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PUERTO RICO NUCLEAR CENTER

TORTUGUERO BAY ENVIRONMENTAL STUDIES

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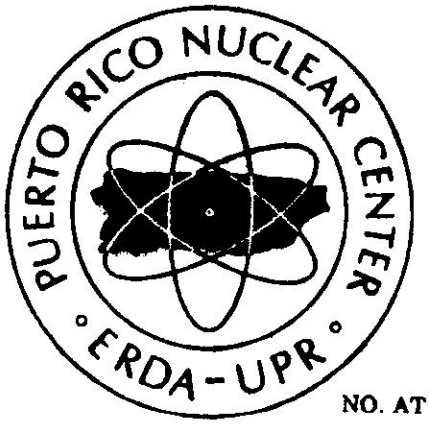

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TORTUGUERO BAY ENVIRONMENTAL STUDIES

by

E. D. Wood, M. J. Youngbluth, M. E. Nutt, P. Yoshioka,
and M. J. Canoy

PREFACE

This report stems from investigations carried on by the Puerto Rico Nuclear Center. The studies were designed to provide data upon which to judge the suitability of a site for the construction of power generating facilities and to allow the determination of the impact of such construction and operation upon the environment.

The report represents the combined effort of the scientists, technicians and support staff of the Site Selection Survey Project.

The authors who contributed to the Tortuguero Bay Site Selection Survey are:

E. D. Wood, Project Leader	Physical, Chemical and Geological Parameters
Marsh J. Youngbluth	Zooplankton Studies 1973
Mary E. Nutt	Zooplankton Studies 1974
Paul Yoshioka	Benthic Invertebrates and Fish Studies
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1.1 INTRODUCTION

The Puerto Rico Nuclear Center of the University of Puerto Rico has been under contract to the Puerto Rico Water Resources Authority since 1972 to conduct site selection surveys and environmental research studies of seven coastal sites. Experience gained from these investigations will add to the knowledge about these areas, and provide useful data which will aid in the assessment of the desirability and practicability of locating power generating plants on one or more of these sites.

Puerto Rico Nuclear Center scientists have studied the physical, chemical and geological parameters of the sites, and the ecological parameters of zooplankton, benthic invertebrate and fish communities. Plant associations, except for the Cabo Rojo Platform site, have been included.

The sites chosen for study were: Tortuguero Bay, Punta Manati, Punta Higuero, Cabo Rojo Platform, Punta Verraco, and Cabo Mala Pascua. The seventh site, Barrio Islote, was studied and reported under a separate contract.

The first site reported is Tortuguero Bay, shown in Figure 1.1-F1. Tortuguero Bay is located in an embayment on the north coast of Puerto Rico between Punta Marchiquita and Punta Chivato, about 35 kilometers west of San Juan (18°28.3'N, 66°28.5'W). It is somewhat protected from the dominant wave train by Punta Chivato. There are no mangroves on the shoreline, and turtle grass grows only as single plants on the hard bottom area. The ocean bottom drops off unevenly from shore with deep water available within about three kilometers. A submarine canyon lies just offshore with its axis in a NW-SE direction. The entire coast of this area, excluding the shores of Tortuguero Lagoon, is composed largely of rocks and cliffs.

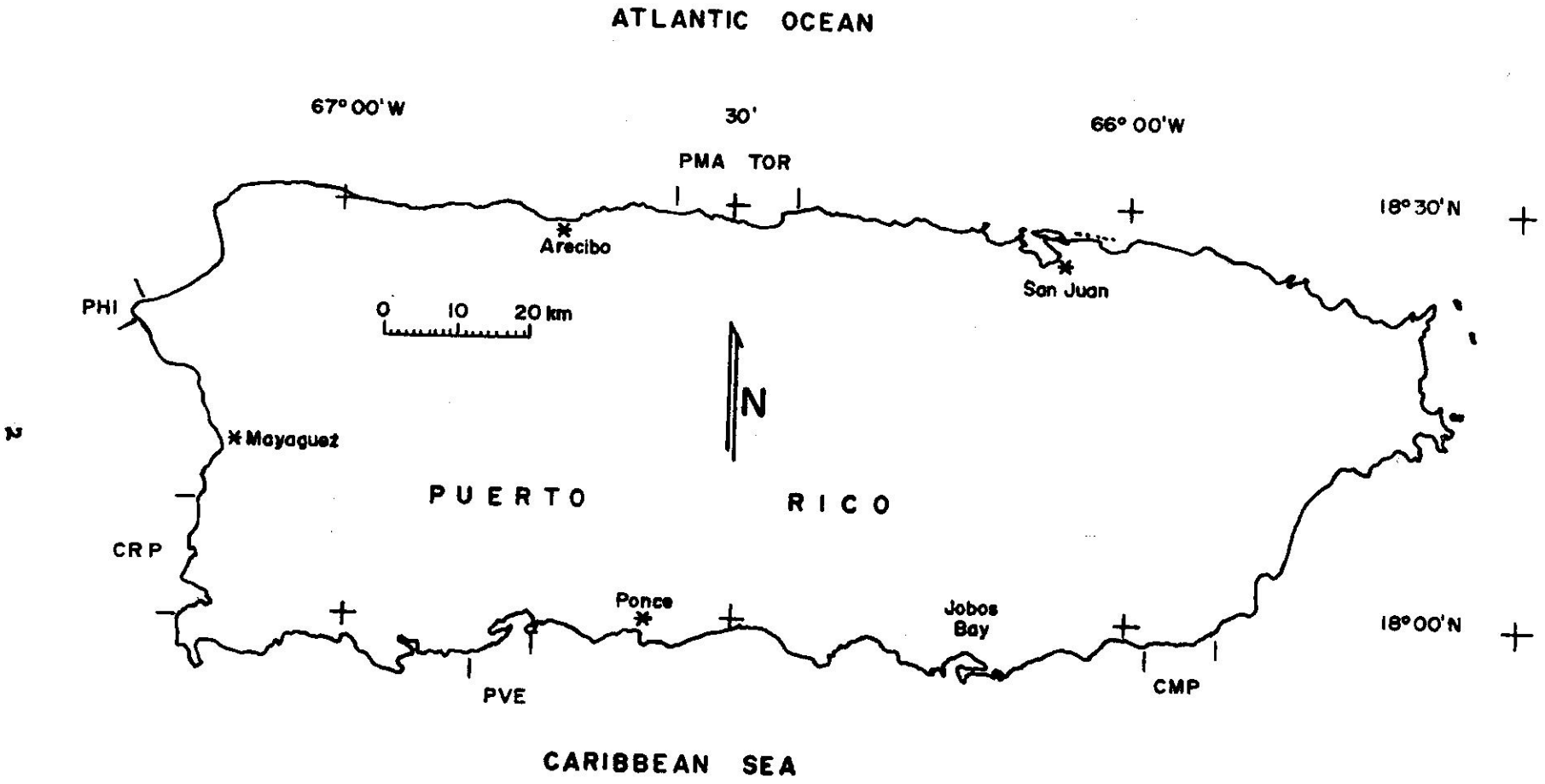


Fig. 1.1-F1. Site Selection Survey Study Sites. Tortuguero Bay (TOR); Punta Manati (PMA); Punta Higuero (PHI); Cabo Rojo Platform (CRP); Punta Verraco (PVE); and Cabo Mala Pascua (CMP). Barrio Islote site not shown.

2.1 PHYSICAL AND CHEMICAL PARAMETERS AT TORTUGUERO BAY

by E.D. Wood

2.1.1 INTRODUCTION

Most of the physical and chemical measurements at the Tortuguero Bay site were made at or near the stations shown in Figure 2.1-F1. The transects were spaced at one nautical mile with the "A" stations located as near to shore as it was safe to sample with the RMV R.F. Palumbo. The "B" stations were located in excess of 125 m and the "C" stations on latitude 18°31.8'N in excess of 325 m depth.

2.1.2 TIDES

The tidal waves that affect the north coast of Puerto Rico originate in the central North Atlantic Ocean and move counterclockwise, that is, from west to east past Tortuguero Bay. The tides are predicted for San Juan (National Oceanic Survey, 1972) and four weeks have been plotted for correlation with currents described in Section 2.1.2. It can be seen from Figure 2.1-F2 that the tides are semi-diurnal with a maximum excursion of about 75 cm and a minimum daily excursion of about 32 cm. The mean daily tidal excursion is 40 cm.

2.1.3 CURRENTS

The currents at Tortuguero Bay have been measured on several occasions with the strongest currents to the west.

Currents measured at depths of 0.3 and 6 m on August 14, 1972 were westward with velocities of 0.4, 0.3 and 0.24 knots, respectively, just shoreward from Station TOR-2A.

Dye drops were made on August 15, 1972 and followed from 0800 to 1030 (Figure 2.1-F3) during a rising tide, and again from 1500 to 1700 (Figure 2.1-F4) during a falling tide. The surface currents varied from about 0.2 to 0.45 knots with generally higher velocities during the afternoon. Several of the outer dye drops disappeared rather quickly indicating a submergence of surface water over the 25-30 m depth contour. The currents were generally westward and tended to follow the coastline.

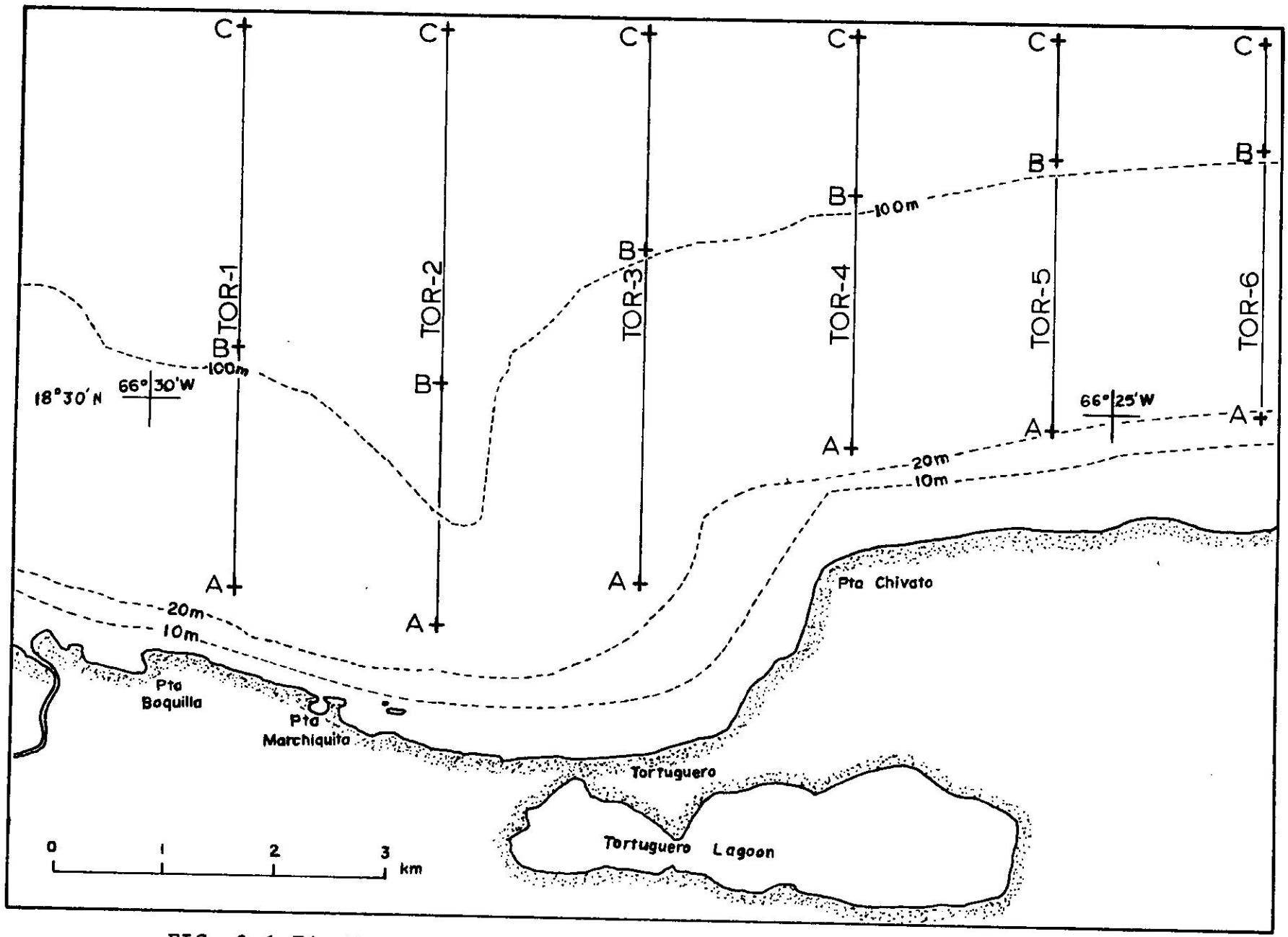


FIG. 2.1-F1 Tortuguero Bay site with depth contour lines and hydrographic sampling transects each with three stations.

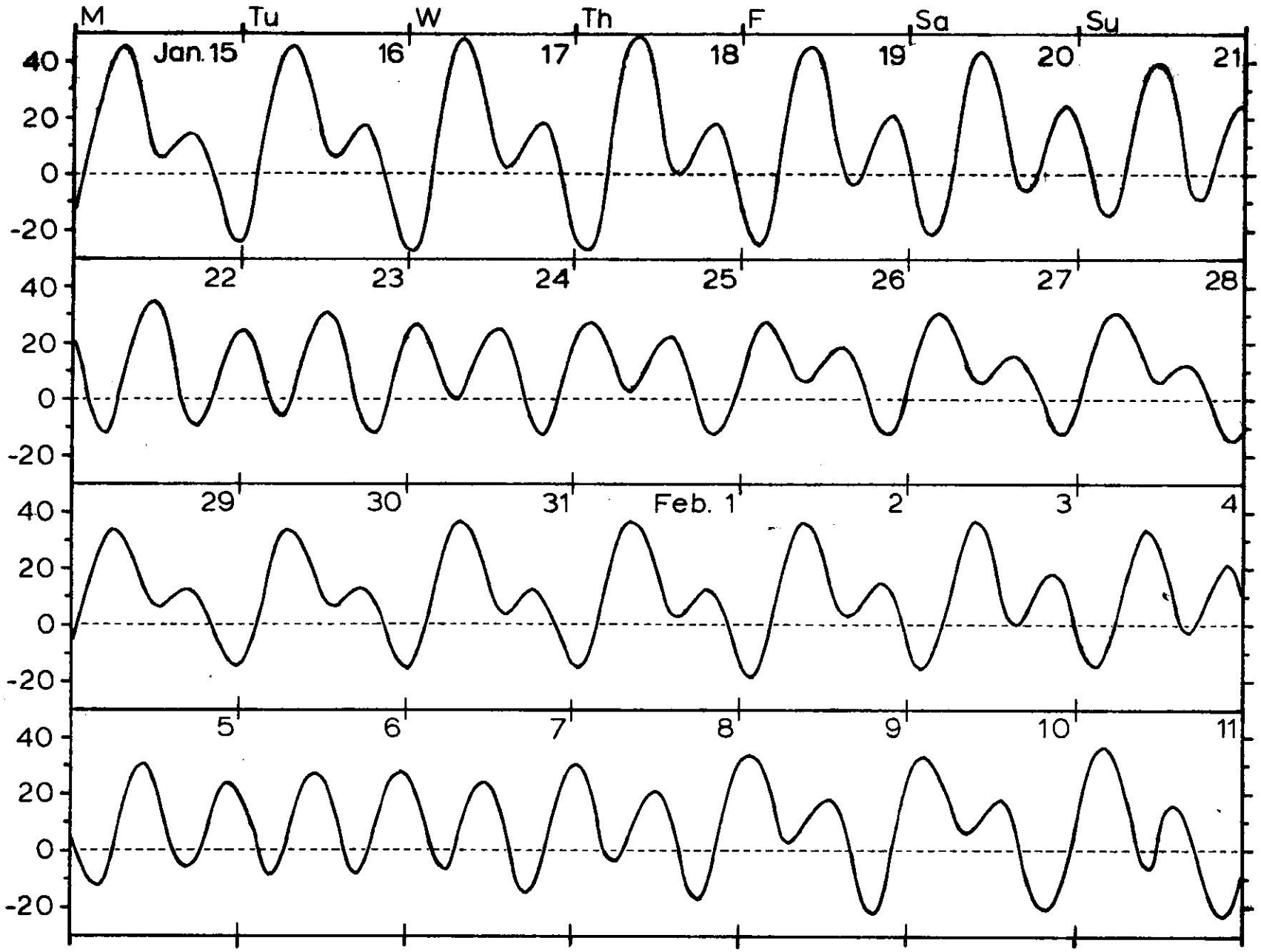


FIG. 2.1-F2 Tides at Tortuguero Bay plotted from predictions for San Juan from January 15 to February 11, 1973.

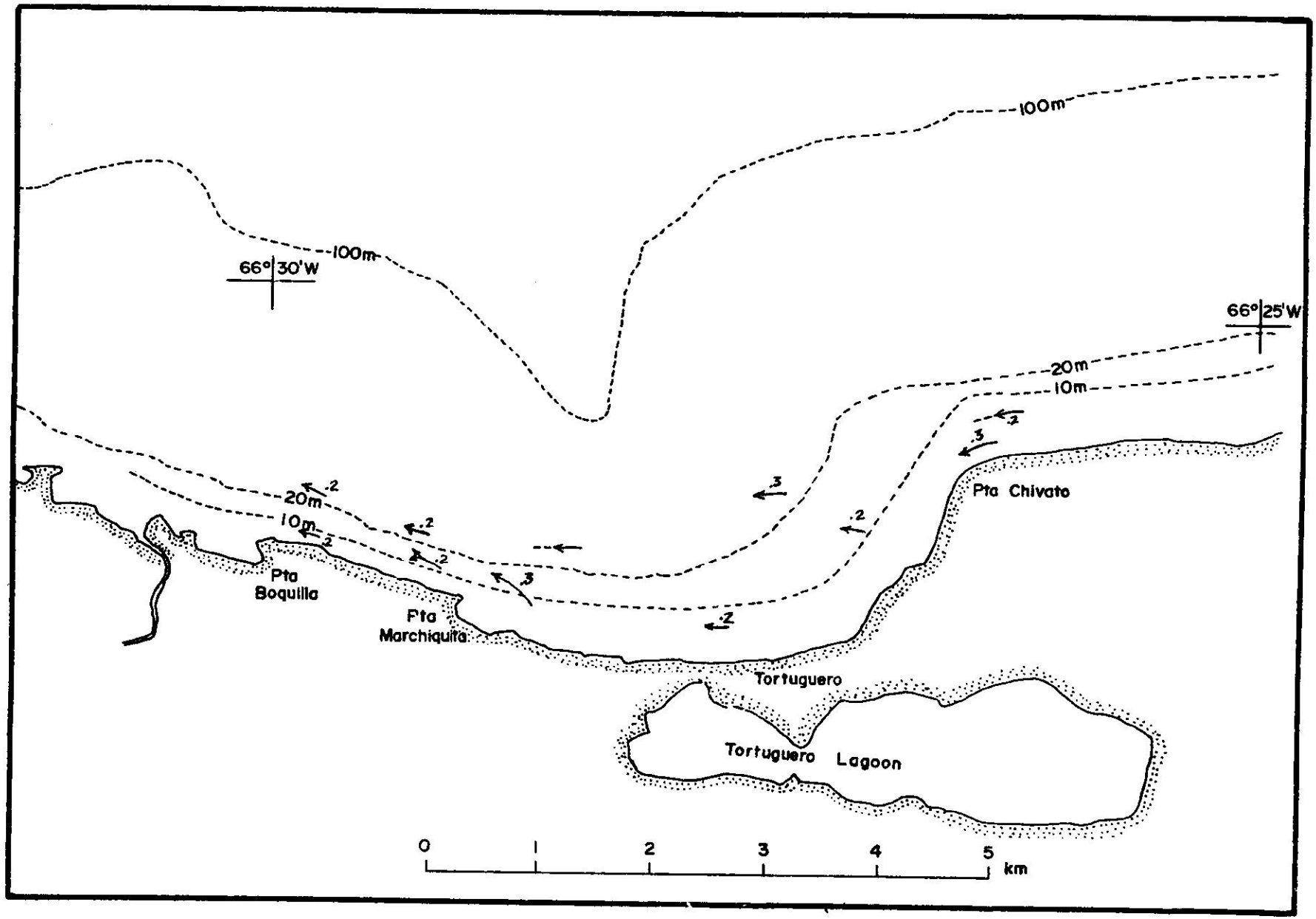


FIG. 2.1-F3 Surface currents for Tortuguero Bay, August 15, 1972 0800-1030 as indicated by dye drops during a rising tide. Velocities are in knots; dashed lines indicate submerged dye spots.

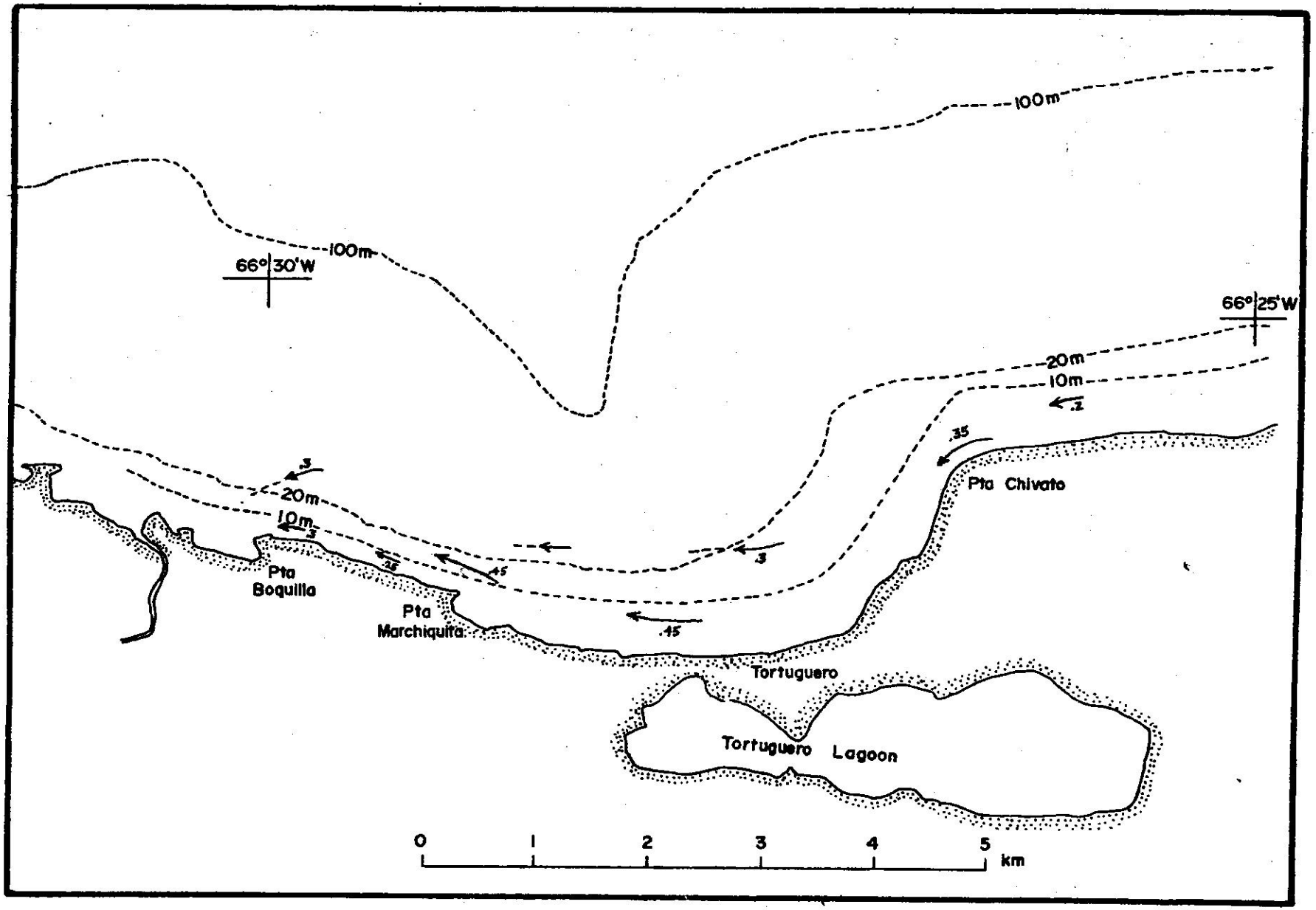


FIG. 2.1-F4 Surface currents for Tortuguero Bay, August 15, 1972 1500-1700 as indicated by dye drops during a falling tide. Velocities are in knots; dashed lines indicate submerged dye spots.

Currents were measured from 1600 January 29 through February 4, 1973 near Station TOR-2A at depths of 4 and 8 m when storm waves carried the current meters into the surf zone and eventually on to the beach where the data were recovered (Figure 2.1-F5).

Currents at both depths tended to be cyclic, being strongest to the west (15 to 25 cm/sec) and decreasing (5 to 15 cm/sec) when the direction changed to the east or southeast. When compared to the tides, (Figure 2.1-F2) it can be seen that the current velocity decreases and the direction changes from westward to eastward or southeastward during the maximum rising tide. Maximum currents are westward during the falling tides with little or no effect of the lesser rising tide on the current pattern.

The wind pattern for the north coast of Puerto Rico can be seen in Figure 2.1-F6 as plotted from hourly data at San Juan International Airport. The winds are usually light (2-3 m/sec) from the southeast at night changing to 5-10 m/sec. from the east or east-northeast during the day. It so happened that the highest wind velocities nearly coincided with the lesser of the daily rising tides so that possibly the wind stress on the surface waters overcame the tendency for the current to reverse its direction. An inspection of the wind patterns for the week of Feb. 5-11, 1973 shows the passing of a winter storm with steady winds (ca 5 m/sec) from the north for about two days. This caused rather high waves in Tortuguero Bay.

2.1.4 BATHYMETRY

Contour lines for 10, 20 and 100 m are shown in Figure 2.1-F1 and offset depth profiles of the six Tortuguero Bay transects are shown in Figure 2.1-F7. The depths were taken from Chart No. C&GS 903 (NOS, 1972). A broad even shelf exists along the coast east of Pt. Chivato. The shelf is also quite shallow and broad just north of the Tortuguero Lagoon along TOR-3. However, a sharp break in the shelf occurs near TOR-2 in the form of a submarine canyon with a longitudinal axis generally in the NW-SE direction. The widened shelf then continues west of Pt. Marchiquita. The vertical lines descending from the surface (transect lines) indicate the relative positions and depths of the A, B and C hydrographic stations. Most of the soundings indicated on the chart were found to be accurate, however, the nearshore regions (<10 m) are not well charted.

2.1.5 TEMPERATURE, SALINITY and DENSITY

The physical parameters of temperature and salinity were measured at the Tortuguero Bay site on seven cruises covering four seasons in two years (Table 2.1-T1). Preliminary measurements were made on August 15, 1972 (PRNC-1972).

TABLE 2.1-T1 Schedule of hydrographic cruises to Tortuguero Bay

	Winter	Spring	Summer	Fall
1972	-	-	8/15	-
1973	1/29	5/10	8/7	-
1974	1/29	5/22	8/14	10/30

The hydrographic sampling grid is shown in Figure 2.1-F1. A maximum of six north-south transects were made on each cruise. Each transect had three stations. The "A" stations were nearshore (ca 15 m) with two sampling depths at 0 and 10 m. The "B" stations were seaward in about 125 m of water with four depths: 0, 25, 50, and 100 m. The most seaward sampling was at the "C" station about 18°31.8'N latitude with eight depths: 0, 25, 50, 100, 150, 200, 250, and 300 m. The sampling analytical and data processing procedures are described in "A Manual for Hydrographic Cruises," (Wood, 1975a).

Temperature

Temperatures were measured using deep sea reversing thermometers accurate to better than ± 0.03°C. The thermometers were used in pairs or in triplicate when possible. Although only one temperature is shown on the computer printout of the data (see Appendix 2.1A), it is often an average of two or three thermometers. Most temperatures below 50 m were measured using both "protected" and "unprotected" reversing thermometers. A thermometric depth, TZ, was then calculated for those sampling depths and correlated quite well with the calculated depth, CZ, obtained from the amount of hydrowire paid out, WZ, and the cosine of the wire angle, ϕ (Figure 2.1-F8).

The data was averaged by a computer program which first interpolated between the depths sampled to provide temperatures at "standard depths". The averaging was done first for all stations by season, then by type of station (A, B or C) seasonally (Figures 2.1-F9 through 16).

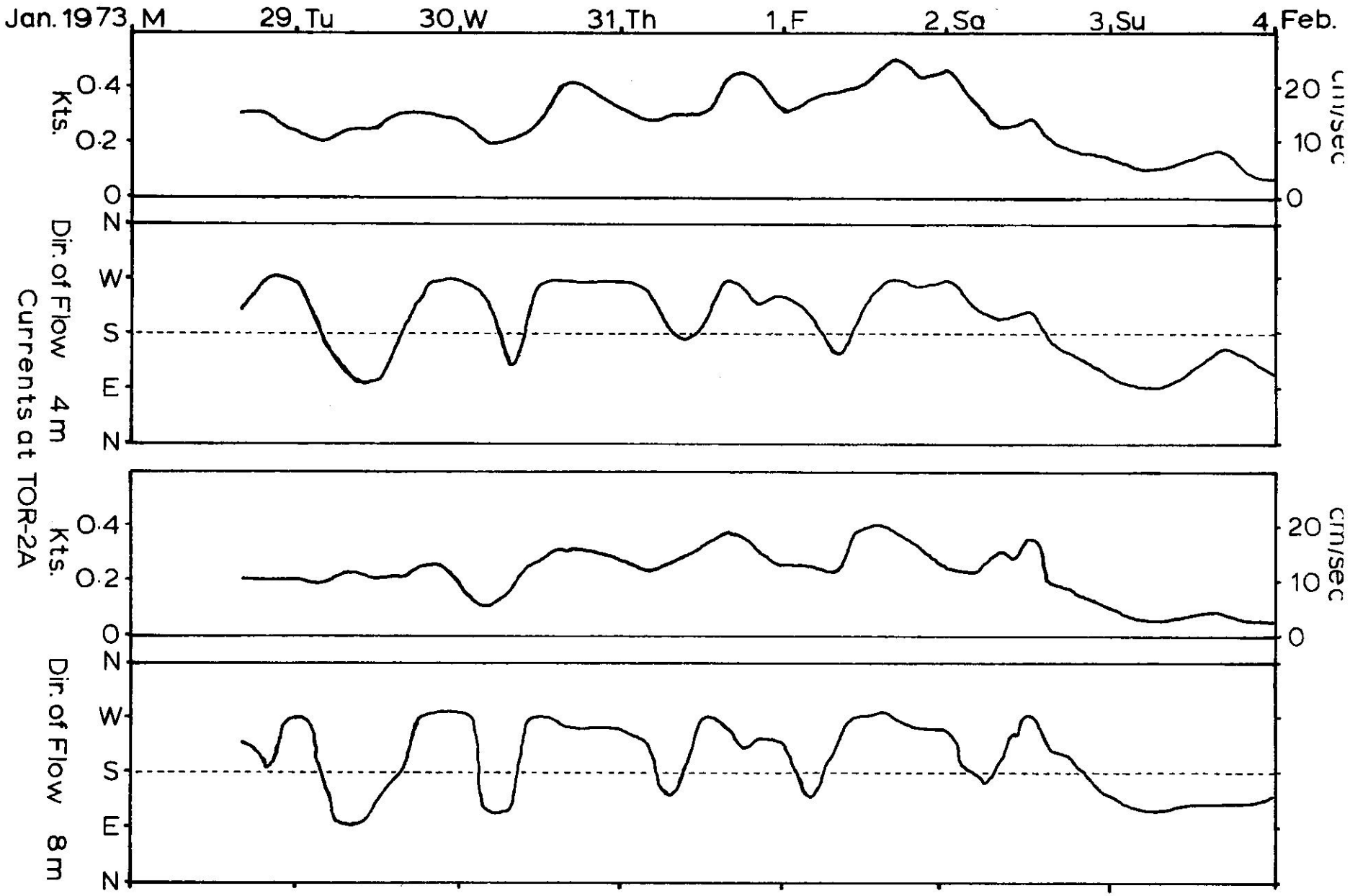


FIG. 2.1-F5 Velocity and direction plots for currents at depths of 4 and 8 m for the period 1600 Monday January 29 through Sunday February 4, 1973.

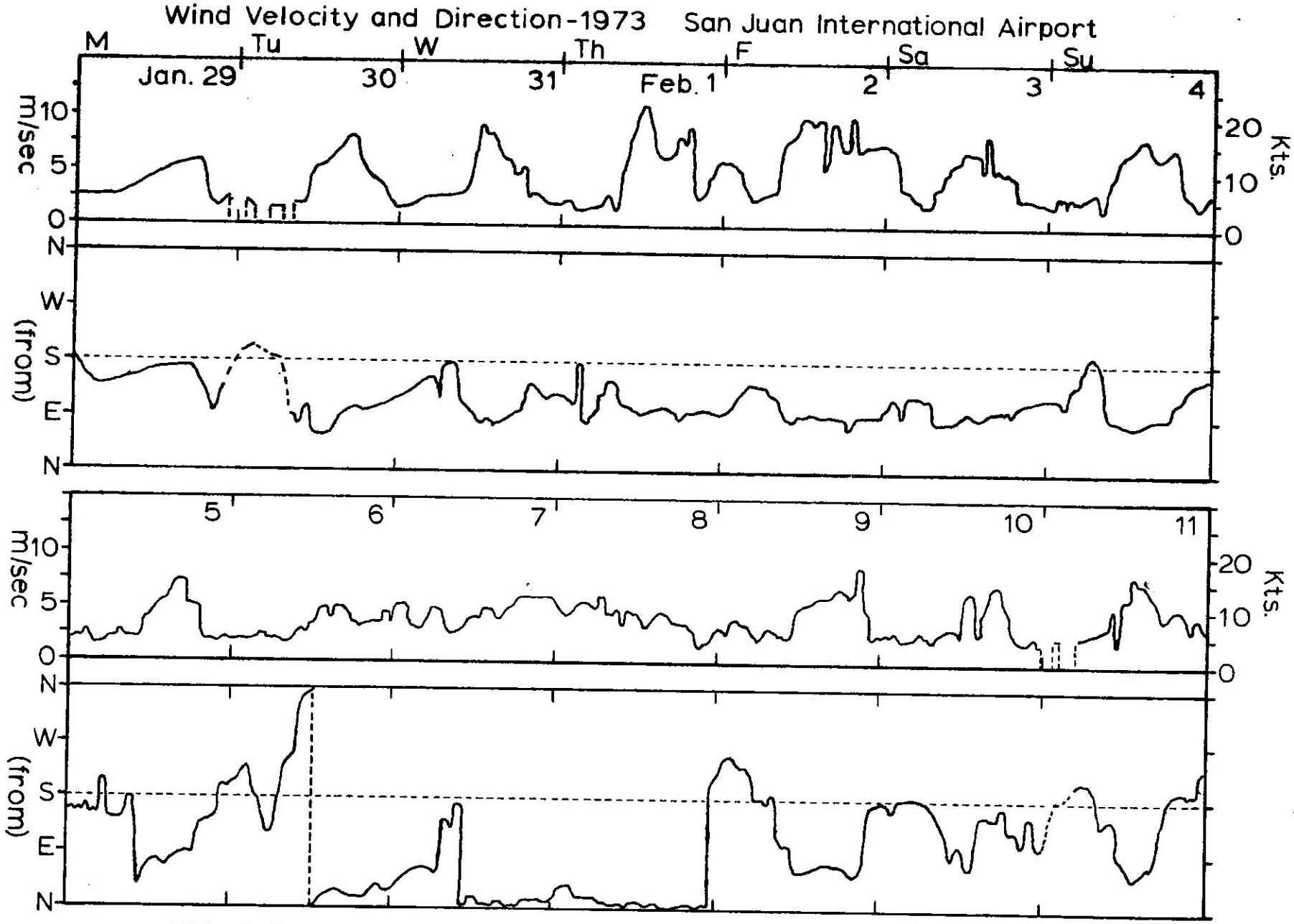
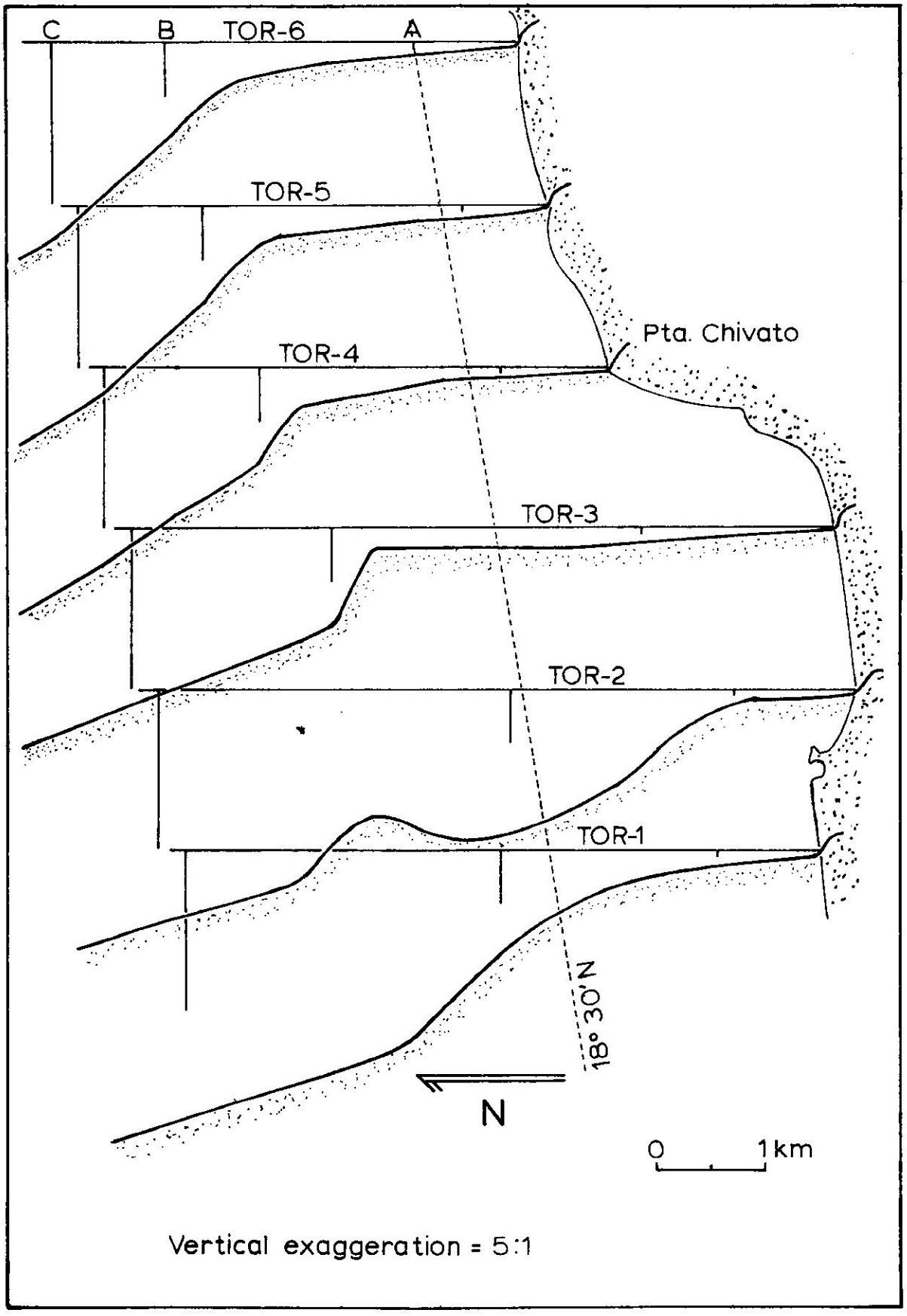


FIG. 2.1-F6 Velocity and direction plots of hourly wind data at San Juan International Airport for Monday January 29 through February 11, 1972.

FIG. 2.1-F7 Offset bottom profiles along the sampling transects of Tortuguero Bay. Vertical lines indicate relative positions of hydrographic casts.



