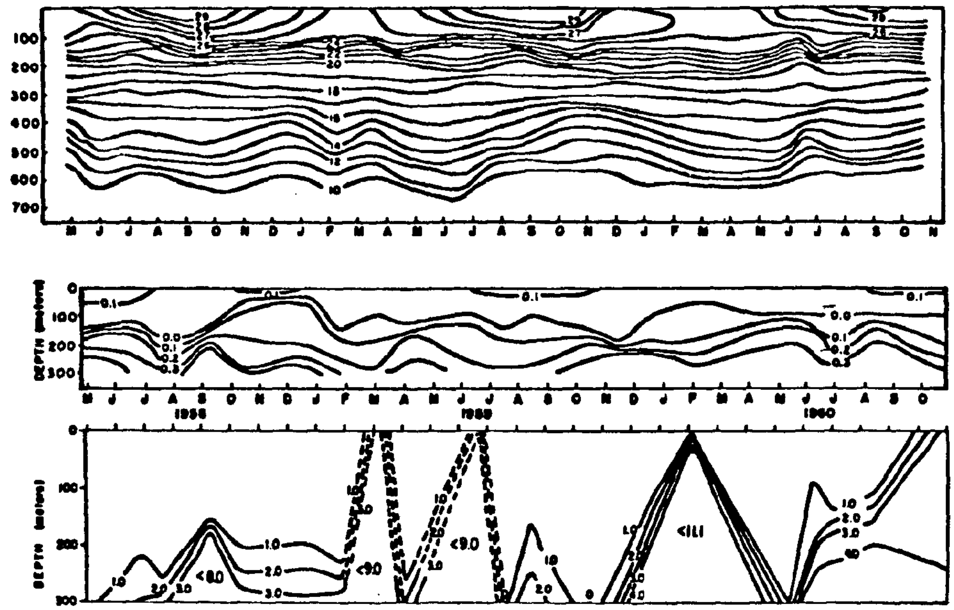


a. Seasonal variation in the percentage of Gulf of Mexico water present. *b.* Seasonal variation in the depth of the 15°C. isotherm. *c.* Seasonal vertical distribution of temperature (°C.).

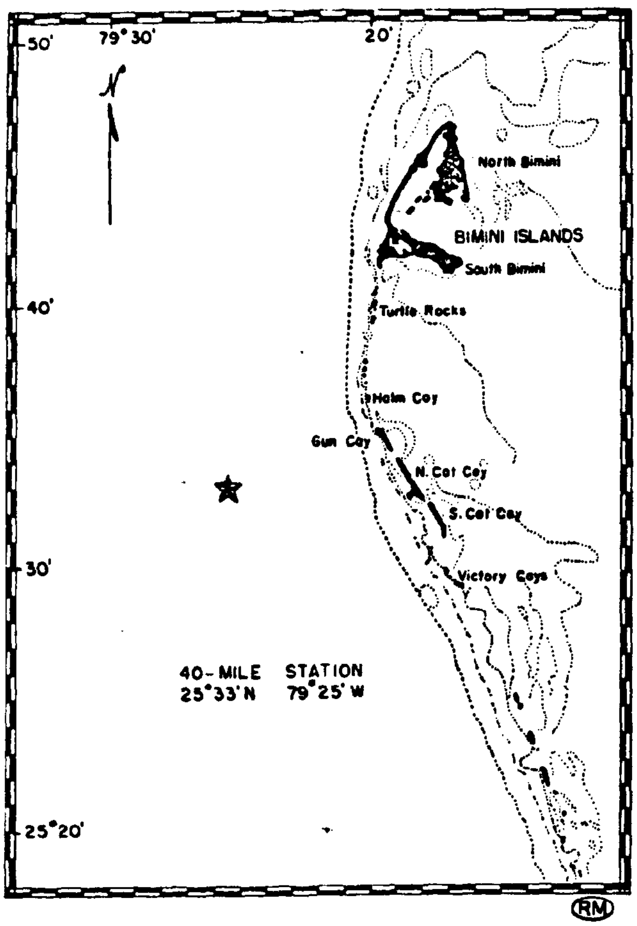


Extreme temperature range encountered from August 1950 to February 1952.

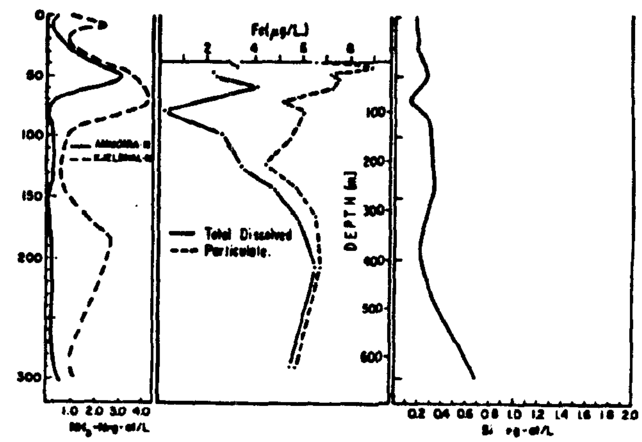
Fig. 48 Seasonal vertical temperature distribution and seasonal variation in percentage of Gulf of Mexico water in Florida Current at 10 Mile Station (from Miller et al., 1953)



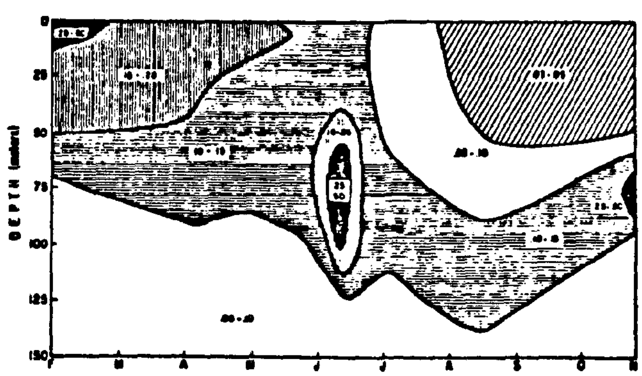
Vertical and seasonal distributions, 1958 through 1960, of: *top*, temperature; *middle*, phosphate-phosphorus in the upper 300 m; *bottom*, nitrite-nitrate nitrogen in the upper 300 m.



Map showing the location of the Cat Cay station.



The vertical distribution of Kjeldahl and ammonia nitrogen, iron, and silicon; 600-meter depth scale applies only to distribution of iron, 300-meter scale to others.



The vertical and seasonal distribution of chlorophyll *a* mg/m³).

Fig. 49 Station location and distributions of temperature, phosphate, nitrite-nitrate, Kjeldahl and ammonia nitrogen, iron, silicon and chlorophyll a in the Florida Current at 40 Mile Station (from Corcoran and Alexander, 1963)

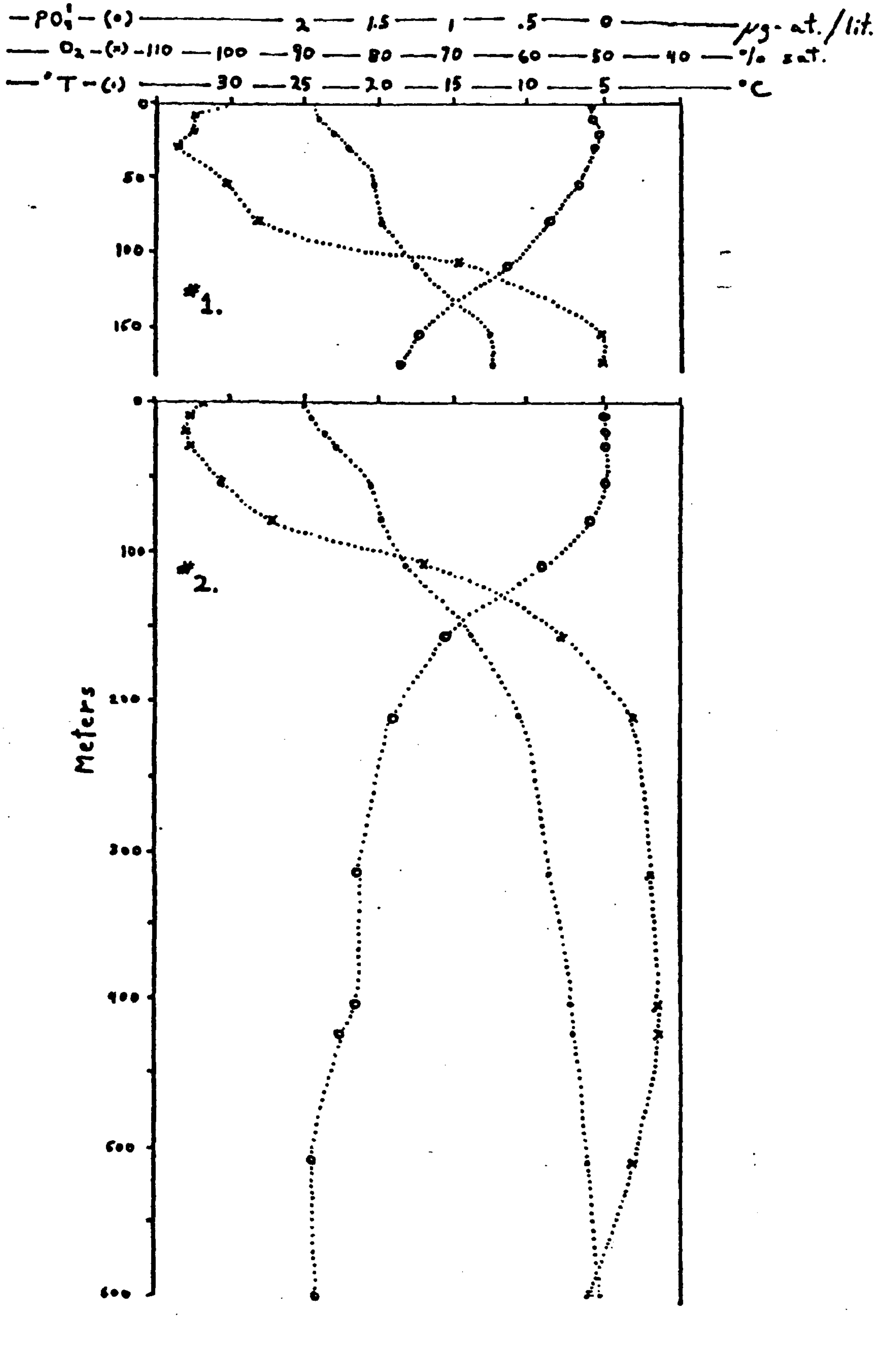


Fig. 50 Phosphate, oxygen and temperature profiles at two stations in the Straits of Florida over the Pourtales Terrace (from Gomberg, 1976).

AREA 13 KEYWEST

23-25N 79-83W

SALINITY

MONTHS 1 - 3 MONTHS PRESENT 1, 2, 3

DEPTH	MAX	AVG	MIN	OBS	SCEV
0	36.97	36.22	34.84	219	0.27
10	36.92	36.22	34.87	212	0.27
20	36.82	36.24	35.22	187	0.23
30	36.70	36.24	35.54	142	0.17
50	36.46	36.23	35.72	118	C.12
75	36.57	36.22	35.53	114	0.15
100	36.66	36.14	35.38	103	0.22
125	36.73	36.06	35.28	100	0.35
150	36.92	36.07	35.23	86	0.46
20C	36.88	36.33	35.27	50	0.44
250	36.86	36.28	35.29	40	0.45
300	36.50	35.96	35.14	39	0.47

MONTHS 4 - 6 MONTHS PRESENT 4, 5, 6

MAX	AVG	MIN	OBS	SDEV
37.20	36.38	34.94	384	0.24
37.20	36.38	35.29	376	0.21
36.85	36.37	35.49	334	0.18
36.82	36.34	35.77	220	0.14
36.80	36.33	35.75	175	0.14
36.72	36.34	35.72	166	0.16
36.99	36.31	35.50	153	0.24
36.79	36.32	35.56	136	0.31
36.77	36.32	35.34	125	0.40
36.79	36.34	35.19	101	0.41
36.66	36.25	35.29	85	0.38
36.60	36.08	35.19	79	0.40

MONTHS 7 - 9 MONTHS PRESENT 7, 8, 9

DEPTH	MAX	AVG	MIN	OBS	SDEV
0	37.20	36.38	35.33	206	0.36
10	37.11	36.37	35.39	197	0.31
20	36.92	36.33	35.56	159	0.25
30	36.65	36.22	35.84	88	C.14
50	36.51	36.24	36.C0	48	0.09
75	36.57	36.25	35.33	48	0.19
100	36.91	36.25	35.39	43	0.27
125	36.72	36.29	35.45	38	0.31
150	36.81	36.28	35.41	34	0.48
200	36.80	36.57	35.83	17	0.26
250	36.63	36.40	35.55	12	0.32
300	36.51	36.32	36.10	10	0.13

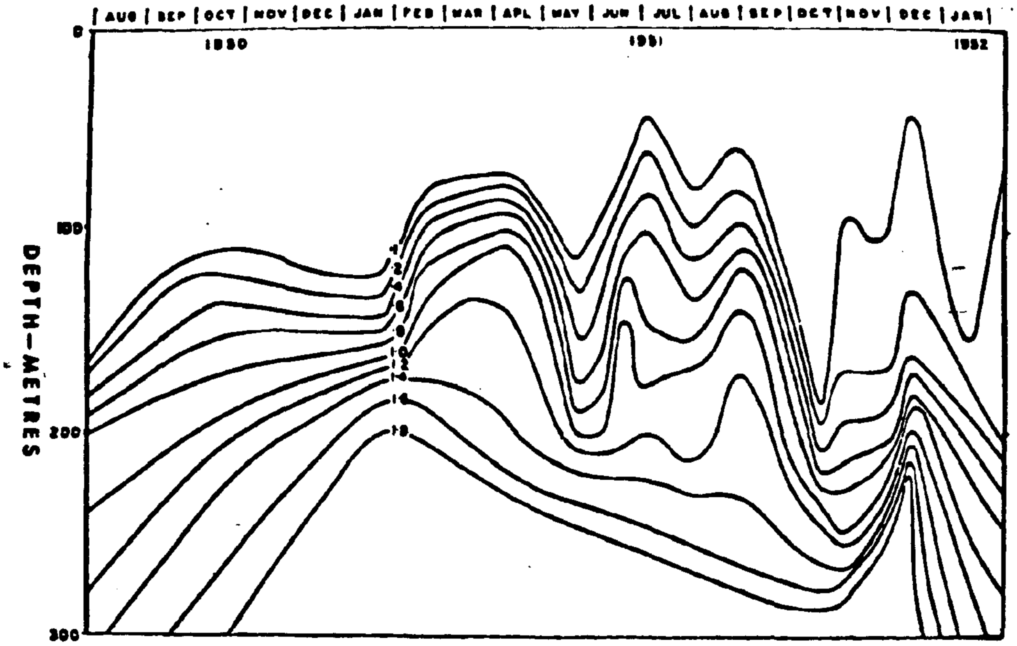
MCNTHS 10 - 12 MONTHS PRESENT 10,11,12

MAX	AVG	MIN	OBS	SUEV
36.93	35.90	34.16	173	0.60
36.95	35.94	34.75	168	0.53
36.94	36.12	35.33	131	0.33
36.57	36.18	35.86	73	0.16
36.56	36.20	35.87	43	0.17
36.63	36.25	35.89	41	0.16
36.68	36.37	35.61	32	0.20
36.78	36.40	35.62	31	0.30
36.84	36.44	35.51	29	0.37
36.64	36.47	35.30	24	0.36
36.65	36.03	35.20	12	0.46
36.42	35.79	35.12	11	0.46