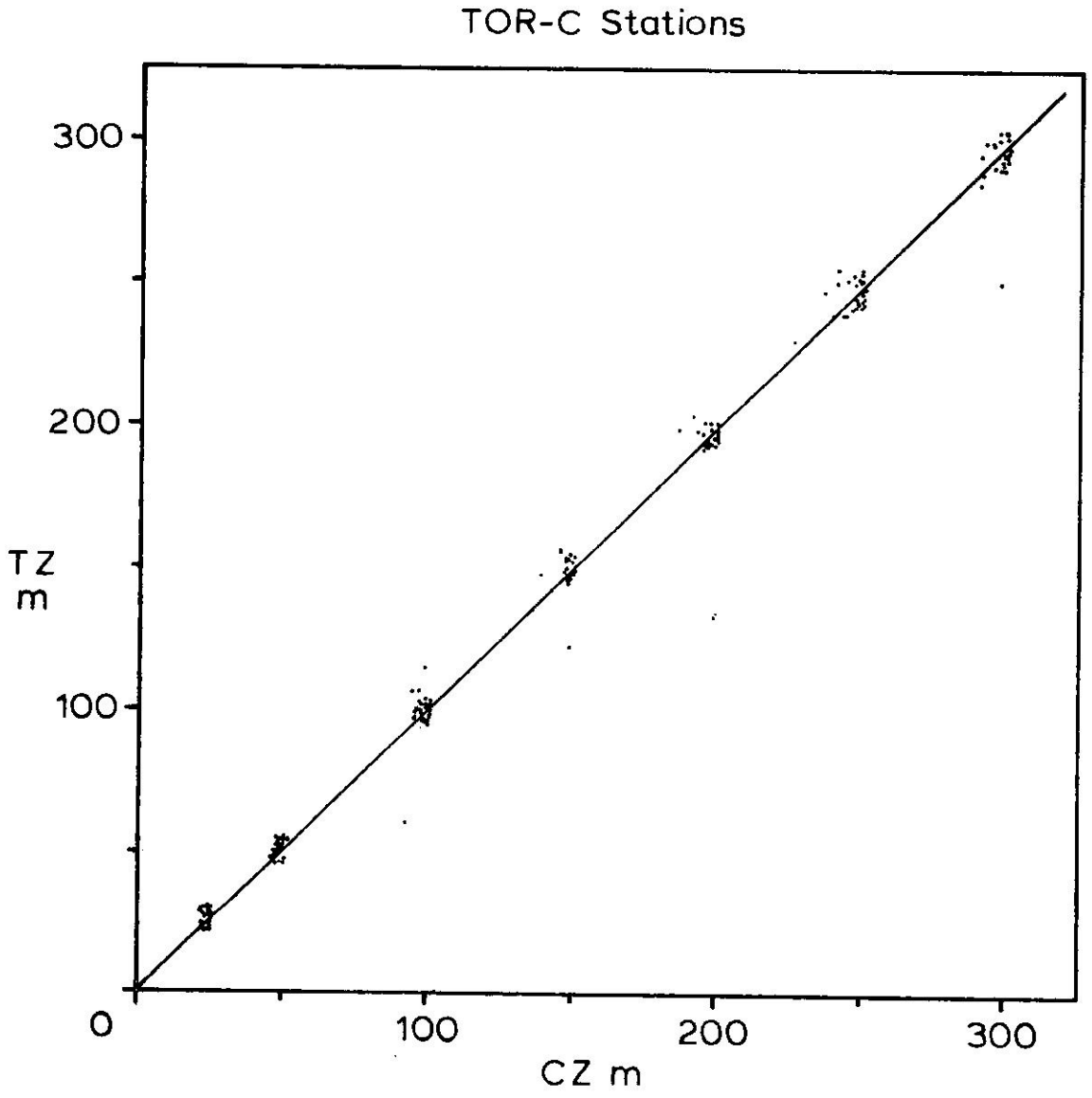


FIG. 2.1-F8 A comparison of sampling depths determined by thermometric (TZ) and wire angle (CZ) calculations.

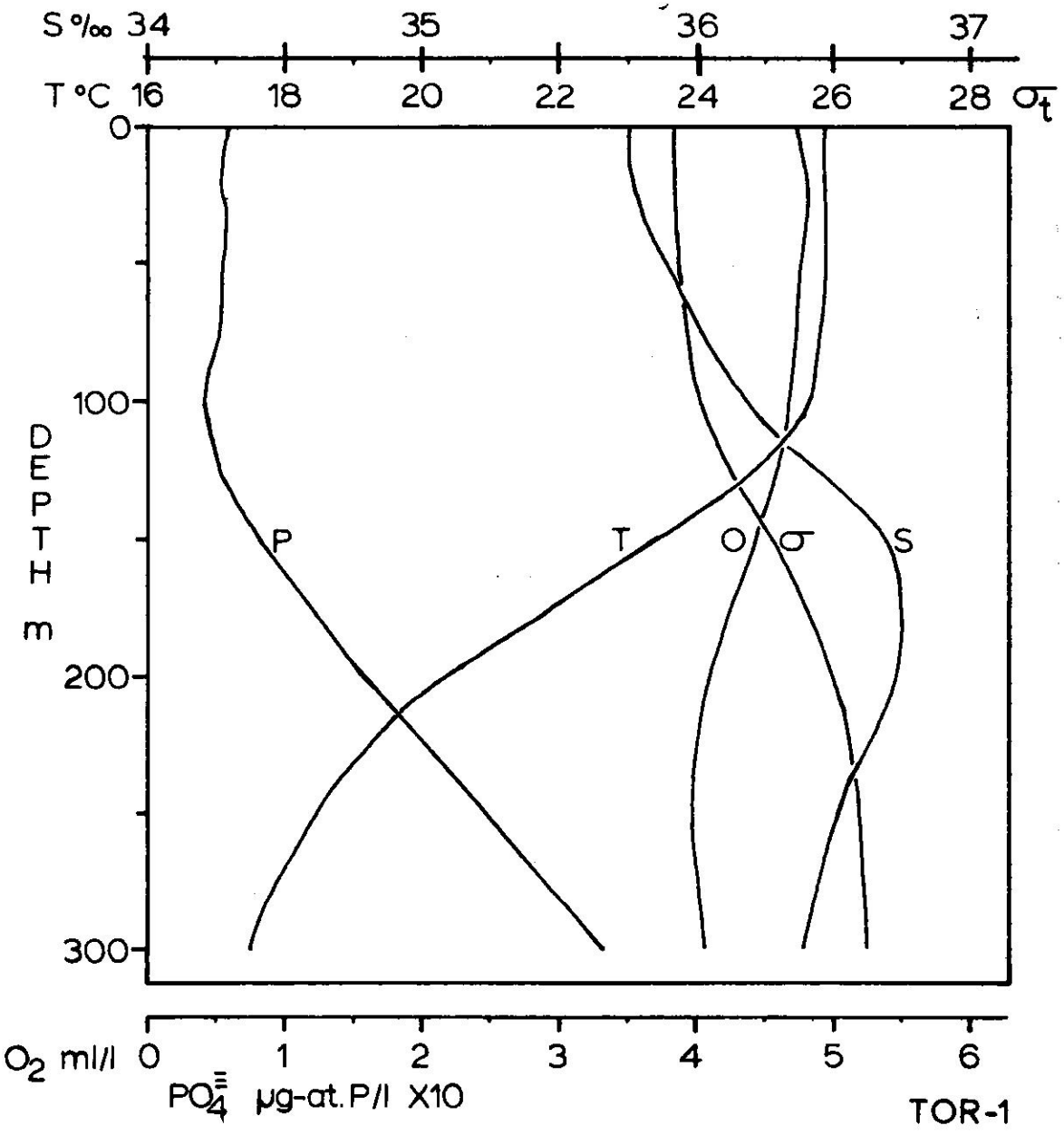


FIG. 2.1-F9 Averaged hydrographic parameters (temperature, T°C, salinity, S °/oo, density, t, dissolved oxygen, O_2, and reactive phosphate, PO) vs. standard depth in meters for the winter seasons of 1973 and 1974 at Tortuguero Bay.

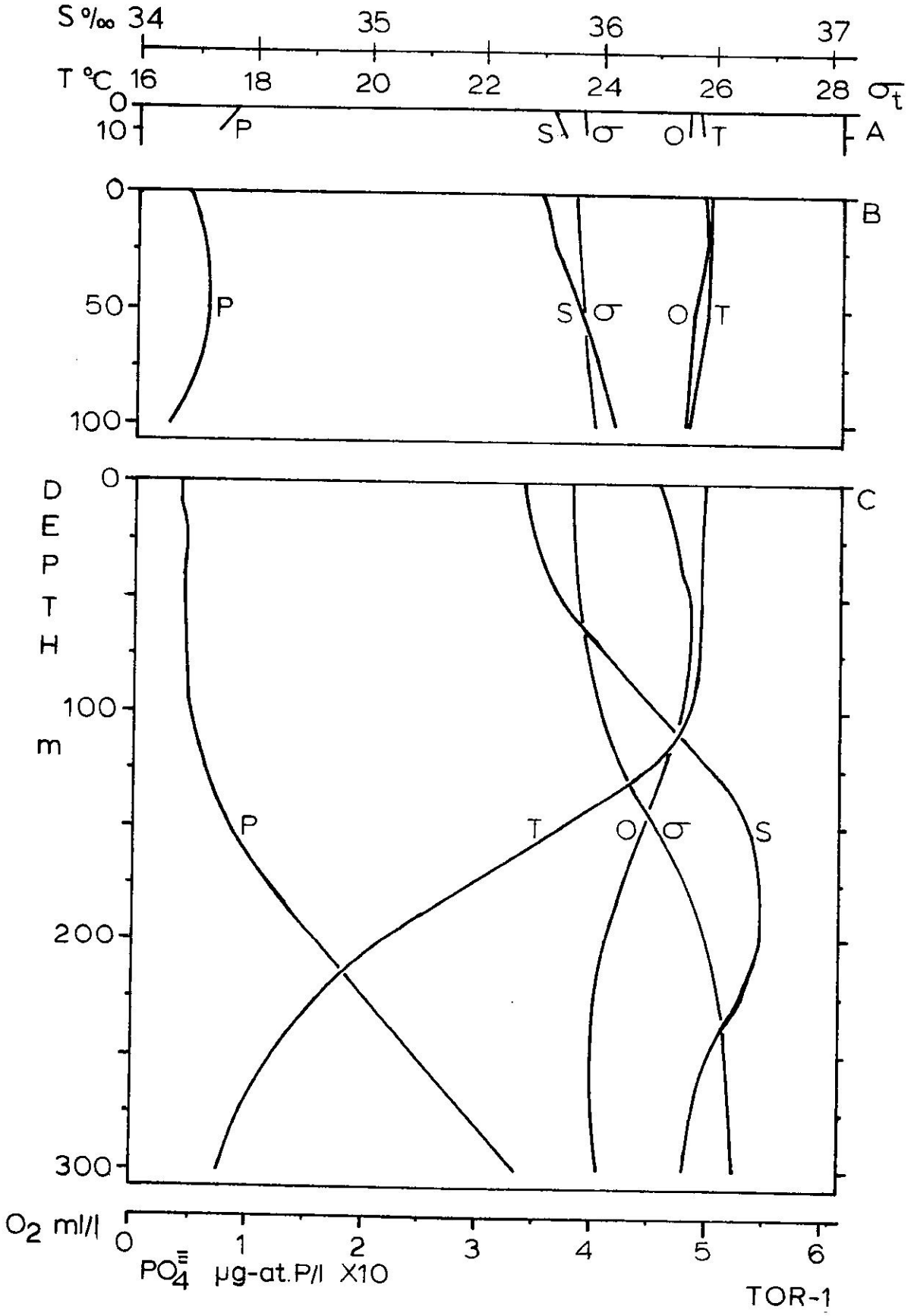


FIG. 2.1-F10 Depth profiles of hydrographic parameters averaged by type of station for the winter seasons of 1973-74.

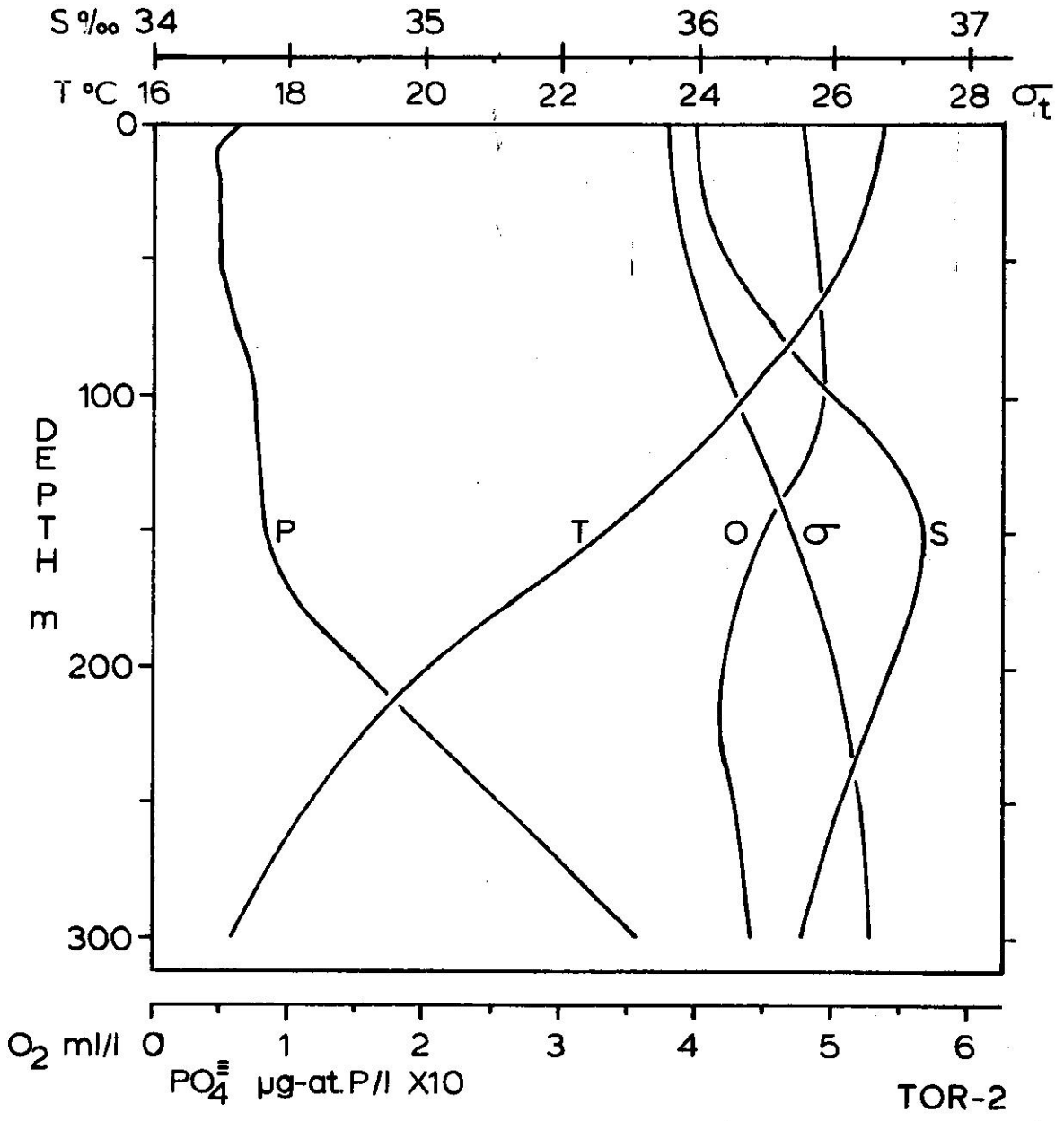


FIG. 2.1-F11 Averaged hydrographic parameter depth profiles for the spring seasons of 1973-74 at Tortuguero Bay.

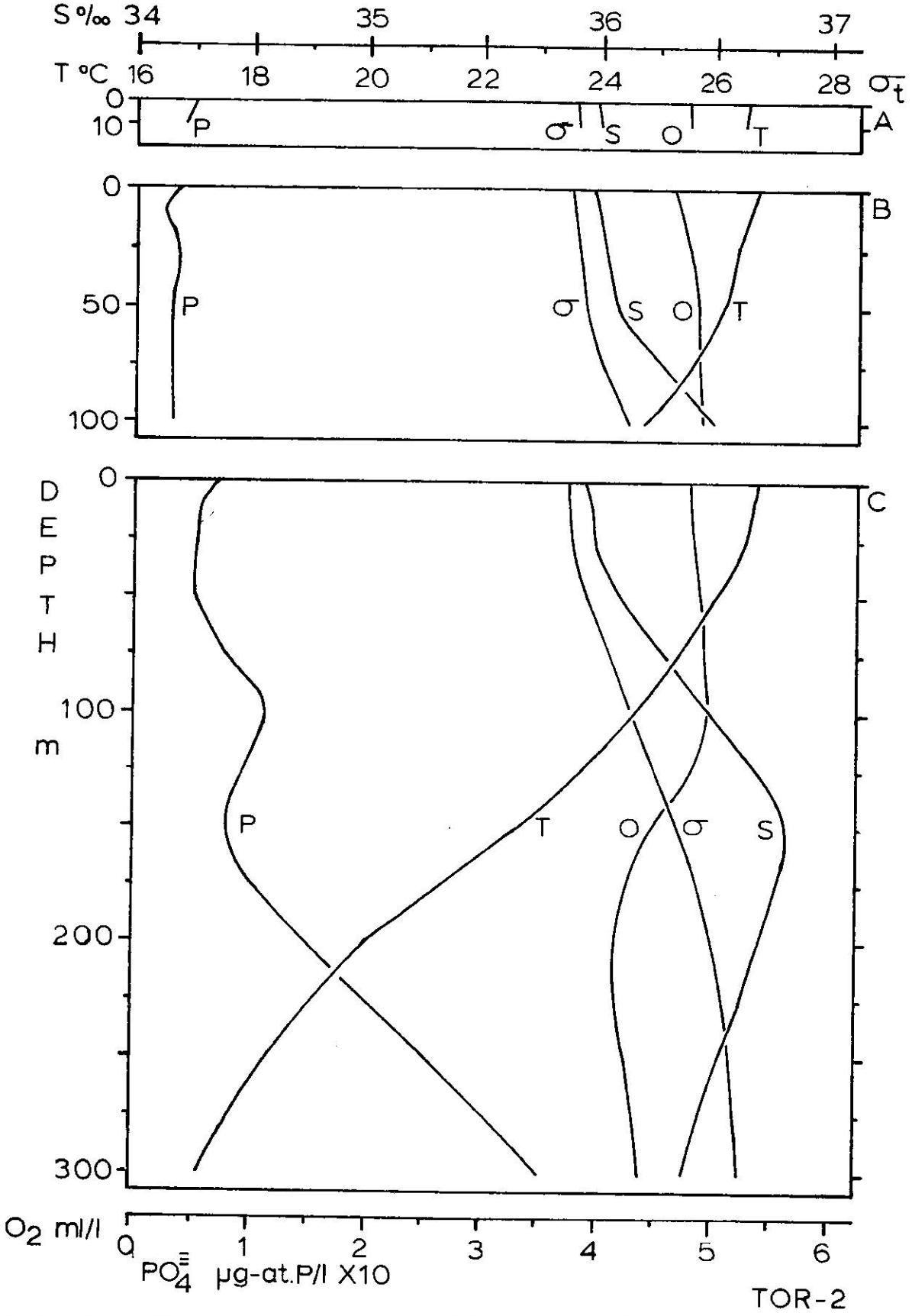


FIG. 2.1-F12 Depth profiles of hydrographic parameters averaged by type of station for the spring seasons of 1973-74.

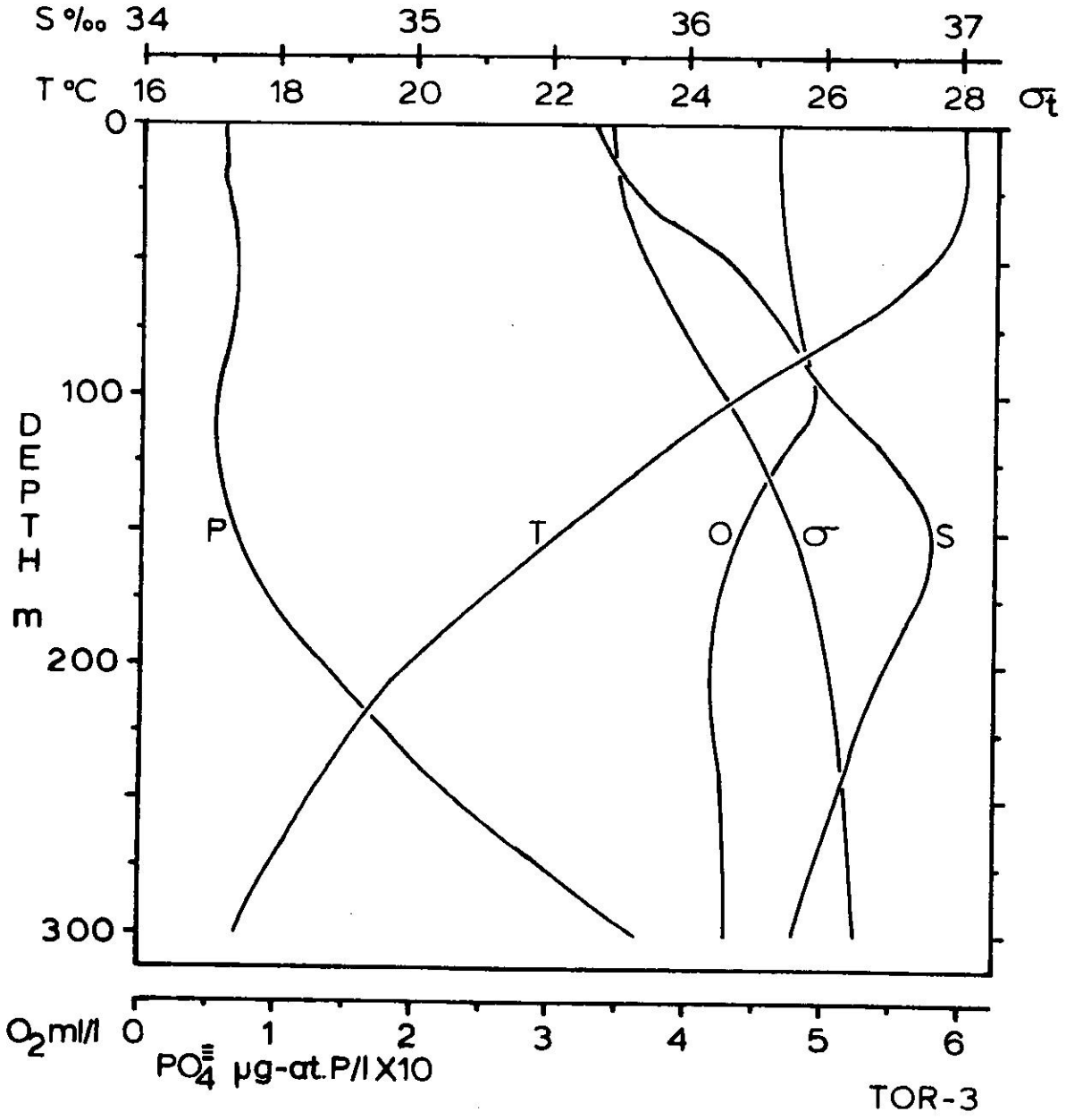


FIG. 2.1-F13 Averaged hydrographic parameter depth profiles for the summer seasons of 1973-74.

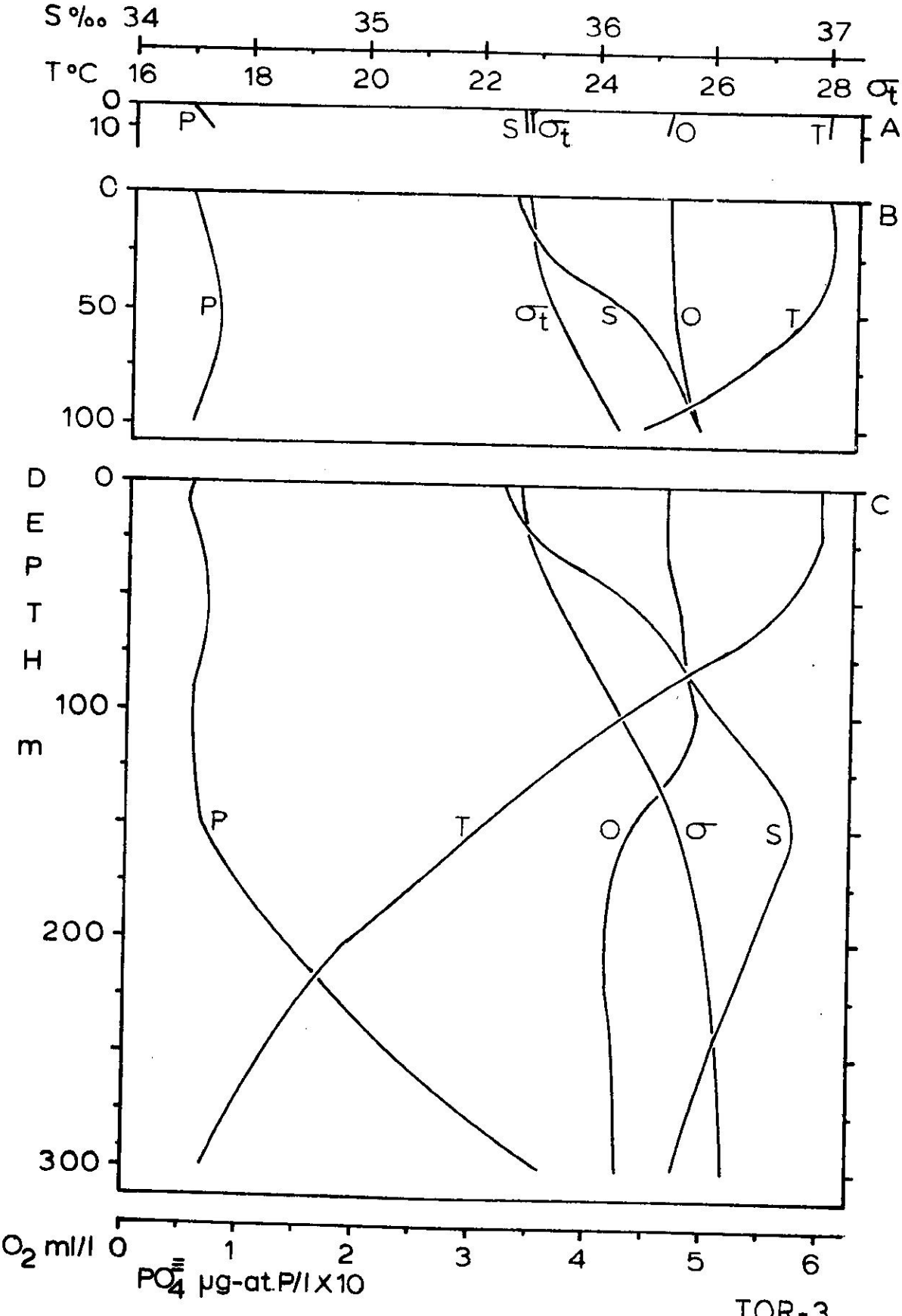


FIG. 2.1-F14 Depth profiles of hydrographic parameters averaged by type of station for the summer seasons of 1973-74.

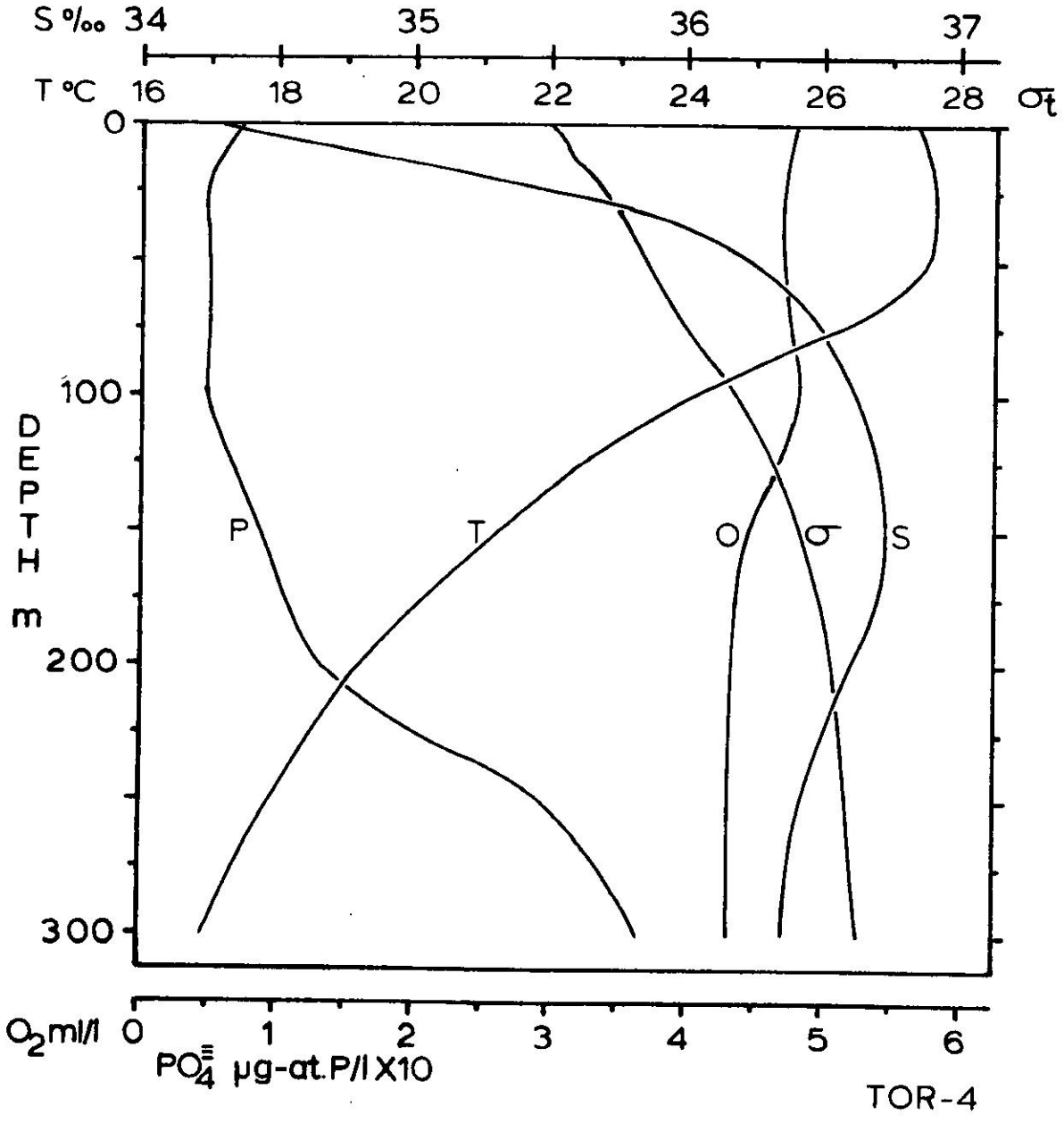


FIG. 2.1-F15 Averaged hydrographic parameter depth profiles for the fall season of 1974.

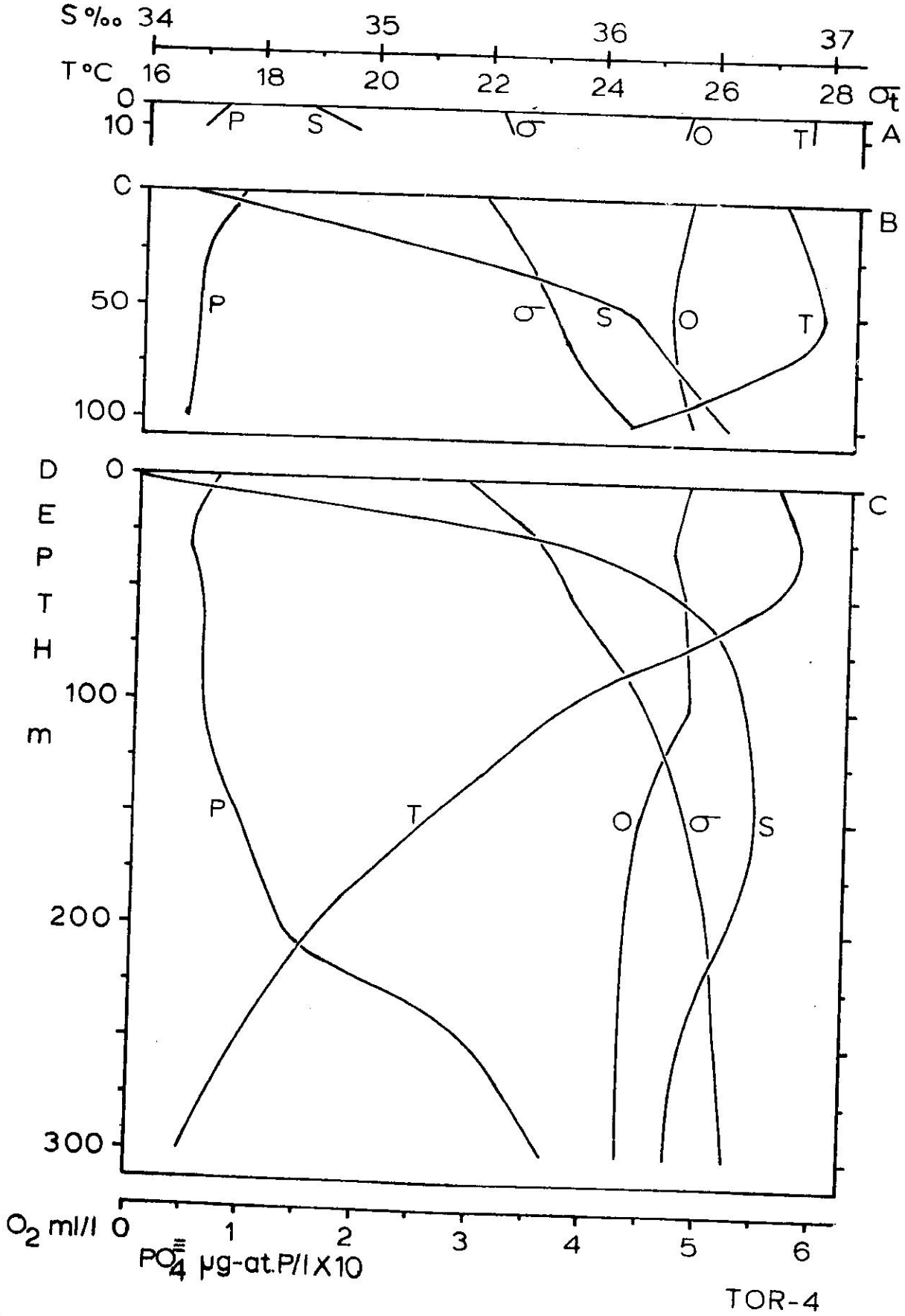


FIG. 2.1-F16 Depth profiles of hydrographic parameters averaged by type of station for the fall season of 1974.

A comparison of the averaged standard depth temperature data by season is shown graphically in Figure 2.1-F17. A sequence of events can be seen from this comparison. Surface temperatures are the lowest in the winter (25.9°C) with the deepest thermocline (100 m). It is interesting to note that the winter mixing transports heat downward so that the warmest temperatures at 100 to 200 m occur during the winter months. Little change is seen below 200 m. There is a steady temperature decrease in the 100 to 200 m region from winter to fall. No true thermocline exists during the spring when generally good weather conditions allow heating of the surface waters with little mixing compared to other seasons. Surface temperatures are at a maximum in the summer months (28.1°C) with a thermocline at about 30 m. There is a temperature range of about 2.2°C between summer and winter in the Tortuguero Bay near-shore surface waters.

A temperature inversion occurs in the fall when surface cooling takes place. The thermocline is at about 50 m with a generally reduced temperature below 100 m compared to the remainder of the year. Surface temperatures generally increased with distance slightly from shore in the winter and spring, but decreased in summer and fall (Figures 2.1-F10, 12, 14 and 16). This is probably a result of cooling by evaporation in the surf zone spray during the dry winter and spring months and generally warmer land temperatures and higher humidity during the summer and fall months.

Salinity

Salinity, S °/oo, is the total salt content of water expressed in parts per thousand. It is used along with temperature to typify ocean water masses. Low salinity usually occurs at the surface and indicates dilution by precipitation, run-off or fresh water intrusions. Salinities were determined to better than ± 0.005 °/oo with an induction salinometer. The averaged salinity data are shown in Figure 2.1-F18.

The surface salinity at the Tortuguero Bay site is usually about 35.8 °/oo. It increases with depth rather rapidly to a maximum of nearly 37 °/oo at about 150 m. The salinity then declines slowly with depth through 300 m. The high salinity layer is about 100-150 m thick and is formed by evaporation in the surface sub-tropical North Atlantic Ocean. The winter salinity profile (Figure 2.1-F18) shows a generally low salinity in the upper 150 m and the deepest maximum in sub-tropical high salinity water. The salinity maximum decreases slightly between summer and fall with a thickening of the high salinity layer. The salinity maximum drops from 150 to 175 m between fall and winter

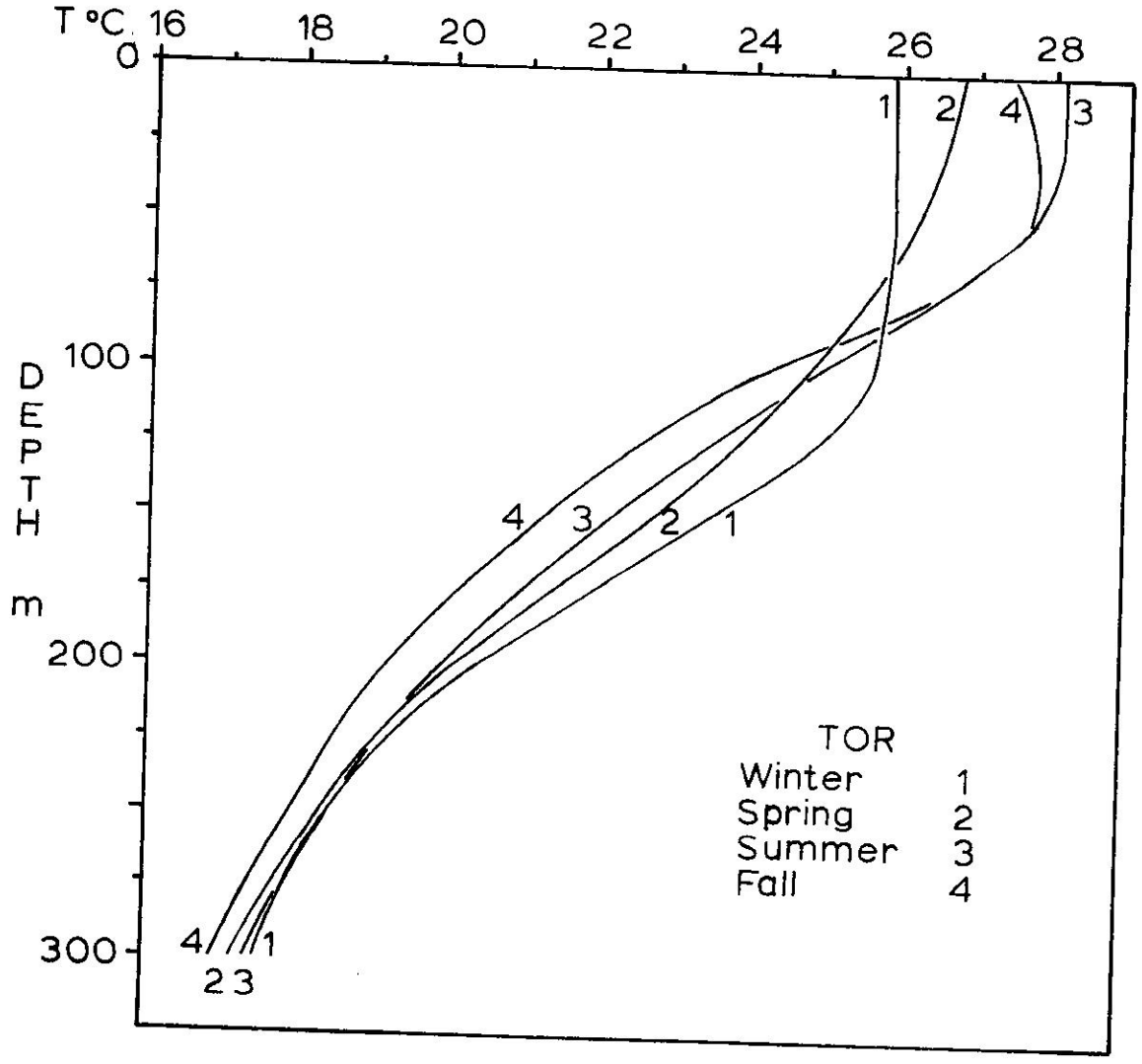


FIG. 2.1-F17 Averaged seasonal depth profiles of temperatures at Tortuguero Bay 1973-74.