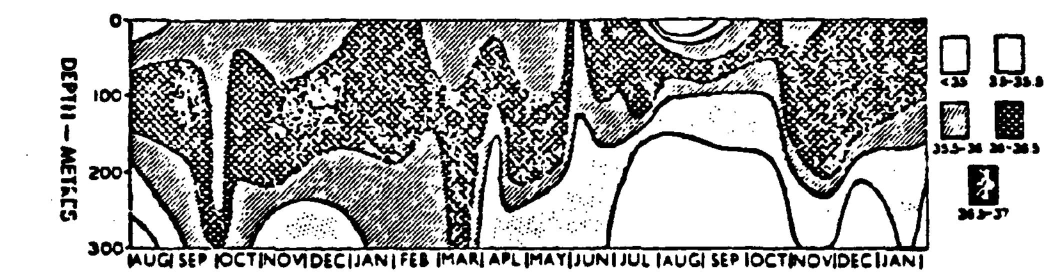
MONTHS 1 - 12 PCNTHS PRESENT 2, 3, 4, 5, 6, 8, 9,10,11

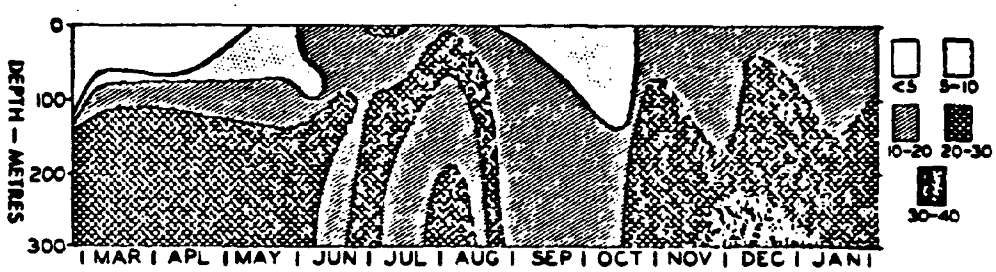
DEPTH	MAX	AVG	MIN	CBS	SDEV
400	36.35	35.62	34.95	127	0.39
500	36.05	35.30	34.87	117	0.26
600	35.66	35.07	34.87	110	0.16
700	35.14	34.94	34.79	88	0.06
800	35.03	34.89	34.78	75	0.04
9C0	35.00	34.90	34.76	62	0.03
1CC0	35.03	34.92	34.81	42	0.04
1100	35.03	34.94	34.82	28	0.04
1200	35.04	34.94	34.83	19	0.04
1300	35.05	34.96	34.84	14	0.05
1400	35.00	34.96	34.85	7	0.03
15C0	35.02	34.97	34.92	6	0.03

Fig. 51 Salinity data, Key West region of Florida Current
(from Churgin and Halminski, 1974)



Seasonal vertical distribution of phosphate-phosphorus (mg-atoms M³).





Seasonal vertical distribution of salinity (‰) from August 1950 to February 1952.
Seasonal vertical distribution of nitrate-nitrogen (mg-atoms M³) from January 1951 to February 1952.

Fig. 52 Seasonal vertical distributions of phosphate, salinity and nitrate at 10 Mile Station (from Miller *et al*., 1953)

AREA 13 KEYWEST

23-25N 79-83W

OXYGEN

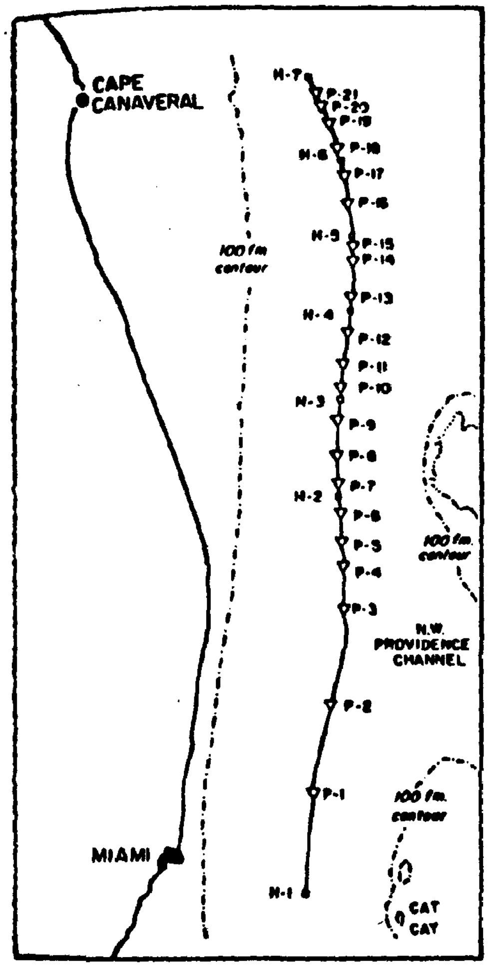
	MONTHS 1 - 3 MONTHS PRESENT 2, 3					MONTHS 4 - 6 MONTHS PRESENT 4, 6				
DEPTH	MAX	AVG	MIN	OBS	SDEV	MAX	AVG	MIN	OBS	SDEV
0	5.12	4.62	3.95	32	0.28	5.25	4.57	4.03	32	0.20
10	5.08	4.64	3.98	34	0.29	6.06	4.63	4.03	32	0.33
20	5.43	4.65	4.01	34	0.30	5.43	4.63	4.04	33	0.26
30	5.14	4.64	3.96	35	0.28	5.56	4.61	3.94	35	0.29
50	5.32	4.56	3.97	37	0.31	5.77	4.59	4.05	38	0.31
75	5.05	4.41	3.15	37	0.42	5.50	4.38	3.76	37	0.37
100	4.73	4.19	2.87	36	0.48	5.61	4.18	3.48	37	0.42
125	4.67	3.98	3.01	35	0.46	4.43	3.97	3.31	37	0.34
150	4.70	3.76	2.43	34	0.51	4.47	3.81	2.85	36	0.38
200	4.54	3.51	2.78	29	0.40	4.34	3.48	2.26	35	0.42
250	4.49	3.45	2.63	28	0.42	4.06	3.39	2.39	29	0.39
300	4.52	3.39	2.46	28	0.48	4.16	3.26	2.43	27	0.41

	MONTHS 7 - 9 MONTHS PRESENT 9					MONTHS 10 - 12 MONTHS PRESENT 10,11				
DEPTH	MAX	AVG	MIN	OBS	SDEV	MAX	AVG	MIN	OBS	SDEV
0	4.36	4.16	3.74	7	0.21	5.24	4.56	4.24	10	0.27
10	4.33	4.16	3.89	7	0.17	4.74	4.51	4.25	10	0.17
20	4.40	4.16	3.80	7	0.20	4.72	4.51	4.27	10	0.17
30	4.43	4.17	3.74	7	0.24	4.73	4.50	4.28	10	0.16
50	4.47	4.20	3.77	7	0.26	4.68	4.45	4.23	11	0.13
75	4.53	4.19	3.93	7	0.21	4.81	4.21	3.32	11	0.43
100	4.24	3.86	3.13	7	0.38	4.45	3.75	2.90	11	0.46
125	3.97	3.50	2.91	7	0.31	4.24	3.49	3.03	11	0.41
150	3.84	3.29	2.69	7	0.36	4.16	3.44	2.89	9	0.38
200	3.26	3.04	2.82	2	0.31	3.62	3.30	2.58	4	0.48
250	3.08	2.90	2.72	2	0.25	3.47	3.13	2.86	5	0.25
300						3.35	3.08	2.84	4	0.21

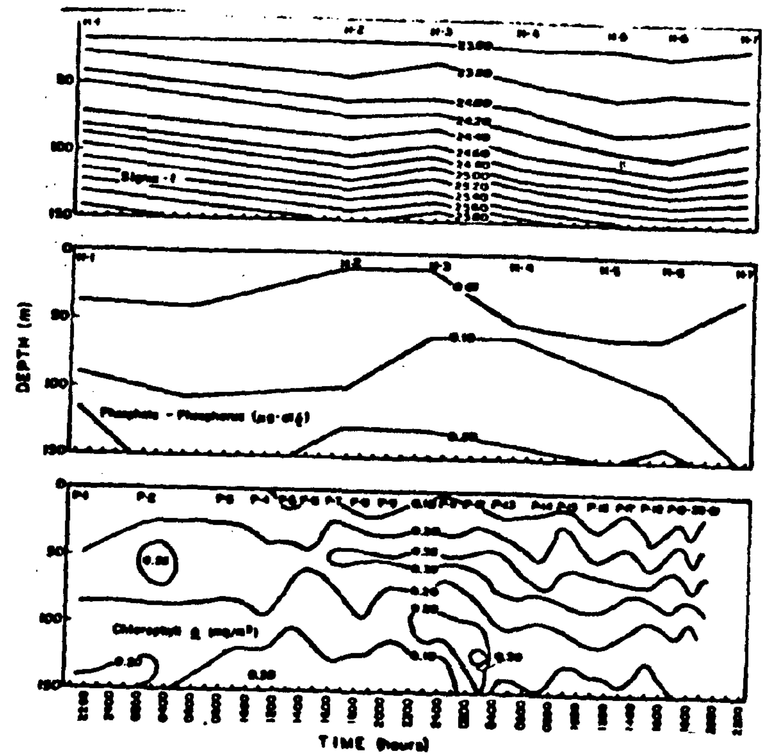
MONTHS 1 - 12 MONTHS PRESENT 2, 3, 4, 6, 9,10,11

DEPTH	MAX	AVG	MIN	OBS	SDEV
400	4.09	3.04	2.27	53	0.29
500	3.70	2.86	2.16	50	0.25
600	3.99	2.93	2.26	47	0.33
700	4.23	3.05	2.07	40	0.38
800	4.36	3.29	2.25	34	0.43
900	4.62	3.65	2.94	29	0.39
1000	4.45	3.97	2.82	22	0.40
1100	4.80	4.27	3.70	17	0.32
1200	5.03	4.45	4.00	13	0.30
1300	4.76	4.54	4.33	9	0.18
1400	4.89	4.82	4.72	4	0.07
1500	4.98	4.90	4.84	3	0.07

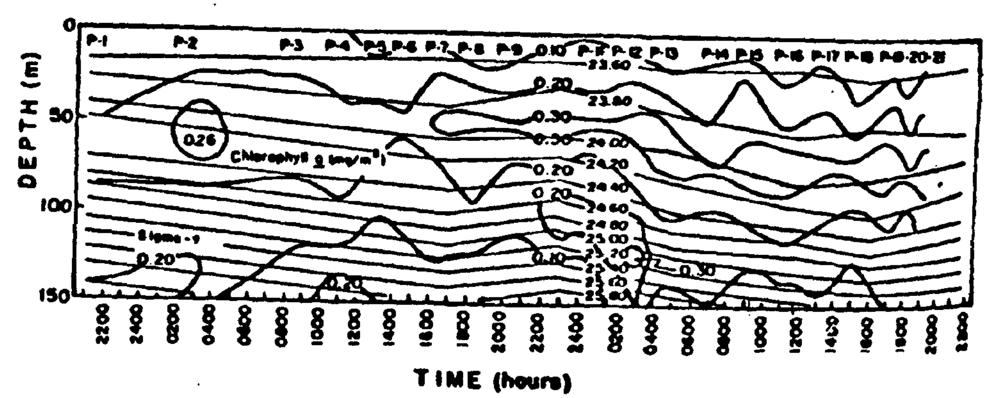
Fig. 53 Oxygen data, Key West region of Florida Current (from Churgin and Halminski, 1974). Dissolved oxygen is reported in ml/l.



Hydrographic and chlorophyll sampling stations between Miami and Cape Canaveral. Hydrographic stations are marked with an H before the number and the position is indicated with a small square. Chlorophyll sampling stations are prefixed with a P and a triangle marks the position.

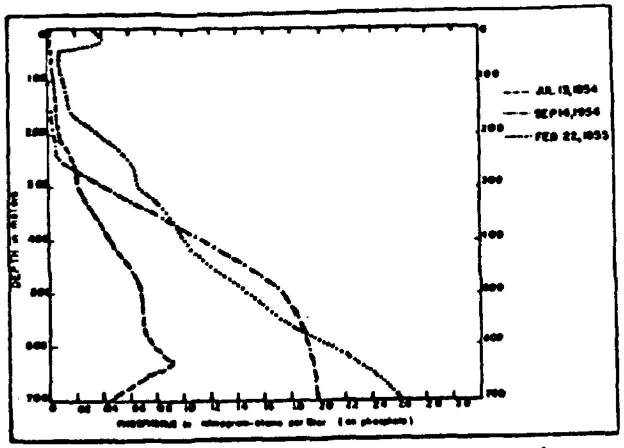


The relationship of σ_t, phosphate-phosphorus (μg-at./L) and chlorophyll *a* (mg/m³).

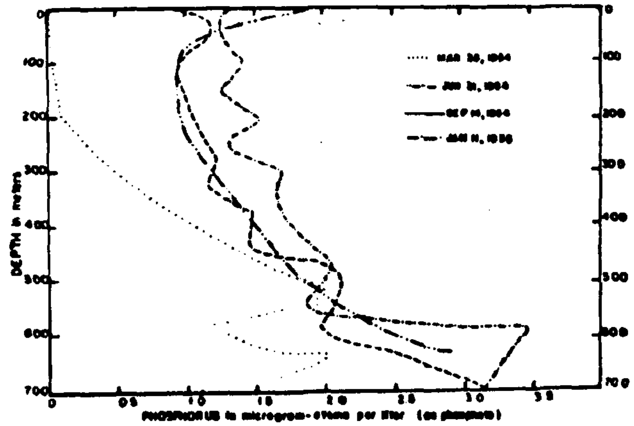


The chlorophyll *a* concentrations (mg/m³) during 47-hr study. The stippled area shows the chlorophyll *a* maxima.

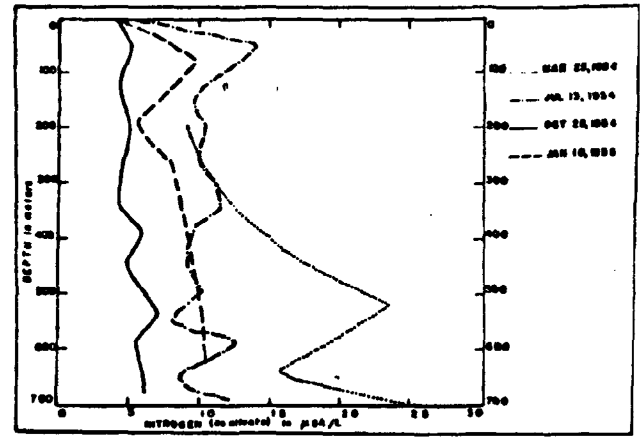
Fig. 54 Station locations, sigma-t, phosphate and chlorophyll data during a 47 hour study in the Florida Current (from Alexander and Corcoran, 1963)



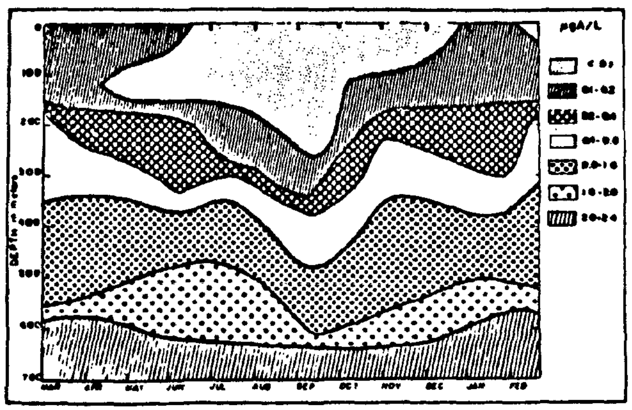
Typical vertical distributions of phosphate-phosphorus in the Florida Current.



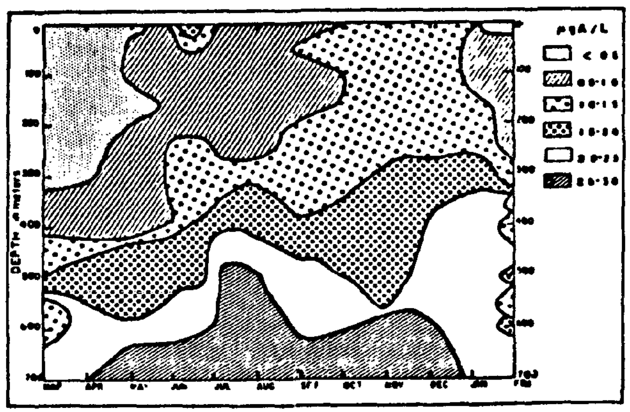
Typical vertical distribution of total phosphorus in the Florida Current.



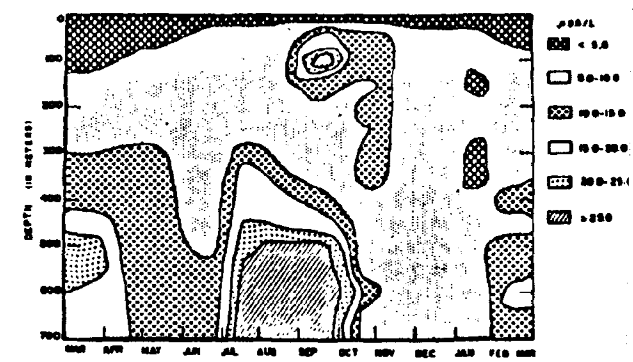
Typical vertical distributions of the nitrate-nitrogen in the Florida Current.



Seasonal vertical distribution of phosphate-phosphorus in the Florida Current.



Seasonal variation of total phosphorus in the Florida Current.



Seasonal variation of nitrate-nitrogen in the Florida Current.

Fig. 55 Vertical and seasonal distributions of phosphate, total phosphorus and nitrate in the Florida Current at 40 Mile Station (from Bsharah, 1957)

AREA 13 KEYWEST

23-25N 79-83W

PHOSPHATE

DEPTH	MONTHS 1 - 3 MONTHS PRESENT 2, 3 MAX	AVG	MIN	OBS	SDEV	MONTHS 4 - 6 MONTHS PRESENT 4, 5, 6 MAX	AVG	MIN	OBS	SDEV
0	0.42	0.09	0.0	36	0.05	0.40	0.10	0.0	38	0.08
10	0.20	0.05	0.0	27	0.06	0.20	0.04	0.0	15	0.05
20	0.27	0.06	0.0	27	0.07	0.17	0.05	0.0	21	0.04
30	0.20	0.05	0.0	21	0.05	0.20	0.03	0.0	18	0.04
50	0.55	0.10	0.0	34	0.11	0.76	0.13	0.0	36	0.13
75	1.06	0.26	0.0	33	0.31	0.67	0.21	0.0	27	0.20
100	1.40	0.41	0.0	31	0.42	1.03	0.30	0.0	39	0.27
125	1.54	0.72	0.05	12	0.56	0.92	0.27	0.03	7	0.30
150	2.19	0.71	0.0	26	0.68	1.42	0.54	0.11	32	0.41
200	1.81	0.65	0.11	18	0.55	1.76	0.66	0.19	39	0.39
250	2.00	0.87	0.30	6	0.70	1.14	0.73	0.33	13	0.25
300	1.82	0.86	0.20	16	0.90	1.50	0.75	0.0	22	0.37

DEPTH	MONTHS 7 - 9 MONTHS PRESENT 7, 8, 9 MAX	AVG	MIN	OBS	SDEV	MONTHS 10 - 12 MONTHS PRESENT 10,11 MAX	AVG	MIN	OBS	SDEV
0	0.35	0.07	0.0	25	0.11	0.21	0.10	0.0	10	0.08
10	0.13	0.01	0.0	18	0.03	0.09	0.04	0.0	5	0.03
20	0.25	0.03	0.0	19	0.07	0.18	0.07	0.0	7	0.07
30	0.06	0.0	0.0	17	0.01	0.08	0.03	0.0	4	0.04
50	0.40	0.07	0.0	22	0.12	1.22	0.21	0.0	10	0.36
75	0.57	0.17	0.0	17	0.21	0.30	0.11	0.0	7	0.13
100	1.04	0.35	0.0	21	0.34	0.74	0.30	0.0	10	0.22
125	1.31	0.49	0.03	3	0.70	0.35	0.35	0.35	1	0.0
150	1.64	0.56	0.0	17	0.50	1.65	0.61	0.0	11	0.50
200	1.44	0.43	0.12	15	0.35	1.44	0.75	0.25	12	0.38
250	0.50	0.39	0.32	4	0.07	1.54	1.02	0.50	3	0.52
300	1.76	0.73	0.36	7	0.57	2.09	1.19	0.58	6	0.54

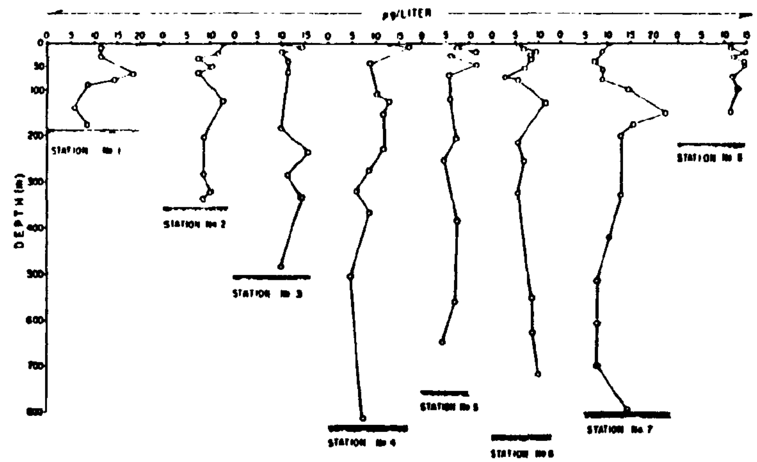
MONTHS 1 - 12 MONTHS PRESENT 2, 3, 4, 6, 8, 9,10,11

DEPTH	MAX	AVG	MIN	OBS	SDEV
400	2.15	1.08	0.27	40	0.47
500	1.97	1.39	0.84	37	0.29
600	1.93	1.63	1.19	15	0.24
700	2.34	1.93	1.57	11	0.23
800	2.18	1.87	1.46	14	0.21
900	2.06	1.93	1.71	3	0.19
1000	1.95	1.66	1.31	10	0.26
1100	1.61	1.38	1.23	3	0.20
1200	1.81	1.55	1.46	3	0.18
1300	1.67	1.50	1.34	2	0.23
1400	1.97	1.70	1.43	3	0.27
1500	1.40	1.40	1.40	1	0.0

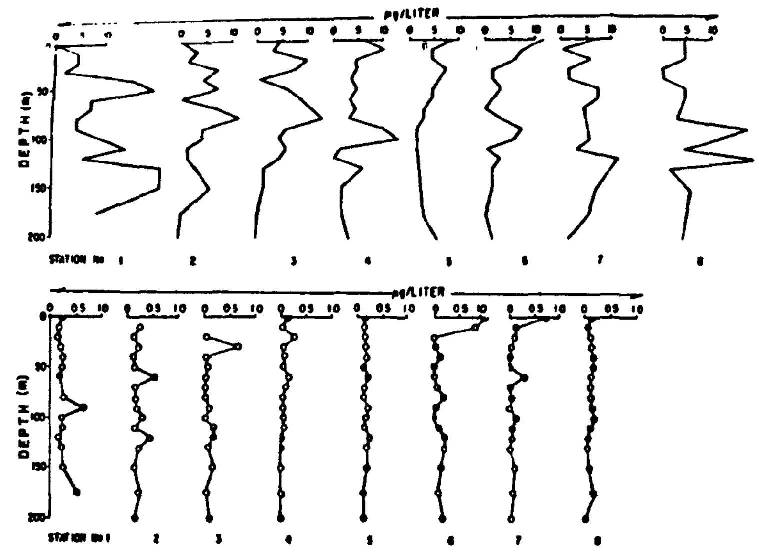
Fig. 56 Phosphate data, Key West region of Florida Current (from Churgin and Halminski, 1974). Units are ug-atoms/l.

Station locations in the Straits of Florida

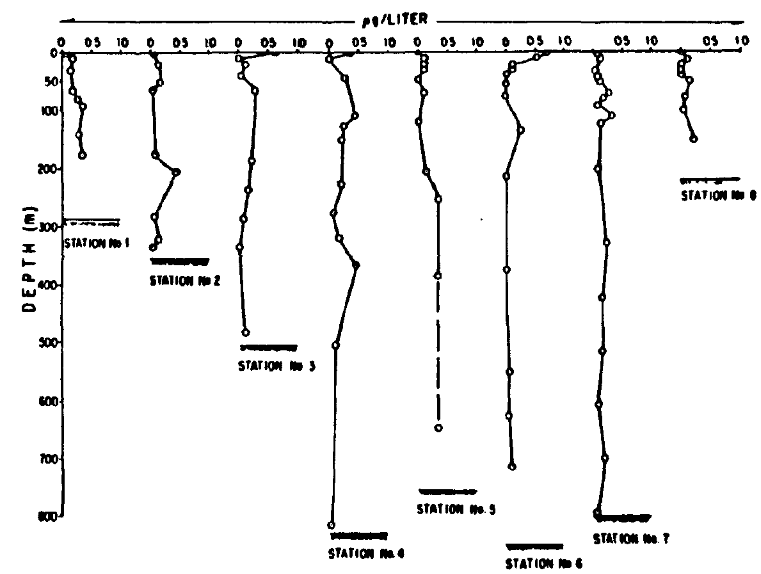
Station No.	Lat	Long
1	25°38' N	80°02' W
2	25°37' N	79°57' W
3	25°37' N	79°52' W
4	25°37' N	79°47' W
5	25°39' N	79°42' W
6	25°38' N	79°30' W
7	25°35' N	79°25' W
8	25°34' N	79°20' W



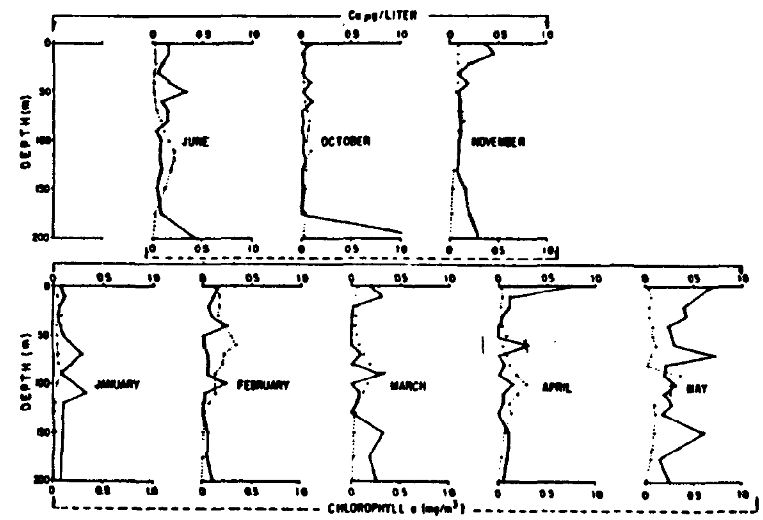
The vertical and horizontal distribution of the total soluble copper between Fowey Rocks and Cat Cay during January 1963.



The distribution of the total soluble (above) and particulate (below) copper in the upper 200 m of water between Fowey Rocks and Cat Cay in March 1963.

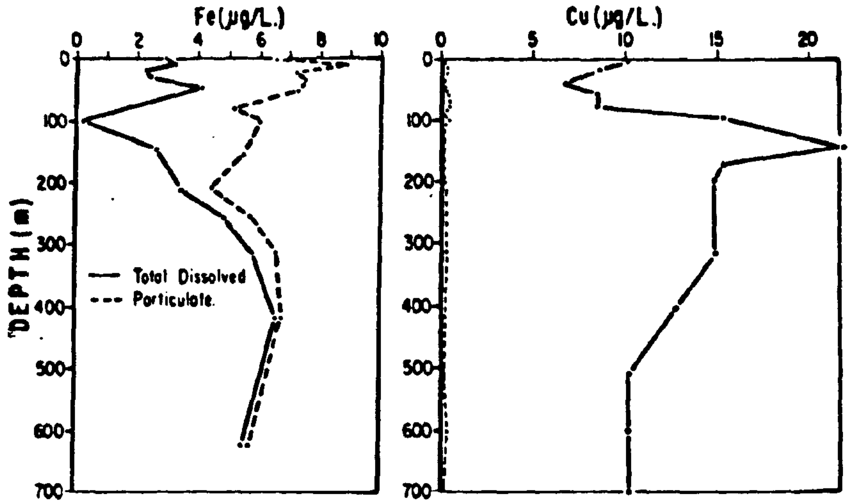


The vertical and horizontal distribution of particulate copper in the Straits of Florida during January 1963.