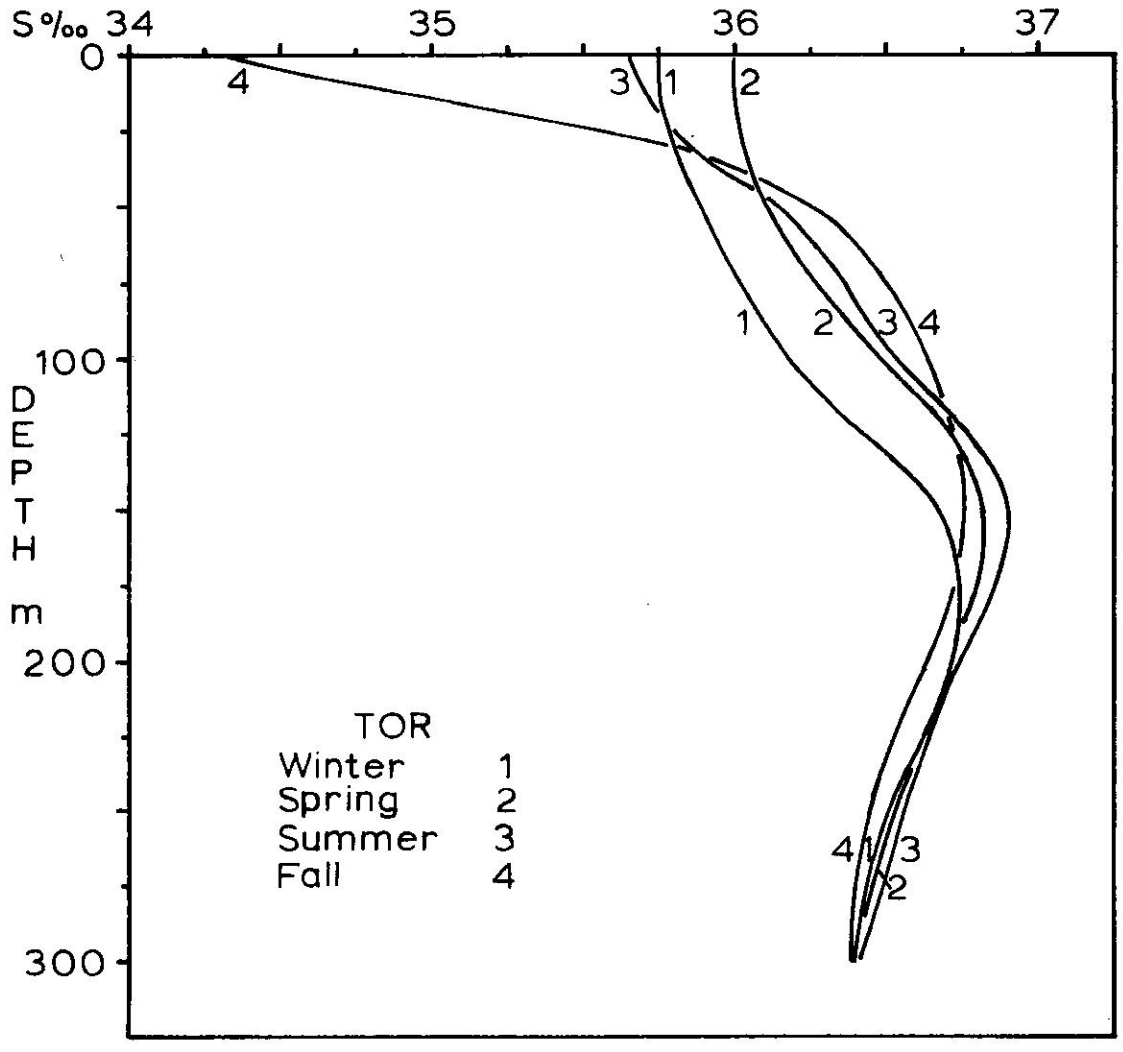


FIG. 2.1-F18 Averaged seasonal depth profiles of salinity at Tortuguero Bay 1973-74.

with a reduced thickness of the high salinity layer. The change in salinity is moderate below 25 m. Winter salinities are significantly lower between 25 and 175 m with slightly higher salt content at about 75 m in the fall profile. The most obvious anomaly is the low salinity surface water occurring during the rainy fall months. Surface salinities below 34 °/oo are not uncommon in the fall, especially near river mouths. The highest surface salinities occur in the late spring at the end of the dry season. Salinity between 50 and 100 m shows a steady increase from winter into fall with a rapid drop between fall and winter, probably as a result of storm mixing of low salinity surface water with high salinity sub-surface water.

Density

The stability of the water column is a function of the density gradient. Density, ρ, is a function of temperature and salinity (pressure is significant only at great depths) and always increases with depth in a stable water column. Density is usually converted for convenience to an expression, sigma-t, σ_t

$$\sigma t = (\rho - 1) \times 10^3. \qquad (2.1)$$

Small changes in sigma-t with depth indicate a well-mixed or unstable zone, whereas a high gradient is indicative of a very stable region of the water column.

A comparison of the seasonal sigma-t plots is shown in Figure 2.1-F19. Sigma-t varies from 22 to 24 in the surface waters and is highest in the winter months. The pyconocline occurs at about 100 m in winter because of deep storm mixing and generally cooler surface temperatures. The most stable water column occurs in the fall when surface water density decreases because of dilution. Very little seasonal change in sigma-t is seen at about 75 m and below 200 m.

An interesting phenomenon is the general increase in density between 75 and 200 m from winter to fall while the opposite sequence of events is noted in the surface waters.

A comparison of the surface water density at the A, B and C stations (see Figures 2.1-F10, 12, 14 and 16) shows a definite trend toward higher sigma-t values in the near-shore stations. This can be explained by a slight tendency for up-welling on the north coast of Puerto Rico from Ekman transport because of the general westward ocean flow and Coriolis force. Another mechanism which may produce higher density water nearshore is the increased evaporation in the surf zone which produces increased salinity and decreased temperatures.

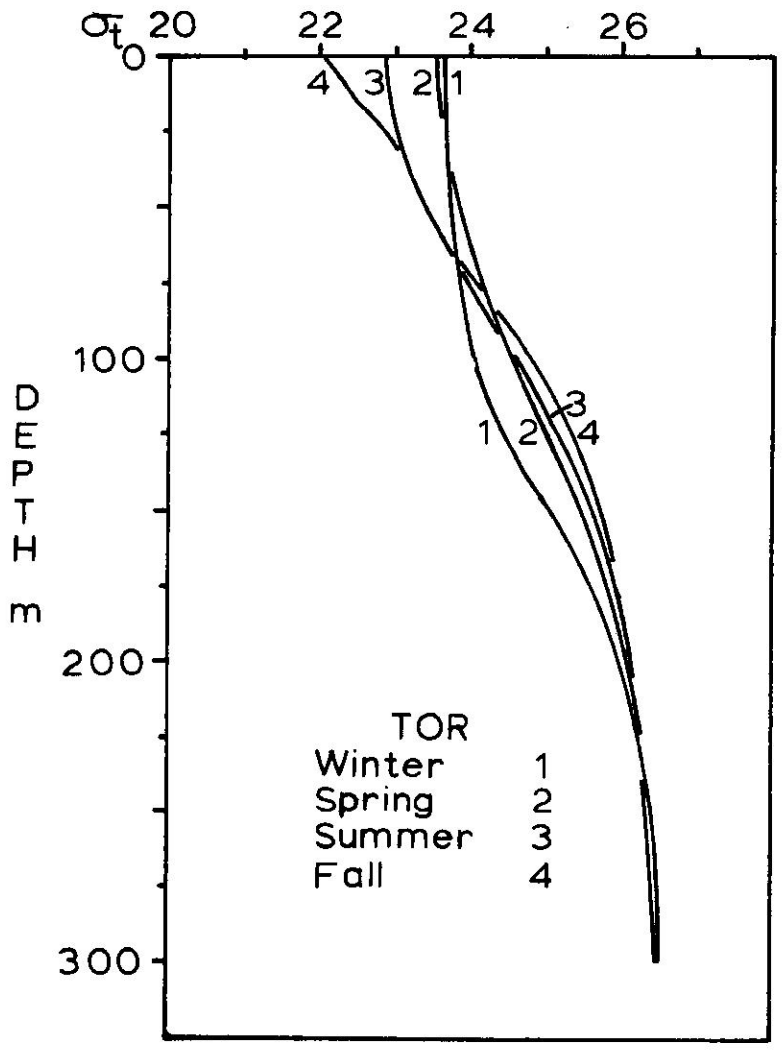


FIG. 2.1-F19 Averaged water density (sigma-t) plotted against depth by season for Tortuguero Bay 1973-74.

Averaged sigma-t profiles are plotted by season with other hydrographic parameters in Figures 2.1-F9 through 16.

2.2 CHEMISTRY

2.2.1 DISSOLVED OXYGEN

The amount of dissolved oxygen in the water off Tortuguero Bay was determined by the Winkler titration method with the analyses usually done on board within a few hours of collection of samples. Some of the values were checked with a YSI oxygen probe with results similar to those reported for Pt. Higuero (Wood, 1974). Oxygen values are usually good to better than ± 1%. However, some analytical problems were experienced on the 1973 winter cruise. Dissolved oxygen data are included with the hydrographic data in the Appendix 2.1A in ml/ℓ, mg/ℓ and % sat.

Oxygen saturation is a function of both temperature and salinity. Since neither shift drastically in the tropics, little change is expected in the dissolved oxygen content. Averaged dissolved oxygen values in milliliters per liter are plotted with other hydrographic parameters in Figures 2.1-F9 through 16 by season and type of station. The highest values, except for the winter season, are found at about 100 m. Surface values are near saturation with some super-saturation at depths of 25-75 m because of photosynthesis. A comparison of seasonal averaged values is shown in Figure 2.2-F1. The oxygen minimum occurs at 200 to 250 m where much of the organic matter raining down from the surface water begins to degrade. Saturation values here are about 75%. In the winter slightly lower oxygen values were noted than during other seasons below 200 m, but this may be due to the analytical inconsistency mentioned above.

2.2.2 NUTRIENTS

Nutrients are important from two aspects. First, nutrients are generally low in the tropical Atlantic Ocean and limit primary productivity. Second, the discharge of wastes from agricultural, municipal or industrial sources may contain such high nutrient levels that they cause eutrophication and local ecological degradation.

Reactive phosphate can be determined quickly and accurately with the Murphy and Riley molybdate complex method (Strickland and Parsons, 1968) and is a good indicator of pollution. Only limited nitrate analysis has been performed

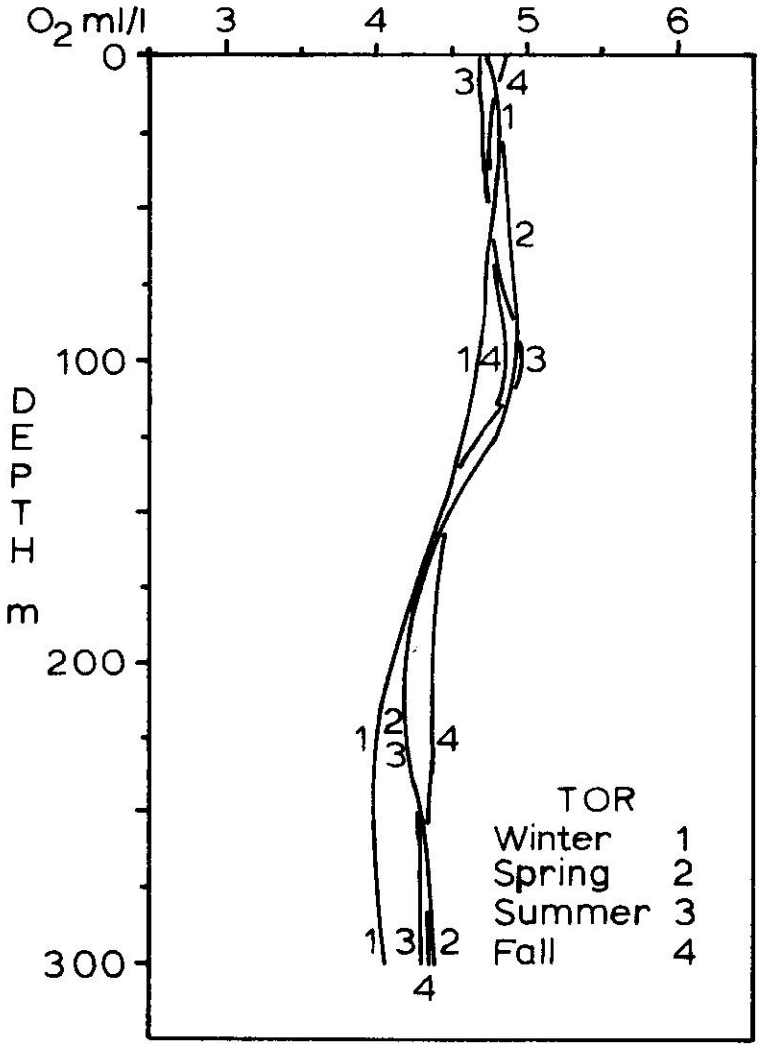


FIG. 2.2-F1 Averaged dissolved oxygen depth profiles by season, 1973-74.

on the waters off Tortuguero Bay because there exists a good relationship between phosphate, $PO_4^{\equiv}$, and nitrate, NO_3^-, in the open ocean (1:14) (except that nitrate is somewhat deficient in the tropical and sub-tropical Atlantic Ocean surface waters). Reactive silica is usually not regarded as a problem from a pollutant aspect.

Reactive Phosphate

The concentration of reactive phosphate is generally low in the surface waters (0.05 µg-at. P/1) to depths greater than 100 m. It then increases steadily to about 0.35 µg-at. P/1 at 300 m. A slight increase in phosphate was noticed in the surface waters in spring and fall over the other seasons (Figure 2.2-F2), at 100 m in the spring and from 225 to 300 m in the fall. The higher than average phosphate values in the fall at 225 to 300 m coincide with generally low temperatures and salinities for the same season (Figures 2.1-F12 and 13).

Nitrate

Nitrate was determined by the cadmium-copper reduction method (Wood, et al. 1967). Samples were analyzed for nitrate at Tortuguero Bay only for the fall 1974 season. (Nitrates have been done routinely at the Islote site about 10 km further to the west and the data are available in Kendall, et al. 1975).

A nitrate profile is shown in Figure 2.2-F3. It is similar to the phosphate profile for the same season with a slight increase in the surface concentration, very low values to below 100 m, and with a slight "hump" in the curve at about 250 m.

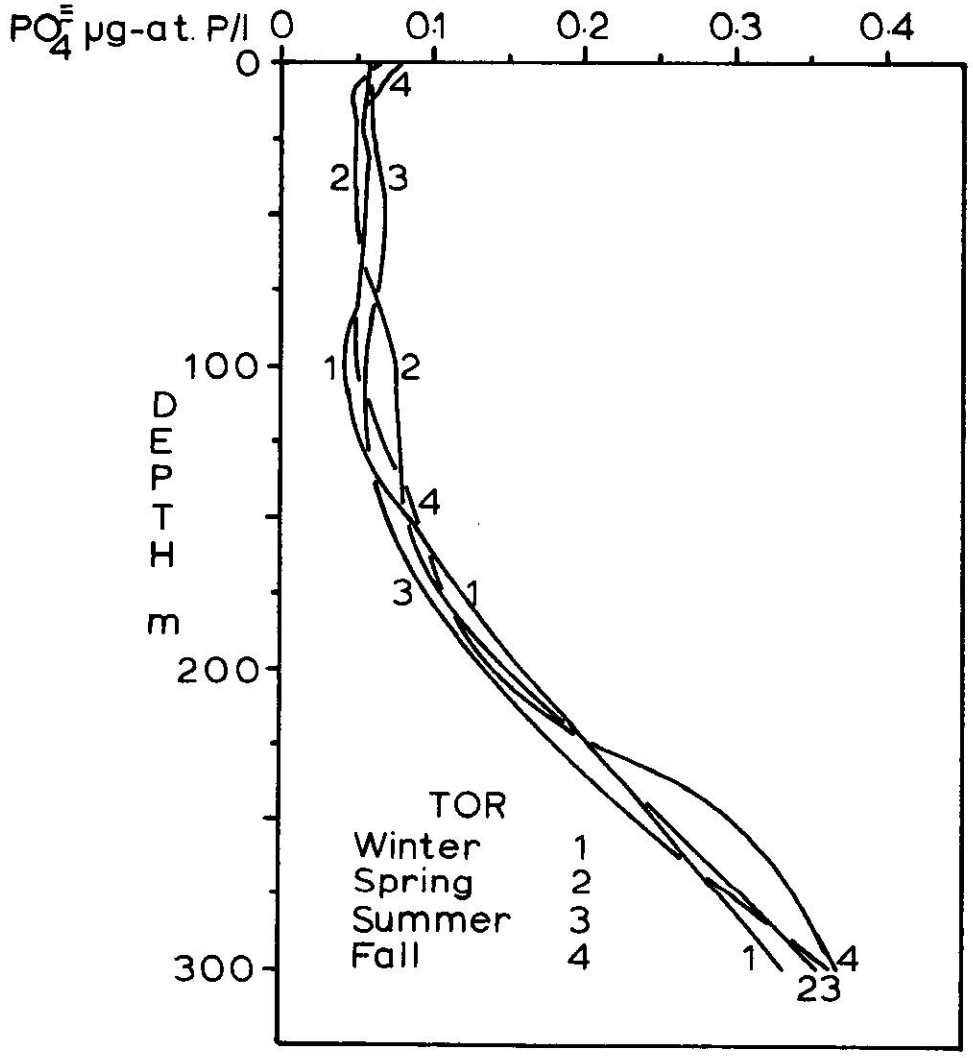


FIG. 2.2-F2 Averaged reactive phosphate depth profiles by season, 1973-74.

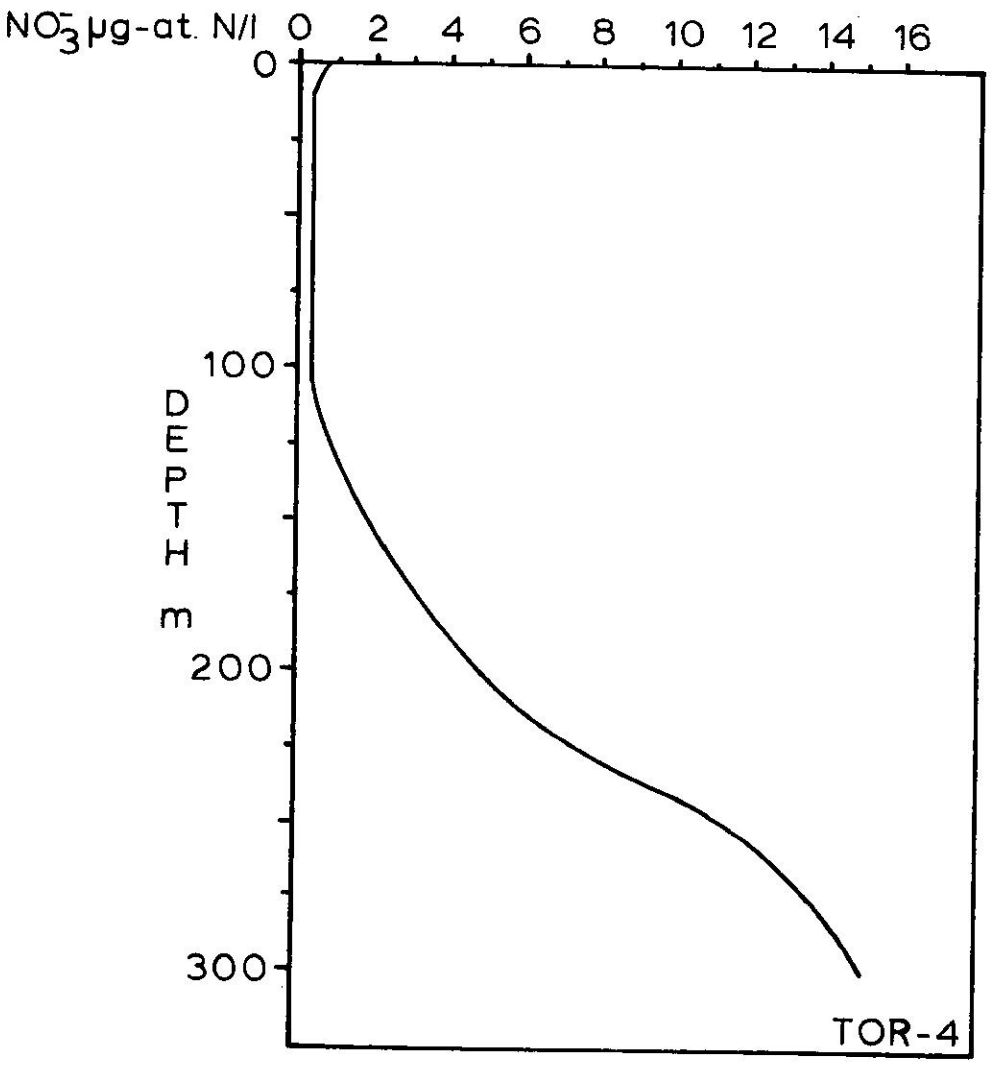


FIG. 2.2-F3 Plot of nitrate vs. standard depth for the fall season of 1974.

3.1 GEOLOGICAL PARAMETERS

The sediment in the Tortuguero Bay region is mostly medium to coarse sand composed of polished shell fragments with moderate amounts of quartz and volcanic rock fragments (Monroe, 1971). Bench deposits exist east from Pt. Chivato, north of Tortuguero Lagoon and behind the calcareous eolian sandstone outcrops west from Pt. Marchiquita (Figure 3.1-F1).

The source of sediments in Tortuguero Bay is predominantly from the beaches, rivers and reefs to the east since the strongest currents come from the east. The bay receives some protection from Pt. Chivato allowing sediments to accumulate between Pt. Chivato and Pt. Marchiquita.

Attempts were made to collect sediment samples at all "A" stations. Stations TOR-1A, 2A and 5A had hard bottoms. The only things retrieved at these stations were some bits of red algae. Samples were obtained at Stations TOR-3A, 4A and 6A. Portions of these samples were dried and sieved (ca 100 g dry wt.). The results are shown in Figure 3.1-F2. A histogram and an accumulative weight percent curve are shown for each of the three sediments. The size is in phi,

$$\emptyset = -\log_2 S \qquad 3\text{-}1$$

where S is the size (in mm) of the screen retaining the particular size fraction. Phi size increases with decreased sediment size.

The sediment from 3A (mean size, $\emptyset$=1.1) is well sorted. About 92% of the sediment is between 0.25 and 1 mm in diameter. Pt. Chivato is a high energy head land with only the more coarse sediments able to settle there. The size distribution plot in the middle of Figure 3.1-F1 shows this well with the principal sediment size being $\emptyset$= -1. The mean size is $\emptyset$= -0.7 with about 97% of the sediment larger than 0.5 mm. The histogram for the sediment at 6A is bi-modal, possibly indicating two types of sediments, e.g. coarse from marine sources and fine from rivers. The mean size is $\emptyset$=0.4 and a range from greater than 2 mm to less than 0.062 mm.

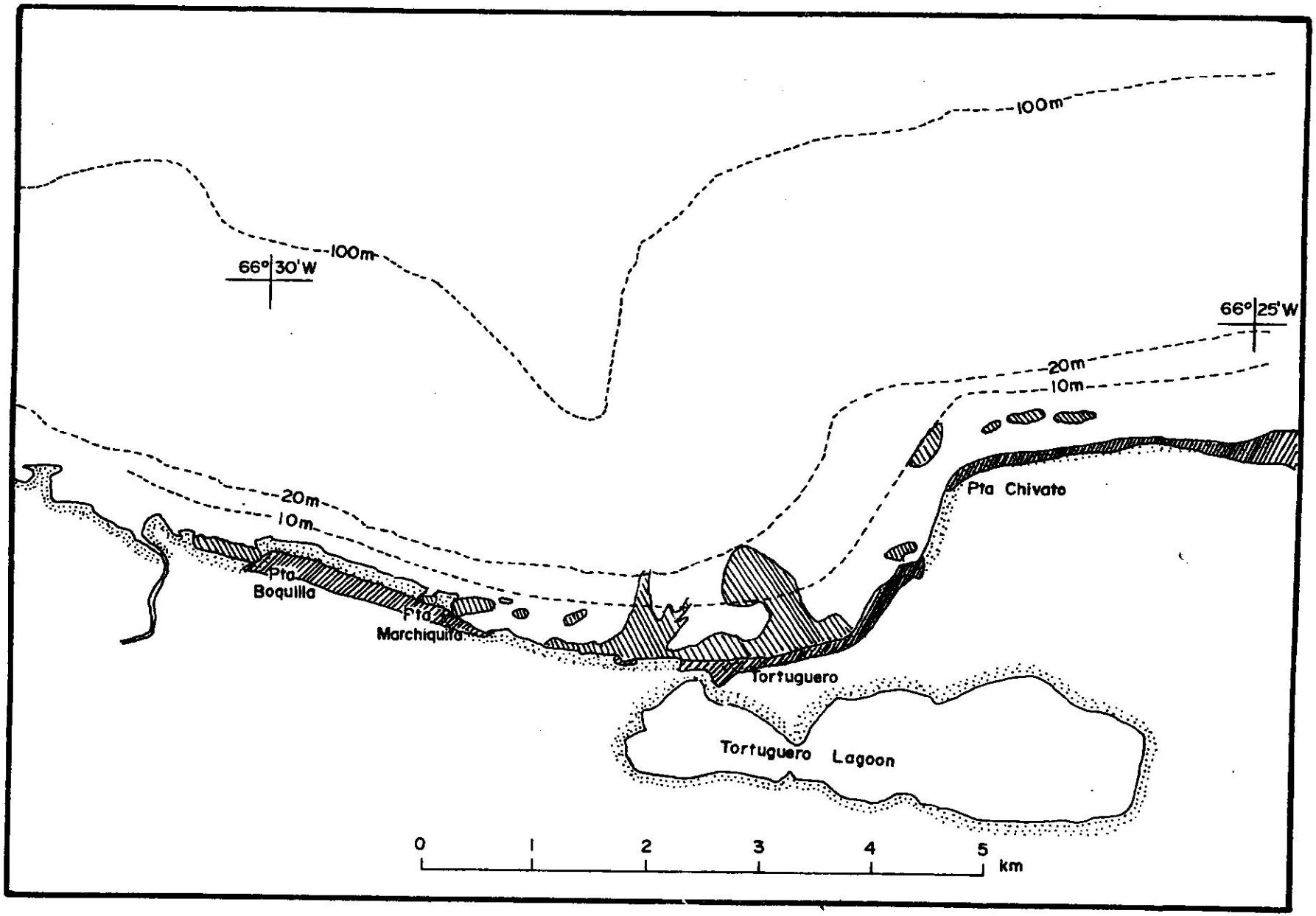
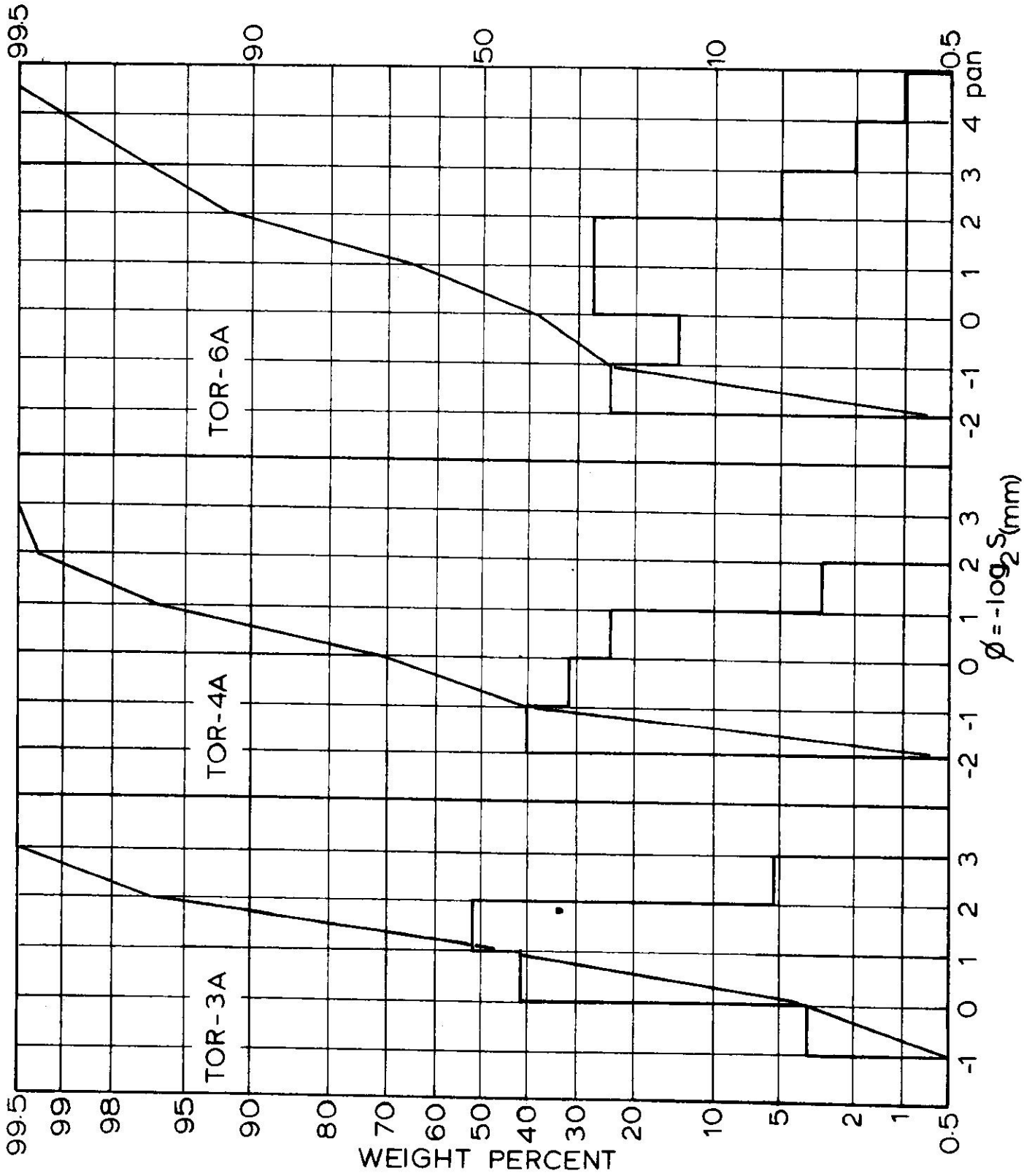


FIG. 3.1-F1 Deposits of unconsolidated sediments at Tortuguero Bay.

FIG. 3.1-F2 Histograms and cumulative weight percent plots of sediments from Stations TOR-3A, 4A and 6A.



4.1 ZOOPLANKTON STUDIES 1973

by Marsh J. Youngbluth

4.1.1 INTRODUCTION

The following report provides estimates of the abundance and density of zooplankton in the surface waters along a portion of the north coast of Puerto Rico. These data form one part of an environmental survey conducted by the Puerto Rico Nuclear Center. All collections were gathered in an area adjacent to the region proposed for the siting of a future power plant. Samples were gathered on 3 days during 1973, 29 January, 10 May, and 8 August.

4.1.2 MATERIALS AND METHODS

Field Procedures

Zooplankton were collected with a 1/2 meter diameter cylinder-cone shaped nylon net. This net was designed to reduce clogging error (Smith et al. 1968). Mesh size was 233 microns. The net was towed from a 17 ft skiff in a circular path through the upper 2 meters. The speed of the vessel ranged from 2 and 3 knots (determined with a Sims yacht speedometer). The duration of a tow was 10 minutes. After each tow, before the cod end was removed, the net was washed with sea water with the aid of a battery driven pump (12 volt, Jabsco water-puppy). The catch was preserved in 4% sea water formalin buffered to pH 7.6. All samples were gathered during the daylight hours. The volume of water filtered through a net was estimated with a flowmeter (TSK or General Oceanics Model 2030) suspended off-center in the mouth of the net. The volumes usually ranged from 100 to 150 m^3. The meters were calibrated every 2 months. Calibration factors fell within 8% of the mean.

At each site three tows were made in the area adjacent to the region where a power station may be located. Single tows were taken at the other stations. The regions sampled were chosen in such a way as to collect within and around the area where thermal alteration is likely to occur (Figure 4.1-F1).

Laboratory Procedures

Within 24 hours after samples were collected the pH was checked and adjusted, if necessary, to 7.6. If a sample contained a noticeable conglomerate of phytoplankton or detritus,

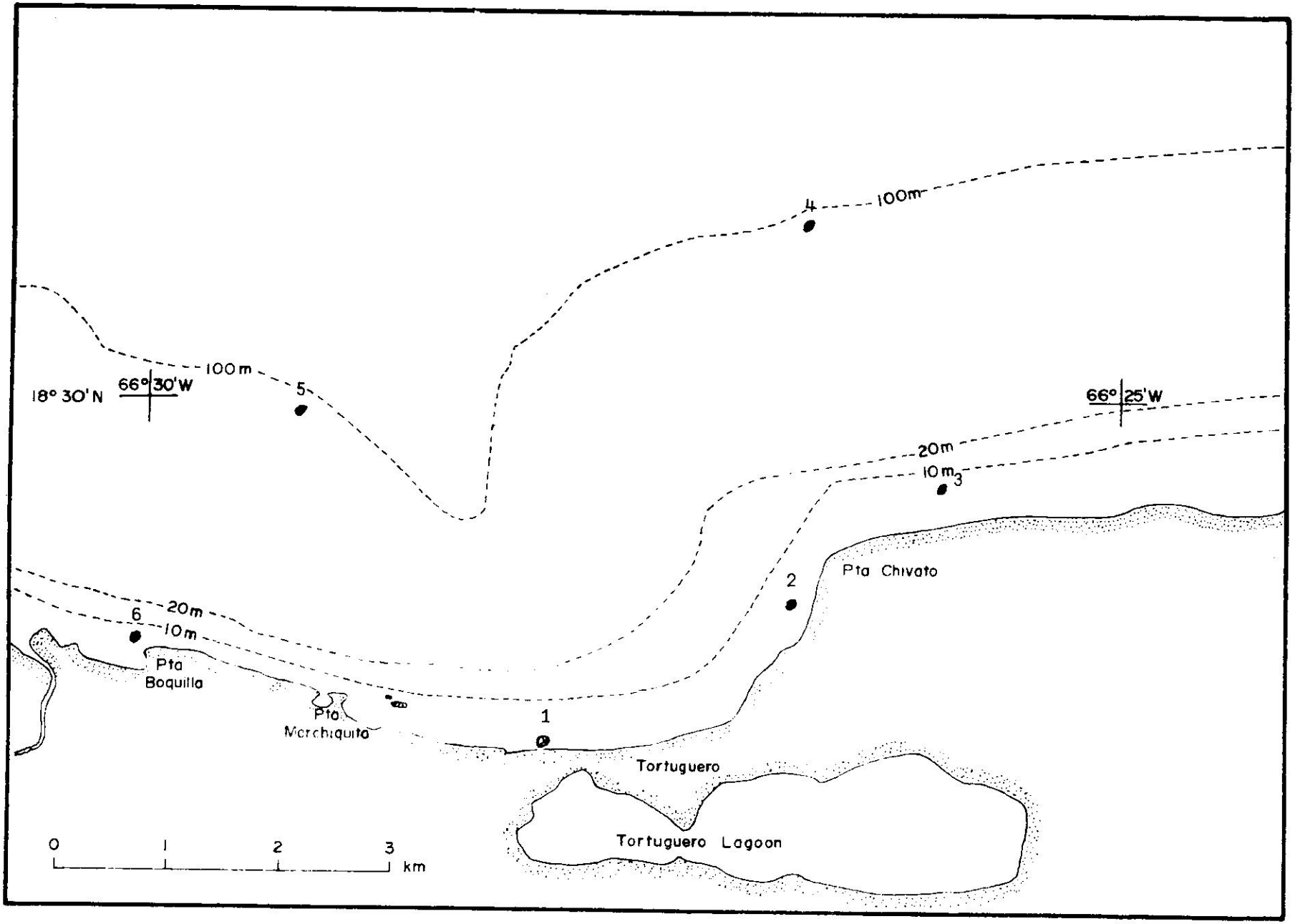


Fig. 4.1-F1. Location of 1973 Tortuguero Bay zooplankton stations.

the zooplankton were separated from such material by gentle filtration through 202 micron mesh netting. Before estimates of biomass or numbers were made all organisms larger than 1 cm, usually hydrozoan medusae, were removed.

Biomass was calculated as wet volume (Ahlstrom and Thraikill 1962). This estimate is subject to considerable error and should be viewed only as a rough measure of standing stock. The measurements were reproducible but are undoubtedly biased toward higher than actual values by the variable proportion of interstitial water and detritus.

The total number of organisms was estimated by volumetric subsampling with replacement (Brinton 1962). Three aliquots from each sample were counted. The abundance of major taxonomic groups of holoplankton and meroplankton were determined from dilutions of 300 to 500 organisms. Copepods, usually the most numerous of the zooplankters, were identified to species.

All biomass and enumeration data were standardized to a per cubic meter basis or multiple thereof. Data were initially reduced with hand calculators (Hewlett Packard Model 45) and more recently with a computer (PDP-10). See Appendix 4.1A for a listing of the program.

4.1.3 RESULTS

A total of 24 samples were collected from 6 stations (Figure 4.1-F1). The densities of several taxonomic groups of zooplankton at each station have been determined (Tables 4.1-T6-17). These data are arranged to facilitate comparisons between sets of consecutive tows, nearshore tows, and offshore tows. The densities of total zooplankton usually differed more between catches from different areas than between consecutive samples from one area. The degree of variation between samples is expressed as a ratio formed by dividing the largest total number of zooplankton by the smallest within each set (Table 4.1-T1). The ratios are similar to those observed in other coastal regions around Puerto Rico. Another way of judging differences between samples was determined by calculating the variance between consecutive samples and estimating the number of tows needed to detect various levels of difference (Table 4.1-T2).

TABLE 4.1-T1. Summary of ratios between the highest and lowest density values of total zooplankton during each period

DATE	29 January	10 May	8 August
Consecutive Tows	2.3	1.2	1.5
Nearshore Tows	5.5	2.6	2.2
Offshore Tows	10.0	1.0	1.1
All Tows	13.3	5.0	2.2

TABLE 4.1-T2. Total zooplankton ($\log_{10}$ transformed) from 3 sets of replicate tows. The number of replicate tows (n) needed to detect a $\pm$ 5 to 40% difference in density is indicated.

DATE STATION	10 May 1	8 August 1
	2.49276	2.58771
	2.51322	2.71349
	2.42160	2.54033
n5%	17	59
n20%	1	4
n40%	1	1

*$\frac{n=t^2 \times s^2}{d^2}$ Where (t) is Student's t for the 95% confidence level (d.f.=2), s^2 is the sample variance based on replicate tows, and d is the half-width of the confidence interval desired.

These data indicate that a large number of replicate tows would be necessary to detect density differences at the 5% level. However, on the average, differences of 20% can be noted with only 3 tows. Differences of 40% may be revealed with a single tow. Density estimates larger than 40% were found within and between nearshore and offshore catches. The range of density values during a sampling period was from two to thirteen-fold. Seasonal changes in the abundance of total zooplankton at any station fell within a small range, two to five-fold. The average concentrations of all zooplankton sampled during each period were quite similar and not significantly different since the 95% confidence intervals overlapped (Table 4.1-T3).