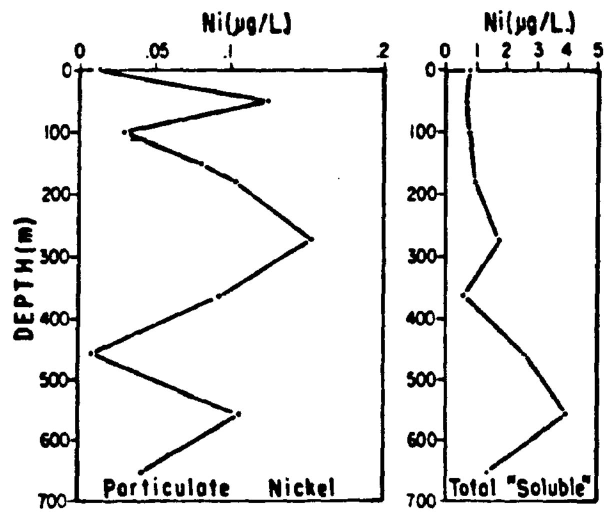


A comparison of the seasonal distribution of copper and chlorophyll *a* in the upper 200 m at station 7 during 1963.

Fig. 57 Station locations, distributions of total soluble copper, particulate copper and chlorophyll a in the Florida Current between Fowey Rocks and Cat Cay (from Alexander and Corcoran, 1967)

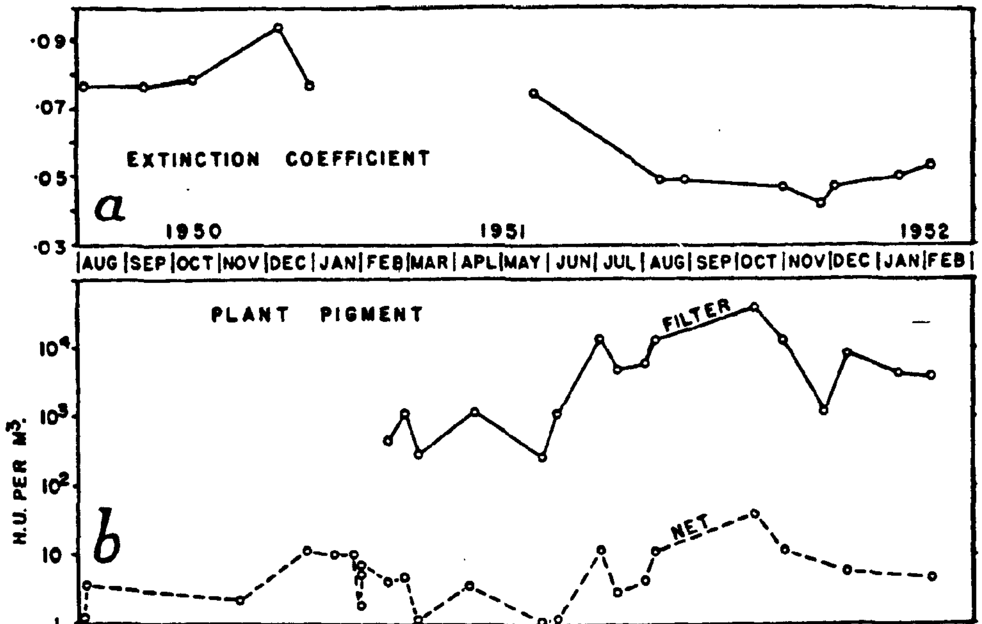


Vertical distribution of particulate and total "soluble" iron and copper at the Cat Cay Station.

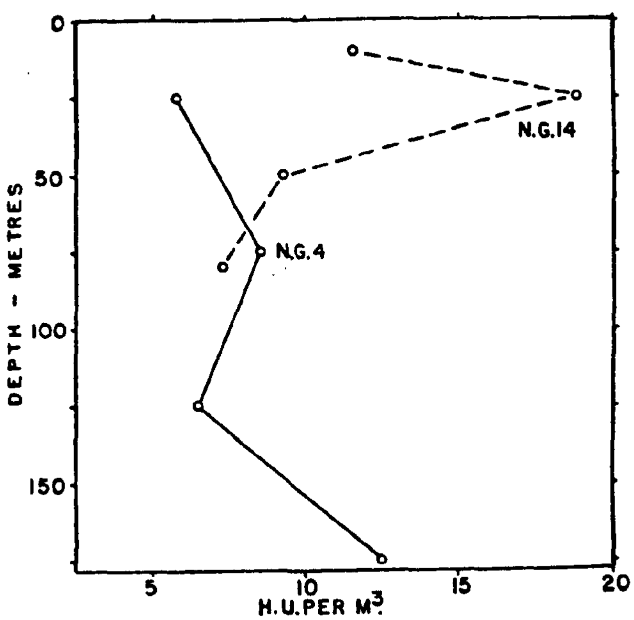


Vertical distribution of particulate and total "soluble" nickel at the Cat Cay Station.

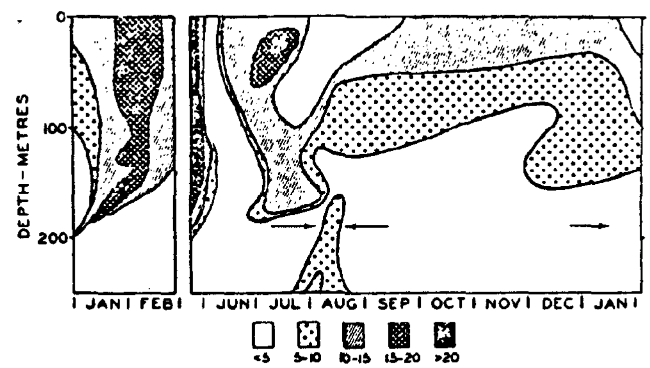
Fig. 58 Vertical distribution of iron, nickel and copper in the Straits of Florida (from Corcoran and Alexander, 1964).



a. Seasonal variation in the extinction coefficient from August 1950 to January 1952. b. Seasonal variation in the surface concentration of plant pigment over the same period.

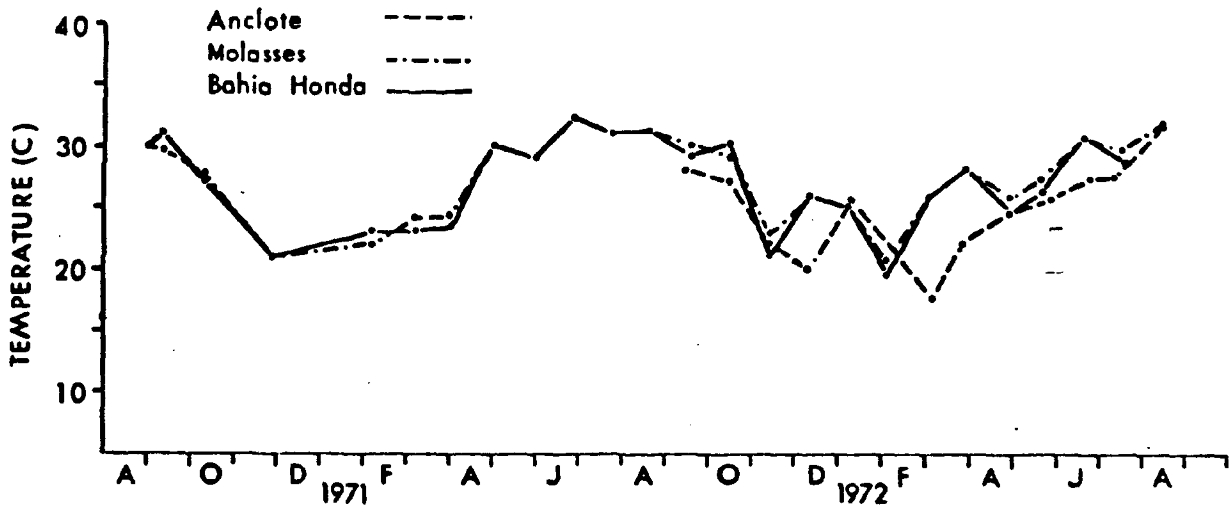


Vertical distribution of plant pigment on August 3, 1950 (National Geographic Station 4), and on January 12, 1951 (N.G. 14).



Seasonal vertical distribution of zooplankton (cm³/mile) from January 1951 to February 1952. Arrows enclose periods of possible intrusion of Sargasso water.

Fig. 59 Seasonal variation of extinction coefficient and plant pigment from August, 1950 to February, 1952. Vertical distribution of zooplankton from January 1951 to February 1952 at 10 Mile Station (from Miller et al., 1953)



Seasonal variation of water temperatures at the three study sites.

Summary of Environmental Data at Bahia Honda Key

Date	Clod card (g lost/hr)	pH	Temp. (°C) Min.	Temp. (°C) Max.	NO_3 (ppm)	NO_2 (ppm)	PO_4 (ppm)
May 1, 1971	2.23	8.4					
May 29, 1971	0.96	8.5					
June 26, 1971	2.61	8.6	31.0	33.0			
July 23, 1971	0.59	8.2	31.0	32.0			
Aug. 20, 1971	0.94	8.2	30.0	32.0			
Sept. 18, 1971	0.38	8.1	28.0	30.0	0.0212	0.0024	0.124
Oct. 15, 1971	0.55	8.6	29.0	30.5	0.0405	0.0045	0.111
Nov. 13, 1971	0.66	8.3	21.0	24.0	0.0809	0.0050	0.087
Dec. 10, 1971	0.52	8.4	22.0	26.0	0.0422	0.0028	0.071
Jan. 7, 1972	0.60	8.2	25.5	25.5	0.0557	0.0198	0.050
Feb. 5, 1972	0.55	8.3	19.0	22.0	0.0431	0.0029	0.035
Mar. 3, 1972	0.57	8.3	14.4	27.0	0.0376	0.0054	0.022
Mar. 29, 1972	0.92	8.7	27.0	29.0	1.000	0.0103	0.074
Apr. 29, 1972	0.87	8.1	21.0	29.0	0.0082	0.0020	0.052
May 24, 1972	0.78	8.0	25.0	30.0	0.1610	0.0020	0.061
June 23, 1972	0.83	9.1	30.5	31.1	0.0106	0.0040	0.054
July 21, 1972	0.75	8.1	27.8	32.2	0.0052	0.0013	0.055
Aug. 19, 1972		8.2	27.8	32.2	0.0901	0.0109	0.144

Summary of Environmental Data at Molasses Key

Date	Clod card (g lost/hr)	pH	Temp. (°C) Min.	Temp. (°C) Max.	NO_3 (ppm)	NO_2 (ppm)	PO_4 (ppm)
May 1, 1971	2.07	7.6					
May 29, 1971	1.05	8.1					
June 26, 1971	3.29	8.5	28.0	32.0			
July 23, 1971	0.82	8.2	29.0	32.0			
Aug. 20, 1971	0.80	8.0	29.0	33.0			
Sept. 18, 1971	0.43	8.2	29.0	31.0	0.0598	0.0021	0.21
Oct. 15, 1971	0.72	8.5	28.0	30.0	0.0690	0.0034	0.07
Nov. 13, 1971	0.58	8.4	22.5	28.5	0.0870	0.0032	0.06
Dec. 10, 1971	0.66	8.6	22.0	26.0	0.0545	0.0034	0.047
Jan. 7, 1972	0.67	8.2	24.0	25.5	0.0511	0.0264	0.044
Feb. 5, 1972	0.66	8.2	20.5	22.0	0.0566	0.0033	0.047
Mar. 3, 1972	0.91	8.5			0.0636	0.0109	0.030
Mar. 29, 1972	1.22	8.6	20.5	28.0	0.3235	0.0045	0.074
Apr. 29, 1972	1.63	8.2	21.0	29.0	0.0057	0.0007	0.052
May 24, 1972	0.83	8.0	25.0	29.0	0.0861	0.0041	0.061
June 23, 1972	0.99	8.9	28.3	30.0	0.0149	0.0039	0.069
July 21, 1972	0.98	8.1			0.0026	0.0059	0.080
Aug. 19, 1972	0.94	8.2			0.0082	0.0018	0.059

Fig. 60 Water quality data, Molasses and Bahia Honda Keys (from Dawes et al.. 1974)

Summary of Water Quality Data
Fla. Dept. Pollution Control (1973)
"Survey of water quality in waterways
and canals of the Florida Keys; with recommendations"

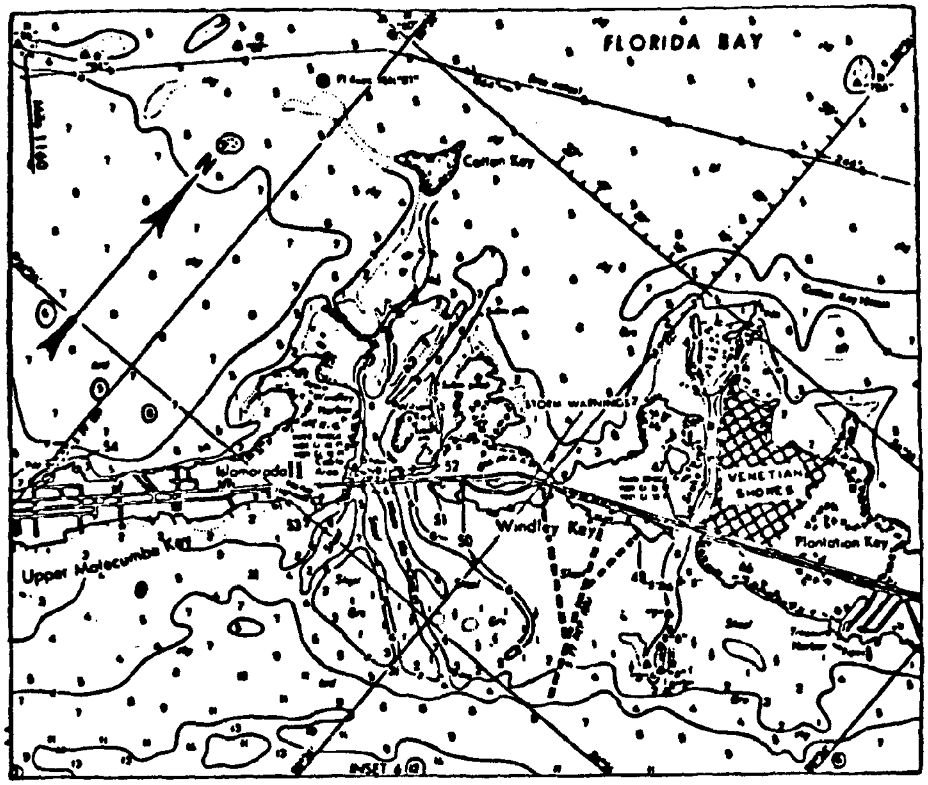
TEMPERATURE						(CONTROLS)				
Depth (ft)	n	$\bar{x}$	s	min	max	n	$\bar{x}$	s	min	max
0 - 5	63	25.7	0.7	24.9	27.0	13	25.8	0.7	25.0	27.0
5 -10	59	25.6	0.7	24.0	27.0	5	26.0	0.4	25.5	26.5
10 -15	27	25.1	0.6	24.0	26.0	-	-	-	-	-
15 -20	17	24.7	0.7	24.0	26.0	1	26.0	0.0	26.0	26.0
20 -25	7	24.2	0.4	24.0	25.0	-	-	-	-	-
25 -30	2	23.5	0.7	23.0	24.0	-	-	-	-	-
over 30	3	24.0	0.0	24.0	24.0	-	-	-	-	-

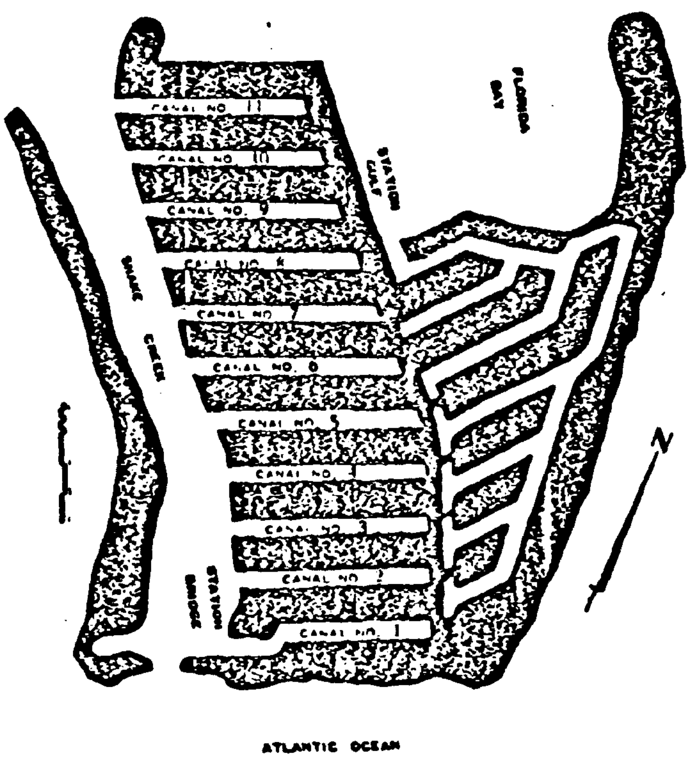
DISSOLVED OXYGEN						(CONTROLS)				
Depth (ft)	n	$\bar{x}$	s	min	max	n	$\bar{x}$	s	min	max
0 - 5	61	3.8	2.2	0.2	7.8	13	6.8	1.0	4.5	7.7
5 -10	59	4.3	1.8	0.3	7.3	5	7.3	0.2	7.1	7.4
10 -15	26	3.3	2.5	0.3	7.7	-	-	-	-	-
15 -20	16	1.8	1.4	0.4	4.0	1	7.4	0.0	7.4	7.4
20 -25	7	1.7	1.6	0.4	3.9	-	-	-	-	-
25 -30	2	2.8	3.4	0.4	5.2	-	-	-	-	-
over 30	3	0.4	0.2	0.2	0.6	-	-	-	-	-

	HEAVY METALS (WATER)					HEAVY METALS (MUD)				
	n	$\bar{x}$	s	min	max	n	$\bar{x}$	s	min	max
Cr	11	0.07	0.06	0.02	0.20	3	8.2	2.8	5.5	11.0
Cu	11	0.04	0.05	0.00	0.16	3	4.3	4.9	1	10
Mn	11	0.02	0.01	0.01	0.03	3	14	1.0	13	15
Fe	11	0.17	0.11	0.01	0.35	3	340	57	280	390
Ni	11	0.12	0.06	0.01	0.22	3	21	3.8	18	25
Pb	4	0.19	0.05	0.12	0.25	3	3.1	3.1	0.6	6.6
Cd	4	0.0018	0.0003	.0015	.002	3	0.21	0.04	0.17	0.25
Co	11	0.01	0.01	$<$0.01	0.03	3	4.2	3.3	2.2	8.0

NUTRIENTS					
	n	$\bar{x}$	s	min	max
PO_4	11	0.04	0.01	0.03	0.07
NO_3	11	0.23	0.02	0.20	0.26
NH_2 & organics	11	0.93	0.22	0.76	1.48

Fig. 61 Summary of water quality data for canals in the Florida Keys (From Fla. Dept. Pollution Control, 1973). Sample size (n), mean ($\bar{x}$), standard deviation (s), minimum (min) and maximum (max) values given for temperature (°C), dissolved oxygen (mg/l), heavy metals in water (mg/l), heavy metals in mud (mg/kg) and nutrients (mg/l).





PLAN VIEW OF THE PROJECT

DESCRIPTION OF STATIONS

Station	Description
11	At the dead end of Canal No. 1 which is the easternmost of the existing canals.
12	At approximately the mid point of Canal No. 1
13	At the mouth of Canal No. 1
31	At the dead end of Canal No. 3
51	At the dead end of Canal No. 5
52	At the mid point of Canal No. 5
53	At the mouth of Canal No. 5
81	At the dead end of Canal No. 8
82	At the mid point of Canal No. 8
111	At the dead end of Canal No. 11 which is the westernmost of the existing canals
112	At the mid point of Canal No. 11
113	At the mouth of Canal No. 11

Control Station	
Atlantic	Between Markers 8 and 9 on the Atlantic side of the Snake Creek Bridge
Florida Bay	Approximately 1/2 mile north of the entrance of the new canal system
Snake Creek	Just opposite of Canal No. 11

Fig. 62 Station locations and descriptions (Michel, 1973)

TEMPERATURE, SALINITY AND DISSOLVED OXYGEN
22-23 JANUARY 1973

Station*	Day	Time(1) (Hrs E)	Depth of(2) Sample (ft)	Temp (°C)	Sal (‰)	O_2 (ML/L)	O_2 (% Sat)
11	22	1047	17	19.79	36.189	3.15	81.1
		1057	8.5	21.31	36.378	5.15	103.1
		1053	0	24.20	36.361	6.34	112.2
11	23	0835	15	19.06	36.029	3.19	62.1
		0843	7.5	21.19	36.305	4.59	91.6
		0841	0	23.19	36.325	4.62	95.3
12	23	1430	21.	19.91	36.046	3.47	67.6
		1440	10.5	21.36	36.089	4.91	90.0
		1435	0	24.00	36.582	4.82	102.3
13	23	1436	11.5	20.75	36.739	4.00	92.3
		1305	3.3	23.36	36.627	4.72	97.9
		1300	0	24.63	36.800	5.00	105.7
31	22	1756	25	22.41	36.360	4.62	94.1
		1804	12.5	23.28	36.493	5.02	103.7
		1801	0	24.37	36.443	4.75	100.6
51	23	0905	24	22.03	36.595	4.42	90.6
		0914	12	23.37	36.633	4.56	94.4
		0909	0	23.33	36.499	4.65	96.3
52	23	1302	27	22.23	36.746	4.22	85.8
		1312	13.5	23.80	36.610	4.37	93.2
		1307	0	24.63	36.406	4.91	103.6
53	23	1322	25.5	23.41	36.665	4.38	93.2
		1331	12.7	24.20	36.395	4.91	103.4
		1320	0	24.70	36.631	5.04	104.3
111	23	1136	33	17.97	37.030	4.10	77.2
		1146	16.5	21.03	37.102	3.12	62.8
		1139	0	24.25	36.645	4.69	98.7
112	23	1202	33	18.03	37.036	4.07	76.0
		1211	16.5	22.18	36.873	4.32	87.8
		1207	0	24.11	36.679	4.64	97.3
113	23	1227	32.5	17.90	37.013	4.10	77.6
		1236	16.2	21.01	37.039	3.60	71.6
		1232	0	24.00	36.747	4.68	97.9
Atlantic	22	1727	10	23.93	36.343	5.36	115.0
		1730	0	23.97	36.346	5.57	116.0
Atlantic	23	0934	10	23.31	36.643	4.45	91.9
		0936	0	23.39	36.636	4.30	89.0
Florida Bay	23	1107	3	23.23	36.062	5.11	105.5
		1110	0	23.40	36.776	4.90	101.6

TEMPERATURE, SALINITY AND DISSOLVED OXYGEN
14-15 FEBRUARY 1973

Station*	Day	Time(1) (Hrs E)	Depth of(2) Sample (ft)	Temp (°C)	Sal (‰)	O_2 (ML/L)	O_2 (% Sat)
11	15	0830	20	16.0	37.692	3.34	68.9
		0832	10	18.3		4.09	
		0834	0	20.0	37.067	4.07	95.1
11	15	0904	22	17.6	37.720	4.06	76.0
		0905	11	19.0		4.54	
		0907	0	20.0	37.153	4.97	97.2
12	14	1525	21	23.0	37.720	4.37	90.1
		1530	10.5	22.2		4.73	
		1535	0	20.4	37.431	5.30	109.8
31	14	1735	25	17.0	37.159	4.73	87.6
		1739	12.5	19.3		5.41	
		1803	0	20.0	37.133	5.46	106.5
31	15	0927	27	17.2	37.092	4.37	81.2
		0930	13.5	20.0		5.09	
		0933	0	20.0	37.062	5.06	99.2
51	14	1617	31	16.5	37.773	4.70	84.2
		1623	15.3	18.7		4.99	
			0	19.0	37.144	5.19	101.3
51	15	0946	25	18.0	37.153	5.09	96.1
		0948	12.5	19.0		5.26	
		0950	0	20.0	37.046	5.01	98.0
52	14	1641	26	17.5	37.379	5.20	98.7
		1644	13	19.2		5.64	
		1649	0	20.0	37.110	5.90	117.0
52	15	0936	27	19.0	37.293	5.14	95.2
			13.3	19.0		5.21	
		1004	0	19.8	36.932	4.80	93.5
81	14	1815	31	16.0	37.918	5.09	92.8
		1821	15.5	16.5		5.21	
		1825	0	19.5	37.228	5.18	100.6
81	15	1019	31	13.0	37.903	4.77	87.4
			15.3	18.9		5.41	
		1022	0	20.8	37.029	5.05	100.2
111	14	1705	32	16.0	37.760	4.07	89.2
		1710	16	18.6		5.00	
		1713	0	19.9	37.461	5.10	98.3
111	14	1727	32	16.2	37.826	4.90	89.9
		1738	16	18.0		4.93	
		1741	0	20.0	37.411		
111	15		32	16.0	37.771	4.61	86.2
			16	18.0		4.82	
		1043	0	21.0	37.195	5.05	100.3
111	15		32	16.0	37.771	4.80	87.8
			16	18.0		4.76	
		1104	0	20.0	37.220	4.92	96.0
Control Station							
Snake Creek	14	1536	12	19.0		3.56	
		1600	0	20.0	37.113	5.87	115.0
Snake Creek	15		10	20.3		4.87	
		1116	0	20.9	37.091	6.11	121.5

NITRATES AND PHOSPHATES
14-15 FEBRUARY 1973

Station	Day	Time(1) (Hrs E)	Depth of(2) Sample (ft)	Temp (°C)	Total Phosphate µg At/L	NO_2+NO_3 µg At/L
11	15	0832	10	18.3	0.71	0.40
12	14	1530	10.5	22.2	1.10	0.60
13	15	0905	11	19.0	0.30	0.30
31	14	1739	12.5	19.5	1.30	0.30
31	15	0930	13.5	20.0	2.46	0.32
51	14	1623	15.5	18.7	0.63	0.20
51	15	0948	12.5	10.8	0.92	0.26
52	14	1646	13	19.2	0.63	0.20
52	15	1000	13.5	19.8	0.65	0.30
81	14	1821	15.5	18.5	0.50	0.63
82	15	1018	13.5	18.8	0.62	0.32
112	14	1710	16	18.6	2.09	0.43
112	14	1730	16	18.8	0.89	0.40
112	15	1040	16	18.0	0.64	0.40
112	15	1100	16	18.0	0.85	0.45
Control Station						
Snake Creek	14	1556	0	20.0	0.70	0.22
Snake Creek	15	0918	0	20.8	0.80	0.48
Snake Creek	15	1116	10	20.5	0.76	0.22

* For station description see Table 2.
(1)Time is Eastern Standard Time.
(2)The deepest sample is taken at the bottom.

Fig. 63 Temperature, salinity, dissolved oxygen, nitrates and phosphates. Data from Venetian Shores canal system, Plantation Key, and control sites (from Michel, 1973)

UPPER KEYS

CANAL 35. VENETIAN SHORES SUBDIVISION, PLANTATION KEY (Fig.14). A system of eleven finger canals emptying into Snake Creek. The canals were built at different times from the south towards the north. Single family dwellings on septic tanks are more abundant on the southern half of the subdivision than on the younger canals on the northern end of the subdivision.

CANAL 36. PLANTATION KEY COLONY, PLANTATION KEY (Fig.14). A branching canal system with moderately dense single family residences on septic tanks.

CANAL 37. OCEAN DRIVE CANAL, PLANTATION KEY (Fig.14). A long, finger canal with single family residences on almost every lot (36 houses).

CANAL 38. BLUE WATER TRAILER VILLAGE, KEY LARGO (Fig.15). A branching canal system with a large central basin. The canals are lined with trailers on septic tanks.

CANAL 39. DOVE CREEK, KEY LARGO (Fig.15). A long, finger canal bisected at its center with a natural mangrove canal. There was a moderate density of single family houses on septic tanks.

CANAL 40. SUNRISE POINT, KEY LARGO (Fig.15). A long finger canal densely populated with single family residences on septic tanks.

CANAL 41. OCEAN SHORES ESTATES, KEY LARGO (Fig.16). Two canals, one of which continues from the ocean side of Key Largo through to Rock Harbor. Only a few single family residences adjoin the canal.

CANAL 42. PORT LARGO, KEY LARGO (Fig.16). A large system of branching canals four of which were constructed within a year of the survey and four have been in use for several years. A sparse population of single family houses adjoins two canals while the third has a motel, two marinas, and an airport adjacent to it.

CANAL 43. BIPARK CANAL, KEY LARGO (Fig.16). A small, branching canal adjoining Pennekamp State Park. There were no residences adjoining the canal.

CANAL 44. CROSS KEY WATERWAY ESTATES, KEY LARGO (Fig.17). A large, branching system of canals lined with trailers on septic tanks.

CANAL 45. LARGO SOUND VILLAGE, KEY LARGO (Fig.17). A curved canal with two entrances, lined with single family residences on septic tanks. The canal is inside Largo Sound.

CANAL 46. NORTH CREEK, KEY LARGO (Fig.17). A natural mangrove canal extending from the northern end of Largo Sound to the Atlantic. The main canal is well flushed by tidal currents, tributaries are less well flushed.