TABLE 4.1-T3. Average density of all zooplankton collected
Total Zooplankton/m^3

DATE	29 January	10 May	8 August
Range	48-642	107-554	216-477
Median	294	243	275
Mean	313	260	342
95% C.L.	±233	173	107

These fluctuations in density refer primarily to holoplanktonic organisms since they composed, in most cases, 70 to 90% of the total zooplankton. Meroplankton varied mainly between 6 to 20% and were most numerous during August. Both groups tended to be more abundant near the coast. Copepods dominated the holoplankton and the larvae of gastropods and decapods formed the bulk of the meroplankton.

Fish eggs in this area constituted a 1 to 20% of the total zooplankton (Table 4.1-T4). The largest density, 55/m^3, was observed at Station 5 in August. Fish eggs were always more abundant in the offshore catches and most numerous at all the stations in August when they averaged 27/m^3. The majority of the eggs were round and 0.5 to 2 mm in diameter. Oblong eggs were frequently observed but were never numerous. It is not known which groups of fish are represented by most of the eggs.

TABLE 4.1-T4. Summary of densities of fish eggs from all stations sampled

	STATION						
	Nearshore				Offshore		
	6	1	2	3	5	4	ALL
Range	17-25	4-23	6-14	5-22	22-55	13-29	4-55
Median	19	5	10	14	32	18	19
Mean	20	11	9	14	36	20	18

Copepods usually formed 50 to 70% of the zooplankton community. Since time did not allow a detailed examination of species abundance at all stations, one sample at Station 1 from each period was selected for study. The entire sample was scanned to form a species list and subsampled for quantitative analysis. A total of 33 species was identified. The species most numerous, those commonly observed, and others occasionally found, are listed in Table 4.1-T5.

TABLE 4.1-T5. Copepod populations observed at the Tortuguero Bay Site

Species usually most numerous (>5 individuals/m^3)

- *Clausocalanus furcatus*
- *Paracalanus* spp. (*P. aculeatus*, *P. crassirostris*, *P. parvus*)
- *Farranula gracilis*
- *Oithona* spp. (*O. plumifera*, *O.* spp)
- *Acartia spinata*

Species commonly present (observed on 2 or more sampling periods)

- *Temora* spp. (*T. turbinata*, *T. stylifera*)
- *Corycaeus* spp. (*C. giesbrechti*, *C. pacificus*, *C. speciosus*)
- *Oncaea* spp. (*O. mediterranea*, *O. venusta*, *O.* spp.)
- *Undinula vulgaris*
- *Calocalanus pavo*
- *Mecynocera clausi*

Species occasionally present

- *Calanopia americana*
- *Euchaeta marina*
- *Centropages* spp. (*C. furcatus*, *C. caribbeanensis*)
- *Corycaeus subulatus*
- *Scolecithrix danae*
- *Labidocera* spp.
- *Acrocalanus longicornis*
- *Acartia lilljeborgii*
- *Eucalanus* spp.
- *Lucicutia flavicornis*
- *Sapphirina tropica*
- *Pontella plumata*
- *Euterpina acutifrons*

4.1.4 DISCUSSION

The variety and abundance of zooplankton observed at the Tortuguero Bay site were similar at each station and throughout the year. Holoplanktonic forms dominated the zooplankton community. Meroplanktonic organisms, particularly the larvae of gastropods and decapods, and fish eggs were equally numerous. Zooplankton tended to be more abundant along the coast and fish eggs more dense further offshore.

Limitations of the Data

The sampling program was designed to provide quantitative estimates of: 1) the standing stock of zooplankton, 2) the variety of major taxonomic groups, and 3) the diversity and abundance of the more numerous copepod species. The manner of field sampling determined the variety and biomass of organisms encountered. The data in this report are based on collections made in the surface waters during the daylight hours. The sampling gear and methods were kept uniform, i.e., net type, net mesh, towing speed, and depth range sampled. A small number of replicate tows were gathered at each site to obtain some measure of the variability between samples. To obtain a better understanding of the zooplankton community more sampling with replication should be done at frequent intervals, at a greater number of stations, at different depths, during the day and night, and during different seasons for several years. Information gathered in these ways will be necessary to interpret fluctuations in standing stock and diversity in relation to environmental changes and biotic interactions.

TABLE 4.1-T6. Total biomass of zooplankton (ml/m^3) Tortuguero Bay Site

	Nearshore Replicate Tows Stations			Nearshore Tows Stations				Offshore Tows Stations	
DATE	1a	1b	1c	6	1	2	3	5	4
290173	.038	----	.052	.089	.045	.149	.139	.037	.007
100573*	----	----	----	----	----	----	----	----	----
80873*	----	----	----	----	----	----	----	----	----

TABLE 4.1-T7. Total number of zooplankton (number/m^3)

	Nearshore Replicate Tows Stations			Nearshore Tows Stations				Offshore Tows Stations	
DATE	1a	1b	1c	6	1	2	3	5	4
290173	162	----	71	311	117	642	276	481	48
100573	311	326	264	274	301	554	213	107	110
80873	387	517	347	216	417	395	477	287	262

*Not measured.

TABLE 4.1-T8. Total number of holoplankton (number/m^3) Tortuguero Bay Site

	Nearshore Replicate Tows Stations			Nearshore Tows Stations				Offshore Tows Stations	
DATE	1a	1b	1c	6	1	2	3	5	4
290173	127	----	62	248	95	580	221	439	34
100573	265	263	229	202	252	490	168	75	78
80873	317	364	268	161	316	284	335	210	201

TABLE 4.1-T9. Total number of meroplankton (number/m^3)

	Nearshore Replicate Tows Stations			Nearshore Tows Stations				Offshore Tows Stations	
DATE	1a	1b	1c	6	1	2	3	5	4
290173	29	----	6	28	16	37	22	8	14
100573	36	55	26	42	39	52	41	11	13
80873	41	59	53	29	51	89	123	22	30

TABLE 4.1-T10. Total number of copepods (number/m^3) Tortuguero Bay Site

	Nearshore Replicate Tows Stations			Nearshore Tows Stations				Offshore Tows Stations	
DATE	1a	1b	1c	6	1	2	3	5	4
290173	108	----	48	204	78	470	166	426	20
100573	209	194	182	156	195	386	151	52	56
80873	269	304	230	145	268	224	263	100	143

TABLE 4.1-T11. Total number of chaetognaths (number/10 m^3)

	Nearshore Replicate Tows Stations			Nearshore Tows Stations				Offshore Tows Stations	
DATE	1a	1b	1c	6	1	2	3	5	4
290173	40	----	37	196	39	556	284	29	17
100573	67	29	8	74	34	386	96	33	59
80873	248	337	186	54	257	367	378	169	178

TABLE 4.1-T12. Total number of larvaceans (number/$10m^3$) Tortuguero Bay Site

DATE	Nearshore Replicate Tows Stations 1a	1b	1c	Nearshore Tows Stations 6	1	2	3	Offshore Tows Stations 5	4
290173	112	----	80	101	96	144	149	103	115
100573	447	625	397	190	489	327	40	163	132
80873	178	223	170	38	190	179	200	822	290

TABLE 4.1-T13. Total number of veliger larvae (number/$10m^3$)

DATE	Nearshore Replicate Tows Stations 1a	1b	1c	Nearshore Tows Stations 6	1	2	3	Offshore Tows Stations 5	4
290173	110	----	9	190	60	148	121	22	4
100573	115	141	102	277	119	244	232	62	87
80873	159	234	279	187	224	395	515	67	103

TABLE 4.1-T14. Total number of caridean larvae (number/10m^3) Tortuguero Bay Site

	Nearshore Replicate Tows Stations			Nearshore Tows Stations				Offshore Tows Stations	
DATE	1a	1b	1c	6	1	2	3	5	4
290173	78	----	18	38	48	104	9	29	1
100573	133	38	38	14	69	59	53	+	7
80873	33	86	97	16	72	329	389	36	22

TABLE 4.1-T15. Total number of brachyuran larvae (number/10m^3)

	Nearshore Replicate Tows Stations			Nearshore Tows Stations				Offshore Tows Stations	
DATE	1a	1b	1c	6	1	2	3	5	4
290173	30	----	11	6	21	30	23	29	7
100573	11	21	34	56	22	50	56	2	7
80873	52	103	57	25	70	54	80	36	40

TABLE 4.1-T16. Total number of cladocerans (number/10m^3) Tortuguero Bay Site

	Nearshore Replicate Tows Stations			Nearshore Tows Stations				Offshore Tows Stations	
DATE	1a	1b	1c	6	1	2	3	5	4
290173	+	----	+	+	+	+	+	-	-
100573	+	+	+	11	+	210	2	+	2
80873	28	17	8	29	18	21	34	31	54

TABLE 4.1-T17. Total number of fish eggs (number/m^3)

	Nearshore Replicate Tows Stations			Nearshore Tows Stations				Offshore Tows Stations	
DATE	1a	1b	1c	6	1	2	3	5	4
290173	5	----	2	17	4	6	22	32	13
100573	3	4	6	19	5	6	5	22	18
80873	22	27	20	25	23	14	14	55	29

4.2 ZOOPLANKTON STUDIES 1974

by Mary E. Nutt

4.2.1 INTRODUCTION

The following report provides quantitative estimates of the biomass, abundance, and composition of the zooplankton at Tortuguero on 14 May, 15 August, and 31 October 1974. Comparisons are made with 1973 and 1974 samples from two other north coast sites, Islote (Nutt, 1975) and Manati.

4.2.2 MATERIALS AND METHODS

Field Procedures

Four stations were sampled on each occasion. Station 2 is located in 20 meters of water directly north of the proposed power plant site. This station was sampled with three replicate tows. Stations 1 and 3 lie on either side of Station 2. Station 4 is offshore at a depth of 100 meters (Figure 4.2-F1).

Oblique tows from the bottom to the surface were made with a 1/2 meter cylinder-cone shaped nylon net (202 μ mesh) towed at 2 knots. Oblique tows ensure that all zooplankton species are sampled regardless of their position in the water column at the time of sampling. This is important since many planktonic organisms migrate diurnally and will be found at different depths during different hours of the day. A 202 μ mesh net does not readily clog with phytoplankton and captures a wide size range of zooplankton organisms. The net was equipped with a digital flowmeter and approximately 100 m of water were filtered. Samples were preserved in 4% buffered formalin.

Laboratory Procedures

Samples were washed to remove phytoplankton and detritus, and all animals larger than 1 cc were removed. Approximately 24 hours after collection the biomass was measured by volume displacement (Ahlstrom and Thrailkill, 1962). Zooplankton abundances were estimated by subsampling; the sample was poured back and forth between two large beakers until thoroughly mixed, at which time a subsample was poured out. Repeated subsampling of a single sample showed all groups of organisms to be randomly distributed by this method. In all cases, subsamples contained more than 450 animals. Each animal was identified to major group and counted. The dominant copepods were identified to species.

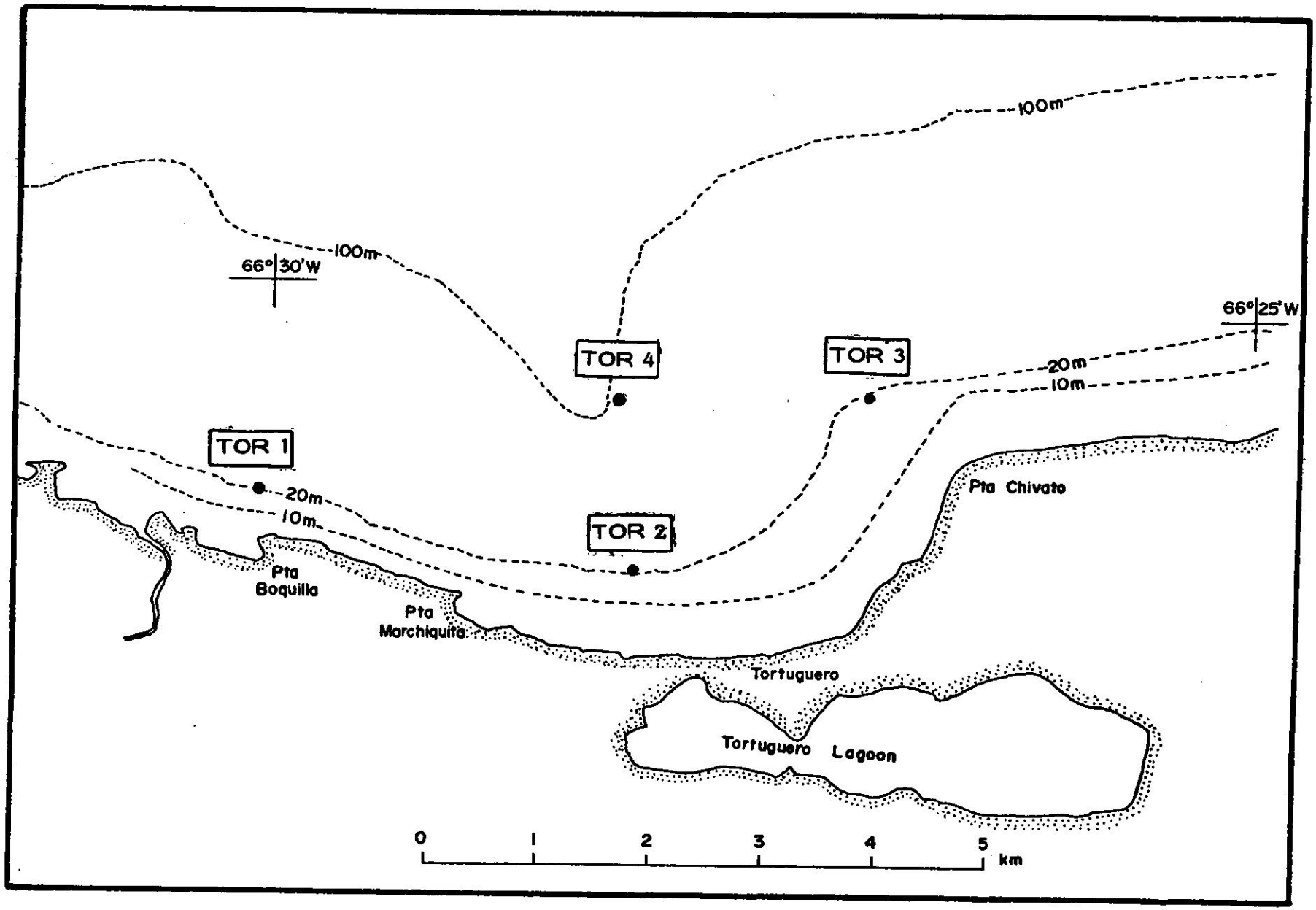


FIGURE 4.2-F1 Location of Tortuguero zooplankton stations.

When replicate tows were taken, confidence intervals were calculated from the equation,

$$\bar{y} \pm t\sqrt{s^2/n}$$

where $\bar{y}$ is the estimated mean, t is Student's t-value, s^2 is the estimated variance, and n is the number of samples.

4.2.3 RESULTS

Zooplankton found in Tortuguero samples are listed in Table 4.2-T1. Copepods are invariably the most abundant organisms, followed by fish eggs, chaetognaths, and larvaceans. Other animals such as ostracods, pteropods, and gastropod veligers are occasionally numerous, but are not always present in the plankton.

Copepods were represented by 45 species, but 80 to 90% of these consisted of four species (Temora turbinata, Clausocalanus furcatus, Paracalanus sp., and Oithona plumifera). Seven other species were consistently present (Temora stylifera, Nannocalanus minor, Calanopia americana, Arcatia spinata, Farranula gracilis, Corycaeus sp., and Oncaea sp.). The remaining copepod species appeared sporadically and in numbers less than 5 per cubic meter.

Fish eggs ranged in abundance from 39 to 122 per cubic meter. Most were clear, round pelagic eggs. No attempts were made at identification. Fish larvae ranged from 0 to 7 per cubic meter; no identifications were made.

Only one spiny lobster larvae was seen in all of the samples examined.

Zooplankton abundances at Stations 1 through 4 show no consistent differences and there is no evidence that distinct zooplankton assemblages exist at these locations. Figures 4.2-F2 and 4.2-F3 show the 95% confidence intervals for the more abundant zooplankton groups at Station 2: copepods, malacostracans, chaetognaths, larvaceans, fish larvae, and fish eggs, as well as total numbers, and biomass. Appendix 4.2A shows abundances of zooplankton groups for all stations and sampling dates. Appendix 4.2B shows abundances of the common copepod species for all stations and sampling dates.

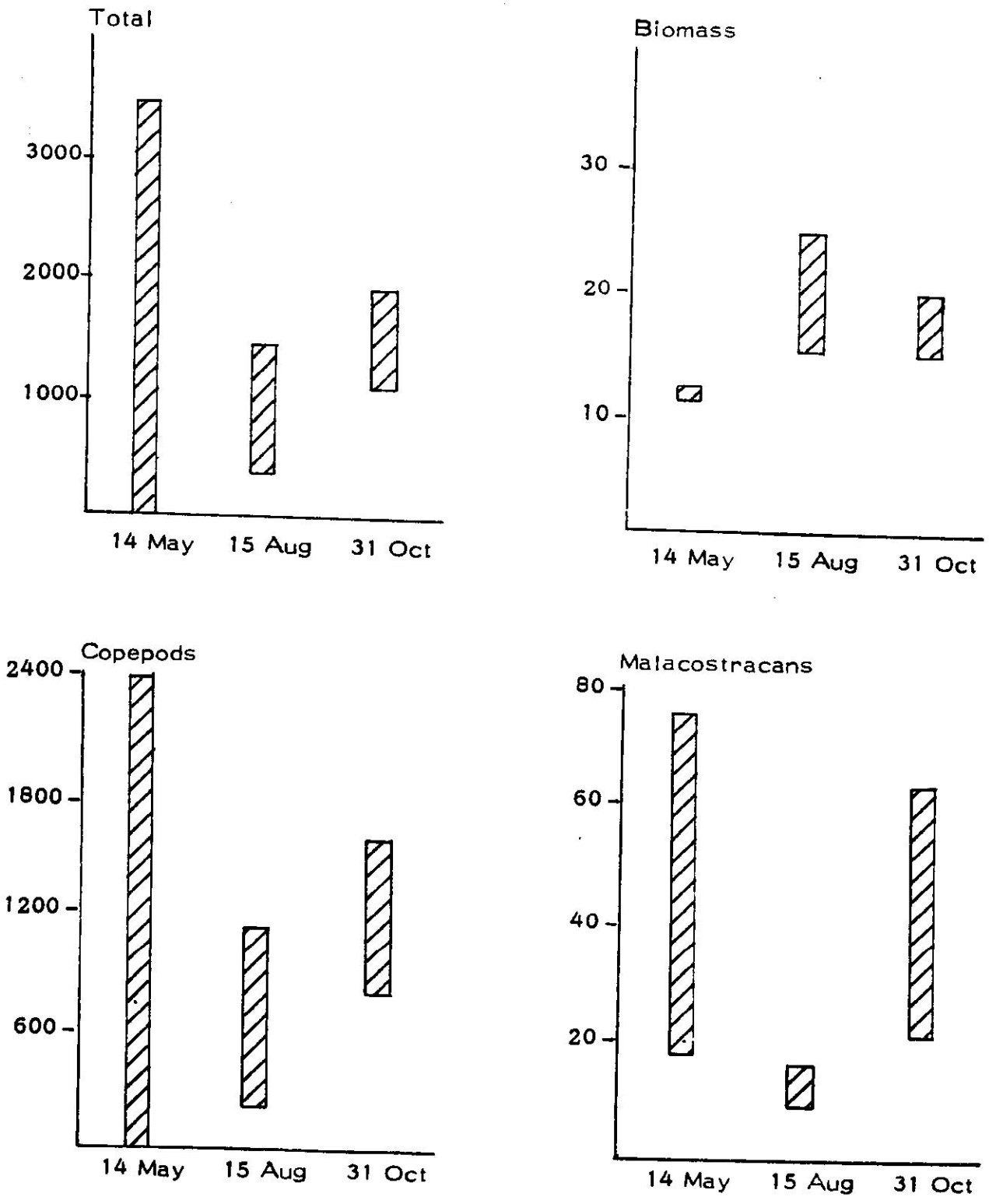


FIGURE 4.2-F2 Zooplankton Abundances at Station 2: 95% confidence intervals for total zooplankton, biomass, copepods, and malacostracans.

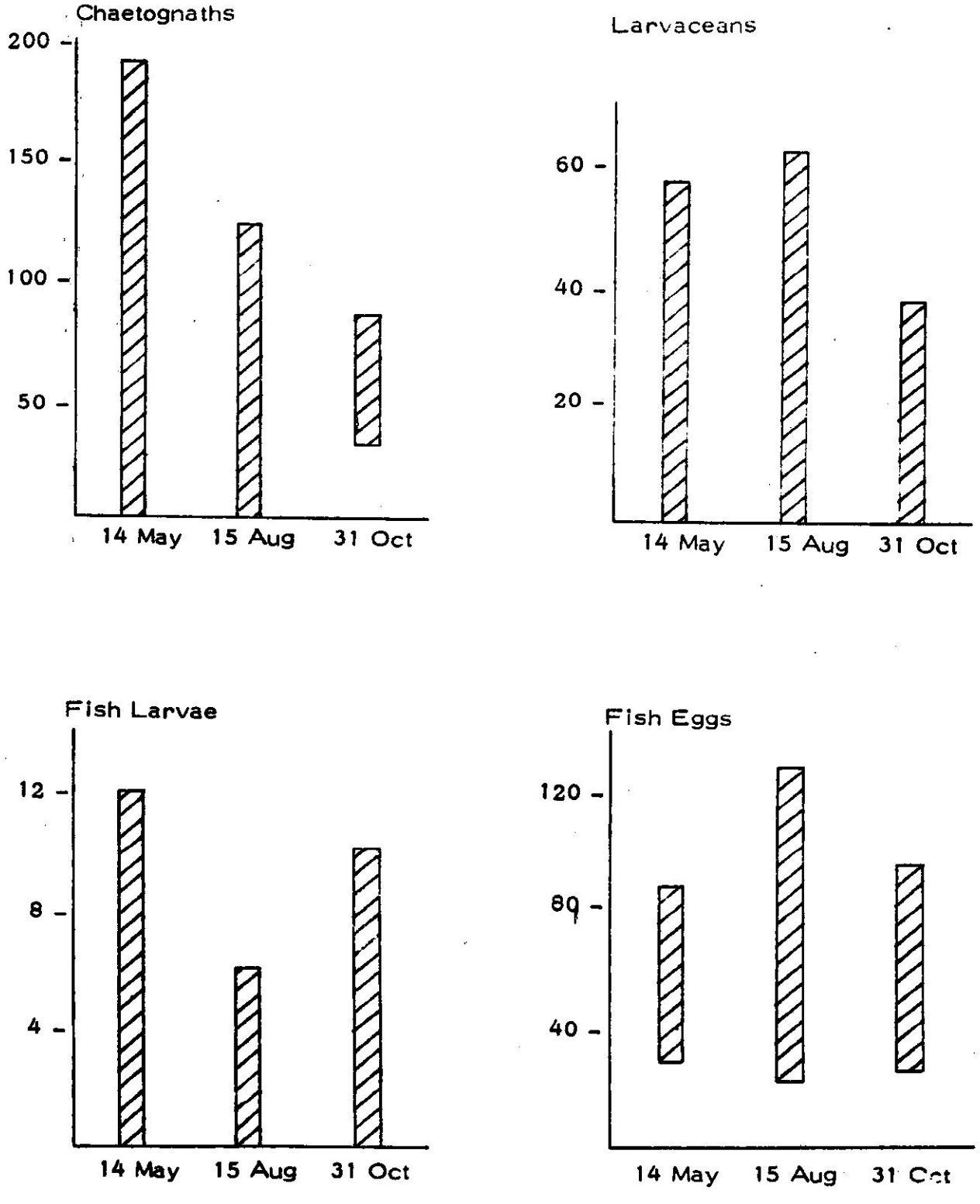


FIGURE 4.2-F3 Zooplankton abundances at Station 2: 95% confidence intervals for chaetognaths, larvaceans, fish larvae, and fish eggs.

TABLE 4.2-T1. Zooplankton from Tortuguero Bay

HOLOPLANKTON

COPEPODS

Calanoids:

Nannocalanus minor
Undinula vulgaris
Eucalanus attenuatus
Acrocalanus longicornis
Acrocalanus andersoni
Paracalanus aculeatus
Paracalanus parvus
Calocalanus pavo
Mecynocera clausii
Clausocalanus furcatus
Euchaeta marina
Scolecithrix danae
Temora stylifera
Temora turbinata
Pleuromamma gracilis
Centropages furcatus
Lucicutia flavicornis
Candacia pachydactyla
Paracandacia bispinosa
Calanopia americana
Labidocera sp.
Acartia spinata

Harpacticoids:

Miracia efferata
Macrosetella gracilis
Oculosetella gracilis
Euterpina acutifrons

Cyclopoids:

Oithona plumifera
Oithona setigera
Oithona oculata
Saphirella tropica
Copilia mirabilis
Copilia quadrata
Corycaeus (Corycaeus) speciosus
Corycaeus (Corycaeus) clausi
Corycaeus (Agetus) flaccus
Corycaeus (Agetus) typicus
Corycaeus (Urocorycaeus) lautus
Corycaeus (Onychocorycaeus) giesbrechti
Corycaeus (Onychocorycaeus) latus
Corycaeus (Onychocorycaeus) agilis
Oncaea mediterranea
Oncaea venusta
Saphirina sp.
Farranula gracilis

TABLE 4.2-T1 (continued)

CHAETOGNATHS

Sagitta hispida
Sagitta enflata
Sagitta tenuis
Sagitta serratodentata
Krohnitta nutabbii
Pterosagitta draco

LARVACEANS

Oikopleura sp.
Fritillaria pellucida

PTEROPODS

Limacina leseurii
Limacina retroversa
Creseis acicula
Styliola subula

OSTRACODS

Euconchoecia chierchiae

MEROPLANKTON

STOMATOPOD

AMPHIPODS

DECAPOD LARVAE

Caridea

Alpheus sp.
Acanthephyra sp.
Penaeidea
Scyllaridea
Palinurus sp.
Galatheidea
Porcellana sp.
Brachyura

SERGESTIDS

Lucifer sp.

CLADOCERANS

Evadne sp.
Penilia sp.

MEDUSAE

SIPHONOPHORES

CTENOPHORES

TUNICATES

Thalia democratica

POLYCHAETES

Tomopteris sp.

ECTOPROCT LARVAE

Membranipora membranacea

GASTROPOD VELIGERS

ANNELID LARVAE

CIRRIPEDE LARVAE

ECHINODERM LARVAE

Ophiopluteus larvae
Echinoplutes larvae

FISH LARVAE

FISH EGGS

Table 4.2-T2 shows individual values, means, variances, and confidence intervals for one set of replicate tows made on 31 October 1974 at Station 2. Most of the variances are significantly higher than their means (χ^2 distribution, variance to mean ratio) which indicates a non-random or patchy distribution. The confidence intervals are wide but realistic for marine zooplankton distributions (Wiebe and Holland, 1968) and must be considered whenever a mean value is used.

TABLE 4.2-T2. Variability among zooplankton replicate tows at Tortuguero, Station 2, 31 October 1974 (Abundances in numbers per cubic meter)

	Total Zooplankton	Copepods	Chaetognaths	Larvaceans	Malacostracans	Fish eggs	Fish larvae
Tow A	1460	1248	45	7	33	48	7
Tow B	1316	1037	57	25	44	57	3
Tow C	1641	1331	66	16	50	75	3
Mean	1472	1206	56	16	42	60	4
Variance	26481	22948	106	76	71	194	6
95% C.I.	1068 to 1876	830 to 1582	31 to 82	0 to 37	21 to 63	25 to 94	0 to 10

4.2.4 DISCUSSION

The zooplankton found at Tortuguero is similar to that found at Punta Manati and Islote in both species composition and abundance. See Figure 4.2-F4. No important differences between sites can be seen; when a particular zooplankton group dominates the plankton at Tortuguero it can usually be found at the other two sites.

A comparison with Youngbluth's data from the previous year (see Section 4.1 of this report) shows a substantial difference in the abundance of the organisms captured. It is suspected that this difference is due to the differences between surface tows (taken by Youngbluth) and oblique tows (taken by Nutt). A comparison between surface and oblique tows made at Islote (Nutt, 1975) illustrates this difference. In general, the same zooplankton groups and species were seen both in 1973 and 1974.

4.3 BENTHIC INVERTEBRATES AND FISH STUDIES

by Paul Yoshioka

4.3.1 INTRODUCTION

This report covers benthic and fish studies made at the Tortuguero Bay site from July, 1972 to September, 1974. Field studies were generally conducted on a quarterly basis. Study sites ranged from the intertidal zone to subtidal areas less than 30 meters in depth from the leeward side of Punta Chivato to midway between Punta Boquilla and Punta Marchiquita. However, not all areas and depths were studied in all seasons. The scope of studies ranged from preliminary and qualitative descriptive surveys to the establishment of permanent quadrats and the performance of several field experiments. Organisms examined in this study ranged from microscopic infaunal populations to the macroinvertebrates and fish.

During the latter part of this study a major portion of the effort was placed on the gorgonians, one of the more visually dominant groups at the Tortuguero Bay site. The gorgonians appeared to be appropriate objects of study because their large size contributes much to the physical structure of their habitat and, as such, probably makes them a major factor affecting the remainder of the biological community (Elton 1966). Also, the longevity of gorgonians implies that they are adapted to long-term environmental factors and, therefore, they may be useful indicators of environmental parameters whose time scales are measured in years. In addition, the Tortuguero Bay site appears to be unique among other north coast sites studied (Manati, Islote) in the dominance of gorgonians over the macroalgae at depths greater than 10 meters. A study of the gorgonian community would hopefully reveal those environmental factors responsible for the uniqueness of the benthic communities at Tortuguero Bay.

4.3.2 MATERIALS AND METHODS

Field Procedures

Field stations at the Tortuguero Bay site are shown in Figure 4.3-F1 and Appendix 4.3A. Field procedures are divided into three categories: shore surveys, transect dives, and station dives.

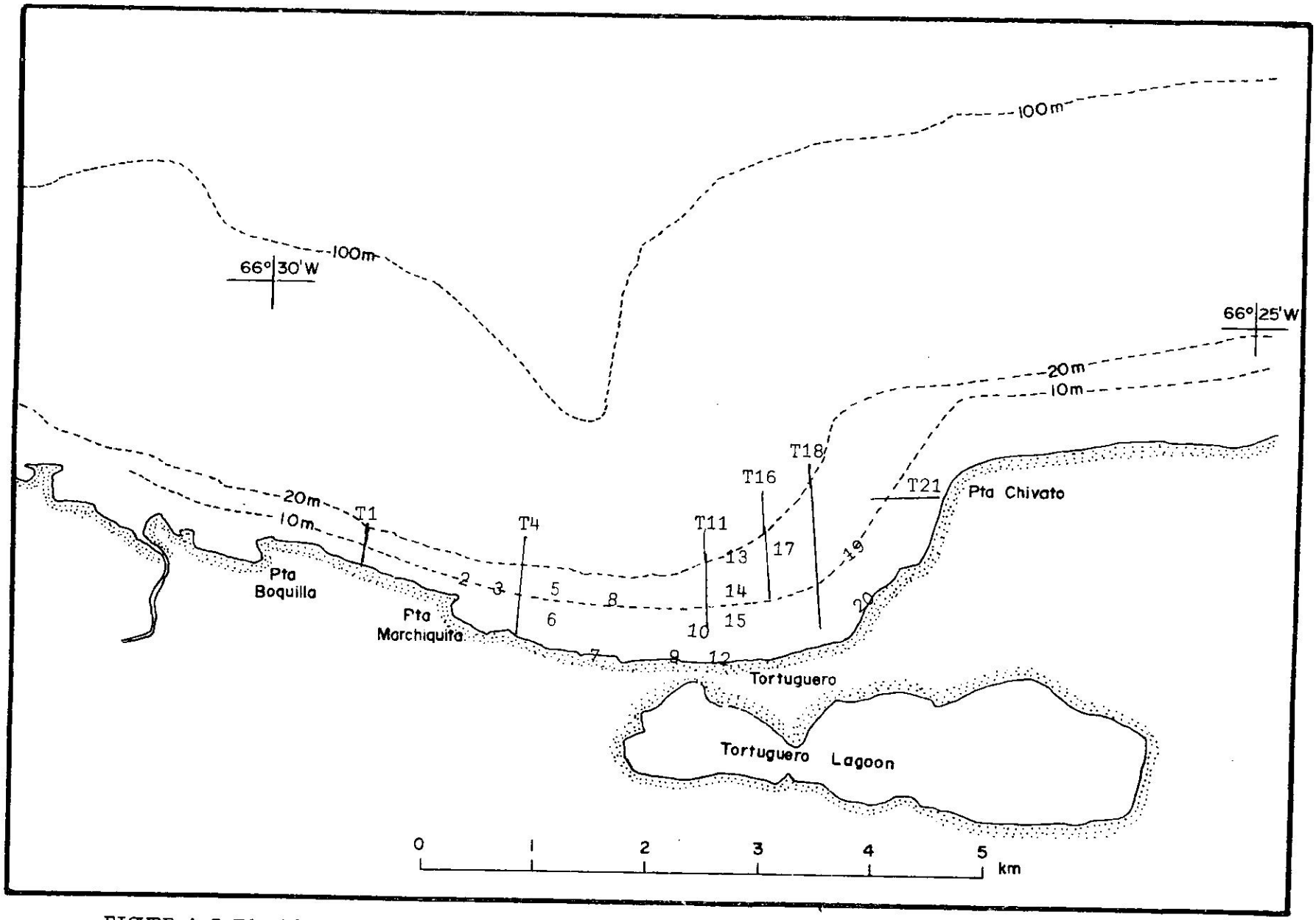


FIGURE 4.3-F1 Field stations at the Tortuguero Bay site.

Shore surveys. Shore surveys were descriptive in nature. The larger, more familiar organisms were identified in the field. Specimens of smaller or unfamiliar organisms were collected and identified in the laboratory.

Transect dives. Transects were traversed on a predetermined compass direction by two divers, either swimming or propelled by a diver propulsion vehicle (DPV). Notes were taken on depth, bottom type, topography, and predominant or unusual organisms. Most transects were run in a direction perpendicular to shore, thereby transversing a depth gradient. One transect was run parallel to the shoreline to observe changes in benthic communities relative to factors other than depth.

Station dives. Dives were made at various stations, usually to collect quantitative samples. Algae and bottom substrate were collected in 1/4 m^2 samples. Replicates were taken whenever possible. Algae were taken by hand, and bottom substrate with the aid of a hammer and chisel. Specimens were placed immediately in plastic bags held adjacent to the collecting site. Algae and/or bottom substrate were collected at Stations 5, 6, 19, and 20. Gorgonians were collected at Stations 1, 13, 14, 15, and 17 in five m^2 (1x5 m) or ten m^2 (2x5 m) subsamples. Gorgonians were collected from a total area of 10 or 20 m^2 at each station. Hard corals were collected from Station 14 and one 5 m^2 (1x5 m) quadrat at Station 17. Stations 8 and 14 were monitored to follow temporal changes in the fauna and flora.

Two permanent one m^2 (1x1 m) observation quadrats were placed at Station 14 in April, 1974. The gorgonians in these quadrats were measured, tagged, and identified to the lowest possible taxonomic level. The collection and observation quadrats were monitored to reveal the effect of gorgonians and/or corals on gorgonian recruitment in terms of species composition and absolute or relative abundance.

Photographs were taken, visibility and time permitting, to aid in gaining a general description of the area. The presence and absence of the larger invertebrates and fish were noted during the latter stages of the investigation. Relative abundance was noted from time to time.

Laboratory Procedures

Gorgonian samples were dried for several weeks, then weighed, measured and identified. The more familiar species were identified on the basis of external characteristics. Questionable individuals were identified with the aid of spicule preparations.

All other samples were sorted into phyogenetic groups and preserved in 70% ethyl alcohol or 10% formalin for later identification. One-fourth m^2 samples were often frozen prior to sorting. Taxonomic references used to identify organisms are listed in the bibliography.

4.3.3 RESULTS

Intertidal area. Both rocky shore and sandy beach habitats are found at the Tortuguero Bay site (Station 7 and 9). Organisms found, in these areas appear to be representative of those found in similar habitats along the north coast of Puerto Rico (Glynn, 1964). Species observed and identified in the intertidal zone are listed in Appendix 4.3B. Shoreline fishes identified at the Tortuguero Bay site are listed in Appendix 4.3C.

Shallow subtidal area. Both sand and rock bottom areas were encountered in the shallow subtidal areas of the Tortuguero Bay site. Species observed and identified in these areas are listed in Appendix 4.3D. Depth at the shallow subtidal stations ranged between one and five meters. No quantitative samples were taken.

Deeper subtidal areas. Sand appears to be the dominant substrate at depths greater than 20 meters at Tortuguero Bay. Occasional clumps of the plant Halophila and one patch of Udotea, and several individuals of the fighting conch Strombus pugilis and the starfish Astropecten were observed in this habitat. The blue runner Caranx fusus was the only species of fish observed in this area. A sandrock interface with large topographic relief was usually encountered at a depth of about 20 meters. The rock walls, almost vertical at places, rise up to 7 meters off the sand bottom. Sand channels, sometimes bordered by vertical rock walls, extend shoreward from this area for distances of over 100 meters, and to depths of about 14 meters. In this area of sand channels and high relief rock walls the visually most impressive abundance of benthic and fish life was observed. Fish schools consisting of from 50 to 100 individuals were often encountered. School species included snappers Lutjanus sp., the French grunt Haemulon flavolineatum, the porkfish Anisotremus virginicus and the yellow goatfish Mulloidichthys martinicus. Individuals or smaller groups of other species (listed in Appendix 4.3E) were quite abundant. These observations are similar to those of Smith (1973) who found that the greatest abundance of fish life was correlated with reef slopes or in areas of high topographic relief, apparently due to the shelter provided in such areas.

Gorgonians were quite abundant. Densities of the larger colonies (greater than 20 cm in height) were estimated to be between one and four colonies per square meter. Hard corals and sponges covered from one to 10% of the surface area.

In areas at the western edge of the Tortuguero Bay site (Station T4) the abundance of macroalgae appear to increase relative to the gorgonians and hard corals.

Species lists of the larger invertebrates observed and fish identified in these areas are listed in Appendix 4.3E.

The 10 to 14 meter depth range is characterized by a flat rocky substrate with relatively little topographic relief. In the immediate area near Punta Chivato, algae dominated by Sargassum become predominant. Elsewhere, the gorgonian and hard coral fauna are dominant and appear similar to those found in the 14 to 20 meter depth range (Appendix 4.3E). The average size of these corals and gorgonians appears to decrease with the lessening depth.

The most striking difference between this and deeper areas is the greatly diminished number of both individuals and species of fish. For instance, 12 species were recorded in the area of Station 14 located in this zone compared with 22 species at Station 8 located near the sand-rock interface. Fish schools were noticeably absent in this area.

In the 5 to 10 meter depth ranges, the hard corals, gorgonians, and sponges seem to diminish both in abundance and number of species. The abundance of brown and red algae greatly increases. The dominant alga appears to be Sargassum.

Quantitative Samples

Species identified in the 1/4 m^2 substrate samples are listed in Appendix 4.3F. The infaunal populations appear to be characterized by a very high species diversity. Over 130 species were found in the four samples. However, it is possible that the 1/4 m^2 quadrat does not adequately describe the structure of the infaunal community. The maximum number of species any two samples had in common was 11, and no species occurred in all samples. There was no correlation of the relative abundances of species between the samples. The differences between the samples cannot be ascribed entirely to differences in habitat; samples taken a few meters apart at other sites have shown even greater dissimilarities.

The most dominant organisms at depths greater than about 10 meters were the sponges, hard corals, and gorgonians. Measurements of the surface areas of the hard corals collected at Stations 14 and 17 indicated a 2% and 3% surface cover at the bottom, respectively, which correlated well with the visual estimates.

Gorgonian species and numbers of individuals per species collected at Stations 13, 14, 15 and 17 are shown in Table 4.3-T1. The relative abundances of species correlated significantly between subsamples at Stations 14 and 15 (Kendall-Tau, $p<0.01$). No significant correlation was found between replicate subsamples at Stations 13 and 17, but this was probably due to sampling variability arising from the small number of colonies collected. The density of gorgonian colonies apparently reaches a maximum at depths of about 12 meters which correlated with visual impressions gained on transects. The median height of colonies increased with increasing depth, 4 cm at Station 15 (10 meters), 13 cm at 14 (12 meters), 24 cm at 17 (17 meters), and 20 cm at Station 13 (20 meters). Differences in median heights are probably due to differences in species composition and recruitment, growth, and mortality rates.