CANAL 47. SEXTON COVE ESTATES, KEY LARGO (Fig.17). A system of three finger canals and one branching canal system all lined with a dense population of trailers on septic tanks. The canals empty into Blackwater Sound which is an almost totally enclosed basin. Tidal variations are slight in the Sound and canal flushing is achieved almost entirely by wind-driven circulation.

CANAL 48. LAKE SURPRISE ESTATE, KEY LARGO (Fig.17). Two large, branching canal systems lined with a dense population of trailers on septic tanks. One canal system empties into Blackwater Sound while the other empties into Lake Surprise. Circulation is poor and the canal walls have considerable amounts of mangrove peat which causes nutrient problems and stains the water a tea color.

CANAL 49. GARDEN COVE CANAL, KEY LARGO (Fig.17). A long finger canal with two marinas and three residences adjoining it.

CANAL 50. WORLD'S BEYOND MARINA, UPPER KEY LARGO. A small marina with an entrance canal at Point Mary on the Atlantic side of Upper Key Largo. The marina had only a few boats and one or two travel campers at the time of the survey (Fig.25, Section 7.1.).

Fig. 64 Locations and descriptions of Chesher's (1974) water quality stations. See Figs. 65 through 68 for exact locations. (from Chesher, 1974).

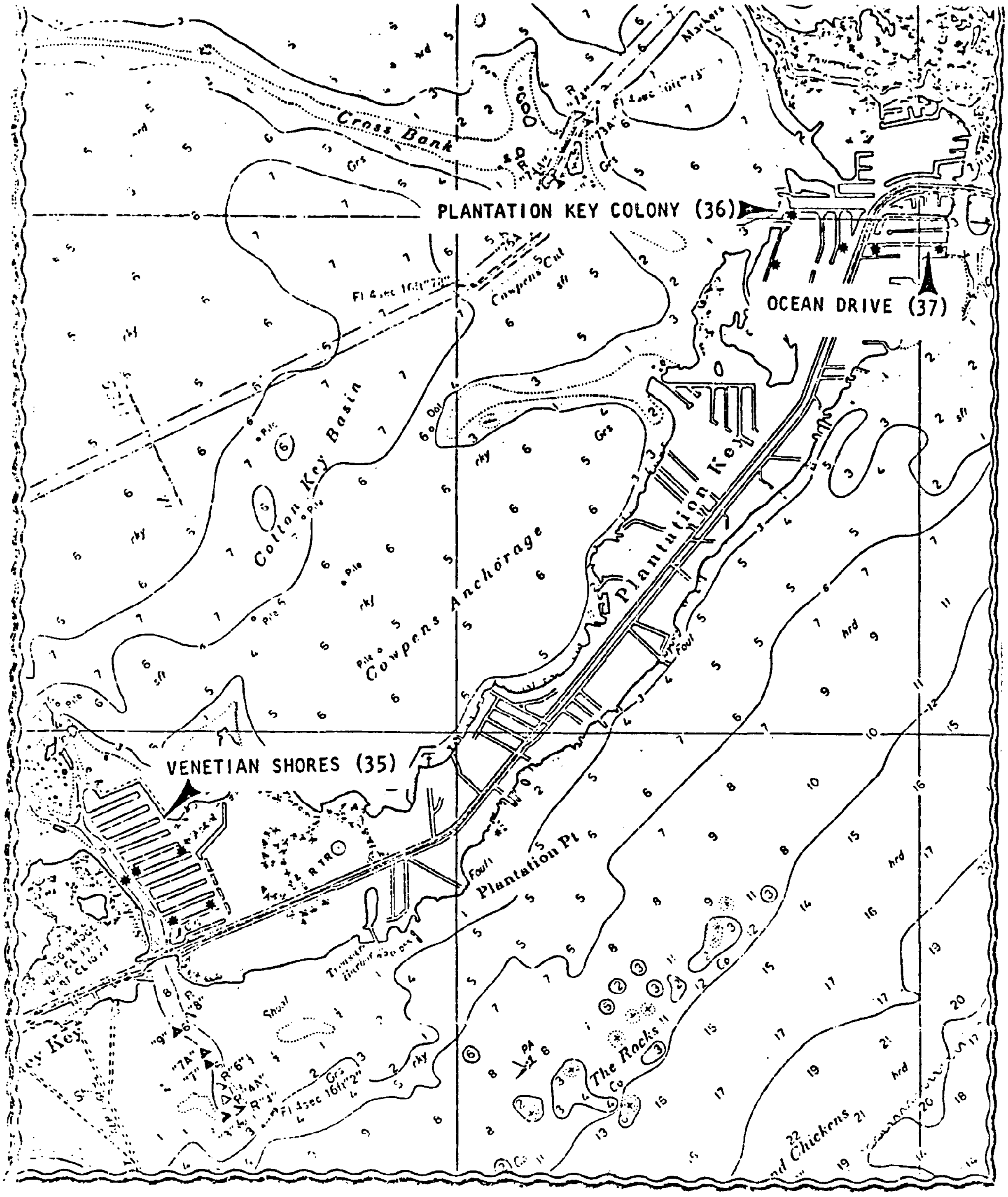


Fig. 65 Locations of stations 35, 36 and 37 (from Chesher, 1974).

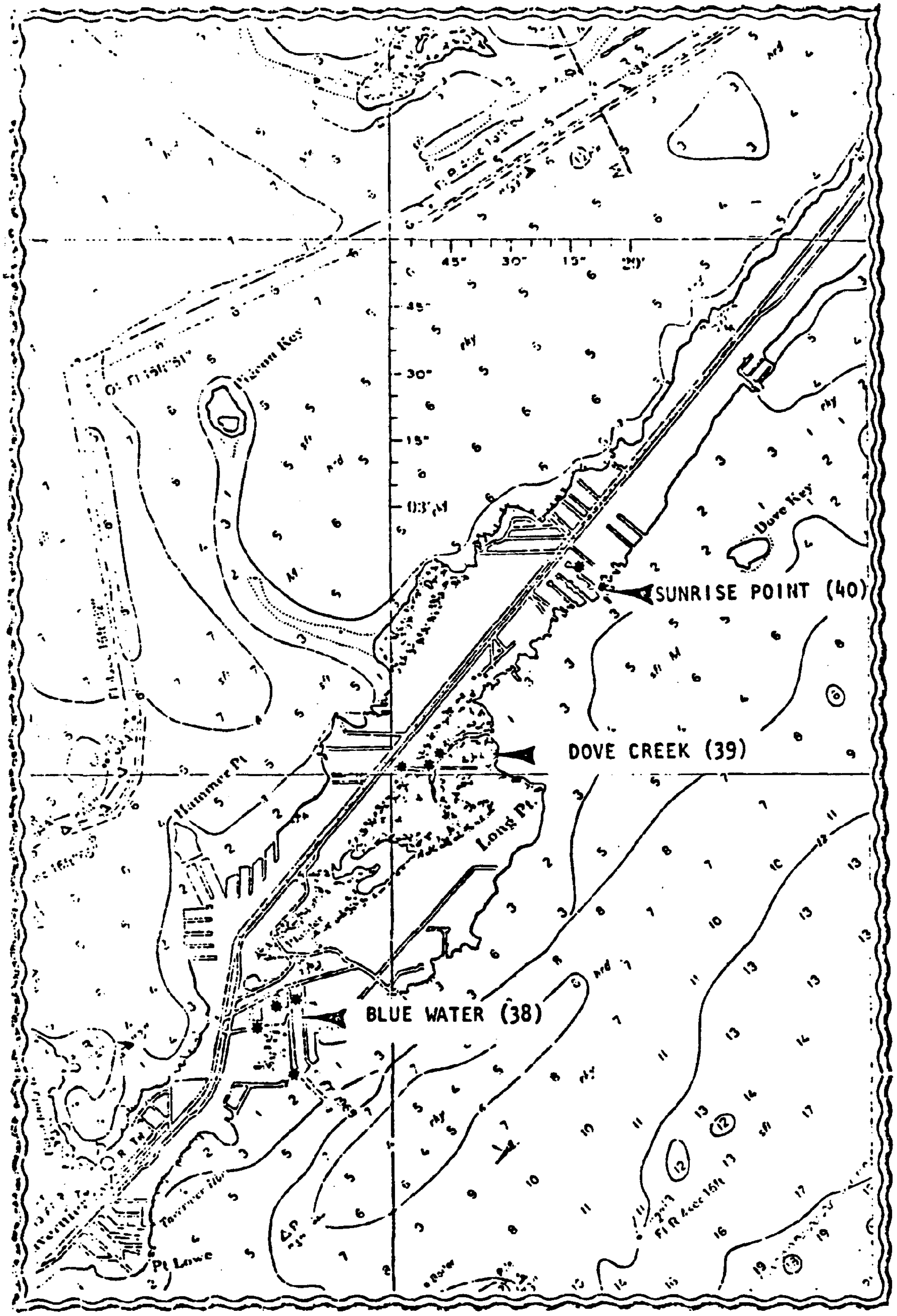


Fig. 66 Locations of stations 38, 39 and 40 (from Chesher, 1974).

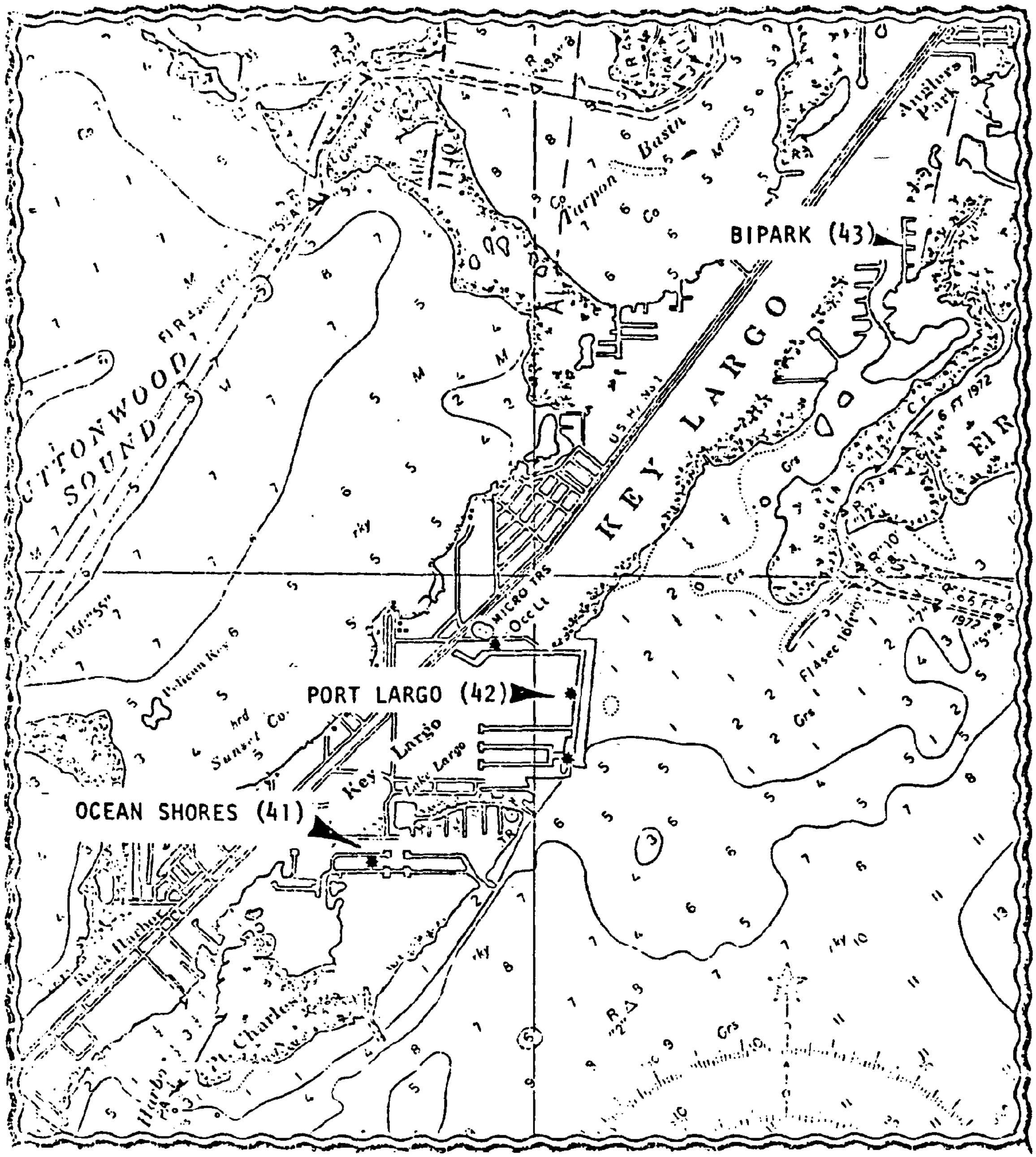


Fig. 67 Locations of stations 41, 42 and 43 (from Chesher, 1974).

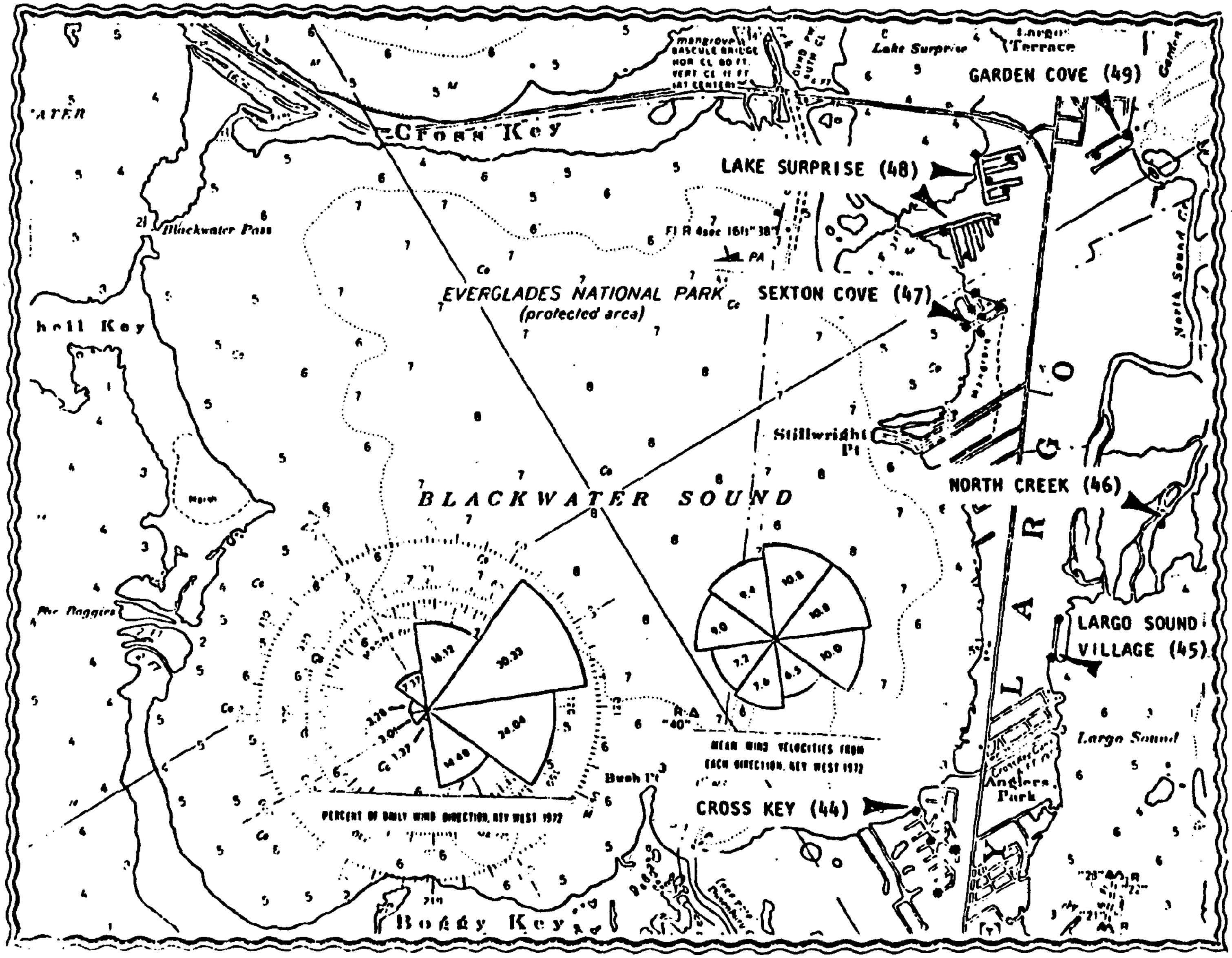


Fig. 68 Locations of stations 44 to 49 (from Chesher, 1974).