The most frequent gorgonian species found throughout the Tortuguero Bay area was Eunicea laxispica. In addition, in October of 1974, Eunicea laxispica was the most abundant species in areas that had been cleared of gorgonians at Station 14 during the preceding May. Over 60% of the newly recruited colonies were Eunicea laxispica. Eunicea laxispica was frequently among the more abundant recruited in areas cleared at Punta Verraco, also. This life history parameter indicates that Eunicea laxispica is a fugitive or colonizing species (Hutchinson 1961).

Measurements of tagged gorgonians in the observation quadrats are given in Table 4.3-T2. The increase in colony height for all colonies present from June to October 1974 was one inch. Recruitment during this period in the observation quadrats was 1 and 5 colonies per m^2, respectively, Mortality as indicated by the disappearance of colonies was 5 and 1 colonies per m^2, respectively.

TABLE 4.3-T1. Gorgonian species and individuals per species collected at Tortuguero

	Station 13	Station 17	Station 14	Station 15
Depth	18 m	16 m	11 m	8 m
Date	10/30/74	3/21/74	5/22/74	8/13/74
Quadrat	2(5x2m)	2(5x2m)	2(5x2m)	2(5x2m)
	#Colonies/quadrat			
FAMILY PLEXAURIDAE				
Plexaura homomalla	3,1	0,0	14,14	0,0
Plexaura flexuosa	11,7	5,5	4,14	1,3
Plexaura sp. A	0,0	3,0	2,1	0,0
Plexaura sp. B	0,0	0,9	0,0	0,1
Pseudoplexaura porosa	0,0	1,0	1,1	0,0
Pseudoplexaura flagellosa	0,0	0,0	0,2	0,0
Pseudoplexaura wagenaari	0,0	0,0	0,3	0,0
Pseudoplexaura crucis	0,0	0,0	0,1	0,0
Eunicea laxispica	4,6	4,16	33,24	39,12
Eunicea tourneforti	0,0	6,4	6,20	8,5
Eunicea calyculata	0,0	2,0	4,6	1,2
Eunicea sp.	0,0	8,0	0,3	2,2
Eunicea clavigera	1,2	0,1	6,9	1,6
Eunicea asperula	0,0	0,1	0,0	0,0
Eunicea laciniata	0,0	2,11	0,0	0,0
Eunicea succinea	0,2	0,0	1,3	0,0
Eunicea mammosa		0,0	0,0	1,0
Muriceopsis flavida	2,1	2,11	6,8	0,0
Muriceopsis sulphurea		0.0	0,0	4,8
Plexaurella dichotoma	0,0	1,3	0,1	5,4
Plexaurella pumila	0,0	0,0	1,0	0,0
Plexaurella grisea	0,0	0,0	0,2	3,4
Plexaurella fusifera	0,0	3,0	0,0	2,0
Muricea muricata	0,0	0,3	0,1	0,0
Muricea atlantica	0,0	4,10	0,1	1,0
FAMILY GORGONIDAE				
Pseudopterogorgia acerosa	1,0	1,0	0,1	0,0
Pseudopterogorgia americana	0,1	0,0	0,1	0,2
Gorgonia ventalina	0,0	0,0	3,0	0,0
Gorgonia mariae	0,0	0,0	1,1	5,12
Pterogorgia guadalupensis	1,0	5,9	1,0	1,0

TABLE 4.3-T2. Heights of tagged gorgonians in observation quadrats at Tortuguero Bay

SPECIES	5 June 1974	13 August 1974	October 1974
First Meter Square			
Eunicea sp.	1 1/2"	3"	gone
Eunicea sp.	4"	4 1/2"	8 1/2"
Eunicea sp.	4 1/2"	5 1/2"	gone
Eunicea laxispica	2"	3"	3"
Eunicea laxispica	2"	3"	3"
Eunicea laxispica	7"	7"	8 1/2"
Eunicea laxispica	8"	9"	9 1/2"
Eunicea laxispica	-	-	1 1/2"(recruit?
Eunicea calyculata	1/2"	1 3/4"	gone
Pseudoplexaura sp.	5"	4 1/2"	4"
Muriceopsis sp.	13 1/2"	13 1/2"	gone
Muricea sp. (fallen down)	9"	9"	gone
Plexaura sp.	7 1/4"	8"	8 1/4"
Second Meter Square			
Pseudoplexaura	13 3/4"	15"	16"
Eunicea sp.	3 1/2"	3 3/4"	4 1/2"
Eunicea sp.	12"	12 3/4"	13 1/2"
Eunicea sp.	10 1/2"	10"	12 1/2"
Eunicea sp.	-	-	1 1/2"(recruit?
Eunicea sp.	-	-	3/4"(recruit?)
Eunicea laxispica	-	-	1/2"(recruit?)
Eunicea laxispica	3"	3 1/2"	3 1/2"
Eunicea tourneforti	5"	5 3/4"	5 1/2"
Eunicea	-	-	1"(recruit?)
Muricea sp. (fallen down)	10"	10"	gone
Pseudoplexaura sp.	-	-	1"(recruit?)
Plexaura sp.	3 3/4"	3 3/4"	4 1/2"

4.3.4 DISCUSSION

The intertidal and shallow subtidal biota of the Tortuguero Bay site appears to be fairly representative of areas along the north coast of Puerto Rico (Glynn 1964).

The infaunal populations appear to possess a very high species diversity. This feature has been found to be common to all substrate samples taken at all sites around the island. However, due to high sampling variability, the structure of the infaunal community could not be deduced.

Fish life at the Tortuguero Bay site appears to be quite abundant both in the number of species and individuals. The abundance of fish life is at least partially attributable to the physical complexity of the benthic terrain at Tortuguero Bay. Most of the fish were noted in areas of high topographic relief such as rock walls, ledges, and caves.

Another notable feature of the Tortuguero Bay site is the presence of such representative benthic coral reef species as sponges, scleractinian corals, and gorgonians. This is in contrast to other north coast sites (Manati, Islote) where the algae appear to be the dominant component of the benthic biota. This difference is at least partially attributable to the influence of Punta Chivato which provides protection against the prevailing northeasterly swell and its accompanying surge and scouring action. Only a few small gorgonians and a fair number of algae were noted at Station 2 which is partially protected by Punta Chivato. Further westward at Manati, the algae become dominant.

Physical disturbance due to heavy swell action probably also plays an important role in the control of the gorgonian community at Tortuguero Bay. The only noted gorgonian mortalities occurred in the observation quadrats on Oct. 30, 1974. Also, transect lines which had remained intact in previous visits from May, 1974 were broken on that date. Just prior to this period a severe storm from the northwest occurred. Its associated swell and surge action were probably responsible for the gorgonian mortalities.

Limitations of the Data

From July 1972 to the conclusion of this investigation, benthic studies at the Tortuguero Bay site have been directed by a number of different investigators. As a consequence, the research emphasis has altered in the course of the study.

There are little data relevant to seasonal or other temporal changes in the benthic communities at Tortuguero Bay. The preliminary portions of this study were necessarily concerned with general descriptive surveys of the Tortuguero Bay site. In such circumstances, only gross temporal change in the benthic communities would have been noted. Monitoring studies at permanent stations began with the terminal portions of this study, and site visits only occurred on a quarterly basis. It was impossible, therefore, to distinguish between seasonal and other temporal changes in the biota.

If the ultimate goal of any environmental study is the prediction of the effects of a pollutant on a natural community, many of the parameters which have been examined (species lists, distributions, biomass, diversity indices) in this or other investigations though often necessary as preliminary studies, are inadequate in this regard. Distributional studies or species lists no matter how complete provide little insight into the interactions of their component species. Diversity indices are highly speculative in their origin and their ecological implications remain a source of controversy (Fager 1972, Hedgpeth 1973). These parameters only provide a static outlook on a community.

What is required is an awareness of the dynamic processes responsible for the control and regulation of natural communities. In order to predict the effect of a disturbance such as thermal pollution, first it is necessary to understand the mechanisms which maintain the organization of a community, and then how these organizing mechanisms will be affected by this pollutant (Dayton 1972). Several studies have shown the ecological processes such as predation and competition are responsible for the observed structure of many natural communities (Janzen 1970; Harper 1969; Huffaker and Kenneth 1959; Brooks and Dodson 1965; Hall et al. 1970; Paine 1966; Conell 1961; Dayton 1971; Paine and Vadas 1969; Kitching and Ebling 1961; and Ogden et al. 1973).

Investigations of the mechanisms responsible for the structure and organization of the benthic communities at the Tortuguero Bay site were just begun at the termination of this study.

4.4 PLANT ASSOCIATIONS

by Michael J. Canoy

4.4.1 INTRODUCTION

The north central coast of Puerto Rico is bounded by a narrow beach/dune community. The mean height of the forest is 2-4 meters with coconut palms rising higher.

The Tortuguero Bay area shows typical xerarach-dune association. Secondary successional associations border the fields and roads.

The exposed beach and oceanward face of the dunes represent a continuous attempt by plants to maintain themselves in a high energy environment. One of the worest things that can happen to this association is disruption of the dune integrity. This allows erosion to begin and the association to be washed away.

4.4.2 MATERIALS AND METHODS

For the adjacent north coast sites (Tortuguero Bay, Punta Manati and Punta Chivato) a simple survey method was used. Beginning 1/2 kilometer west of the Manati site and continuing to 1/2 kilometer east of Punta Chivato, a transect following the coastal highway was covered. (See Figure 4.4-F1). Within every kilometer a 10 meter transect was walked on both sides of the road. The major vegetation along this transect was noted and unknown species were taken to the Mayaguez laboratory for identification.

At the end of each sample transect a one meter square was sampled for grasses, forbs, etc. The species list derived (Appendix 4.4A) was smaller but very similar to the extensive list derived from the study made at Barrio Islote (see Environmental Report for NORCO-NP-1), therefore it was assumed this method was qualitatively accurate.

4.4.3 RESULTS AND DISCUSSION

Generally the vegetation can be divided into three zones: the beach community, semi-xerophytic beach thicket, and the secondary growth around fields and roads.

1. The beach community is largely composed of Ipomea spp., Sporobolus, Kyllinga, and Remirea. This community is a very vagil entity and expands or contracts monthly. In storm periods it may disappear entirely and return a season later.

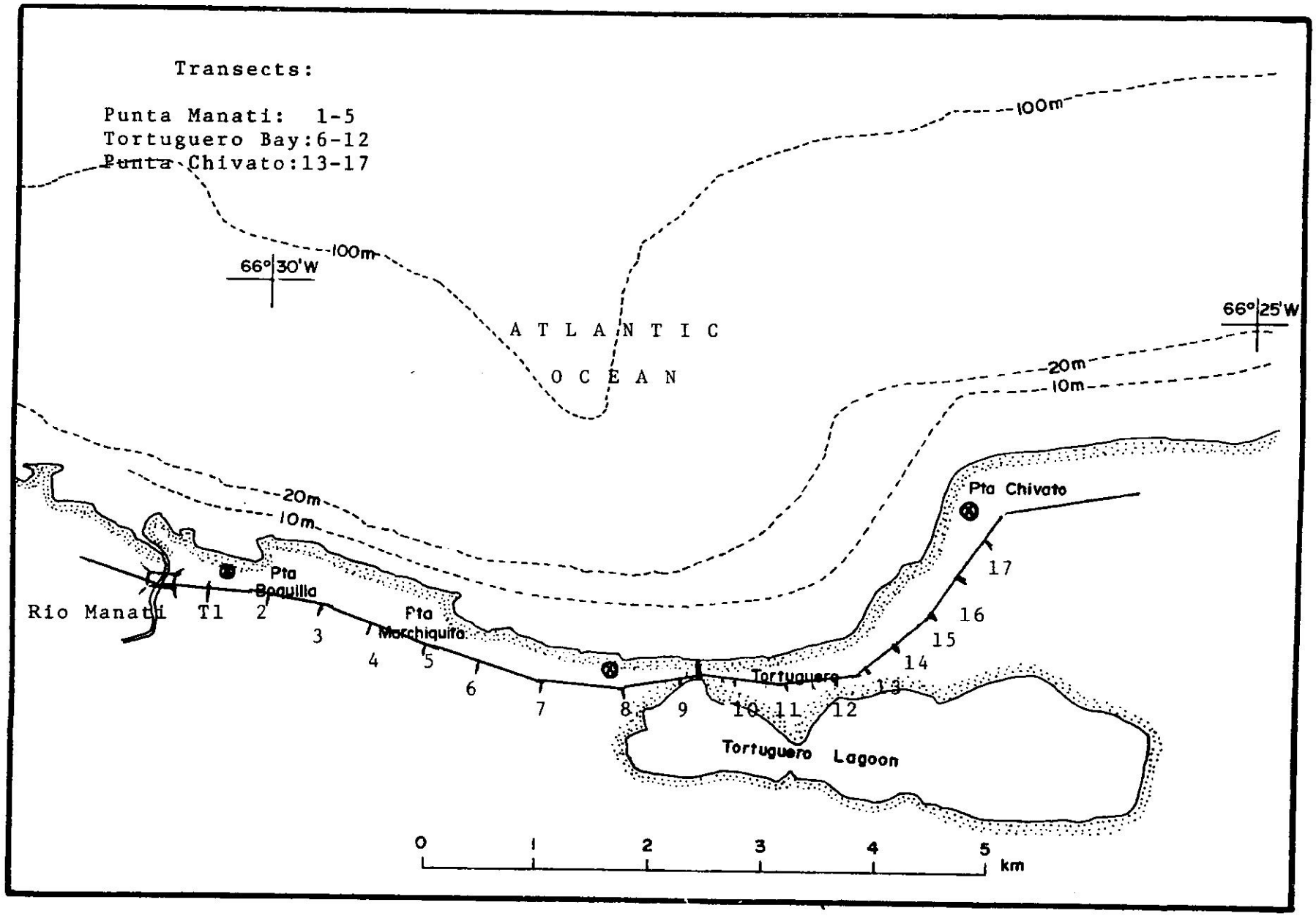


Fig. 4.4-F1. North Central Coastal Area Surveyed for Plant Associations

2. Beach thickets more or less extend from the mean storm wave level into the edge of the pasture and fields. The seaward edge of the thicket is about one meter in height. This increases inland to about 5-6 meters. A few coconuts, almonds, and Tabebuia reach 8-10 meters.

The most important pioneer shrub in the thicket is Coccoloba uvifera. Chrysobalanus and Scaevola and also such woody herbaceous plants as Lantana, Randia, and Crotalaria. The thicket ends where the shrubs Rauwolfia, Psychotria, and Plumiera give way to trees such as Tabebuia, Burserea and Sideroxylon.

3. Secondary growth is typically composed of human satellite plants such as Tabebuia, Coconut, Almond, and Black Olive. Flamboyan and Cassia trees appear occasionally and Mamey apples have been planted. Around human habitation are banana, plantains, oranges, and avocados. These plants should be surveyed for resident background radiation (total beta and gamma spectrum and total) prior to operating any nuclear facilities.

REFERENCES

Ahlstrom, D.H. and J.R. Thraikill, 1962. Plankton volume loss with time of preservation. CALCOFI Rept. 9: 57-73.

Almy, C.C., Jr. and C. Carrión-Torres, 1963. Shallow-water stony corals of Puerto Rico. Carib. J. Sci. 3(2&3): 133-162.

Bailey, R.M. (Chairman), 1970. A List of Common and Scientific Names of Fishes from the United States and Canada (Third Edition. Amer. Fish. Soc. Publ. No. 6: 1-149.

Bayer, F.M., 1961. The shallow-water Octocorallia of the West Indian region. Martinus Nijhoff, The Hague, Netherlands.

Bigelow, H.B. and W.C. Schroeder, 1953. Fishes of the Gulf of Maine. Fish and Wildl. Serv. Fish. Bull. 74, Vol. 53, U.S. Dept. of the Interior, GOP, Washington, D.C.

Bohlke, J.E. and C.C.G. Chaplin, 1968. Fishes of the Bahamas and Adjacent Tropical Waters. Acad. of Nat. Sci. of Phila., Livingston Publ. Co., Wynnewood, Pa.

Breder, C.M., Jr., 1948. Field Book of Marine Fishes of the Atlantic Coast. G.M. Putnam's Sons, New York.

Brinton, E., 1962. Variable factors affecting the range and estimated concentration of euphausiids in the North Pacafic. Pac. Sci. 16: 374-408.

Brock, V.E., 1954. A preliminary report on a method of estimating reef fish populations. J. of Wildl. Mgmt. 18(3): 297-308.

Brooks, J.L. and S.L. Dodson, 1965. Predation, body size, and competition of plankton. Science 150: 28-35.

Carpenter, E.J., S.J. Anderson, and B.B. Peck, 1974. Copepod and chlorophyll concentrations in receiving waters of a nuclear power station and problems associated with their measurement. Estuar. and Coast. Mar. Sci. 2: 1-25.

Casey, J.G., 1964. Angler's guide to sharks of the northeastern United States Maine to Chesapeake Bay. Bur. of Sport Fisheries and Wildlife, Circular 179, Washington, D.C.

Cervigon, F., 1964. Los Corycaeidae del Caribe suroriental (Copepoda, Cyclopoida). Mem. Soc. Science Nat. La Salle. 24: 163-201.

_____, 1966. Los Peces Marinos de Venezuela, Tomos I y II, Monografias Nos. 11 y 12, Fundacion La Salle de Ciencias Naturales, Caracas.

Chace, F.A., 1972. The shrimps of the Smithsonian-Bredin Caribbean Expeditions with a summary of the West Indian shallow-water species (Crustacea: Decapoda: Natantia), Smith Contr. Zool., No. 98.

Chaplin, C.C.G. and P. Scott, 1972. Fishwatcher's Guide to West Atlantic Coral Reefs. Livingston Publ. Co., Wynnewood, Pa.

Clark, H.L., 1933. Scientific survey of Porto Rico and the Virgin Islands. A handbook of the littoral echinoderms of Porto Rico and the other West Indian islands. N.Y. Acad. Sci. 16(1).

Connell, J.H., 1961. The influence of interspecific competition and other factors on the distribution of the barnacle Chthamalus stellatus. Ecology 42: 710-723.

Darwin, C., 1854. A monograph on the subclass Cirripedia. Ray Society, London. Repr. by Johnson Reprint Corp. (1968), New York.

Dawson, E.Y., 1956. How to Know the Seaweeds. William C. Brown Co., Dubuque, Iowa.

Day, J.H., 1967. A monograph on the polychaeta of southern Africa, Parts I and II. British Museum (Natural History), London.

Dayton, P.K., 1971. Competition, disturbance, and community organization: the provision and subsequent utilization of space in a rocky intertidal community. Ecol. Mon. 41: 351-389.

_____, 1972. Toward an understanding of community resilience of the potential effects of enrichments to the benthos at McMundo Sound Antarctica. Proc. Coll. Conserv. Prob. in Antarctica, Ed. B.C. Parker, Allen Press, p. 81-85.

Dukin, W.J. and A.N. Colefax, 1940. The plankton of the Australian coastal waters of New South Wales. Univ. Sydney Dept. Zool., Monogr. 1.

Elton, C., 1966. Animal Ecology. Sedgwick and Johnson, London.

Fraser, J.H. and V.K. Hansen (Eds.). Fiches d'Identification du Zooplankton. Conseil Permanent International pour l'Exploration de la Mer. Andr. Fred. Host & Fils, Copenhague.

Frost, B. and A. Fleminger, 1968. A revision of the genus Clausocalanus (Copepoda: Calanoida) with remarks on distributional patterns in diagnostic characters. Bull. Scripps Inst. Oceanogr.

Glynn, P.W., 1964. Common Marine Invertebrate Animals of the Shallow Waters of Puerto Rico. Inst. Mar. Sci., Univ. Puerto Rico, Mayaguez.

Gonzalez, J.G. and T.E. Bowman, 1965. Planktonic copepods from Bahia Fosforescente, Puerto Rico, and adjacent waters. Proc. U.S. Nat. Mus. 117(3513): 241-304.

Grice, G.D., 1960. Copepods of the genus Oithona from the Gulf of Mexico. Bull. Mar. Sci. 10: 485-490.

_____, 1961. Calanoid copepods from equatorial waters of the Pacific Ocean. Fish. Bull. 61: 1-246.

_____, 1963. A revision of the genus Candacia. Zool. Mededelingen. 38: 171-194.

Grigg, R.W., 1972. Orientation and growth forms of sea fans. Limnol. and Oceanogr. 17: 185-192.

Hall, D.J., W.E. Cooper, and E.E. Werner, 1970. An experimental approach to the production dynamics and structure of fresh water animal communities. Limnol. and Oceanogr. 15: 839-929.

Harper, J.L., 1969. The role of predation in vegetational diversity. Brookhaven Symp. Biol. No. 22: 48-62.

Hartman, W.D., 1955. A collection of sponges from the west coast of the Yucatan Peninsula with descriptions of two new species. Bull. Mar. Sci. Gulf Carib. 5(3): 161-189, and A color key to the sponges of La Parguera, Puerto Rico. Inst. Mar. Biol., Univ. Puerto Rico, Mayaguez, No. 1789.

Hedgpeth, J.W., 1973. The impact of impact studies. Helgol. wiss. Mures. 24: 436-445.

Huffaker, C.B. and C.E. Kenneth, 1959. A ten year study of vegetation changes associated with biological control of Klamath weed. J. Range Manag. 12: 69-82.

Huselman, K., 1966. A revision of the genus Lucicutia. Bull. Mar. Sci. 16: 702-747.

Hutchinson, G.E., 1961. The paradox of the plankton. Am. Nat. 95: 137-145.

Hyman, L.H., 1955. The invertebrates: Echinodermata. The coelomate Bilateria. Vol. 4.

Janzen, D.H., 1970. Herbivores and the number of tree species in tropical forests. Am. Nat. 104: 50-528.

Kaas, P., 1972. Polypacophora of the Caribbean region. Studies on the fauna of Curacao and other Caribbean islands. 41(137): 1-162.

Kendall, T.R., E.D. Wood, and T. Smith, 1975. Hydrographic data report, north coast of Puerto Rico, 1973-1974. PRNC Report-177.

Kinzie, R.A., III, 1973. The zonation of West Indian gorgonians. Bull. Mar. Sci. 23: 93-155.

Laubenfels, M. de, 1936. A discussion of the sponge fauna of the Dry Tortugas in particular and the West Indies in general, with material for a revision of the families and orders of the Porifera. Publ. Carneg. Inst. 467 (Paps. Tortugas Lab. 30): 1-225.

_____, 1949. Sponges of the western Bahamas. Am. Mus. Novit. 1431: 1-25.

Manning, R.B. Key to the genera and species of Western Atlantic Stomatopoda. After Schmitt, W.L., The stomatopods of the west coast of America, based on the collections made by the Allan Hancock Expeditions, 1933-1938. Allan Hancock Pac. Exped., 5(4): 129-255.

McLean, R.A., 1951. Scientific survey of Porto Rico and the Virgin Islands. The Pelecypoda of Porto Rico and the Virgin Islands. N.Y. Acad. Sci. 17(1).

Menzies, R.J. and P.W. Glynn, 1968. The common marine isopod crustacea of Puerto Rico. Studies on the fauna of Curacao and other Caribbean islands. 27(104): 1-133.

Monroe, W.H., 1971. Geologic map of the Manati Quadrangle, Puerto Rico- Map I-671. U.S.G.S., Dept. of the Interior.

National Oceanic Survey, 1972a. Tide Tables, 1973, East Coast of North and South America, NOAA, U.S. Dept. of Commerce.

_____, 1972b. North Coast of Puerto Rico, Chart No. C&GS 903. NOAA, Dept. of Commerce, Nov. 4, 1972.

National Weather Service, 1973. Raw weather data taken hourly at San Juan International Airport. NOAA, Dept. of Commerce, San Juan.

Nutt, M.E., 1975. Islote Environmental report, 1975. Puerto Rico Nuclear Center.

Ogden, J.C., R.A. Brown, and N. Salesky, 1973. Grazing by the echinoid Diadema antillarum Philippi. Formation of halos around West Indian patch reefs. Science 182: 715-717.

Opresko, D.M., 1973. Abundance and distribution of shallow-water gorgonians in the area of Miami, Florida. Bull. Mar. Sci. 23: 535-558.

Owre, J.B. and M. Fayo, 1967. Copepods of the Florida current. Fauna Caribaea 1: 1-137.

Park, T.S., 1970. Calanoid copepods from the Caribbean Sea and Gulf of Mexico, 2. New species and new records from plankton samples. Bull. Mar. Sci. 20: 472-546.

Provenzano, A.J., 1959. The shallow-water hermit crabs of Florida. Bull. Mar. Sci. Gulf and Carib.,9(4): 349-420.

_____, 1961. Pagurid crabs (Decapoda, Anomura) from St. John, Virgin Islands, with descriptions of three new species. Crustaceana, 3(2): 151-166.

Puerto Rico Nuclear Center, 1972. Preliminary report on the survey of Tortuguero Bay site for the installation of nuclear power plants. Report to Puerto Rico Water Resources Authority, Aug. 23, 1972.

_____, 1974. PRNC-174. Punta Higuero power plant environmental studies 1973-1974. Report to the Puerto Rico Water Resources Authority.

Rathbun, M.J., 1933. Scientific survey of Porto Rico and the Virgin Islands. Brachyuran crabs of Porto Rico and the Virgin Islands. N.Y. Acad. Sci. 15(1).

Roos, P.J., 1971. The shallow-water stony corals of the Netherlands Antilles. Studies on the fauna of Curacao and other Caribbean islands. 37(130):1-108.

Rose, M., 1933. Copepodes pelagiques. Faune Fr. 26: 1-374.

Schmitt, W.L., 1935. Scientific survey of Porto Rico and the Virgin Islands. Crustacea Macrura and Anomura of Porto Rico and the Virgin Islands. N.Y. Acad. Sci. 15(2): 125-227.

Schultz, G.A., 1969. How to Know the Marine Isopod Crustaceans. William C. Brown Co., Dubuque, Iowa.

Shoemaker, C.R., 1935. Scientific survey of Porto Rico and the Virgin Islands. The amphipods of Porto Rico and the Virgin Islands. N.Y. Acad. Sci. 15(2): 229-262.

Smith, F.G.W., 1971. Atlantic Reef Corals. Univ. Miami Press, Coral Gables, Florida.

Strickland, J.D.H. and T.R. Parsons, 1968. A Practical Handbook of Seawater Analysis, Bulletin 167. Fish. Res. Bd. Canada, Ottawa.

Suarez-Caabro, J.A., 1955. Quetognatos de los mares Cubanos. Mem. de la Sociedad Cubana de Historia Natural. 22: 125-180.

Taylor, W.M., 1960. Marine algae of the eastern tropical and subtropical coasts of the Americas. Univ. Michigan Studies Sci. Ser., 21.

Thomas, L.P., 1962. The shallow water amphiurid brittle stars (Echinodermata, Ophiuroidea) of Florida. Bull. Mar. Sci. Gulf Carib. 12(4): 623-694.

Treadwell, A.L., 1939. Scientific survey of Porto Rico and the Virgin Islands. Polychaetous annelids of Porto Rico and vicinity. N.Y. Acad. Sci. 16(2): 151-319.

Van Name, W.G., 1930. Scientific survey of Porto Rico and the Virgin Islands. The ascidians of Porto Rico and the Virgin Islands. N.Y. Acad. Sci. 10(4): 405-535.

_____, 1945. The North and South American ascidians. Bull. Amer. Mus. Nat. Hist., 84.

Vicente, V.P. A key to the sponges of the West Indies. Unpubl.

Warmke, G.L. and R.T. Abbott, 1962. Caribbean Seashells. Livingston Publ. Co., Wynnewood, Pa.

Wiebe, P.H. and W.R. Holland, 1968. Plankton patchiness: Effects of repeated net tows. Limnol. and Oceanogr. 13: 315-321.

Williams, A.B., 1965. Marine decapod crustaceans of the Carolinas. U.S. Fish Wildl. Serv. Fish. Bull. 65(1).

Wood, E.D., 1974. Punta Higuero power plant environmental studies 1973-1974, in PRNC-174, Report to the Puerto Rico Water Resources Authority.

_____, 1975a. A Manual for Hydrographic Cruises. In preparation (as a PRNC Report, 1975).

Wood, E.D., F.A.J. Armstrong, and F.A. Richards, 1967. Determination of nitrate in seawater by cadmium-copper reduction to nitrate. J. Mar. Biol. Ass. U.K. 47: 23-31.

Yamaji, I., 1973. Illustrations of the Marine Plankton of Japan. Hoikuska Publ. Co. Ltd.

Youngbluth, M.J., 1973. Results of the plankton survey at Bahia de Tortuguero Punta Manati and Quebrada de Toro. I. January and March 1973. Unpubl. report, PRNC.

_____, 1974a. Diel changes in the composition of a tropical, coastal zooplankton community.

_____, 1974b. Diel changes in the composition of tropical zooplankton assemblages from coastal waters around Puerto Rico. Unpubl. report, PRNC.

_____, 1974c. Survey of zooplankton populations in Jobos Bay. Unpubl. report, PRNC.

APPENDIX 2.1A

ALL DEPTHS ARE IN METERS. NUTRIENTS IN UG-AT./L.
MAX-SAMP. DEPTH = MAXIMUM SAMPLING DEPTH X 0.01.
TRANSPARENCY - SECCHI DISC DEPTH.
WAVE HEIGHT - H.O. 215 WIND WAVE CODE.
WAVE PERIOD - IN SECONDS.
WIND SPEED - IN METERS PER SECOND.
WEATHER, VISIBILITY, CLOUD TYPE AND AMOUNT - H.O. 215 CODE.

FOREL WATER COLOR SCALE CODE

Code	Description
00	Deep blue.
10	Blue.
20	Greenish-blue (or green blue).
30	Bluish-green (or blue green).
40	Green.
50	Light green.
60	Yellowish-green.
70	Yellow green.
80	Green yellow.
90	Greenish-yellow.
99	Yellow.

STATE OF SEA-WIND WAVES
(WMO Code 75)

Code	Description	Height Meters
0	Calm-glassy	0
1	Calm-ripples	0-1/10
2	Smooth-wavelets	1/10-1/2
3	Slight	1/2-1 1/4
4	Moderate	1 1/4-2 1/2
5	Rough	2 1/2-4
6	Very rough	4-6
7	High	6-9
8	Very high	9-14
9	Phenomenal	over 14

WEATHER STATE CODE

00-49. No precipitation at the ship at the time of observation.

00-19. No precipitation, fog, duststorm, sandstorm, or drifting snow at the ship at the time of observation or during the preceding hour, except for 09.

00	Cloud development not observed or not observable.	No hydrometeors except clouds.
01	Clouds generally dissolving or becoming less developed.	
02	State of sky on the whole unchanged.	Characteristic change of the state of sky during past hour.
03	Clouds, generally forming or developing.	

Higher number indicate various rain conditions.

COMPASS DIRECTION CODE

True Direction From Which Surface Wind is Blowing or From Which Wave System is Approaching, in 10° intervals. (WMO Code 23)

Code				
00	Calm			
01	5°	to	14°	
02	15°	to	24°	NNE.
03	25°	to	34°	
04	35°	to	44°	
05	45°	to	54°	NE.
06	55°	to	64°	
07	65°	to	74°	ENE.
08	75°	to	84°	
09	85°	to	94°	E.
10	95°	to	104°	
11	105°	to	114°	ESE.
12	115°	to	124°	
13	125°	to	134°	
14	135°	to	144°	SE
15	145°	to	154°	
16	155°	to	164°	SSE.
17	165°	to	174°	
18	175°	to	184°	S.
19	185°	to	194°	
20	195°	to	204°	SSW.
21	205°	to	214°	
22	215°	to	224°	
23	225°	to	234°	SW.
24	235°	to	244°	
25	245°	to	254°	WSW.
26	255°	to	264°	
27	265°	to	274°	W.
28	275°	to	284°	
29	285°	to	294°	WNW.
30	295°	to	304°	
31	305°	to	314°	
32	315°	to	324°	NW.
33	325°	to	334°	
34	335°	to	344°	NNW.
35	345°	to	354°	
36	355°	to	4°	N.
99	Direction variable or unknown.			

VISIBILITY CODE

(Use range-finder readings of known landmarks if possible).

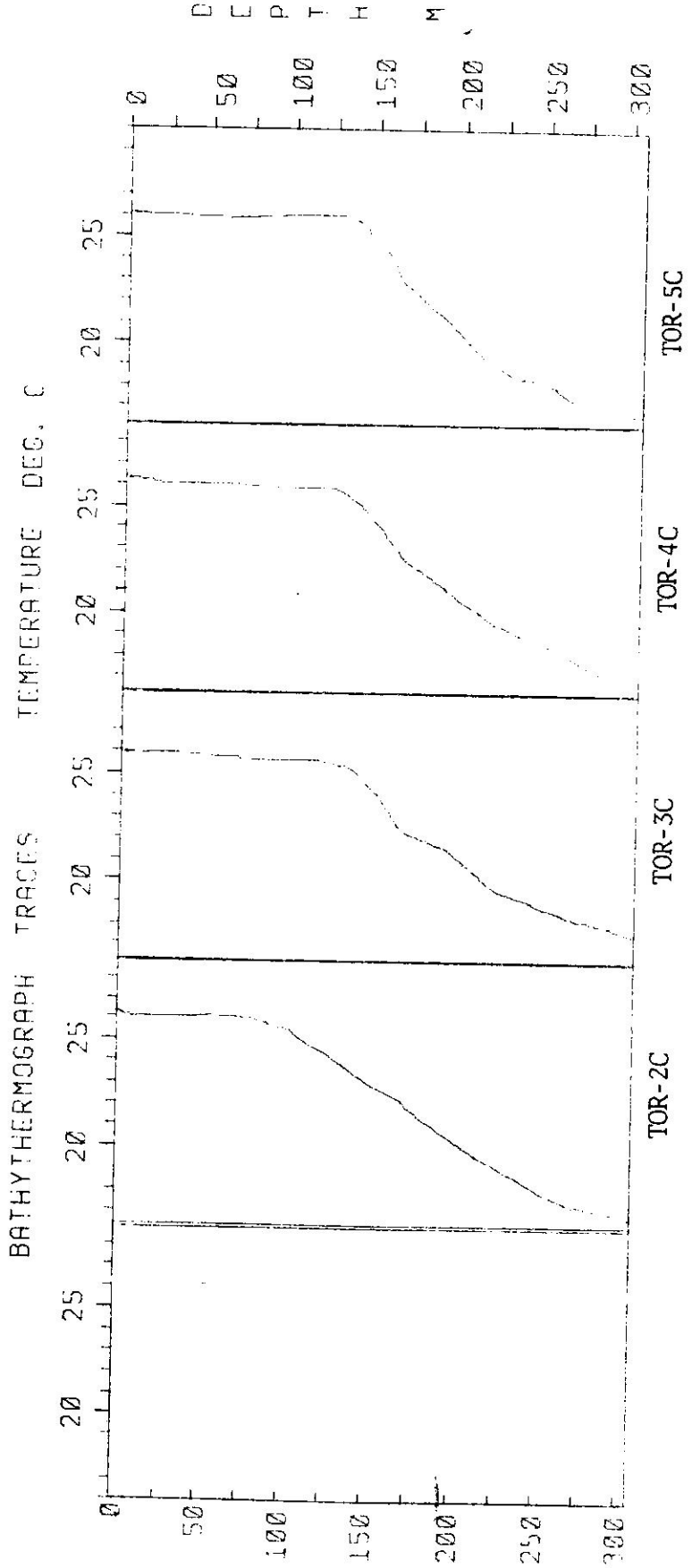
Code	Objects not visible at-	Description
0	50 yards	Dense fog.
1	200 yards	Thick fog.
2	400 yards	Fog.
3	1,000 yards	Moderate fog.
4	1 nautical mile	Thin fog or mist.
5	2 nautical miles	Visibility poor.
6	5 nautical miles	Visibility moderate.
7	10 nautical miles	Visibility good.
8	30 nautical miles	Visibility very good.
9	Over 30	Visibility excellent.

CLOUD COVER CODE

Code	Amount of sky covered in tenths
0	No clouds.
1	Less than 1 and 1.
2	2 and 3.
3	4.
4	5.
5	6.
6	7 and 8.
7	9 and 9 plus.
8	10.
9	Sky obscured.

CLOUD TYPE CODE

Code	Cloud Type
0	Stratus or Fractostratus (St or Ts).
1	Cirrus (Ci).
2	Cirrostratus (Cs).
3	Cirrocumulus (Cc).
4	Altocumulus (Ac).
5	Altostratus (As).
6	Stratocumulus (Sc).
7	Nimbostratus (Ns).
8	Cumulus or Fractocumulus (Cu or Fc).
9	Cumulonimbus (Cb).