Canal	Temp. °C	Oxygen ppm	Salinity ppt	pH	Ortho-phosphate ppm	Nitrate ppm	Horizontal visib. ft.	JTU	Coliform Per 100 ml	Date
35 Surf.	28.75	5.10	32.25	9.16	0.500	-	15.50	4.70	-	8/15/73
Bott.	29.00	2.70	35.87	9.02	0.360	-	-	9.70	-	8/29/73
36 Surf.	29.41	3.74	39.96	9.10	0.020	-	-	5.60	-	8/15/73
Bott.	29.53	1.17	40.75	9.05	0.010	-	-	36.60	-	10/16/73
37 Surf.	29.42	5.73	34.83	9.06	0.040	-	-	7.40	71.5	8/15/73
Bott.	28.25	1.37	40.17	9.13	0.020	-	-	7.30	95.5	10/16/73
38 Surf.	31.75	7.30	38.50	8.94	0.100	0.02	28.0	-	14.0	8/7/73
Bott.	27.62	1.82	39.25	8.80	0.150	0.04	-	-	38.0	
39 Surf.	29.08	5.23	34.92	8.99	0.020	-	24.0	4.20	0	8/14/73
Bott.	28.83	4.98	35.58	9.02	0.020	-	-	4.80	246.5	10/16/73
40 Surf.	28.77	5.92	33.83	9.10	0.040	-	23.0	5.40	122.0	8/14/73
Bott.	28.17	5.03	35.17	9.10	0.040	-	23.0	6.00	59.5	10/16/73
41 Surf.	32.00	6.00	38.00	9.00	-	-	20.0	-	-	8/6/73
Bott.	31.00	6.10	40.00	9.10	-	-	-	-	-	
42 Surf.	31.19	7.10	37.25	9.07	-	0.11	28.33	-	4.0	8/6/73
Bott.	29.90	5.00	37.83	8.93	-	0.02	-	-	45.0	8/8/73
43 Surf.	28.35	3.17	37.50	9.10	0.025	-	14.5	-	0	8/13/73
Bott.	26.75	2.00	37.65	8.85	0.025	-	-	-	153.0	
44 Surf.	31.60	4.94	39.60	8.96	0.050	0.06	25.0	3.50	0	8/7/73
Bott.	32.10	3.52	40.80	9.13	0.050	0.11	-	1.30	0	10/15/73
45 Surf.	29.25	5.40	35.37	8.60	0.060	0.05	27.0	2.00	0	8/6-7/73
Bott.	28.75	5.00	36.50	9.20	0	0.08	21.0	3.50	0	10/15/73
46 Surf.	29.80	2.70	38.00	9.05	0.150	0.05	32.0	-	0	8/6/73
Bott.	29.80	2.80	38.00	9.15	0.050	0.05	-	-	49.0	
47 Surf.	28.32	5.13	36.81	9.05	0.015	-	27.2	4.50	86.0	8/13/73
Bott.	26.18	0.99	39.11	9.07	0.025	-	-	4.40	80.66	10/15,30,31/73
48 Surf.	32.60	4.32	38.60	9.01	0.075	-	9.37	14.50	54.0	8/8/73
Bott.	30.60	2.16	39.60	9.04	0.080	-	-	20.00	22.0	8/14-15/73
49 Surf.	29.50	5.85	35.75	8.17	0.030	-	10.0	-	63.0	8/14/73
Bott.	25.45	0	37.75	8.77	15.000	-	1.0	-	111.0	
50 Surf.	32.17	13.15	35.00	9.32	0.035	-	5.0	-	164.0	8/15/73
Bott.	25.40	0	37.66	8.37	4.000	-	-	-	92.0	

Fig. 69 Temperature, dissolved oxygen, salinity, pH, orthophosphate, nitrate, visibility, turbidity and coliform data for canals in the northern Florida Keys (from Chesher, 1974). Station locations are shown in Figs. through

CONCENTRATIONS OF PESTICIDES (PARTS PER BILLION, DRY WEIGHT) FOUND IN SEDIMENTS FROM CANAL BOTTOMS

Sample	Aldrin	Heptachlor Epoxide	Dieldrin	o,p'DDE	p,p'DDE	o,p'DDD	p,p'DDD	o,p'DDT	p,p'DDT
Ocean Drive (37)	12.2	18.3	20.1	27.4	43.7	-	-	9.8	T
Garden Cove (49)	14.5	7.7	39.8	22.5	43.7	-	T	9.6	36.0
Port Largo (42)	21.4	9.8	17.8	14.8	31.5	-	T	11.7	93.6
Sexton Cove (47)	44.5	13.8	11.5	-	15.5	-	-	14.2	40.5
Sexton Cove (47)	21.3	16.8	11.1	24.9	12.3	-	-	20.4	328.2

Fig. 70 Pesticide concentrations in canal sediments, northern Florida Keys (from Chesher, 1974).
T = trace amounts.

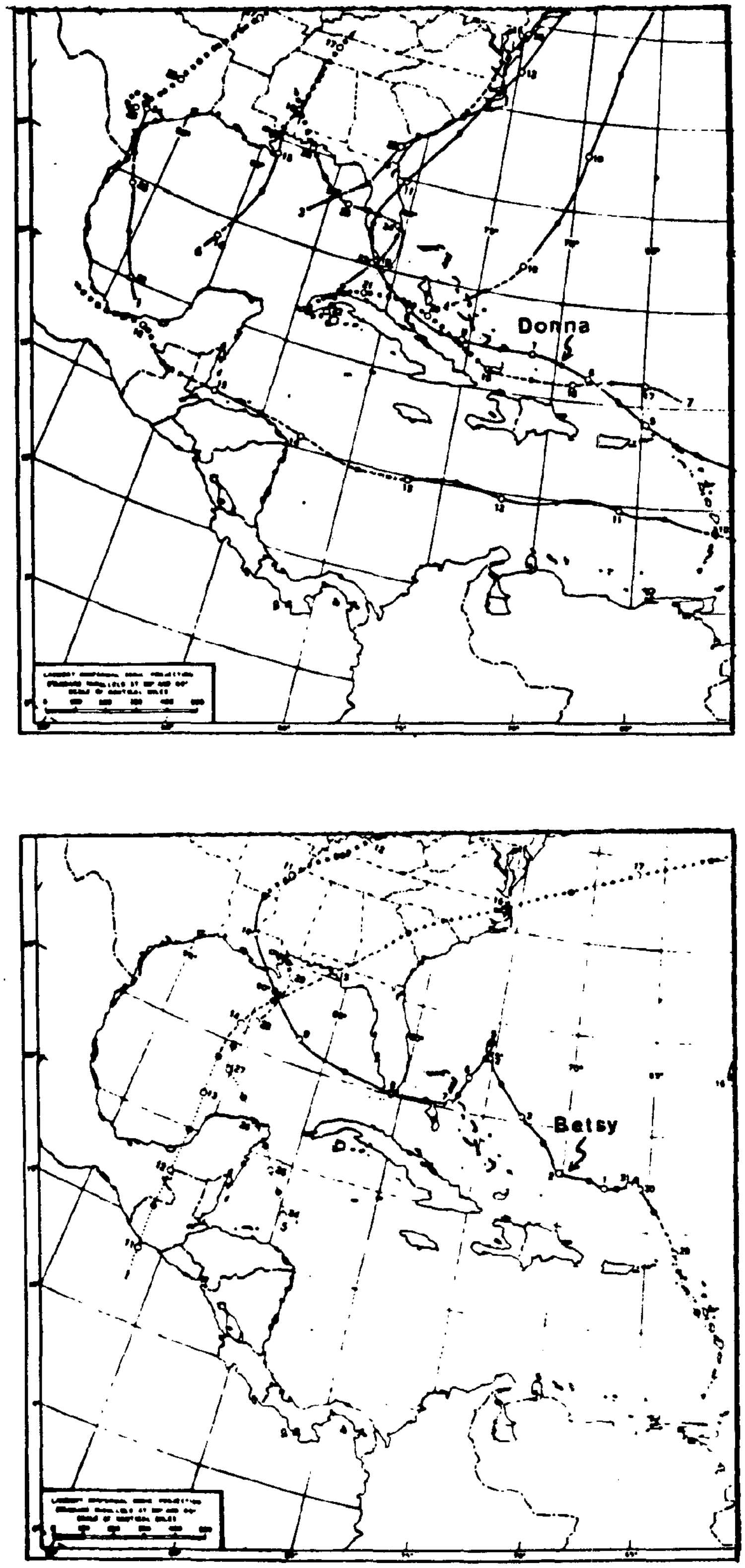


Fig. 71 Tracks of Hurricanes Donna (1960) and Betsy (1965) (from Neumann <u>et al</u>., 1978)

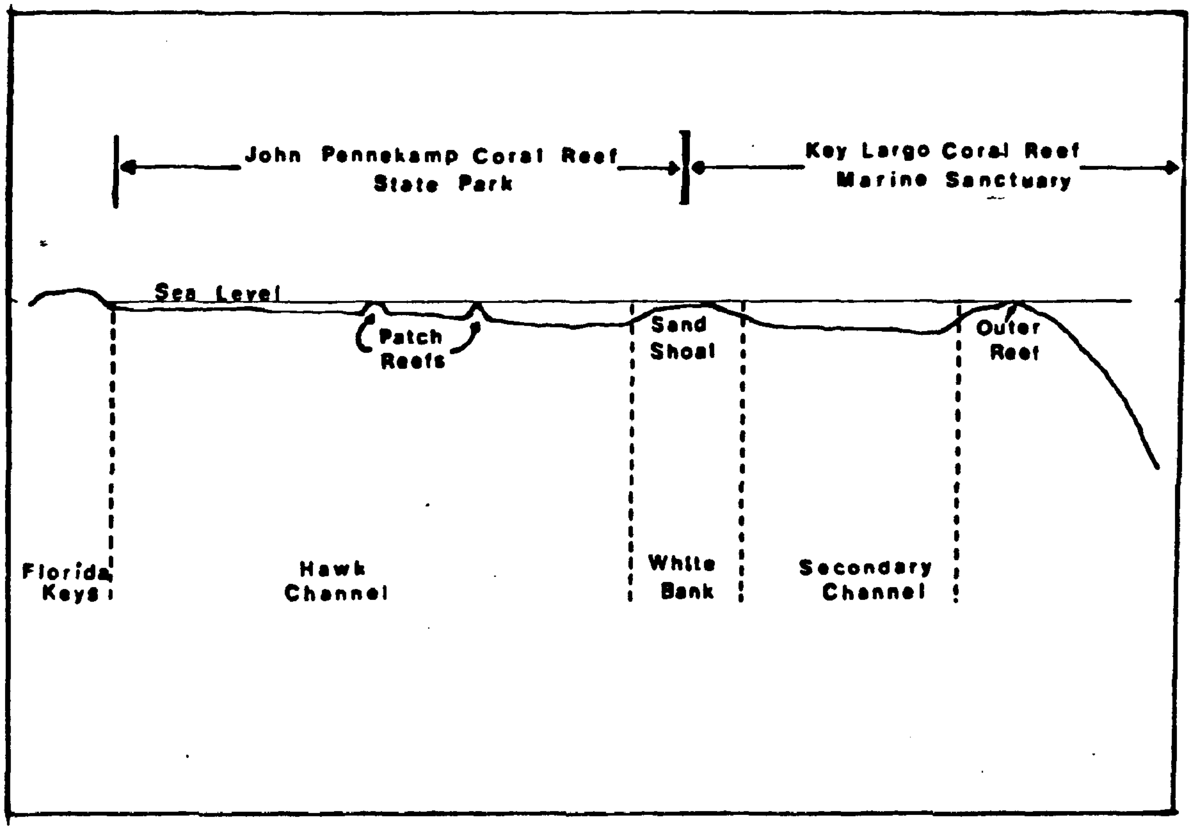


Fig. 72 Diagrammatic profile across the south Florida shelf margin, showing location of secondary channel between White Bank and the Outer Reef (after Enos and Perkins, 1978)