Cruise No. PA022
January 31, 1973

R V FALU BO CRUISE STATION TOR-1P PRIOR REFERENCE 22280

DATE	1/31/73	BARO	1019,5	WEATHER	02	WIND VELOC	03	WAVE PERIOD	6
HOUR	12,2	TEMP DRY	26.2	VISIBILITY	8	WIND DIREC	11	TRANSPAR	*
LAT	18-3M,2 N	TEMP WET	0,0	CLOUD TYPE	8	WAVE DIREC	08	SONIC DEP	0216
LONG	66-29,5 W	REL HUMID	076	CLOUD AMT	5	WAVE HEIGHT	3	COLOR	10

CAST 1 MESS TIME 12,1 GMT, 8 9 LOCAL MAX DEPTH 100 WIRE ANGLE 0
OXYGEN TITER 1,019 METER WHEEL FACTOR ,997

DEPTH (M)			TEMP					OXYGEN					
WIRE	CZ	TZ	BN	TL	TM	TAVE	SALIN	SIG T	ML/L	MG/L	%SAT	PHOS	NITRA
0	1	0	11	26,38	26,39	26,39	35,625	23,43	4,57	6,52	94,86	,03	,
25	25	23	15	26,40	0,00	26,40	35,671	23,43	4,78	6,83	99,36	,06	,
50	50	48	12	26,36	0,00	26,36	35,761	23,53	4,81	6,87	100,14	,05	,
100	100	132	16	26,12	0,00	26,12	35,341	24,03	4,78	6,83	98,36	,03	,

R V PALUMBO CRUISE STATION TOR-1C PRNC REFERENCE 22281

DATE	7/31/73	BARO	1019,6	WEATHER	02	WIND VELOC	04	WAVE PERIOD	7
HOUR	13,7	TEMP DRY	28,0	VISIBILITY	8	WIND DIREC	12	TRANSPAR	•
LAT	18-31,8 N	TEMP WET	0,0	CLOUD TYPE	8	WAVE DIREC	09	SONIC DEP	0460
LONG	66-29,5 W	REL HUMID	067	CLOUD AMT	6	WAVE HEIGHT	2	COLOR	10

CAST 1 MESS TIME 13,7 GMT, 941 LOCAL MAX DEPTH 302 WIRE ANGLE 8
OXYGEN TITER 1,319 METER WHEEL FACTOR ,997

DEPTH (M)				TEMP				OXYGEN						
WIRE	CE	TE	AN	TL	TM	TAVE	SALIN	SIG T	ML/L	MG/L	%SAT	PHOS	NITRA	
150	149	0	11	25,16	25,30	25,23	35,681	23,81	4,52	6,45	92,35	,05	,	
200	198	239	15	24,78	2,22	24,78	35,859	24,08	4,07	6,67	93,94	,06	,	
250	247	303	12	23,78	2,30	23,78	36,317	24,72	4,74	6,77	92,61	,04	,	
300	297	210	16	21,20	0,00	21,20	36,769	25,80	4,28	6,12	81,64	,13	,	Pre-trip

CAST 2 MESS TIME 14,1 GMT, [illegible] LOCAL MAX DEPTH 100 WIRE ANGLE 1
OXYGEN TITER 1,319 METER WHEEL FACTOR ,997

DEPTH (M)				TEMP				OXYGEN						
WIRE	CE	TE	AN	TL	TM	TAVE	SALIN	SIG T	ML/L	MG/L	%SAT	PHOS	NITRA	
0	1	0	11	26,32	26,37	26,35	35,662	23,44	4,83	6,96	100,32	,04	,	
25	25	26	15	26,35	2,00	26,36	35,664	23,44	4,74	6,77	98,47	,03	,	
50	50	52	12	25,33	2,00	25,32	35,725	23,48	4,97	7,[illegible]	101,98	,04	,	
100	100	103	16	24,24	2,00	24,24	36,305	23,96	4,9[illegible]	7,0[illegible]	100,87	,01	,	

R V PALUMBO CRUISE 022 STATION TOR-2A PRNC REFERENCE 022269

DATE 01/29/73	BARO 1015.8	WEATHER 02	WIND VELOC 10	WAVE PERIOD 4
HOUR 18.0	TEMP DRY 32.5	VISIBILITY 9	WIND DIREC 08	TRANSPAR *
LAT 18-28.7 N	TEMP WET 0.0	CLOUD TYPE 8	WAVE DIREC 08	SONIC DEP 0030
LONG 066-28.5 W	REL HUMID 062	CLOUD AMT 5	WAVE HEIGHT 2	COLOR 10

CAST 1 MESS TIME 18.0 GMT, 14 2 LOCAL MAX DEPTH 10 WIRE ANGLE 0
OXYGEN TITER 1.026 METER WHEEL FACTOR .997

DEPTH (M)			TEMP					OXYGEN					
WIRE	CZ	TZ	BN	TL	TM	TAVE	SALIN	SIG T	ML/L	MG/L	%SAT	PHOS	NITRA
0	0	0	10	26.65	26.64	26.65	35.848	23.49	4.72	6.74	98.82	.10	0.00
10	10	9	15	26.49	0.00	26.49	35.850	23.54	4.78	6.83	99.88	.09	0.00

022 269 STANDARD DEPTHS

0	26.65	35.848	23.49	4.72	6.74	0.00	0.10	0.00
10	26.49	35.850	23.54	4.78	6.83	0.00	0.09	0.00

R V PALUMBO CRUISE 022 STATION TOR-2B PRNC REFERENCE 022270

DATE	01 /29/73	BARO	1015.5	WEATHER	02	WIND VELOC	07	WAVE PERIOD	7
HOUR	18.5	TEMP DRY	33.2	VISIBILITY	8	WIND DIREC	08	TRANSPAR	*
LAT	18-30.1 N	TEMP WET	0.0	CLOUD TYPE	8	WAVE DIREC	08	SONIC DEP	0275
LONG	066-28.5 W	REL HUMID	061	CLOUD AMT	5	WAVE HEIGHT	2	COLOR	10

CAST 1 MESS TIME 18.5 GMT, 1430 LOCAL MAX DEPTH 100 WIRE ANGLE 12
OXYGEN TITER 1.026 METER WHEEL FACTOR .997

DEPTH (M)			TEMP					OXYGEN					
WIRE	CZ	TZ	BN	TL	TM	TAVE	SALIN	SIG T	ML/L	MG/L	%SAT	PHOS	NITRA
0	0	0	10	26.62	26.60	26.61	35.834	23.49	4.79	6.85	100.24	.06	0.00
25	25	24	15	26.48	0.00	26.48	35.947	23.62	4.83	6.91	101.12	.08	0.00
50	49	49	12	26.36	0.00	26.36	36.594	24.14	4.79	6.85	99.18	.00	0.00
100	98	99	16	24.73	0.00	24.73	36.132	24.30	4.69	6.70	89.28	.03	0.00

022 270 STANDARD DEPTHS

0	26.61	35.834	23.49	4.79	6.85	0.00	0.06	0.00
10	26.56	35.879	23.54	4.81	6.87	0.00	0.07	0.00
20	26.51	35.924	23.59	4.83	6.90	0.00	0.08	0.00
30	26.45	36.076	23.72	4.83	6.90	0.00	0.08	0.00
50	26.34	36.585	24.14	4.79	6.84	0.00	0.06	0.00
75	25.61	36.498	24.30	4.74	6.77	0.00	0.07	0.00
100	24.66	36.113	24.30	4.69	6.69	0.00	0.03	0.00

R V PALUMBO CRUISE 022 STATION TOR-2C PRNC REFERENCE 022271

DATE 01 /29/73	BARO 1015.4	WEATHER 02	WIND VELOC 09	WAVE PERIOD 5			
HOUR 19.7	TEMP DRY 34.2	VISIBILITY 8	WIND DIREC 09	TRANSPAR *			
LAT 18-31.8 N	TEMP WET 0.0	CLOUD TYPE 8	WAVE DIREC 09	SONIC DEP 0340			
LONG 066-28.5 W	REL HUMID 061	CLOUD AMT 5	WAVE HEIGHT 2	COLOR 10			

CAST 1 MESS TIME 20.1 GMT, 16 7 LOCAL MAX DEPTH 100 WIRE ANGLE 0
OXYGEN TITER 1.026 METER WHEEL FACTOR .997

DEPTH (M)			TEMP					OXYGEN					
WIRE	CZ	TZ	BN	TL	TM	TAVE	SALIN	SIG T	ML/L	MG/L	%SAT	PHOS	NITRA
0	0	0	10	26.50	26.51	26.51	35.543	23.30	4.89	6.98	101.43	.00	0.00
25	25	25	15	26.25	0.00	26.25	35.917	23.67	4.87	6.96	101.55	.00	0.00
50	50	48	12	26.39	0.00	26.39	36.240	23.87	4.87	6.96	100.23	.01	0.00
100	100	94	16	25.32	0.00	25.32	36.550	24.43	4.79	6.85	98.48	.05	0.00

CAST 2 MESS TIME 19.7 GMT, 1539 LOCAL MAX DEPTH 300 WIRE ANGLE 0
OXYGEN TITER 1.026 METER WHEEL FACTOR .997

DEPTH (M)			TEMP					OXYGEN					
WIRE	CZ	TZ	BN	TL	TM	TAVE	SALIN	SIG T	ML/L	MG/L	%SAT	PHOS	NITRA
150	150	0	10	23.02	23.02	23.02	36.727	25.26	4.77	6.82	92.07	.07	0.00
200	200	194	15	20.27	0.00	20.27	36.691	26.00	4.14	5.91	78.30	.10	0.00
250	250	246	12	18.49	0.00	18.49	36.551	26.35	4.33	6.19	76.52	.17	0.00
300	300	303	16	17.78	0.00	17.78	36.472	26.47	4.42	6.32	77.66	.29	0.00

022 271 STANDARD DEPTHS

0	26.51	35.543	23.31	4.89	6.98	0.00	0.06	0.00
10	26.40	35.693	23.45	4.88	6.97	0.00	0.07	0.00
20	26.29	35.843	23.60	4.88	6.97	0.00	0.08	0.00
30	26.28	35.989	23.71	4.87	6.96	0.00	0.08	0.00
50	26.39	36.240	23.87	4.87	6.96	0.00	0.01	0.00
75	26.04	36.431	24.12	4.84	6.91	0.00	0.04	0.00
100	25.32	36.550	24.43	4.79	6.85	0.00	0.05	0.00
150	23.02	36.727	25.26	4.77	6.82	0.00	0.07	0.00
200	20.27	36.691	26.00	4.14	5.91	0.00	0.10	0.00
250	18.49	36.551	26.35	4.33	6.19	0.00	0.17	0.00
300	17.78	36.472	26.47	4.42	6.32	0.00	0.29	0.00

R V PALUMBO CRUISE 022 STATION TOR-3A PRNC REFERENCE 022268

DATE 01 /29/73	BARO 1017.0	WEATHER 02	WIND VELOC 05	WAVE PERIOD 6
HOUR 16.5	TEMP DRY 31.5	VISIBILITY 9	WIND DIREC 08	TRANSPAR *
LAT 18-29.0 N	TEMP WET 0.0	CLOUD TYPE 8	WAVE DIREC 07	SONIC DEP 0020
LONG 066-27.4 W	REL HUMID	CLOUD AMT 4	WAVE HEIGHT 1	COLOR 10

CAST 1 MESS TIME 16.5 GMT, 1232 LOCAL MAX DEPTH 10 WIRE ANGLE 0
OXYGEN TITER 1.026 METER WHEEL FACTOR .997

DEPTH (M)				TEMP					OXYGEN				
WIRE	CZ	TZ	BN	TL	TM	TAVE	SALIN	SIG T	ML/L	MG/L	%SAT	PHOS	NITRA
0	0	0	10	26.51	26.51	26.51	35.818	23.51	4.75	6.79	99.20	.03	0.00
10	10	10	15	26.43	0.00	26.43	35.889	23.59	4.78	6.83	99.86	.00	0.00
022 268		STANDARD DEPTHS											
	0					26.51	35.818	23.51	4.75	6.79	0.00	0.06	0.00
	10					26.43	35.889	23.59	4.78	6.83	0.00	0.07	0.00

R V PALUMBO CRUISE 022 STATION TOR-3B PRNC REFERENCE 022279

DATE 01/31/73	BARO 1018.6	WEATHER 02	WIND VELOC 02	WAVE PERIOD 7
HOUR 11.1	TEMP DRY 22.9	VISIBILITY 8	WIND DIREC 11	TRANSPAR *
LAT 18-30.8 N	TEMP WET 0.0	CLOUD TYPE 8	WAVE DIREC 08	SONIC DEP 0252
LONG 066-27.4 W	REL HUMID 090	CLOUD AMT 2	WAVE HEIGHT 2	COLOR 10

CAST 1 MESS TIME 11.1 GMT, 7 6 LOCAL MAX DEPTH 100 WIRE ANGLE 0
OXYGEN TITER 1.019 METER WHEEL FACTOR .997

DEPTH (M)			TEMP					OXYGEN					
WIRE	CZ	TZ	BN	TL	TM	TAVE	SALIN	SIG T	ML/L	MG/L	%SAT	PHOS	NITRA
0	0	0	10	26.15	26.18	26.17	35.721	23.55	4.79	6.84	99.33	.06	0.00
25	25	25	15	26.40	0.00	26.40	35.725	23.47	4.92	7.03	102.43	.05	0.00
50	50	49	12	26.39	0.00	26.39	35.813	23.54	4.84	6.92	100.88	.10	0.00
100	100	105	16	26.34	0.00	26.34	36.096	23.77	4.87	6.96	101.97	.04	0.00

022 279 STANDARD DEPTHS

0	26.17	35.721	23.55	4.79	6.84	0.00	0.06	0.00
10	26.26	35.723	23.52	4.84	6.92	0.00	0.06	0.00
20	26.36	35.724	23.49	4.90	7.00	0.00	0.05	0.00
30	26.40	35.737	23.48	4.92	7.02	0.00	0.06	0.00
50	26.39	35.813	23.54	4.84	6.92	0.00	0.10	0.00
75	26.37	35.937	23.64	4.86	6.94	0.00	0.10	0.00
100	26.34	36.096	23.77	4.87	6.96	0.00	0.04	0.00

R V PALUMBO CRUISE 022 STATION TOR-3C PRNC REFERENCE 022278

DATE	01 /30/73	BARO	1018.1	WEATHER	02	WIND VELOC	08	WAVE PERIOD	6
HOUR	19.8	TEMP DRY	30.7	VISIBILITY	8	WIND DIREC	08	TRANSPAR	*
LAT	18-32.3 N	TEMP WET	0.0	CLOUD TYPE	8	WAVE DIREC	08	SONIC DEP	0378
LONG	066-27.4 W	REL HUMID	067	CLOUD AMT	2	WAVE HEIGHT	2	COLOR	10

CAST 1 MESS TIME 19.8 GMT, 1545 LOCAL MAX DEPTH 100 WIRE ANGLE 12
OXYGEN TITER 1.026 METER WHEEL FACTOR .997

DEPTH (M)				TEMP				OXYGEN					
WIRE	CZ	TZ	BN	TL	TM	TAVE	SALIN	SIG T	ML/L	MG/L	%SAT	PHOS	NITRA
0	0	0	10	26.41	26.41	26.41	35.666	23.43	4.79	6.85	99.62	.07	0.00
25	25	26	15	26.32	0.00	26.32	35.672	23.46	4.69	6.70	97.37	.06	0.00
50	49	46	12	26.22	0.00	26.22	35.848	23.62	4.54	6.48	94.33	.01	0.00
100	98	101	16	26.02	0.00	26.02	36.359	24.07	4.12	5.88	84.67	.02	0.00

CAST 2 MESS TIME 19.3 GMT, 1521 LOCAL MAX DEPTH 300 WIRE ANGLE 12
OXYGEN TITER 1.026 METER WHEEL FACTOR .997

DEPTH (M)				TEMP				OXYGEN					
WIRE	CZ	TZ	BN	TL	TM	TAVE	SALIN	SIG T	ML/L	MG/L	%SAT	PHOS	NITRA
150	147	0	10	23.23	23.23	23.23	36.767	25.22	4.29	6.12	82.95	.05	0.00
200	196	196	15	20.71	0.00	20.71	36.779	25.94	4.04	5.78	76.85	.17	0.00
250	244	242	12	19.30	0.00	19.30	36.666	26.23	4.09	5.85	73.03	.18	0.00
300	293	300	16	18.12	0.00	18.12	36.540	26.44	4.36	6.23	76.87	.27	0.00

022 278 STANDARD DEPTHS

0	26.41	35.666	23.43	4.79	6.85	0.00	0.07	0.00
10	26.37	35.668	23.44	4.75	6.79	0.00	0.07	0.00
20	26.34	35.671	23.45	4.71	6.73	0.00	0.06	0.00
30	26.30	35.697	23.49	4.66	6.66	0.00	0.05	0.00
50	26.22	35.858	23.63	4.53	6.46	0.00	0.01	0.00
75	26.11	36.113	23.86	4.28	6.12	0.00	0.02	0.00
100	25.93	36.381	24.12	4.12	5.89	0.00	0.02	0.00
150	23.06	36.768	25.28	4.27	6.11	0.00	0.06	0.00
200	20.57	36.772	25.98	4.05	5.78	0.00	0.17	0.00
250	19.15	36.651	26.26	4.12	5.89	0.00	0.19	0.00
300	17.95	36.522	26.47	4.40	6.29	0.00	0.28	0.00

R V PALUMBO CRUISE 022 STATION TOR-4A PRNC REFERENCE 022267

DATE 01 /29/73	BARO 1017.8	WEATHER 02	WIND VELOC 08	WAVE PERIOD 4
HOUR 15.5	TEMP DRY 31.3	VISIBILITY 9	WIND DIREC 08	TRANSPAR *
LAT 18-29.8 N	TEMP WET 0.0	CLOUD TYPE 8	WAVE DIREC 08	SONIC DEP 0020
LONG 066-26.4 W	REL HUMID 067	CLOUD AMT 2	WAVE HEIGHT 2	COLOR 10

CAST 1 MESS TIME 15.5 GMT, 1129 LOCAL MAX DEPTH 10 WIRE ANGLE 0
OXYGEN TITER 1.026 METER WHEEL FACTOR .997

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DEPTH (M)				TEMP				OXYGEN					
WIRE	CZ	TZ	BN	TL	TM	TAVE	SALIN	SIG T	ML/L	MG/L	%SAT	PHOS	NITRA
0	0	0	10	26.43	26.42	26.43	35.885	23.59	4.78	6.83	99.84	.06	0.00
10	10	12	15	26.40	0.00	26.40	35.894	23.60	4.72	6.74	98.53	.03	0.00

022 267 STANDARD DEPTHS

0	26.43	35.885	23.59	4.78	6.83	0.00	0.06	0.00
10	26.40	35.894	23.60	4.72	6.74	0.00	0.03	0.00

R V PALUMBO CRUISE 022 STATION TOR-4B PRNC REFERENCE 022275

DATE 01 /30/73	BARO 1018.8	WEATHER 02	WIND VELOC 08	WAVE PERIOD 6
HOUR 17.1	TEMP DRY 31.1	VISIBILITY 9	WIND DIREC 07	TRANSPAR *
LAT 18-31.1 N	TEMP WET 0.0	CLOUD TYPE 8	WAVE DIREC 07	SONIC DEP 0250
LONG 066-26.4 W	REL HUMID 070	CLOUD AMT 2	WAVE HEIGHT 2	COLOR 10

CAST 1 MESS TIME 17.1 GMT, 13 7 LOCAL MAX DEPTH 100 WIRE ANGLE 17
OXYGEN TITER 1.026 METER WHEEL FACTOR .997

DEPTH (M)			TEMP					OXYGEN					
WIRE	CZ	TZ	BN	TL	TM	TAVE	SALIN	SIG T	ML/L	MG/L	%SAT	PHOS	NITRA
0	0	0	10	26.64	26.63	26.64	35.689	23.37	5.95	8.50	124.16	.04	0.00
25	24	27	15	26.42	0.00	26.42	35.794	23.52	4.83	6.91	100.73	.03	0.00
50	48	47	12	26.40	0.00	26.40	35.834	23.56	5.07	7.24	105.70	.03	0.00
100	96	102	16	26.37	0.00	26.37	36.227	23.86	4.26	6.08	87.55	.00	0.00

022 275 STANDARD DEPTHS

0	26.64	35.689	23.37	5.95	8.50	0.00	0.04	0.00
10	26.55	35.733	23.44	5.49	7.84	0.00	0.04	0.00
20	26.45	35.778	23.50	5.00	7.14	0.00	0.03	0.00
30	26.40	35.812	23.54	4.89	6.99	0.00	0.03	0.00
50	26.40	35.846	23.57	5.05	7.22	0.00	0.03	0.00
75	26.38	36.029	23.71	4.72	6.74	0.00	0.02	0.00
100	26.37	36.260	23.89	4.19	5.99	0.00	-0.00	0.00

R V PALUMBO CRUISE 022 STATION TOR-4C PRNC REFERENCE 022277

DATE 01/30/73	BARO 1018.3	WEATHER 02	WIND VELOC 09	WAVE PERIOD 6
HOUR 18.8	TEMP DRY 28.3	VISIBILITY 8	WIND DIREC 08	TRANSPAR *
LAT 18-32.3 N	TEMP WET 0.0	CLOUD TYPE 8	WAVE DIREC 08	SONIC DEP 0370
LONG 066-26.5 W	REL HUMID 072	CLOUD AMT 2	WAVE HEIGHT 2	COLOR 10

CAST 1 MESS TIME 18.8 GMT, 1445 LOCAL MAX DEPTH 100 WIRE ANGLE 14
OXYGEN TITER 1.026 METER WHEEL FACTOR .997

DEPTH (M)			TEMP					OXYGEN					
WIRE	CZ	TZ	BN	TL	TM	TAVE	SALIN	SIG T	ML/L	MG/L	%SAT	PHOS	NITRA
0	0	0	10	26.50	26.47	26.49	35.670	23.41	3.09	4.41	64.29	.04	0.00
25	25	26	15	26.32	0.00	26.32	35.691	23.47	4.84	6.92	100.60	.03	0.00
50	49	47	12	26.28	0.00	26.28	35.890	23.64	4.85	6.93	101.12	.03	0.00
100	97	100	16	26.18	0.00	26.18	36.383	24.04	4.86	6.95	100.19	.02	0.00

CAST 2 MESS TIME 18.3 GMT, 1416 LOCAL MAX DEPTH 300 WIRE ANGLE 17
OXYGEN TITER 1.026 METER WHEEL FACTOR .997

DEPTH (M)			TEMP					OXYGEN					
WIRE	CZ	TZ	BN	TL	TM	TAVE	SALIN	SIG T	ML/L	MG/L	%SAT	PHOS	NITRA
150	144	0	10	23.28	23.26	23.27	36.759	25.21	4.01	5.73	77.66	.11	0.00
200	191	197	15	20.46	0.00	20.46	36.766	26.00	4.25	6.07	80.60	.18	0.00
250	239	244	12	18.53	0.00	18.53	36.577	26.36	4.09	5.85	72.43	.28	0.00
300	287	297	16	17.84	0.00	17.84	36.503	26.48	3.20	4.57	56.29	.33	0.00

022 277 STANDARD DEPTHS

0	26.49	35.670	23.41	3.09	4.41	0.00	0.04	0.00
10	26.42	35.678	23.43	3.79	5.42	0.00	0.04	0.00
20	26.35	35.687	23.46	4.53	6.47	0.00	0.03	0.00
30	26.31	35.721	23.50	4.85	6.92	0.00	0.03	0.00
50	26.28	35.900	23.65	4.85	6.94	0.00	0.03	0.00
75	26.23	36.156	23.85	4.86	6.95	0.00	0.03	0.00
100	26.03	36.414	24.11	4.81	6.87	0.00	0.02	0.00
150	22.88	36.760	25.32	4.02	5.75	0.00	0.12	0.00
200	20.01	36.734	26.10	4.22	6.03	0.00	0.20	0.00
250	18.32	36.555	26.40	3.92	5.60	0.00	0.29	0.00
300	17.65	36.483	26.51	2.96	4.23	0.00	0.34	0.00

R V PALUMBO CRUISE 022 STATION TOR-5A PRNC REFERENCE 022266

DATE 01 /29/73	BARO 1017.8	WEATHER 02	WIND VELOC 09	WAVE PERIOD 6
HOUR 15.1	TEMP DRY 30.4	VISIBILITY 9	WIND DIREC 09	TRANSPAR *
LAT 18-30.0 N	TEMP WET 0.0	CLOUD TYPE 8	WAVE DIREC 09	SONIC DEP 0025
LONG 066-25.3 W	REL HUMID 067	CLOUD AMT 2	WAVE HEIGHT 2	COLOR 10

CAST 1 MESS TIME 15.1 GMT, 11 7 LOCAL MAX DEPTH 10 WIRE ANGLE 0
OXYGEN TITER 1.026 METER WHEEL FACTOR .997

DEPTH (M)			TEMP					OXYGEN					
WIRE	CZ	TZ	BN	TL	TM	TAVE	SALIN	SIG T	ML/L	MG/L	%SAT	PHOS	NITRA
0	0	0	10	26.43	26.43	26.43	35.889	23.59	4.74	6.77	99.00	.04	0.00
10	10	9	15	26.44	0.00	26.44	35.891	23.59	4.76	6.80	99.45	.04	0.00

022 266 STANDARD DEPTHS

0	26.43	35.889	23.59	4.74	6.77	0.00	0.04	0.00
10	26.44	35.891	23.59	4.76	6.80	0.00	0.04	0.00

R V PALUMBO CRUISE 022 STATION TOR-5B PRNC REFERENCE 022276

DATE	01 /30/73	BARO	1018.5	WEATHER	02	WIND VELOC	09	WAVE PERIOD	7
HOUR	17.7	TEMP DRY	73.0	VISIBILITY	9	WIND DIREC	08	TRANSPAR	*
LAT	18-31.2 N	TEMP WET	0.0	CLOUD TYPE	8	WAVE DIREC	08	SONIC DEP	0216
LONG	066-25.3 W	REL HUMID	074	CLOUD AMT	2	WAVE HEIGHT	2	COLOR	10

CAST 1 MESS TIME 17.7 GMT, 1344 LOCAL MAX DEPTH 100 WIRE ANGLE 15
OXYGEN TITER 1.026 METER WHEEL FACTOR .997

DEPTH (M)			TEMP					OXYGEN					
WIRE	CZ	TZ	BN	TL	TM	TAVE	SALIN	SIG T	ML/L	MG/L	%SAT	PHOS	NITRA
0	0	0	10	26.49	26.47	26.48	35.653	23.40	4.78	6.83	99.48	.07	0.00
25	25	27	15	26.43	0.00	26.43	35.889	23.59	5.50	7.86	114.85	.05	0.00
50	49	47	12	26.41	0.00	26.41	35.859	23.57	3.42	4.88	71.30	.05	0.00
100	97	102	16	26.09	0.00	26.09	36.347	24.04	4.19	5.98	86.16	.05	0.00

022 276 STANDARD DEPTHS

0	26.48	35.653	23.40	4.78	6.83	0.00	0.07	0.00
10	26.46	35.747	23.47	5.07	7.24	0.00	0.06	0.00
20	26.44	35.847	23.55	5.36	7.65	0.00	0.05	0.00
30	26.42	35.883	23.59	5.15	7.36	0.00	0.05	0.00
50	26.41	35.865	23.58	3.43	4.91	0.00	0.05	0.00
75	26.26	36.078	23.79	3.43	4.89	0.00	0.05	0.00
100	26.07	36.378	24.07	4.24	6.05	0.00	0.05	0.00

R V HALUMBO CRUISE 022 STATION TOR-5C PRNC REFERENCE 022274

DATE 01 /30/73	BARO 1020.2	WEATHER 02	WIND VELOC 05	WAVE PERIOD 7
HOUR 14.1	TEMP DRY 30.0	VISIBILITY 9	WIND DIREC 08	TRANSPAR *
LAT 18-31.8 N	TEMP WET 0.0	CLOUD TYPE 8	WAVE DIREC 07	SONIC DEP 0340
LONG 066-25,3 W	REL HUMID 068	CLOUD AMT 1	WAVE HEIGHT 2	COLOR 10

CAST 1 MESS TIME 14.7 GMT, 1041 LOCAL MAX DEPTH 100 WIRE ANGLE 11
OXYGEN TITER 1.026 METER WHEEL FACTOR .997

DEPTH (M)			TEMP					OXYGEN					
WIRE	CZ	TZ	BN	TL	TM	TAVE	SALIN	SIG T	ML/L	MG/L	%SAT	PHOS	NITRA
0	0	0	10	26.44	0.00	26.44	35.694	23.44	4.80	6.86	99.93	.01	0.00
25	25	25	15	26.39	0.00	26.39	35.737	23.49	4.43	6.33	92.25	.04	0.00
50	49	47	12	26.28	0.00	26.28	35.854	23.61	4.93	7.04	102.55	.04	0.00
100	98	104	16	26.42	0.00	26.42	36.172	23.81	5.48	7.83	112.55	.07	0.00

CAST 2 MESS TIME 14.1 GMT, 10 5 LOCAL MAX DEPTH 300 WIRE ANGLE 12
OXYGEN TITER 1.026 METER WHEEL FACTOR .997

DEPTH (M)					TEMP			OXYGEN					
WIRE	CZ	TZ	BN	TL	TM	TAVE	SALIN	SIG T	ML/L	MG/L	%SAT	PHOS	NITRA
200	196	194	15	20.20	0.00	20.20	36.702	26.02	4.28	6.11	80.94	.11	0.00
250	244	240	12	18.45	0.00	18.45	36.552	26.36	2.35	3.36	41.53	.25	0.00
300	293	284	16	17.78	0.00	17.78	36.492	26.49	3.74	5.34	65.63	.25	0.00

022 274 STANDARD DEPTHS

0	26.44	35.694	23.44	4.80	6.86	0.00	0.01	0.00
10	26.42	35.711	23.46	4.66	6.65	0.00	0.02	0.00
20	26.40	35.727	23.48	4.49	6.41	0.00	0.03	0.00
30	26.37	35.756	23.51	4.50	6.42	0.00	0.04	0.00
50	26.28	35.860	23.61	4.94	7.06	0.00	0.04	0.00
75	26.29	36.018	23.73	5.31	7.58	0.00	0.05	0.00
100	26.32	36.184	23.85	5.46	7.79	0.00	0.07	0.00
150	23.44	36.471	24.94	5.23	7.46	0.00	0.09	0.00
200	20.02	36.693	26.07	4.07	5.82	0.00	0.12	0.00
250	18.34	36.542	26.39	2.52	3.60	0.00	0.25	0.00
300	17.68	36.483	26.50	3.93	5.62	0.00	0.25	0.00

R V PALUMBO CRUISE 022 STATION TOR-6A PRNC REFERENCE 022265

DATE 01 /29/73	BARO 1017.8	WEATHER 02	WIND VELOC 08	WAVE PERIOD 4
HOUR 14.2	TEMP DRY 27.3	VISIBILITY 9	WIND DIREC 08	TRANSPAR *
LAT 18-30.0 N	TEMP WET 0.0	CLOUD TYPE 8	WAVE DIREC 08	SONIC DEP 0022
LONG 066-24.0 W	REL HUMID 079	CLOUD AMT 1	WAVE HEIGHT 2	COLOR 10

CAST 1 MESS TIME 14.1 GMT, 10 9 LOCAL MAX DEPTH 10 WIRE ANGLE 0
OXYGEN TITER 1.026 METER WHEEL FACTOR .997

DEPTH (M)			TEMP			OXYGEN							
WIRE	CZ	TZ	BN	TL	TM	TAVE	SALIN	SIG T	ML/L	MG/L	%SAT	PHOS	NITRA
0	0	0	10	26.38	26.38	26.38	35.948	23.65	4.74	6.77	99.03	.10	0.00
10	10	12	15	26.40	0.00	26.40	35.990	23.67	4.63	6.61	96.78	.04	0.00

022 265 STANDARD DEPTHS

0	26.38	35.948	23.65	4.74	6.77	0.00	0.10	0.00
10	26.40	35.990	23.67	4.63	6.61	0.00	0.04	0.00

R V PALUMBO CRUISE 022 STATION TOR-6B PRNC REFERENCE 022272

DATE 01 /30/73	BARO 1018.5	WEATHER 02	WIND VELOC 03	WAVE PERIOD 7
HOUR 12.4	TEMP DRY 27.6	VISIBILITY 9	WIND DIREC 15	TRANSPAR *
LAT 18-31.4 N	TEMP WET 0.0	CLOUD TYPE 8	WAVE DIREC 07	SONIC DEP 0270
LONG 066-24.2 W	REL HUMID 072	CLOUD AMT 1	WAVE HEIGHT 2	COLOR 10

CAST 1 MESS TIME 12.4 GMT, 822 LOCAL MAX DEPTH 100 WIRE ANGLE 7
OXYGEN TITER 1.026 METER WHEEL FACTOR .997

DEPTH (M)			TEMP					OXYGEN					
WIRE	CZ	TZ	BN	TL	TM	TAVE	SALIN	SIG T	ML/L	MG/L	%SAT	PHOS	NITRA
0	0	0	10	26.37	26.35	26.36	35.708	23.47	4.69	6.70	97.49	.02	0.00
25	25	27	15	26.39	0.00	26.39	35.784	23.52	4.73	6.76	98.53	.04	0.00
50	50	49	12	26.38	0.00	26.38	35.993	23.68	4.31	6.16	90.11	.03	0.00
100	99	105	16	26.17	0.00	26.17	36.224	23.92	3.62	5.18	74.42	.01	0.00

022 272 STANDARD DEPTHS

0	26.36	35.708	23.48	4.69	6.70	0.00	0.02	0.00
10	26.37	35.738	23.49	4.71	6.72	0.00	0.03	0.00
20	26.38	35.766	23.51	4.72	6.75	0.00	0.04	0.00
30	26.39	35.821	23.55	4.67	6.67	0.00	0.04	0.00
50	26.38	35.993	23.68	4.31	6.16	0.00	0.03	0.00
75	26.29	36.126	23.81	3.95	5.64	0.00	0.02	0.00
100	26.17	36.229	23.93	3.61	5.16	0.00	0.01	0.00

R V PALUMBO CRUISE 022 STATION TOR-6C PRNC REFERENCE 022273

DATE 01 /30/73	BARO 1018.3	WEATHER 02	WIND VELOC 04	WAVE PERIOD 6
HOUR 13.1	TEMP DRY 32.5	VISIBILITY 9	WIND DIREC 10	TRANSPAR *
LAT 18-32.3 N	TEMP WET 0.0	CLOUD TYPE 8	WAVE DIREC 07	SONIC DEP 0450
LONG 066-24.2 W	REL HUMID 059	CLOUD AMT 1	WAVE HEIGHT 2	COLOR 10

CAST 1 MESS TIME 13.5 GMT, 932 LOCAL MAX DEPTH 100 WIRE ANGLE 14
OXYGEN TITER 1.026 METER WHEEL FACTOR .997

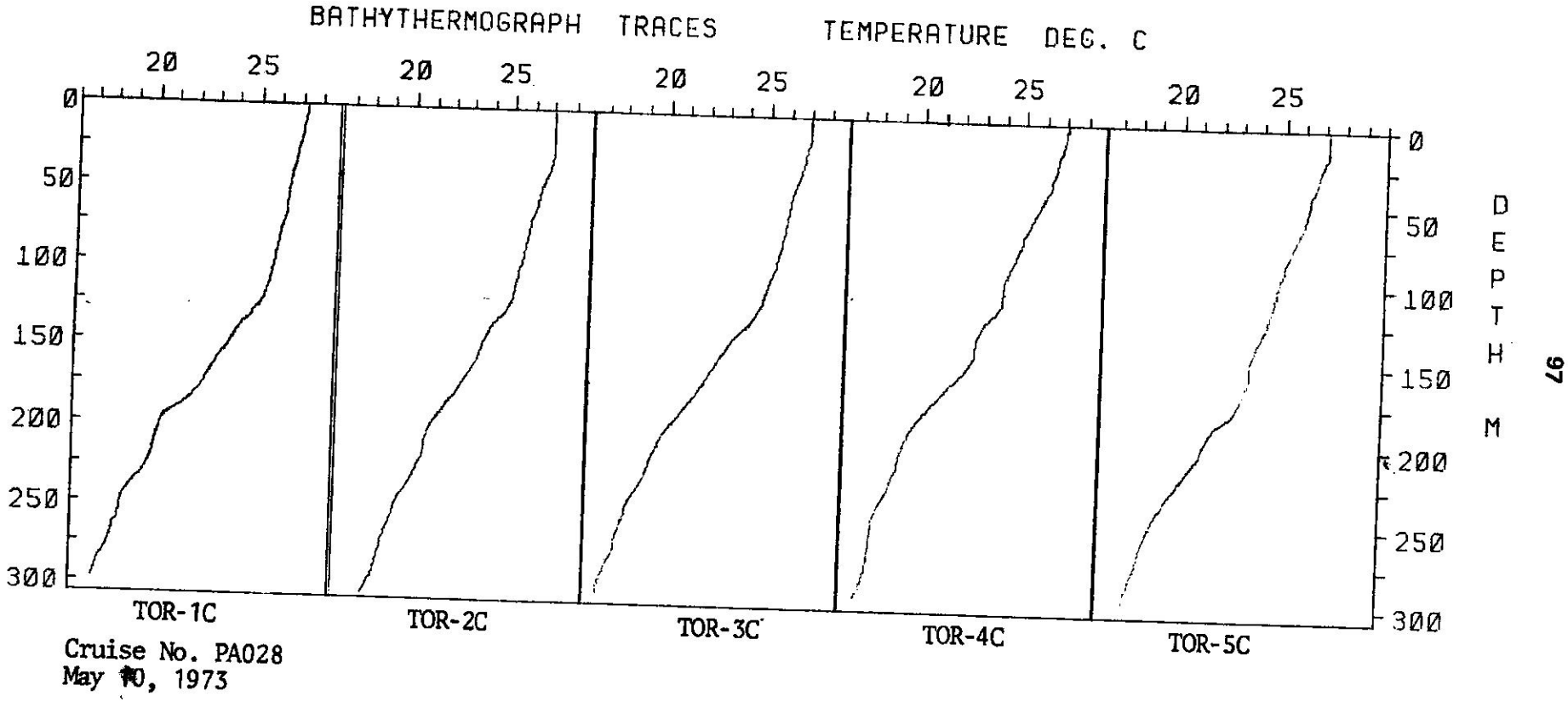
DEPTH (M)			TEMP				OXYGEN					
WIRE	CZ	TZ	BN	TL	TM	TAVE	SALIN	SIG T	ML/L	MG/L	%SAT	PHOS	NITRA
0	0	0	10	26.30	26.30	26.30	35.646	23.45	4.19	5.98	86.87	.03	0.00
25	25	23	15	26.35	0.00	26.35	35.731	23.50	4.01	5.73	83.44	.03	0.00
50	49	48	12	26.27	0.00	26.27	35.847	23.61	4.19	5.98	87.15	.07	0.00
100	97	103	16	26.25	0.00	26.25	36.236	23.91	4.66	6.66	95.75	.05	0.00

CAST 2 MESS TIME 13.1 GMT, 9 9 LOCAL MAX DEPTH 300 WIRE ANGLE 0
OXYGEN TITER 1.026 METER WHEEL FACTOR .997

DEPTH (M)			TEMP				OXYGEN					
WIRE	CZ	TZ	BN	TL	TM	TAVE	SALIN	SIG T	ML/L	MG/L	%SAT	PHOS	NITRA
150	150	0	10	23.21	23.21	23.21	36.751	25.20	4.14	5.91	80.30	.10	0.00
200	200	193	15	20.29	0.00	20.29	36.669	25.97	3.93	5.62	74.46	.15	0.00
250	250	242	12	18.67	0.00	18.67	36.476	26.25	4.75	6.79	83.82	.21	0.00
300	300	301	16	17.74	0.00	17.74	36.476	26.48	4.75	6.79	83.41	.28	0.00

022 273 STANDARD DEPTHS

0	26.30	35.646	23.45	4.19	5.98	0.00	0.03	0.00
10	26.32	35.680	23.47	4.12	5.88	0.00	0.03	0.00
20	26.34	35.713	23.46	4.04	5.77	0.00	0.03	0.00
30	26.34	35.751	23.51	4.03	5.76	0.00	0.04	0.00
50	26.27	35.854	23.61	4.20	6.00	0.00	0.07	0.00
75	26.26	36.042	23.76	4.49	6.41	0.00	0.06	0.00
100	26.12	36.273	23.98	4.64	6.63	0.00	0.05	0.00
150	23.21	36.751	25.20	4.14	5.91	0.00	0.10	0.00
200	20.29	36.669	25.97	3.93	5.62	0.00	0.15	0.00
250	18.67	36.476	26.25	4.75	6.79	0.00	0.21	0.00
300	17.74	36.476	26.48	4.75	6.79	0.00	0.28	0.00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Cruise No. PA028
May 10, 1973

R V PALUMBO CRUISE STATION TOR-1A PRNC REFERENCE 28468

DATE	5/11/73	BARO	1015.5	WEATHER	02	WIND VELOC		WAVE PERIOD	4
HOUR	21.7	TEMP DRY	27.0	VISIBILITY	7	WIND DIREC	09	TRANSPAR	
LAT	18-28.9 N	TEMP WET	0.0	CLOUD TYPE	8	WAVE DIREC	02	SONIC DEP	0018
LONG	66-29.4 W	REL HUMID	078	CLOUD AMT	8	WAVE HEIGHT	3	COLOR	20

CAST 1 MESS TIME 21.8 GMT, 1745 LOCAL MAX DEPTH 10 WIRE ANGLE 0

OXYGEN TITER 1.117 METER WHEEL FACTOR .997

DEPTH (M)				TEMP					OXYGEN			
WIRE	CZ	TZ	BN	TL	TM	TAVE	SALIN	SIG T	ML/L	PPM	PHOS	NITRA
DELTA T GREATER THAN 2%												
0	1	0	11	27.82	27.17	27.82	36.036	23.25	5.27	7.36	.03	,
10	10	0	12	27.16	0.00	27.16	36.037	23.47	5.30	7.39	.00	,

R V PALUMBO CRUISE STATION TOR-18 PRNC REFERENCE 28458

DATE	5/10/73	BARO	1018.5	WEATHER	02	WIND VELOC	06	WAVE PERIOD	5
HOUR	15.5	TEMP DRY	30.0	VISIBILITY	8	WIND DIREC	07	TRANSPAR	
LAT	18-30.6 N	TEMP WET	0.0	CLOUD TYPE	8	WAVE DIREC	07	SONIC DEP	0182
LONG	66-29.6 W	REL HUMID	075	CLOUD AMT	2	WAVE HEIGHT	3	COLOR	10

CAST 1 MESS TIME 15.5 GMT, 1132 LOCAL MAX DEPTH 100 WIRE ANGLE 14
OXYGEN TITER 1.117 METER WHEEL FACTOR .997

66

DEPTH (M)			TEMP					OXYGEN			
WIRE	CE	TE	BN	TL	TM	TAVE	SALIN	SIG T	ML/L	PPM	PHOS	NITRA
0	1	0	11	27.00	27.00	27.00	35.985	23.48	5.06	7.07	.07	.
25	25	0	12	26.81	0.00	26.81	35.997	23.55	5.12	7.14	.03	.
50	49	0	15	26.21	0.00	26.21	36.120	23.83	5.19	7.23	.03	.
100	97	0	16	24.94	0.00	24.94	36.48[illegible]	24.50	5.17	7.21	.02	.