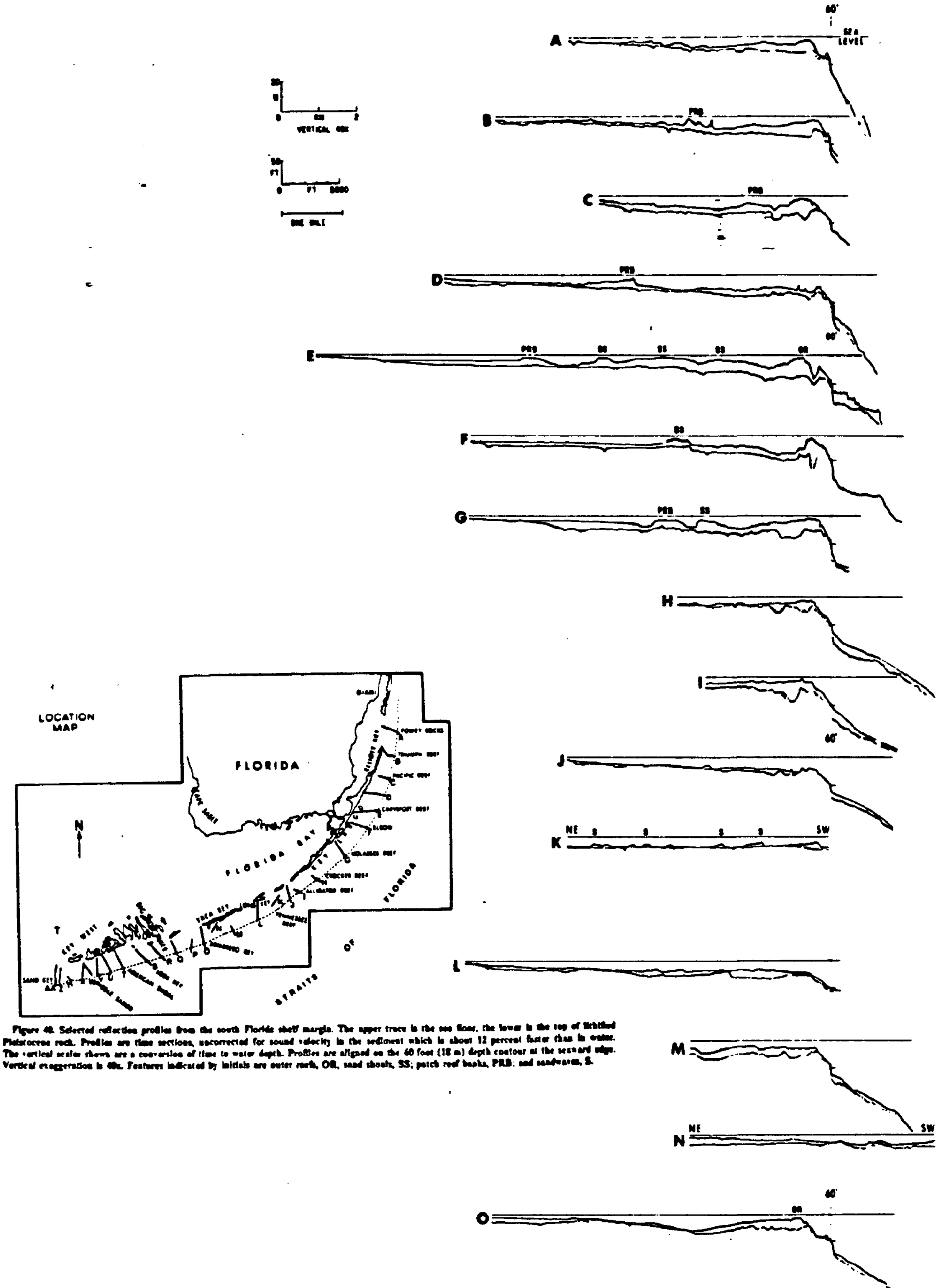


Figure 40. Selected reflection profiles from the south Florida shelf margin. The upper trace is the sea floor, the lower is the top of lithified Pleistocene rock. Profiles are time sections, uncorrected for sound velocity in the sediment which is about 12 percent faster than in water. The vertical scales shown are a conversion of time to water depth. Profiles are aligned on the 60 foot (18 m) depth contour at the seaward edge. Vertical exaggeration is 60x. Features indicated by initials are outer reefs, OR, sand shoals, SS; patch reef banks, PRB; and sandwaves, S.

Fig. 73 Seismic reflection profiles, Fowey Rocks to Sombrero Key (from Enos and Perkins, 1977)

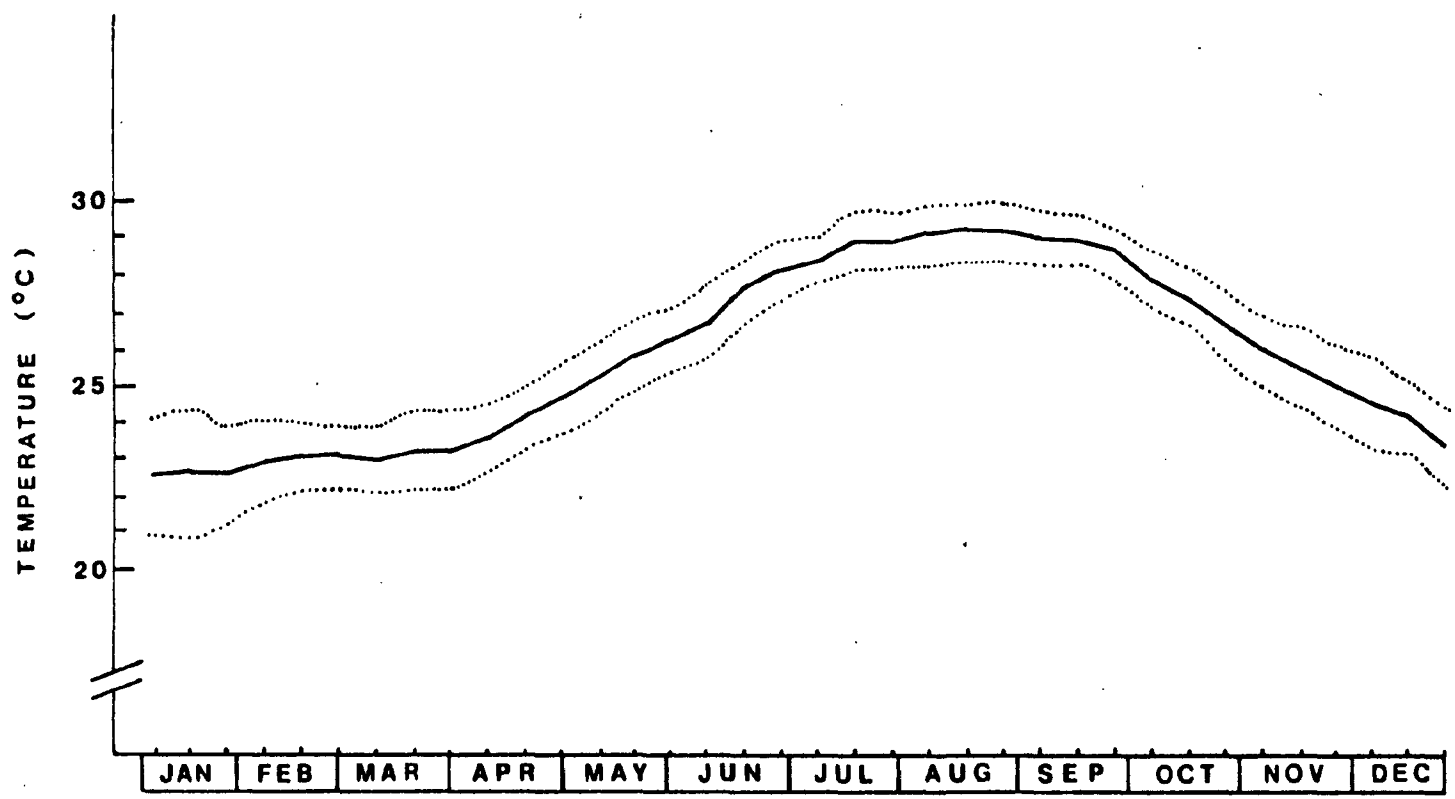


Fig.74 Average annual surface temperature curve for Carysfort Reef for the period 1881 to 1899. Dotted lines indicate $\pm$ one standard deviation. Derived from 10-day means of Vaughan (1918).

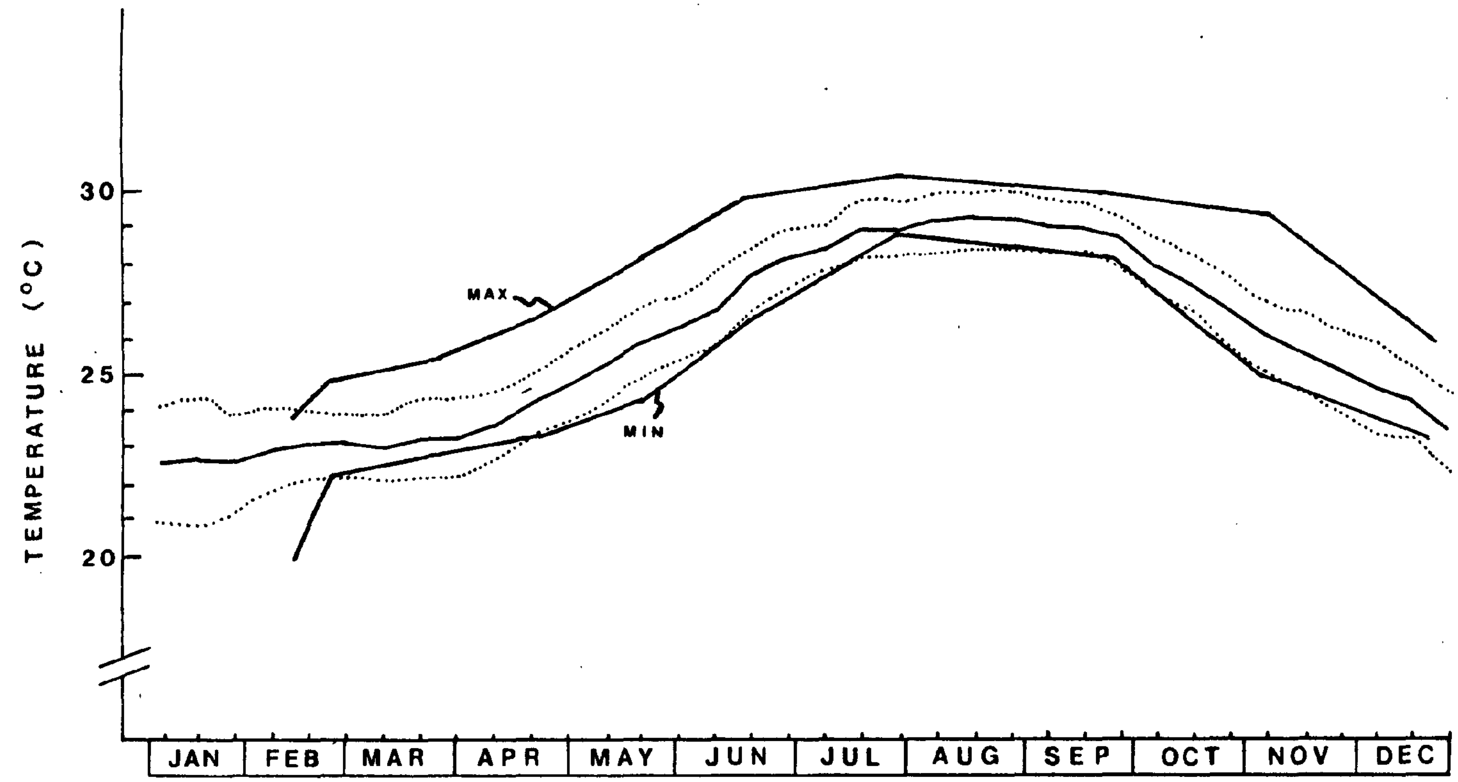


Fig. 75 1966 Maximum/Minimum temperature data for Key Largo Dry Rocks (Shinn, 1966) superimposed on Vaughan's (1918) temperature data for Carysfort Reef for the period 1878 to 1899 (shaded curve).

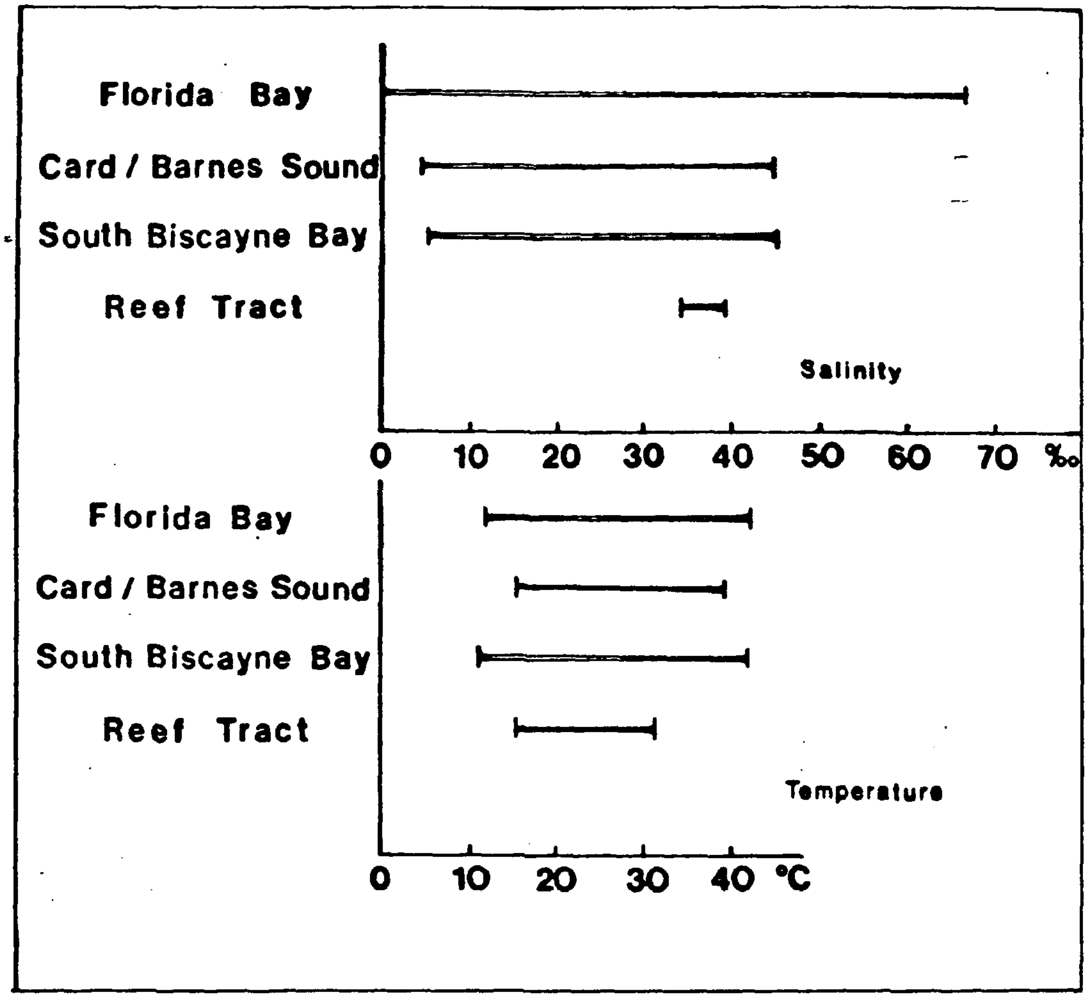


Fig. 76 Salinity and temperature ranges for Florida Bay, Card and Barnes Sound, South Biscayne Bay and the Reef Tract (Data from Schmidt & Davis, 1978)