R. V PALUMBO CRUISE 028 STATION TOR-2A PRNC REFERENCE 028448

DATE 05 /10/73	BARO 1018,5	WEATHER 02	WIND VELOC 00	WAVE PERIOD 4			
HOUR 11.3	TEMP DRY 30.0	VISIBILITY 8	WIND DIREC	TRANSPAR			
LAT 18-28,8 N	TEMP WET 0.0	CLOUD TYPE 8	WAVE DIREC 06	SONIC DEP 0018			
LONG 066-29,5 W	REL HUMID 060	CLOUD AMT 2	WAVE HEIGHT 2	COLOR 20			

CAST 1 MESS TIME 11.3 GMT, 719 LOCAL MAX DEPTH 10 WIRE ANGLE 0
OXYGEN TITER 1.054 METER WHEEL FACTOR .997

DEPTH (M)			TEMP					OXYGEN					
WIRE	CZ	TZ	BN	TL	TM	TAVE	SALIN	SIG T	ML/L	MG/L	%SAT	PHOS	NITRA
0	0	0	11	26,77	26,75	26,76	36,041	23,60	4,74	6,78	99,92	,04	0,00
10	10	14	12	26,75	0,00	26,75	36,025	23,59	4,74	6,78	99,87	,04	0,00

028 448 STANDARD DEPTHS

0	26,76	36,041	23,60	4,74	6,78	0,00	0,04	0,00
10	26,75	36,025	23,59	4,74	6,78	0,00	0,04	0,00

R V PALUMBO CRUISE 028 STATION TOR-2B PRNC REFERENCE 028457

DATE	05 /10/73	BARO	1019.5	WEATHER	02	WIND VELOC	06	WAVE PERIOD	4
HOUR	15.2	TEMP DRY	30.0	VISIBILITY	8	WIND DIREC	07	TRANSPAR	
LAT	18-30.1 N	TEMP WET	0.0	CLOUD TYPE	8	WAVE DIREC	07	SONIC DEP	0220
LONG	066-28.4 W	REL HUMID	076	CLOUD AMT	2	WAVE HEIGHT	4	COLOR	10

CAST 1 MESS TIME 15.2 GMT, 1110 LOCAL MAX DEPTH 100 WIRE ANGLE 8
OXYGEN TITER 1.054 METER WHEEL FACTOR .997

DEPTH (M)				TEMP		OXYGEN							
WIRE	CZ	TZ	BN	TL	TM	TAVE	SALIN	SIG T	ML/L	MG/L	%SAT	PHOS	NITRA
0	0	7	1	26.92	0.00	26.92	36.009	23.52	4.80	6.85	101.24	.03	0.00
25	25	25	2	26.51	0.00	26.51	36.077	23.71	4.84	6.91	101.56	.03	0.00
50	50	51	3	26.05	0.00	26.05	36.160	23.91	4.88	6.97	100.13	.00	0.00
100	99	99	4	24.82	0.00	24.82	36.536	24.58	4.89	6.99	94.79	.03	0.00

028 457 STANDARD DEPTHS

0	26.92	36.009	23.52	4.80	6.85	0.00	0.03	0.00
10	26.76	36.036	23.60	4.81	6.88	0.00	0.03	0.00
20	26.59	36.063	23.67	4.83	6.90	0.00	0.03	0.00
30	26.43	36.090	23.74	4.85	6.93	0.00	0.03	0.00
50	26.05	36.160	23.91	4.88	6.97	0.00	0.03	0.00
75	25.45	36.334	24.23	4.89	6.98	0.00	0.03	0.00
100	24.79	36.544	24.59	4.89	6.99	0.00	0.03	0.00

R V PALUMBO CRUISE 028 STATION TOR-2C PRNC REFERENCE 028460

DATE	05 /11/73	BARO	1017.5	WEATHER	02	WIND VELOC	01	WAVE PERIOD	5
HOUR	10.9	TEMP DRY	25.0	VISIBILITY	8	WIND DIREC	08	TRANSPAR	
LAT	18-31.3 N	TEMP WET	0.0	CLOUD TYPE	8	WAVE DIREC	07	SONIC DEP	0320
LONG	066-28.4 W	REL HUMID	092	CLOUD AMT	2	WAVE HEIGHT	3	COLOR	10

CAST 1 MESS TIME 10.9 GMT, 654 LOCAL MAX DEPTH 300 WIRE ANGLE 7
OXYGEN TITER 1.054 METER WHEEL FACTOR .997

DEPTH (M)				TEMP				OXYGEN					
WIRE	CZ	TZ	BN	TL	TM	TAVE	SALIN	SIG T	ML/L	MG/L	%SAT	PHOS	NITRA
0	0	0	11	26.98	26.98	26.98	35.934	23.45	4.72	6.75	99.60	.04	0.00
25	25	24	12	26.97	0.00	26.97	35.960	23.47	4.79	6.84	100.98	.03	0.00
50	50	52	15	26.42	0.00	26.42	36.069	23.73	4.85	6.93	101.60	.06	0.00
100	99	99	16	25.37	0.00	25.37	36.393	24.30	4.98	7.11	102.12	.14	0.00
150	149	146	1	23.64	0.00	23.64	36.785	25.12	4.53	6.46	88.04	.19	0.00
200	198	195	2	20.89	0.00	20.89	36.697	25.83	4.30	6.15	81.78	.11	0.00
250	248	244	3	19.35	0.00	19.35	36.599	26.17	4.27	6.10	75.97	.15	0.00
300	297	292	4	18.03	0.00	18.03	36.473	26.41	4.46	6.37	76.40	.24	0.00

028 460 STANDARD DEPTHS

0	26.98	35.934	23.45	4.72	6.75	0.00	0.04	0.00
10	26.98	35.944	23.46	4.75	6.78	0.00	0.04	0.00
20	26.97	35.955	23.47	4.77	6.82	0.00	0.03	0.00
30	26.89	35.976	23.51	4.80	6.86	0.00	0.03	0.00
50	26.42	36.069	23.73	4.85	6.93	0.00	0.06	0.00
75	25.92	36.221	24.00	4.91	7.02	0.00	0.10	0.00
100	25.34	36.403	24.32	4.97	7.10	0.00	0.14	0.00
150	23.58	36.783	25.13	4.53	6.47	0.00	0.19	0.00
200	20.81	36.693	25.85	4.30	6.14	0.00	0.11	0.00
250	19.29	36.594	26.18	4.28	6.11	0.00	0.15	0.00
300	17.95	36.465	26.42	4.47	6.39	0.00	0.25	0.00

R V PALUMBO CRUISE 028 STATION TOR-3A PRNC REFERENCE 028449

DATE	05 /10/73	BARO	1018.5	WEATHER	02	WIND VELOC	01	WAVE PERIOD	4
HOUR	11.8	TEMP DRY	32.0	VISIBILITY	8	WIND DIREC	14	TRANSPAR	
LAT	18-29.8 N	TEMP WET	0.0	CLOUD TYPE	8	WAVE DIREC	04	SONIC DEP	0019
LONG	066-27.3 W	REL HUMID	063	CLOUD AMT	2	WAVE HEIGHT	5	COLOR	20

CAST 1 MESS TIME 11.8 GMT, 747 LOCAL MAX DEPTH 10 WIRE ANGLE 0
OXYGEN TITER 1.054 METER WHEEL FACTOR .997

DEPTH (M)			TEMP					OXYGEN					
WIRE	CZ	TZ	BN	TL	TM	TAVE	SALIN	SIG T	ML/L	MG/L	%SAT	PHOS	NITRA
0	0	0	11	26.73	26,73	26,73	36.031	23,60	4.82	6,88	101,40	,04	0,00
10	10	9	12	26.66	0,00	26,66	36,053	23,64	4,87	6,96	102,44	,04	0,00

028 449 STANDARD DEPTHS

0	26,73	36.031	23,60	4,82	6,88	0,00	0,04	0,00
10	26,66	36.053	23,64	4,87	6,96	0,00	0,04	0,00

R V PALUMBO CRUISE 028 STATION TOR-38 PRNC REFERENCE 028456

DATE	05 /10/73	BARO	1018.5	WEATHER	02	WIND VELOC	06	WAVE PERIOD	5
HOUR	14.7	TEMP DRY	30.0	VISIBILITY	8	WIND DIREC	08	TRANSPAR	
LAT	18-30.9 N	TEMP WET	0.0	CLOUD TYPE	8	WAVE DIREC	08	SONIC DEP	0154
LONG	066-27.4 W	REL HUMID	076	CLOUD AMT	2	WAVE HEIGHT	4	COLOR	10

CAST 1 MESS TIME 14.7 GMT, 1042 LOCAL MAX DEPTH 100 WIRE ANGLE 8
OXYGEN TITER 1.054 METER WHEEL FACTOR .997

DEPTH (M) WIRE	CZ	TZ	BN	TL	TEMP TM	TAVE	SALIN	SIG T	OXYGEN ML/L	MG/L	%SAT	PHOS	NITRA
0	0	12	1	26.93	0.00	26.93	36.003	23.52	4.81	6.87	101.46	.00	0.00
25	25	28	2	26.41	0.00	26.41	36.094	23.75	4.88	6.97	102.29	.03	0.00
50	50	54	3	26.20	0.00	26.20	36.147	23.86	4.84	6.91	99.28	.00	0.00
100	99	106	4	25.08	0.00	25.08	36.440	24.42	4.97	7.09	101.81	.02	0.00

028 456 STANDARD DEPTHS

0	26.93	36.003	23.52	4.81	6.87	0.00	0.04	0.00
10	26.72	36.039	23.61	4.84	6.91	0.00	0.01	0.00
20	26.51	36.077	23.71	4.87	6.96	0.00	0.02	0.00
30	26.36	36.104	23.77	4.88	6.97	0.00	0.03	0.00
50	26.20	36.147	23.86	4.84	6.91	0.00	0.03	0.00
75	25.69	36.281	24.12	4.89	6.98	0.00	0.02	0.00
100	25.06	36.446	24.44	4.97	7.10	0.00	0.02	0.00

R V PALUMBO CRUISE 028 STATION TOR-3C PRNC REFERENCE 028459

DATE	05 /10/73	BARO	1017.5	WEATHER	02	WIND VELOC	09	WAVE PERIOD	4
HOUR	18.9	TEMP DRY	32.0	VISIBILITY	8	WIND DIREC	08	TRANSPAR	
LAT	18-31.8 N	TEMP WET	0.0	CLOUD TYPE	8	WAVE DIREC	07	SONIC DEP	0402
LONG	066-27.3 W	REL HUMID		CLOUD AMT	1	WAVE HEIGHT	3	COLOR	10

CAST 1 MESS TIME 18.9 GMT, 1454 LOCAL MAX DEPTH 100 WIRE ANGLE 18
OXYGEN TITER 1.054 METER WHEEL FACTOR .997

DEPTH (M)				TEMP				OXYGEN					
WIRE	CE	TE	BN	TL	TM	TAVE	SALIN	SIG T	ML/L	MG/L	%SAT	PHOS	NITRA
0	0	0	11	27.01	27,00	27.01	35.980	23,47	4,78	6,82	100,87	,04	0,00
25	24	25	12	26.81	0,00	26,81	36,009	23,56	4,81	6,87	101,27	,00	0,00
50	48	47	15	26.18	0,00	26,18	36,125	23,85	4,92	7,03	102,81	,03	0,00
100	95	106	16	25,34	0,00	25,34	36,369	24,29	5,01	7,15	102,74	,03	0,00

CAST 2 MESS TIME 20,3 GMT, 1615 LOCAL MAX DEPTH 300 WIRE ANGLE 17
OXYGEN TITER 1.054 METER WHEEL FACTOR ,997

DEPTH (M)				TEMP				OXYGEN					
WIRE	CE	TE	BN	TL	TM	TAVE	SALIN	SIG T	ML/L	MG/L	%SAT	PHOS	NITRA
150	144	150	2	22,80	0,00	22,80	36,820	25,39	4,65	6,64	89,78	,06	0,00
200	191	207	4	20,01	0,00	20,01	36,649	26,03	4,25	6,07	80,29	,15	0,00
250	239	251	15	18,18	0,00	18,18	36,473	26,37	4,41	6,30	77,54	,24	0,00
300	287	296	16	16.94	0,00	16,94	36,305	26,55	4,45	6,36	77,50	,32	0,00

028 459 STANDARD DEPTHS

0	27,01	35,980	23,47	4,78	6,82	0,00	0,04	0,00
10	26,92	35,992	23,51	4,79	6,84	0,00	0,02	0,00
20	26,85	36,004	23,54	4,80	6,86	0,00	0,02	0,00
30	26,67	36,032	23,62	4,83	6,91	0,00	0,03	0,00
50	26,15	36,133	23,86	4,93	7,04	0,00	0,03	0,00
75	25,76	36,253	24,07	5,00	7,14	0,00	0,03	0,00
100	25,13	36,425	24,40	4,98	7,12	0,00	0,03	0,00
150	22,43	36,815	25,49	4,58	6,55	0,00	0,07	0,00
200	19,61	36,616	26,12	4,26	6,09	0,00	0,17	0,00
250	17,87	36,434	26,42	4,42	6,32	0,00	0,26	0,00
300	16,60	36,259	26,59	4,46	6,37	0,00	0,34	0,00

R V PALUMBO CRUISE 028 STATION TOR-4A PRNC REFERENCE 028450

DATE 05 /10/73	BARO 1018.5	WEATHER 02	WIND VELOC 01	WAVE PERIOD 4			
HOUR 12.2	TEMP DRY 30.0	VISIBILITY 8	WIND DIREC 13	TRANSPAR			
LAT 18-29.6 N	TEMP WET 0.0	CLOUD TYPE 8	WAVE DIREC 04	SONIC DEP 0020			
LONG 066-26.3 W	REL HUMID 072	CLOUD AMT 2	WAVE HEIGHT 3	COLOR 20			

CAST 1 MESS TIME 12.2 GMT, 811 LOCAL MAX DEPTH 10 WIRE ANGLE 0
OXYGEN TITER 1.054 METER WHEEL FACTOR .997

DEPTH (M)				TEMP				OXYGEN					
WIRE	CZ	TZ	BN	TL	TM	TAVE	SALIN	SIG T	ML/L	MG/L	%SAT	PHOS	NITRA
0	0	0	11	26.77	26.76	26.77	35.997	23.56	4.83	6.90	101.61	.06	0.00
10	10	11	12	26.63	0.00	26.63	36.044	23.64	4.85	6.93	101.92	.05	0.00

028 450 STANDARD DEPTHS

0	26.77	35.997	23.56	4.83	6.90	0.00	0.06	0.00
10	26.63	36.044	23.64	4.85	6.93	0.00	0.05	0.00

R V PALUMBO CRUISE 028 STATION TOR-4B PRNC REFERENCE 028455

DATE	05 /10/73	BARO	1019.5	WEATHER	02	WIND VELOC	07	WAVE PERIOD	4
HOUR	14.3	TEMP DRY	29.0	VISIBILITY	8	WIND DIREC	09	TRANSPAR	
LAT	18-31.1 N	TEMP WET	0.0	CLOUD TYPE	8	WAVE DIREC	08	SONIC DEP	0164
LONG	066-26.3 W	REL HUMID	074	CLOUD AMT	2	WAVE HEIGHT	4	COLOR	10

CAST 1 MESS TIME 14.3 GMT, 1018 LOCAL MAX DEPTH 100 WIRE ANGLE 15
OXYGEN TITER 1.054 METER WHEEL FACTOR .997

DEPTH (M)				TEMP				OXYGEN					
WIRE	CZ	TZ	BN	TL	TM	TAVE	SALIN	SIG T	ML/L	MG/L	%SAT	PHOS	NITRA
0	0	6	1	26.96	0.00	26.96	36.001	23.50	4.82	6.88	101.73	.00	0.00
25	25	29	2	26.54	0.00	26.54	36.066	23.69	4.83	6.90	101.37	.04	0.00
50	49	52	3	26.23	0.00	26.23	36.131	23.83	4.85	6.93	99.48	.03	0.00
100	97	100	4	25.14	0.00	25.14	36.450	24.41	4.99	7.12	102.28	.03	0.00

028 455 STANDARD DEPTHS

0	26.96	36.001	23.51	4.82	6.88	0.00	0.06	0.00
10	26.79	36.027	23.58	4.82	6.89	0.00	0.02	0.00
20	26.62	36.053	23.65	4.83	6.90	0.00	0.03	0.00
30	26.48	36.077	23.72	4.83	6.90	0.00	0.04	0.00
50	26.21	36.136	23.84	4.85	6.93	0.00	0.03	0.00
75	25.68	36.288	24.13	4.92	7.02	0.00	0.03	0.00
100	25.07	36.470	24.45	5.00	7.14	0.00	0.03	0.00

R V PALUMBO CRUISE 028 STATION TOR-4C PRNC REFERENCE 028447

DATE 05 /10/73	BARO 1019.5	WEATHER 02	WIND VELOC 08	WAVE PERIOD 4
HOUR 3.6	TEMP DRY 25.0	VISIBILITY 8	WIND DIREC 07	TRANSPAR
LAT 18-31.8 N	TEMP WET 0.0	CLOUD TYPE 8	WAVE DIREC 07	SONIC DEP 0400
LONG 066-26.3 W	REL HUMID 085	CLOUD AMT 2	WAVE HEIGHT 4	COLOR 10

CAST 1 MESS TIME 3.6 GMT, 2337 LOCAL MAX DEPTH 300 WIRE ANGLE 2
OXYGEN TITER 1.054 METER WHEEL FACTOR .997

DEPTH (M)					TEMP			OXYGEN					
WIRE	CZ	TZ	BN	TL	TM	TAVE	SALIN	SIG T	ML/L	MG/L	XSAT	PHOS	NITRA
0	0	0	11	27.01	26.99	27.00	36.019	23.51	4.87	6.96	102.96	.08	0.00
25	25	32	12	26.56	0.00	26.56	36.079	23.69	4.93	7.05	103.64	.00	0.00
50	50	55	15	25.83	0.00	25.83	36.266	24.06	4.98	7.11	102.16	.08	0.00
100	100	100	16	24.06	0.00	24.06	36.635	24.88	5.02	7.17	97.20	.03	0.00
150	150	151	1	22.69	0.00	22.69	36.832	25.43	4.39	6.27	84.69	.12	0.00
200	200	200	2	19.32	0.00	19.32	36.630	26.20	4.25	6.07	75.68	.22	0.00
250	250	246	3	17.86	0.00	17.86	36.484	26.46	4.45	6.36	78.18	.32	0.00
300	299	294	4	17.12	0.00	17.12	36.378	26.56	4.47	6.39	78.05	.36	0.00

028 447 STANDARD DEPTHS

0	27.00	36.019	23.51	4.87	6.96	0.00	0.08	0.00
10	26.82	36.043	23.58	4.90	6.99	0.00	0.05	0.00
20	26.65	36.064	23.65	4.92	7.03	0.00	0.05	0.00
30	26.43	36.110	23.75	4.94	7.06	0.00	0.05	0.00
50	25.83	36.266	24.06	4.98	7.11	0.00	0.08	0.00
75	24.95	36.462	24.48	5.00	7.15	0.00	0.07	0.00
100	24.06	36.635	24.88	5.02	7.17	0.00	0.03	0.00
150	22.69	36.832	25.43	4.39	6.27	0.00	0.12	0.00
200	19.32	36.630	26.20	4.25	6.07	0.00	0.22	0.00
250	17.86	36.484	26.46	4.45	6.36	0.00	0.32	0.00
300	17.10	36.376	26.56	4.47	6.39	0.00	0.36	0.00

R V PALUMBO CRUISE 028 STATION TOR-5A PRNC REFERENCE 028451

DATE 05 /10/73	BARO 1018.5	WEATHER 02	WIND VELOC 02	WAVE PERIOD 4			
HOUR 12.6	TEMP DRY 28.0	VISIBILITY 8	WIND DIREC 13	TRANSPAR			
LAT 18-29.5 N	TEMP WET 0.0	CLOUD TYPE 8	WAVE DIREC 03	SONIC DEP 0020			
LONG 066-25.3 W	REL HUMID 078	CLOUD AMT 2	WAVE HEIGHT 4	COLOR 20			

CAST 1 MESS TIME 12.6 GMT, 834 LOCAL MAX DEPTH 10 WIRE ANGLE 0
OXYGEN TITER 1.054 METER WHEEL FACTOR .997

110

DEPTH (M)			TEMP					OXYGEN					
WIRE	CZ	TZ	BN	TL	TM	TAVE	SALIN	SIG T	ML/L	MG/L	%SAT	PHOS	NITRA
0	0	0	11	26.76	26.73	26.75	36.034	23.60	4.81	6.87	101.21	.00	0.00
10	10	10	12	26.70	0.00	26.70	36.045	23.62	4.74	6.78	99.83	.08	0.00
028 451			STANDARD DEPTHS										
	0					26.75	36.034	23.60	4.81	6.87	0.00	0.08	0.00
	10					26.70	36.045	23.62	4.74	6.78	0.00	0.05	0.00

R V PALUMBO CRUISE 028 STATION TOR-5B PRNC REFERENCE 028454

DATE 05 /10/73	BARO 1017.5	WEATHER 02	WIND VELOC 07	WAVE PERIOD 4			
HOUR 13.9	TEMP DRY 28.0	VISIBILITY 8	WIND DIREC 11	TRANSPAR			
LAT 18-31.3 N	TEMP WET 0.0	CLOUD TYPE 8	WAVE DIREC 10	SONIC DEP 0168			
LONG 066-25.4 W	REL HUMID 079	CLOUD AMT 2	WAVE HEIGHT 4	COLOR 10			

CAST 1 MESS TIME 14.2 GMT, 973 LOCAL MAX DEPTH 100 WIRE ANGLE 5
OXYGEN TITER 1.054 METER WHEEL FACTOR .997

DEPTH (M)				TEMP				OXYGEN					
WIRE	CZ	TZ	BN	TL	TM	TAVE	SALIN	SIG T	ML/L	MG/L	%SAT	PHOS	NITRA
0	0	9	1	26,90	0,00	26,90	36.001	23,52	4,83	6,90	101,85	,00	0,00
25	25	24	2	26,60	0,00	26,60	36.066	23,67	4,82	6,88	101,25	,00	0,00
50	50	47	3	26,38	0,00	26,38	36.116	23,78	4,88	6,97	102,28	,00	0,00
100	100	104	4	24,95	0,00	24,95	36.500	24,51	4,96	7,08	95,93	,00	0,00

028 454 STANDARD DEPTHS

0	26,90	36.001	23,52	4,83	6,90	0,00	0,06	0,00
10	26,78	36.027	23,58	4,82	6,89	0,00	0,05	0,00
20	26,66	36.053	23,64	4,82	6,89	0,00	0,05	0,00
30	26,56	36.073	23,69	4,83	6,90	0,00	0,05	0,00
50	26,38	36.116	23,78	4,88	6,97	0,00	0,06	0,00
75	25,83	36.261	24,06	4,93	7,04	0,00	0,07	0,00
100	24,95	36.500	24,51	4,96	7,08	0,00	0,03	0,00

R V PALUMBO CRUISE 028 STATION TOR-5C PRNC REFERENCE 028446

DATE 05 /10/73	BARO 1019.5	WEATHER 02	WIND VELOC 06	WAVE PERIOD 4			
HOUR 2.6	TEMP DRY 26.0	VISIBILITY 8	WIND DIREC 07	TRANSPAR			
LAT 18-31.8 N	TEMP WET 0.0	CLOUD TYPE 8	WAVE DIREC 07	SONIC DEP 0398			
LONG 066-25.3 W	REL HUMID 086	CLOUD AMT 2	WAVE HEIGHT 4	COLOR 10			

CAST 1 MESS TIME 2.8 GMT, 2248 LOCAL MAX DEPTH 300 WIRE ANGLE 2
OXYGEN TITER 1.054 METER WHEEL FACTOR .997

DEPTH (M)			TEMP					OXYGEN					
WIRE	CZ	TZ	BN	TL	TM	TAVE	SALIN	SIG T	ML/L	MG/L	XSAT	PHOS	NITRA
0	0	0	11	27.00	27,01	27,01	36.018	23,50	4,88	6,97	103,19	,00	0,00
25	25	28	12	26.70	0,00	26,70	36,061	23,63	4,92	7,03	103,64	,00	0,00
50	50	46	15	26.09	0,00	26,09	36.141	23,89	4,94	7,06	101,41	,04	0,00
100	100	112	16	24,75	0,00	24,75	36,408	24,50	5.02	7,17	96,67	,03	0,00
150	150	121	1	23.61	0,00	23,61	36.787	25,13	4,73	6,76	91,91	,03	0,00
200	200	130	2	21,52	0,00	21,52	36,832	25,76	4,29	6,13	82,11	,07	0,00
250	250	0	3	18,83	0,00	18,83	36.632	26,33	4,29	6,13	76,20	,12	0,00
300	299	250	4	17,63	0,00	17,63	36,493	26,52	4,47	6,39	78,47	,29	0,00

028 446 STANDARD DEPTHS

0	27,01	36.018	23,50	4,88	6,97	0,00	0,08	0,00
10	26,88	36.035	23,56	4,90	7,00	0,00	0,05	0,00
20	26,77	36.052	23,60	4,92	7,02	0,00	0,05	0,00
30	26,60	36,074	23,68	4,93	7,04	0,00	0,05	0,00
50	26,09	36,141	23,89	4,94	7,06	0,00	0,04	0,00
75	25,42	36,259	24,18	4,98	7,11	0,00	0,03	0,00
100	24,75	36,408	24,50	5,02	7,17	0,00	0,03	0,00
150	23,61	36,787	25,13	4,73	6,76	0,00	0,03	0,00
200	21,52	36,832	25,76	4,29	6,13	0,00	0,07	0,00
250	18,83	36,632	26,33	4,29	6,13	0,00	0,12	0,00
300	17,61	36,490	26,53	4,47	6,39	0,00	0,29	0,00

R V PALUMBO CRUISE 028 STATION TOR-6A PRNC REFERENCE 028452

DATE	05 /10/73	BARO	1018.5	WEATHER	02	WIND VELOC	02	WAVE PERIOD	5
HOUR	12.9	TEMP DRY	28.0	VISIBILITY	8	WIND DIREC	12	TRANSPAR	
LAT	18-29.8 N	TEMP WET	0.0	CLOUD TYPE	8	WAVE DIREC	06	SONIC DEP	0026
LONG	066-24.3 W	REL HUMID		CLOUD AMT	2	WAVE HEIGHT	4	COLOR	20

CAST 1 MESS TIME 12.9 GMT, 856 LOCAL MAX DEPTH 10 WIRE ANGLE 0
OXYGEN TITER 1.054 METER WHEEL FACTOR .997

DEPTH (M)				TEMP					OXYGEN				
WIRE	CZ	TZ	BN	TL	TM	TAVE	SALIN	SIG T	ML/L	MG/L	%SAT	PHOS	NITRA
0	0	0	11	26.77	26.80	26.79	36.025	23.58	4.78	6.82	100.60	.03	0.00
10	10	31	12	26.77	0.00	26.77	36.010	23.57	4.82	6.88	101.43	.00	0.00

028 452 STANDARD DEPTHS

0	26.79	36.025	23.58	4.78	6.82	0.00	0.08	0.00
10	26.77	36.010	23.57	4.82	6.88	0.00	0.05	0.00

R V PALUMBO CRUISE 028 STATION TOR-6B PRNC REFERENCE 028453

DATE 05 /10/73	BARO 1018.5	WEATHER 02	WIND VELOC 06	WAVE PERIOD 4			
HOUR 13.4	TEMP DRY 28.0	VISIBILITY 8	WIND DIREC 10	TRANSPAR			
LAT 18-31.3 N	TEMP WET 0.0	CLOUD TYPE 8	WAVE DIREC 08	SONIC DEP 0214			
LONG 066-24.2 W	REL HUMID 079	CLOUD AMT 2	WAVE HEIGHT 4	COLOR 10			

CAST 1 MESS TIME 13.4 GMT, 923 LOCAL MAX DEPTH 100 WIRE ANGLE 0
OXYGEN TITER 1.054 METER WHEEL FACTOR .997

DEPTH (M)				TEMP				OXYGEN					
WIRE	CZ	TZ	BN	TL	TM	TAVE	SALIN	SIG T	ML/L	MG/L	%SAT	PHOS	NITRA
0	0	6	1	26.94	0.00	26.94	36.001	23.51	4.82	6.88	101.70	.00	0.00
25	25	28	2	26.74	0.00	26.74	36.025	23.59	4.80	6.85	100.96	.00	0.00
50	50	53	3	26.41	0.00	26.41	36.102	23.76	4.91	7.02	102.97	.08	0.00
100	100	100	4	25.16	0.00	25.16	36.459	24.41	4.97	7.09	101.86	.00	0.00

028 453 STANDARD DEPTHS

0	26.94	36.001	23.51	4.82	6.88	0.00	0.08	0.00
10	26.86	36.011	23.54	4.81	6.87	0.00	0.05	0.00
20	26.78	36.019	23.58	4.80	6.86	0.00	0.05	0.00
30	26.69	36.035	23.62	4.82	6.88	0.00	0.05	0.00
50	26.41	36.102	23.76	4.91	7.02	0.00	0.04	0.00
75	25.88	36.247	24.03	4.94	7.06	0.00	0.03	0.00
100	25.16	36.459	24.41	4.97	7.09	0.00	0.03	0.00

R V PALUMBO CRUISE 028 STATION TOR-6C PRNC REFERENCE 028445

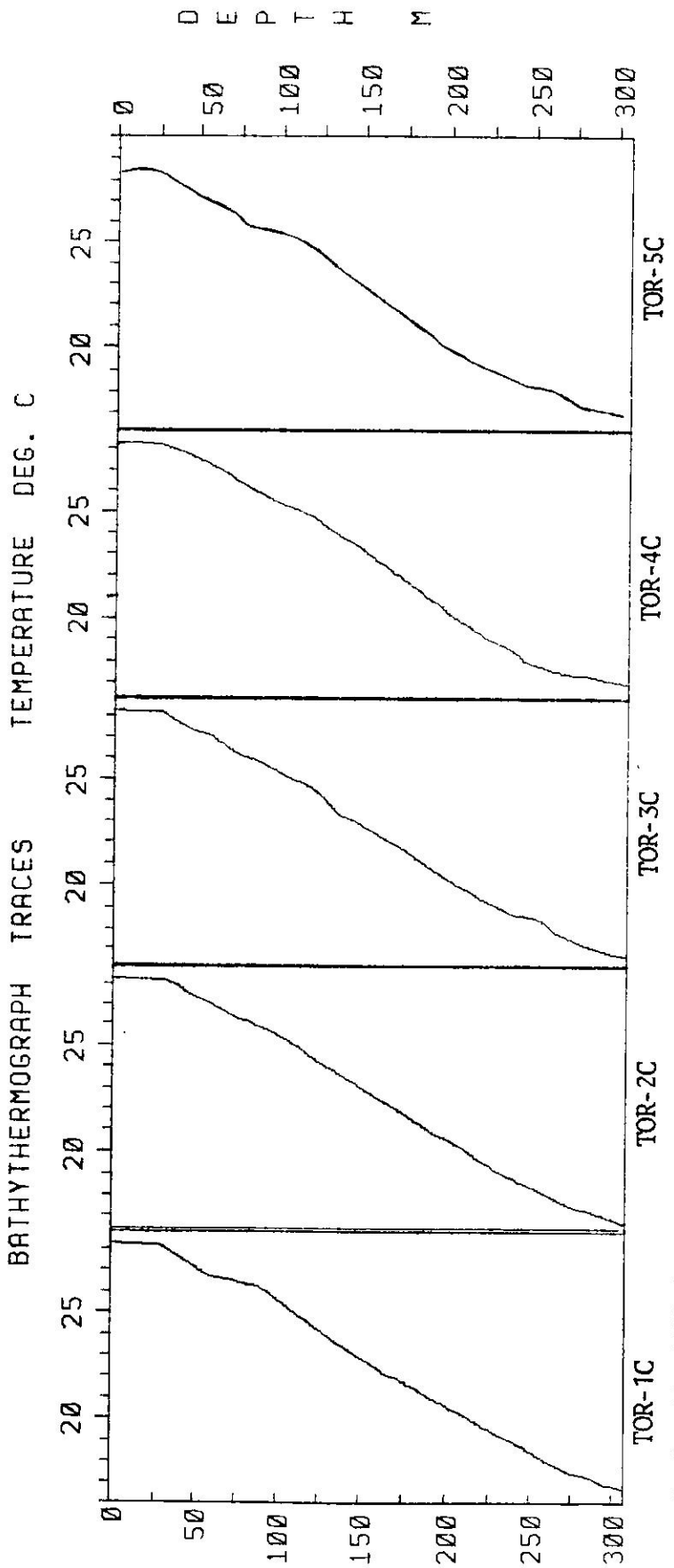
DATE	05 /10/73	BARO	1019.5	WEATHER	02	WIND VELOC	07	WAVE PERIOD	3
HOUR	1.5	TEMP DRY	27.0	VISIBILITY	8	WIND DIREC	08	TRANSPAR	
LAT	18-31.8 N	TEMP WET	0.0	CLOUD TYPE	8	WAVE DIREC	07	SONIC DEP	0420
LONG	066-24.1 W	REL HUMID	084	CLOUD AMT	1	WAVE HEIGHT	4	COLOR	10

CAST 1 MESS TIME 1.6 GMT, 2137 LOCAL MAX DEPTH 300 WIRE ANGLE 2
OXYGEN TITER 1.054 METER WHEEL FACTOR .997

DEPTH (M)					TEMP			OXYGEN					
WIRE	CZ	TZ	BN	TL	TM	TAVE	SALIN	SIG T	ML/L	MG/L	%SAT	PHOS	NITRA
0	0	0	11	27,02	27,00	27,01	36,017	23,50	4,86	6,94	102,75	,07	0,00
25	25	26	12	26,98	0,00	26,98	36,024	23,52	4,80	6,85	101,38	,05	0,00
50	50	52	15	26,13	0,00	26,13	36,193	23,91	5,01	7,15	102,80	,05	0,00
100	100	97	16	24,73	0,00	24,73	36,594	24,65	4,97	7,09	96,41	,04	0,00
150	150	149	1	22,81	0,00	22,81	36,819	25,39	4,43	6,33	85,55	,05	0,00
200	200	200	2	19,75	0,00	19,75	36,661	26,11	4,21	6,01	75,24	,15	0,00
250	250	249	3	18,22	0,00	18,22	36,532	26,41	4,44	6,34	78,26	,20	0,00
300	299	294	4	17,07	0,00	17,07	36,363	26,56	4,47	6,39	78,01	,34	0,00

028 445 STANDARD DEPTHS

0	27,01	36,017	23,50	4,86	6,94	0,00	0,07	0,00
10	27,00	36,020	23,51	4,84	6,91	0,00	0,06	0,00
20	26,99	36,023	23,51	4,81	6,87	0,00	0,05	0,00
30	26,85	36,048	23,58	4,83	6,90	0,00	0,05	0,00
50	26,13	36,193	23,91	5,01	7,15	0,00	0,05	0,00
75	25,44	36,399	24,28	4,99	7,12	0,00	0,05	0,00
100	24,73	36,594	24,65	4,97	7,09	0,00	0,04	0,00
150	22,81	36,819	25,39	4,43	6,33	0,00	0,05	0,00
200	19,75	36,661	26,11	4,21	6,01	0,00	0,15	0,00
250	18,22	36,532	26,41	4,44	6,34	0,00	0,20	0,00
300	17,05	36,360	26,56	4,47	6,39	0,00	0,34	0,00



Cruise No. PA032
August 8, 1973

R V PALUMBO CRUISE 032 STATION TOR-1A PRNC REFERENCE 032542

DATE 08 /07/73	BARO 1016.7	WEATHER 01	WIND VELOC 12	WAVE PERIOD 4
HOUR 22.0	TEMP DRY 29.0	VISIBILITY 8	WIND DIREC 09	TRANSPAR
LAT 18-29,1 N	TEMP WET 0.0	CLOUD TYPE 8	WAVE DIREC 07	SONIC DEP 0025
LONG 066-29,5 W	REL HUMID 080	CLOUD AMT 3	WAVE HEIGHT 3	COLOR

CAST 1 MESS TIME 22.1 GMT, 18 7 LOCAL MAX DEPTH 10 WIRE ANGLE 2
OXYGEN TITER 1.040 METER WHEEL FACTOR .997

DEPTH (M)			TEMP					OXYGEN					
WIRE	CZ	TZ	BN	TL	TM	TAVE	SALIN	SIG T	ML/L	MG/L	%SAT	PHOS	NITRA
0	0	0	11	28.32	28.33	28.33	35.940	23.01	4.64	6.63	100.07	.06	0.00
10	10	13	12	28.31	0.00	28.31	35.934	23.02	4.62	6.60	99.58	.09	0.00

032 542 STANDARD DEPTHS

0	28,33	35,940	23,02	4,64	6,63	0,00	0,06	0,00
10	28,31	35,934	23,02	4,62	6,60	0,00	0,09	0,00

R V PALUMBO CRUISE 032 STATION TOR-18 PRNC REFERENCE 032538

DATE	08 /07/73	BARO	1016.5	WEATHER	03	WIND VELOC	14	WAVE PERIOD	4
HOUR	20.4	TEMP DRY	30.0	VISIBILITY	8	WIND DIREC	09	TRANSPAR	
LAT	18-30.2 N	TEMP WET	0.0	CLOUD TYPE	8	WAVE DIREC	07	SONIC DEP	0180
LONG	066-29.5 W	REL HUMID	080	CLOUD AMT	3	WAVE HEIGHT	3	COLOR	

CAST 1 MESS TIME 20.4 GMT, 1625 LOCAL MAX DEPTH 100 WIRE ANGLE 8
OXYGEN TITER 1.040 METER WHEEL FACTOR .997

DEPTH (M)			TEMP					OXYGEN					
WIRE	CZ	TZ	BN	TL	TM	TAVE	SALIN	SIG T	ML/L	MG/L	%SAT	PHOS	NITRA
0	0	0	11	28.36	28.33	28.35	35.951	23.02	4.69	6.70	101.27	.00	0.00
25	25	27	12	28.36	0.00	28.36	35.949	23.01	4.70	6.72	101.51	.05	0.00
50	50	52	15	27.79	0.00	27.79	36.108	23.32	4.81	6.87	103.28	.05	0.00
100	99	96	16	25.81	0.00	25.81	36.309	24.10	4.88	6.97	100.22	.00	0.00

032 538 STANDARD DEPTHS

0	28.35	35.951	23.02	4.69	6.70	0.00	0.06	0.00
10	28.35	35.950	23.01	4.70	6.71	0.00	0.02	0.00
20	28.36	35.949	23.01	4.70	6.71	0.00	0.04	0.00
30	28.29	35.974	23.05	4.72	6.74	0.00	0.05	0.00
50	27.79	36.108	23.32	4.81	6.87	0.00	0.05	0.00
75	26.85	36.220	23.70	4.85	6.93	0.00	0.03	0.00
100	25.77	36.313	24.12	4.88	6.97	0.00	-0.00	0.00

R V PALUMBO CRUISE 032 STATION TOR-1C PRNC REFERENCE 032552

DATE	08 /08/73	BARO	1019.6	WEATHER	02	WIND VELOC	12	WAVE PERIOD	5
HOUR	13.8	TEMP DRY	29.0	VISIBILITY	8	WIND DIREC	10	TRANSPAR	
LAT	18-31.8 N	TEMP WET	0.0	CLOUD TYPE	8	WAVE DIREC	07	SONIC DEP	0380
LONG	066-29.5 W	REL HUMID	073	CLOUD AMT	1	WAVE HEIGHT	3	COLOR	

CAST 1 MESS TIME 13.8 GMT, 950 LOCAL MAX DEPTH 300 WIRE ANGLE 0
OXYGEN TITER 1.040 METER WHEEL FACTOR .997

DEPTH (M)				TEMP				OXYGEN					
WIRE	CZ	TZ	BN	TL	TM	TAVE	SALIN	SIG T	ML/L	MG/L	%SAT	PHOS	NITRA
0	0	0	11	28.25	28.24	28.25	35.881	23.00	4.69	6.70	100.85	.06	0.00
25	25	26	12	28.27	0.00	28.27	35.914	23.01	4.62	6.60	99.44	.06	0.00
50	50	54	15	26.96	0.00	26.96	36.090	23.57	4.92	7.03	104.12	.08	0.00
100	100	99	16	25.34	0.00	25.34	36.594	24.46	4.90	7.00	100.73	.06	0.00
150	150	155	1	22.71	0.00	22.71	37.036	25.58	4.39	6.27	85.25	.09	0.00
200	200	194	2	20.51	0.00	20.51	36.868	26.07	4.15	5.93	78.85	.13	0.00
250	250	249	3	18.47	0.00	18.47	36.580	26.38	4.29	6.12	75.79	.24	0.00
300	300	297	4	17.32	0.00	17.32	36.418	26.54	3.46	4.95	60.60	.34	0.00

032 552 STANDARD DEPTHS

0	28.25	35.881	23.00	4.69	6.70	0.00	0.06	0.00
10	28.26	35.894	23.00	4.66	6.66	0.00	0.06	0.00
20	28.27	35.907	23.01	4.63	6.62	0.00	0.06	0.00
30	28.07	35.940	23.10	4.67	6.67	0.00	0.06	0.00
50	26.96	36.090	23.57	4.92	7.03	0.00	0.08	0.00
75	25.13	36.333	24.02	4.91	7.01	0.00	0.08	0.00
100	25.34	36.594	24.46	4.90	7.00	0.00	0.06	0.00
150	22.71	37.036	25.58	4.39	6.27	0.00	0.09	0.00
200	20.51	36.868	26.07	4.15	5.93	0.00	0.13	0.00
250	18.47	36.580	26.38	4.29	6.12	0.00	0.24	0.00
300	17.32	36.418	26.54	3.46	4.95	0.00	0.34	0.00

R V PALUMBO CRUISE 032 STATION TOR-2A PRNC REFERENCE 032541

DATE 08/07/73	BARO 1016.8	WEATHER 03	WIND VELOC 12	WAVE PERIOD 4
HOUR 21.9	TEMP DRY 29.0	VISIBILITY 8	WIND DIREC 09	TRANSPAR
LAT 18-28.9 N	TEMP WET 0.0	CLOUD TYPE 8	WAVE DIREC 07	SONIC DEP 0026
LONG 066-28.4 W	REL HUMID 079	CLOUD AMT 4	WAVE HEIGHT 3	COLOR

CAST 1 MESS TIME 21.9 GMT, 1752 LOCAL MAX DEPTH 10 WIRE ANGLE 0
OXYGEN TITER 1.040 METER WHEEL FACTOR .997

120

DEPTH (M)			TEMP					OXYGEN					
WIRE	CZ	TZ	BN	TL	TM	TAVE	SALIN	SIG T	ML/L	MG/L	%SAT	PHOS	NITRA
0	0	0	11	28.32	28.33	28.33	35.938	23.01	4.64	6.63	100.07	.10	0.00
10	10	11	12	28.34	0.00	28.34	35.950	23.02	4.63	6.61	99.91	.08	0.00

032 541 STANDARD DEPTHS

0	28.33 35.938	23.01	4.64	6.63	0.00	0.10	0.00
10	28.34 35.950	23.02	4.63	6.61	0.00	0.08	0.00

R V PALUMBO CRUISE 032 STATION TOR-28 PRNC REFERENCE 032539

DATE 08 /07/73	BARO 1016.5	WEATHER 03	WIND VELOC 14	WAVE PERIOD 4
HOUR 21.0	TEMP DRY 29.0	VISIBILITY 8	WIND DIREC 09	TRANSPAR
LAT 18-30.0 N	TEMP WET 0.0	CLOUD TYPE 8	WAVE DIREC 07	SONIC DEP 0182
LONG 066-28.3 W	REL HUMID 080	CLOUD AMT 6	WAVE HEIGHT 3	COLOR

CAST 1 MESS TIME 21.0 GMT, 17 0 LOCAL MAX DEPTH 100 WIRE ANGLE 9
OXYGEN ITER 1.040 METER WHEEL FACTOR .997

DEPTH (M)			TEMP					OXYGEN					
WIRE	CZ	TZ	BN	TL	TM	TAVE	SALIN	SIG T	ML/L	MG/L	%SAT	PHOS	NITRA
0	0	0	11	28.35	28.33	28.34	35.960	23.02	4.68	6.69	101.07	.08	0.00
25	25	24	12	28.37	0.00	28.37	35.954	23.01	4.68	6.69	101.10	.10	0.00
50	50	48	15	28.15	0.00	28.15	36.084	23.18	4.68	6.69	101.18	.09	0.00
100	99	103	16	25.65	0.00	25.65	36.355	24.18	4.88	6.97	100.21	.06	0.00

032 539 STANDARD DEPTHS

0	28.34	35.960	23.03	4.68	6.69	0.00	0.08	0.00
10	28.35	35.958	23.02	4.68	6.69	0.00	0.09	0.00
20	28.36	35.955	23.01	4.68	6.69	0.00	0.10	0.00
30	28.35	35.973	23.03	4.68	6.69	0.00	0.10	0.00
50	28.15	36.084	23.18	4.68	6.69	0.00	0.09	0.00
75	27.05	36.221	23.64	4.77	6.81	0.00	0.08	0.00
100	25.60	36.361	24.20	4.88	6.98	0.00	0.06	0.00

R V PALUMBO CRUISE 032 STATION TOR-2c PRNC REFERENCE 032551

DATE 08 /08/73	BARO 1019.6	WEATHER 03	WIND VELOC 09	WAVE PERIOD 5			
HOUR 13.3	TEMP DRY 29.0	VISIBILITY 8	WIND DIREC 10	TRANSPAR			
LAT 18-32.0 N	TEMP WET 0.0	CLOUD TYPE	WAVE DIREC 08	SONIC DEP 0402			
LONG 066-28.4 W	REL HUMID 076	CLOUD AMT 1	WAVE HEIGHT 1	COLOR			

CAST 1 MESS TIME 13.3 GMT, 920 LOCAL MAX DEPTH 300 WIRE ANGLE 0
OXYGEN TITER 1.040 METER WHEEL FACTOR .997

DEPTH (M)			TEMP					OXYGEN					
WIRE	CZ	TZ	BN	TL	TM	TAVE	SALIN	SIG T	ML/L	MG/L	%SAT	PHOS	NITRA
0	0	0	11	28.26	28.27	28.27	35.828	22.95	4.68	6.69	100.46	.05	0.00
25	25	28	12	28.27	0.00	28.27	35.886	22.99	4.67	6.67	100.46	.09	0.00
50	50	52	15	27.27	0.00	27.27	36.092	23.47	4.89	6.98	104.04	.07	0.00
100	100	99	16	25.27	0.00	25.27	36.640	24.52	4.89	6.98	100.52	.07	0.00
150	150	148	1	22.79	0.00	22.79	37.033	25.55	4.41	6.30	85.71	.07	0.00
200	200	197	2	20.37	0.00	20.37	36.848	26.09	4.15	5.93	78.75	.16	0.00
250	250	247	3	18.53	0.00	18.53	36.586	26.37	4.29	6.12	75.84	.23	0.00
300	300	291	4	17.33	0.00	17.33	36.422	26.54	4.53	6.46	79.17	.34	0.00

032 551 STANDARD DEPTHS

0	28.27	35.828	22.95	4.68	6.69	0.00	0.05	0.00	
10	28.27	35.851	22.97	4.68	6.68	0.00	0.07	0.00	
20	28.27	35.871	22.98	4.67	6.68	0.00	0.08	0.00	
30	28.12	35.917	23.06	4.71	6.73	0.00	0.09	0.00	
50	27.27	36.092	23.47	4.89	6.98	0.00	0.07	0.00	
75	26.30	36.364	23.99	4.89	6.98	0.00	0.07	0.00	
100	25.27	36.640	24.52	4.89	6.98	0.00	0.07	0.00	
150	22.79	37.033	25.55	4.41	6.30	0.00	0.07	0.00	
200	20.37	36.848	26.09	4.15	5.93	0.00	0.16	0.00	
250	18.53	36.586	26.37	4.29	6.12	0.00	0.23	0.00	
300	17.33	36.422	26.54	4.53	6.46	0.00	0.34	0.00	

R V PALUMBO CRUISE 032 STATION TOR-3A PRNC REFERENCE 032540

DATE	08 /07/73	BARO	1016.5	WEATHER	01	WIND VELOC	12	WAVE PERIOD	
HOUR	21.5	TEMP DRY	30.0	VISIBILITY	8	WIND DIREC	09	TRANSPAR	
LAT	18-29.0 N	TEMP WET	0.0	CLOUD TYPE	1	WAVE DIREC	07	SONIC DEP	0021
LONG	066-27.4 W	REL HUMID	079	CLOUD AMT	3	WAVE HEIGHT	3	COLOR	

CAST 1 MESS TIME 21.5 GMT, 1730 LOCAL MAX DEPTH 10 WIRE ANGLE 0
OXYGEN TITER 1.040 METER WHEEL FACTOR .997

DEPTH (M)			TEMP					OXYGEN					
WIRE	CZ	TZ	BN	TL	TM	TAVE	SALIN	SIG T	ML/L	MG/L	%SAT	PHOS	NITRA
0	0	0	11	28.32	28.29	28.31	35.948	23.03	4.69	6.70	101.19	.05	0.00
10	10	12	12	28.32	0.00	28.32	35.946	23.02	4.70	6.72	101.43	.05	0.00

032 540 STANDARD DEPTHS

0			28.31	35.948	23.03	4.69	6.70	0.00	0.05	0.00
10			28.32	35.946	23.02	4.70	6.72	0.00	0.05	0.00

R V PALUMBO CRUISE 032 STATION TOR-38 PRNC REFERENCE 032543

DATE	08 /07/73	BARO	1017.1	WEATHER	03	WIND VELOC	12	WAVE PERIOD	4
HOUR	22.8	TEMP DRY	29.0	VISIBILITY	8	WIND DIREC	09	TRANSPAR	
LAT	18-30.9 N	TEMP WET	0.0	CLOUD TYPE	1	WAVE DIREC	07	SONIC DEP	0160
LONG	066-27.3 W	REL HUMID	081	CLOUD AMT	4	WAVE HEIGHT	3	COLOR	

CAST 1 MESS TIME 22.8 GMT, 1847 LOCAL MAX DEPTH 100 WIRE ANGLE 13
OXYGEN TITER 1.040 METER WHEEL FACTOR .997

DEPTH (M)			TEMP					OXYGEN					
WIRE	CE	TE	BN	TL	TM	TAVE	SALIN	SIG T	ML/L	MG/L	%SAT	PHOS	NITRA
0	0	0	11	28.33	28.33	28.33	35.940	23.01	4.68	6.69	100.98	.07	0.00
25	25	22	12	28.37	0.00	28.37	35.952	23.01	4.65	6.64	100.42	.08	0.00
50	49	54	15	27.94	0.00	27.94	36.088	23.25	4.72	6.75	101.71	.11	0.00
100	98	97	16	25.64	0.00	25.64	36.360	24.19	4.93	7.04	101.28	.09	0.00

032 543 STANDARD DEPTHS

0	28.33	35.940	23.01	4.68	6.69	0.00	0.07	0.00
10	28.35	35.945	23.01	4.67	6.67	0.00	0.07	0.00
20	28.36	35.950	23.01	4.66	6.65	0.00	0.08	0.00
30	28.32	35.974	23.04	4.66	6.66	0.00	0.09	0.00
50	27.90	36.094	23.27	4.73	6.75	0.00	0.11	0.00
75	26.84	36.233	23.72	4.83	6.90	0.00	0.11	0.00
100	25.55	36.371	24.23	4.94	7.06	0.00	0.09	0.00

R V PALUMBO CRUISE 032 STATION TOR-3C PRNC REFERENCE 032550

DATE	08 /08/73	BARO	1019.1	WEATHER	02	WIND VELOC	07	WAVE PERIOD 5
HOUR	12.9	TEMP DRY	28.0	VISIBILITY	8	WIND DIREC	10	TRANSPAR
LAT	18-32.0 N	TEMP WET	0.0	CLOUD TYPE	8	WAVE DIREC	07	SONIC DEP 0362
LONG	066-27.5 W	REL HUMID		CLOUD AMT	1	WAVE HEIGHT	3	COLOR

CAST 1 MESS TIME 12.9 GMT, 852 LOCAL MAX DEPTH 300 WIRE ANGLE 0
OXYGEN TITER 1.040 METER WHEEL FACTOR .997

DEPTH (M)			TEMP					OXYGEN					
WIRE	CZ	TZ	BN	TL	TM	TAVE	SALIN	SIG T	ML/L	MG/L	%SAT	PHOS	NITRA
0	0	0	11	28.28	28.27	28.28	35.991	23.07	4.67	6.67	100.85	.08	0.00
25	25	27	12	28.27	0.00	28.27	35.918	23.02	4.67	6.67	100.57	.07	0.00
50	50	51	15	27.40	0.00	27.40	36.047	23.40	4.86	6.94	103.48	.08	0.00
100	100	98	16	25.39	0.00	25.39	36.511	24.38	4.89	6.98	100.47	.06	0.00
150	150	148	1	22.81	0.00	22.81	36.959	25.49	4.40	6.29	85.35	.09	0.00
200	200	193	2	20.32	0.00	20.32	36.755	26.03	4.13	5.90	78.26	.13	0.00
250	250	250	3	18.46	0.00	18.46	36.507	26.33	4.28	6.11	75.42	.24	0.00
300	300	295	4	17.34	0.00	17.34	36.353	26.49	4.52	6.45	78.86	.34	0.00

032 550 STANDARD DEPTHS

0	28.28	35.991	23.07	4.67	6.67	0.00	0.08	0.00
10	28.27	35.962	23.05	4.67	6.67	0.00	0.08	0.00
20	28.27	35.929	23.02	4.67	6.67	0.00	0.07	0.00
30	28.15	35.930	23.07	4.70	6.72	0.00	0.07	0.00
50	27.40	36.047	23.40	4.86	6.94	0.00	0.08	0.00
75	26.45	36.263	23.86	4.87	6.96	0.00	0.08	0.00
100	25.39	36.511	24.38	4.89	6.98	0.00	0.06	0.00
150	22.81	36.959	25.49	4.40	6.29	0.00	0.09	0.00
200	20.32	36.755	26.03	4.13	5.90	0.00	0.13	0.00
250	18.46	36.507	26.33	4.28	6.11	0.00	0.24	0.00
300	17.34	36.353	26.49	4.52	6.45	0.00	0.34	0.00

R V PALUMBO CRUISE 032 STATION TOR-4A PRNC REFERENCE 032544

DATE	08 /08/73	BARO	1018.5	WEATHER	02	WIND VELOC	02	WAVE PERIOD	5
HOUR	10.5	TEMP DRY	24.0	VISIBILITY	8	WIND DIREC	10	TRANSPAR	
LAT	18-29.7 N	TEMP WET	0.0	CLOUD TYPE	8	WAVE DIREC	07	SONIC DEP	0020
LONG	066-26.3 W	REL HUMID	089	CLOUD AMT	1	WAVE HEIGHT	3	COLOR	

CAST 1 MESS TIME 10.5 GMT, 631 LOCAL MAX DEPTH 10 WIRE ANGLE 0
OXYGEN TITER 1.040 METER WHEEL FACTOR .997

DEPTH (M)			TEMP					OXYGEN					
WIRE	CZ	TZ	BN	TL	TM	TAVE	SALIN	SIG T	ML/L	MG/L	%SAT	PHOS	NITRA
0	0	0	11	28.19	28.17	28.18	36.029	23.13	4.60	6.57	99.24	.00	0.00
10	10	12	12	28.21	0.00	28.21	36.013	23.11	4.62	6.60	99.69	.05	0.00

032 544 STANDARD DEPTHS

0	28.18	36.029	23.13	4.60	6.57	0.00	0.08	0.00
10	28.21	36.013	23.11	4.62	6.60	0.00	0.08	0.00

R V PALUMBO CRUISE 032 STATION TOR-4B PRNC REFERENCE 032546

DATE	08 /08/73	BARO	1018.5	WEATHER	03	WIND VELOC	13	WAVE PERIOD	5
HOUR	11.1	TEMP DRY	24.0	VISIBILITY	8	WIND DIREC	10	TRANSPAR	
LAT	18-31.2 N	TEMP WET	0.0	CLOUD TYPE		WAVE DIREC	07	SONIC DEP	0182
LONG	066-26.3 W	REL HUMID	089	CLOUD AMT	1	WAVE HEIGHT	3	COLOR	

CAST 1 MESS TIME 11.0 GMT, 7 3 LOCAL MAX DEPTH 100 WIRE ANGLE 2
OXYGEN TITER 1.040 METER WHEEL FACTOR .997

DEPTH (M)			TEMP					OXYGEN					
WIRE	CZ	TZ	BN	TL	TM	TAVE	SALIN	SIG T	ML/L	MG/L	%SAT	PHOS	NITRA
0	0	0	11	28.26	28.25	28.26	35.966	23.06	4.62	6.60	99.60	.06	0.00
25	25	23	12	28.28	0.00	28.28	35.997	23.07	4.64	6.63	100.20	.08	0.00
50	50	53	15	27.59	0.00	27.59	36.120	23.39	4.81	6.87	102.94	.00	0.00
100	100	101	16	25.46	0.00	25.46	36.463	24.32	4.88	6.97	100.24	.00	0.00

032 546 STANDARD DEPTHS

0	28.26	35.966	23.06	4.62	6.60	0.00	0.06	0.00
10	28.27	35.978	23.06	4.63	6.61	0.00	0.07	0.00
20	28.28	35.989	23.07	4.64	6.62	0.00	0.08	0.00
30	28.19	36.015	23.12	4.67	6.67	0.00	0.08	0.00
50	27.59	36.120	23.39	4.81	6.87	0.00	0.08	0.00
75	26.65	36.275	23.81	4.84	6.92	0.00	0.08	0.00
100	25.46	36.463	24.33	4.88	6.97	0.00	0.06	0.00

R.V PALUMBO CRUISE 032 STATION TOR-4C PRNC REFERENCE 032549

DATE	08/08/73	BARO	1016.7	WEATHER	01	WIND VELOC	WAVE PERIOD 5
HOUR	12.4	TEMP DRY	27.0	VISIBILITY	8	WIND DIREC 10	TRANSPAR
LAT	18-31.8 N	TEMP WET	0.0	CLOUD TYPE	8	WAVE DIREC 07	SONIC DEP 0457
LONG	066-25.4 W	REL HUMID	073	CLOUD AMT	1	WAVE HEIGHT 3	COLOR

CAST 1 MESS TIME 12.4 GMT, 822 LOCAL MAX DEPTH 300 WIRE ANGLE 0
OXYGEN TIER 1.040 METER WHEEL FACTOR .997

DEPTH (M)			TEMP					OXYGEN					
WIRE	CZ	TZ	BN	TL	TM	TAVE	SALIN	SIG T	ML/L	MG/L	%SAT	PHOS	NITRA
0	0	0	11	28.25	28.26	28.26	35.917	23.02	4.65	6.64	100.10	.04	0.00
25	25	25	12	28.27	0.00	28.27	35.926	23.02	4.62	6.60	99.48	.06	0.00
50	50	53	15	27.49	0.00	27.49	36.080	23.39	4.85	6.93	103.52	.04	0.00
100	100	98	16	25.42	0.00	25.42	36.503	24.37	4.97	7.10	102.19	.04	0.00
150	150	149	1	22.82	0.00	22.82	36.991	25.51	4.39	6.27	85.23	.09	0.00
200	200	199	2	19.96	0.00	19.96	36.715	26.10	4.14	5.92	74.34	.15	0.00
250	250	249	3	18.49	0.00	18.49	36.513	26.32	4.31	6.15	76.00	.23	0.00
300	300	297	4	17.55	0.00	17.55	36.389	26.46	4.50	6.44	78.82	.34	0.00

032 549 STANDARD DEPTHS

0	28.26	35.917	23.02	4.65	6.64	0.00	0.04	0.00
10	28.26	35.921	23.02	4.64	6.63	0.00	0.05	0.00
20	28.27	35.924	23.02	4.63	6.61	0.00	0.06	0.00
30	28.16	35.948	23.07	4.66	6.65	0.00	0.06	0.00
50	27.49	36.080	23.39	4.85	6.93	0.00	0.04	0.00
75	26.53	36.278	23.85	4.97	7.09	0.00	0.04	0.00
100	25.42	36.503	24.37	4.97	7.10	0.00	0.04	0.00
150	22.82	36.991	25.51	4.39	6.27	0.00	0.09	0.00
200	19.96	36.715	26.10	4.14	5.92	0.00	0.15	0.00
250	18.49	36.513	26.32	4.31	6.15	0.00	0.23	0.00
300	17.55	36.389	26.46	4.50	6.44	0.00	0.34	0.00

R V PALUMBO CRUISE Ø32 STATION TOR-5A PRNC REFERENCE Ø32545

DATE Ø8 /Ø8/73	BARO 1Ø16.5	WEATHER Ø2	WIND VELOC Ø2	WAVE PERIOD 5
HOUR 1Ø.7	TEMP DRY 24.Ø	VISIBILITY 8	WIND DIREC 1Ø	TRANSPAR
LAT 18-29.9 N	TEMP WET Ø.Ø	CLOUD TYPE 8	WAVE DIREC Ø7	SONIC DEP Ø019
LONG Ø66-25.4 W	REL HUMID Ø89	CLOUD AMT 1	WAVE HEIGHT 3	COLOR

CAST 1 MESS TIME 1Ø.7 GMT, 644 LOCAL MAX DEPTH 1Ø WIRE ANGLE Ø
OXYGEN TITER 1.Ø4Ø METER WHEEL FACTOR .997

DEPTH (M)			TEMP					OXYGEN					
WIRE	CZ	TZ	BN	TL	TM	TAVE	SALIN	SIG T	ML/L	MG/L	%SAT	PHOS	NITRA
Ø	Ø	Ø	11	26.14	28.15	28.15	36.ØØ5	23.12	4.62	6.6Ø	99.55	.Ø4	Ø.ØØ
1Ø	1Ø	14	12	28.19	Ø.ØØ	28.19	36.ØØ8	23.11	4.64	6.63	1ØØ.Ø9	.18	Ø.ØØ

Ø32 545 STANDARD DEPTHS

Ø									
1Ø	28.15	36.ØØ5	23.12	4.62	6.6Ø	Ø.ØØ	Ø.Ø4	Ø.ØØ
	28.19	36.ØØ8	23.11	4.64	6.63	Ø.ØØ	Ø.18	Ø.ØØ

R V PALUMBO CRUISE 032 STATION TOR-58 PRNC REFERENCE 032547

DATE 08 /08/73	BARO 1016.5	WEATHER 03	WIND VELOC 04	WAVE PERIOD 5
HOUR 11.4	TEMP DRY 26.0	VISIBILITY 8	WIND DIREC 10	TRANSPAR
LAT 18-31.2 N	TEMP WET 0.0	CLOUD TYPE 8	WAVE DIREC 08	SONIC DEP 0190
LONG 066-25.4 W	REL HUMID 088	CLOUD AMT 1	WAVE HEIGHT 3	COLOR

CAST 1 MESS TIME 11.4 GMT, 723 LOCAL MAX DEPTH 100 WIRE ANGLE 0
OXYGEN TITER 1.040 METER WHEEL FACTOR .997

DEPTH (M)				TEMP					OXYGEN					
WIRE	CZ	TZ	BN	TL	TM	TAVE	SALIN	SIG T	ML/L	MG/L	%SAT	PHOS	NITRA
0	0	0	11	28.25	28.25	28.25	35.965	23.06	4.62	6.60	99.59	.07	0.00
25	25	25	12	28.29	0.00	28.29	35.969	23.05	4.65	6.64	100.34	.04	0.00
50	50	52	15	27.68	0.00	27.68	36.121	23.36	4.80	6.85	102.89	.05	0.00
100	100	98	16	25.59	0.00	25.59	36.405	24.24	4.92	7.03	101.10	.04	0.00

032 547 STANDARD DEPTHS

0	28.25	35.965	23.06	4.62	6.60	0.00	0.07	0.00
10	28.27	35.967	23.05	4.63	6.62	0.00	0.06	0.00
20	28.28	35.968	23.05	4.64	6.63	0.00	0.05	0.00
30	28.21	35.992	23.09	4.68	6.68	0.00	0.04	0.00
50	27.68	36.121	23.36	4.80	6.85	0.00	0.05	0.00
75	26.78	36.266	23.76	4.89	6.98	0.00	0.05	0.00
100	25.59	36.405	24.24	4.92	7.03	0.00	0.04	0.00

R V PALUMBO CRUISE 032 STATION TOR-5C PRNC REFERENCE 032548

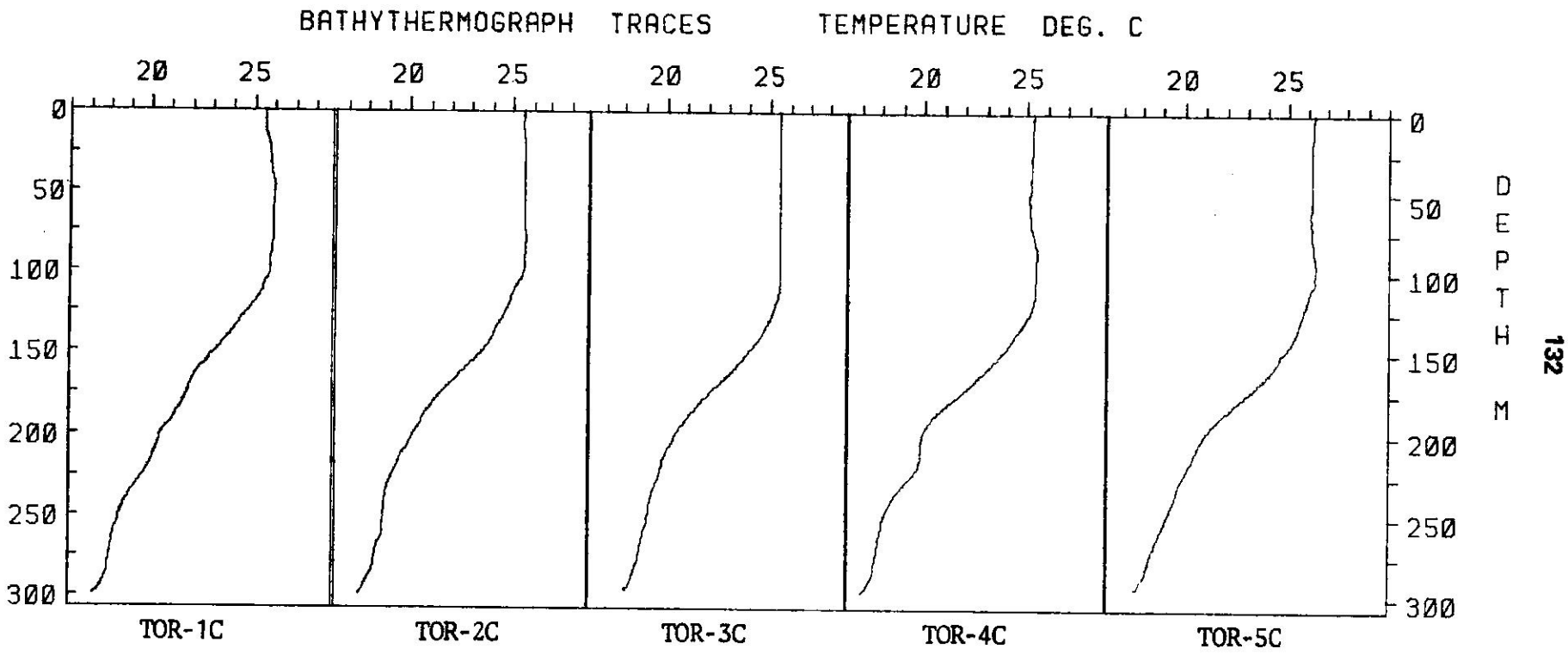
DATE 08 /08/73	BARO 1018.6	WEATHER 02	WIND VELOC 05	WAVE PERIOD 5
HOUR 11.9	TEMP DRY 26.0	VISIBILITY 8	WIND DIREC 10	TRANSPAR
LAT 18-31.7 N	TEMP WET 0.0	CLOUD TYPE 8	WAVE DIREC 07	SONIC DEP 0365
LONG 066-25.4 W	REL HUMID 088	CLOUD AMT 1	WAVE HEIGHT 3	COLOR

CAST 1 MESS TIME 11.9 GMT, 753 LOCAL MAX DEPTH 300 WIRE ANGLE 0
OXYGEN TITER 1.040 METER WHEEL FACTOR .997

DEPTH (M)				TEMP				OXYGEN					
WIRE	CZ	TZ	BN	TL	TM	TAVE	SALIN	SIG T	ML/L	MG/L	%SAT	PHOS	NITRA
0	0	0	11	28.27	28.25	28.26	35.958	23.05	4.66	6.66	100.48	.00	0.00
25	25	28	12	28.28	0.00	28.28	35.965	23.05	4.62	6.60	99.64	.05	0.00
50	50	52	15	27.18	0.00	27.18	36.106	23.51	4.88	6.97	103.69	.04	0.00
100	100	97	16	25.48	0.00	25.48	36.503	24.35	4.93	7.04	101.37	.00	0.00
150	153	153	1	22.63	0.00	22.63	36.983	25.56	4.38	6.26	84.87	.12	0.00
200	200	194	2	20.14	0.00	20.14	36.792	26.11	4.13	5.90	78.18	.14	0.00
250	250	254	3	18.50	0.00	18.50	36.749	26.50	4.37	6.24	77.73	.21	0.00
300	300	296	4	17.35	0.00	17.35	36.395	26.52	4.49	6.42	78.58	.30	0.00

032 548 STANDARD DEPTHS

0	28.26	35.958	23.05	4.66	6.66	0.00	0.07	0.00
10	28.27	35.961	23.05	4.64	6.63	0.00	0.02	0.00
20	28.28	35.964	23.05	4.63	6.61	0.00	0.04	0.00
30	28.11	35.985	23.12	4.66	6.66	0.00	0.05	0.00
50	27.18	36.106	23.51	4.88	6.97	0.00	0.04	0.00
75	26.36	36.290	23.91	4.91	7.01	0.00	0.05	0.00
100	25.48	36.503	24.35	4.93	7.04	0.00	0.07	0.00
150	22.63	36.983	25.56	4.38	6.26	0.00	0.12	0.00
200	20.14	36.792	26.11	4.13	5.90	0.00	0.14	0.00
250	18.50	36.749	26.50	4.37	6.24	0.00	0.21	0.00
300	17.35	36.395	26.52	4.49	6.42	0.00	0.30	0.00



Cruise No. PA038
January 29, 1974

R V PALUMBO CRUISE 038 STATION TOR-1A PRNC REFERENCE 038646

DATE 01/29/74	BARO 1020.5	WEATHER 00	WIND VELOC 03	WAVE PERIOD 6
HOUR 11.8	TEMP DRY 0.0	VISIBILITY 6	WIND DIREC 06	TRANSPAR
LAT 18-29.0 N	TEMP WET 23.0	CLOUD TYPE 8	WAVE DIREC 06	SONIC DEP 0025
LONG 066-29.4 W	REL HUMID 730	CLOUD AMT 2	WAVE HEIGHT 2	COLOR

CAST 1 MESS TIME 11.9 GMT, 755 LOCAL MAX DEPTH 10 WIRE ANGLE 0
OXYGEN TITER 1.043 METER WHEEL FACTOR .997

DEPTH (M)				TEMP					OXYGEN					
WIRE	CZ	TZ	BN	TL	TM	TAVE	SALIN	SIG T	ML/L	MG/L	%SAT	PHOS	NITRA
0	0	0	11	25.37	0.00	25.37	35.848	23.89	4.82	6.89	98.94	.06	0.00
10	10	13	12	25.39	0.00	25.39	35.859	23.89	4.91	7.02	100.91	.05	0.00

038 646 STANDARD DEPTHS

0	25.37	35.848	23.89	4.82	6.89	0.00	0.06	0.00
10	25.39	35.859	23.89	4.91	7.02	0.00	0.05	0.00

R V PALUMBO CRUISE 038 STATION TOR-1B PRNC REFERENCE 038659

DATE	01 /29/74	BARO	1016.5	WEATHER	02	WIND VELOC	10	WAVE PERIOD	6
HOUR	19.6	TEMP DRY	0.0	VISIBILITY	7	WIND DIREC	09	TRANSPAR	
LAT	18-30.3 N	TEMP WET	28.0	CLOUD TYPE	8	WAVE DIREC	07	SONIC DEP	0185
LONG	066-29.5 W	REL HUMID	730	CLOUD AMT	2	WAVE HEIGHT	4	COLOR	

CAST 1 MESS TIME 19.7 GMT, 1539 LOCAL MAX DEPTH 100 WIRE ANGLE 19
OXYGEN TITER 1.043 METER WHEEL FACTOR .997

DEPTH (M)			TEMP					OXYGEN					
WIRE	CZ	TZ	BN	TL	TM	TAVE	SALIN	SIG T	ML/L	MG/L	%SAT	PHOS	NITRA
0	0	0	11	25.55	0.00	25.55	35.653	23.69	4.82	6.89	98.99	.00	0.00
25	24	19	12	25.71	0.00	25.71	35.652	23.64	4.84	6.92	99.63	.07	0.00
50	48	50	10	25.60	0.00	25.60	35.649	23.67	5.03	7.18	103.34	.00	0.00
100	95	99	16	25.48	0.00	25.48	36.059	24.01	4.64	6.63	95.68	.00	0.00

038 659 STANDARD DEPTHS

0	25.55	35.653	23.69	4.82	6.89	0.00	0.06	0.00
10	25.62	35.653	23.67	4.83	6.90	0.00	0.05	0.00
20	25.69	35.652	23.64	4.84	6.91	0.00	0.03	0.00
30	25.70	35.652	23.64	4.89	6.99	0.00	0.04	0.00
50	25.59	35.661	23.68	5.02	7.18	0.00	0.07	0.00
75	25.52	35.851	23.84	4.87	6.95	0.00	0.06	0.00
100	25.47	36.103	24.05	4.60	6.57	0.00	0.05	0.00

R V PALUMBO CRUISE 038 STATION TOR-1C PRNC REFERENCE 038660

DATE 01 /29/74	BARO 1017.5	WEATHER 02	WIND VELOC 11	WAVE PERIOD 6
HOUR 20.8	TEMP DRY 0.0	VISIBILITY 7	WIND DIREC 08	TRANSPAR
LAT 18-31.8 N	TEMP WET 27.0	CLOUD TYPE 8	WAVE DIREC 08	SONIC DEP 0438
LONG 066-29.4 W	REL HUMID 72Ø	CLOUD AMT 2	WAVE HEIGHT 3	COLOR

CAST 1 MESS TIME 20.8 GMT, 1649 LOCAL MAX DEPTH 300 WIRE ANGLE 0
OXYGEN TITER 1.045 METER WHEEL FACTOR .997

DEPTH (M)			TEMP					OXYGEN					
WIRE	CZ	TZ	BN	TL	TM	TAVE	SALIN	SIG T	ML/L	MG/L	%SAT	PHOS	NITRA
0	0	0	11	25.55	0.00	25.55	35.641	23.68	4.89	6.99	100.47	.08	0.00
25	25	29	12	25.59	0.00	25.59	35.628	23.65	4.83	6.90	99.23	.09	0.00
50	50	0	10	25.93	0.00	25.93	35.640	23.56	5.48	7.82	113.05	.04	0.00
100	100	0	16	25.61	0.00	25.61	35.637	23.66	4.93	7.05	101.41	.05	0.00
150	150	0	1	23.06	0.00	23.06	36.569	25.12	4.43	6.33	85.19	.08	0.00
200	200	0	2	20.57	0.00	20.57	36.634	25.87	4.09	5.84	77.53	.16	0.00
250	250	247	3	18.40	0.00	18.40	36.329	26.21	4.08	5.83	71.51	.31	0.00
300	300	285	4	17.18	0.00	17.19	36.134	26.36	4.02	5.74	69.75	.48	0.00

038 660 STANDARD DEPTHS

0	25.55	35.641	23.68	4.89	6.99	0.00	0.08	0.00
10	25.57	35.635	23.67	4.87	6.95	0.00	0.08	0.00
20	25.58	35.628	23.66	4.84	6.92	0.00	0.09	0.00
30	25.66	35.628	23.63	4.95	7.07	0.00	0.08	0.00
50	25.93	35.640	23.56	5.48	7.82	0.00	0.04	0.00
75	25.77	35.639	23.61	5.36	7.65	0.00	0.04	0.00
100	25.61	35.637	23.66	4.93	7.05	0.00	0.05	0.00
150	23.06	36.569	25.12	4.43	6.33	0.00	0.08	0.00
200	20.57	36.634	25.87	4.09	5.84	0.00	0.16	0.00
250	18.40	36.329	26.21	4.08	5.83	0.00	0.31	0.00
300	17.18	36.134	26.36	4.02	5.74	0.00	0.48	0.00

R V PALUMBO CRUISE 038 STATION TOR-2A PRNC REFERENCE 038647

DATE 01 /29/74	BARO 1020.5	WEATHER 02	WIND VELOC 03	WAVE PERIOD 5
HOUR 12.2	TEMP DRY 0.0	VISIBILITY 7	WIND DIREC 07	TRANSPAR
LAT 18-28.7 N	TEMP WET 23.0	CLOUD TYPE 8	WAVE DIREC 07	SONIC DEP 0018
LONG 066-28.6 W	REL HUMID 730	CLOUD AMT 2	WAVE HEIGHT 2	COLOR

CAST 1 MESS TIME 12.2 GMT, 811 LOCAL MAX DEPTH 10 WIRE ANGLE 0
OXYGEN TITER 1.043 METER WHEEL FACTOR .997

DEPTH (M)			TEMP					OXYGEN					
WIRE	CZ	TZ	BN	TL	TM	TAVE	SALIN	SIG T	ML/L	MG/L	%SAT	PHOS	NITRA
0	0	0	11	25.38	0.00	25.38	35.857	23.89	4.83	6.90	99.18	.06	0.00
10	10	14	12	25.41	0.00	25.41	35.879	23.90	4.85	6.93	99.67	.05	0.00

038 647 STANDARD DEPTHS

0	25.38	35.857	23.89	4.83	6.90	0.00	0.06	0.00
10	25.41	35.879	23.90	4.85	6.93	0.00	0.05	0.00

R V PALUMBO CRUISE 038 STATION TOR-2B PRNC REFERENCE 038658

DATE 01/29/74	BARO 1017.5	WEATHER 02	WIND VELOC 11	WAVE PERIOD 6
HOUR 19.2	TEMP DRY 0.0	VISIBILITY 7	WIND DIREC 08	TRANSPAR
LAT 18-30.3 N	TEMP WET 28.0	CLOUD TYPE 8	WAVE DIREC 08	SONIC DEP 0182
LONG 066-28.3 W	REL HUMID 740	CLOUD AMT 2	WAVE HEIGHT 3	COLOR

CAST 1 MESS TIME 19.2 GMT, 1511 LOCAL MAX DEPTH 100 WIRE ANGLE 11
OXYGEN TITER 1.045 METER WHEEL FACTOR .997

DEPTH (M)			TEMP					OXYGEN					
WIRE	CZ	TZ	BN	TL	TM	TAVE	SALIN	SIG T	ML/L	MG/L	%SAT	PHOS	NITRA
0	0	0	11	25.55	0.00	25.55	35.839	23.83	4.87	6.96	100.27	.04	0.00
25	25	0	12	25.56	0.00	25.56	35.878	23.85	4.93	7.05	101.62	.06	0.00
50	49	48	10	25.66	0.00	25.66	35.829	23.78	4.78	6.83	98.49	.04	0.00
100	98	53	16	25.59	0.00	25.59	35.824	23.80	4.91	7.02	101.18	.05	0.00

038 658 STANDARD DEPTHS

0	25.55	35.839	23.83	4.87	6.96	0.00	0.04	0.00
10	25.55	35.855	23.84	4.90	7.00	0.00	0.05	0.00
20	25.56	35.872	23.85	4.92	7.03	0.00	0.06	0.00
30	25.58	35.871	23.84	4.91	7.01	0.00	0.06	0.00
50	25.66	35.828	23.78	4.78	6.83	0.00	0.04	0.00
75	25.65	35.826	23.79	4.81	6.87	0.00	0.04	0.00
100	25.59	35.824	23.80	4.92	7.03	0.00	0.05	0.00

R V PALUMBO CRUISE 038 STATION TOR-2C PRNC REFERENCE 038657

DATE 01/29/74	BARO 1019.5	WEATHER 02	WIND VELOC 12	WAVE PERIOD 6
HOUR 18.5	TEMP DRY 0.0	VISIBILITY 7	WIND DIREC 08	TRANSPAR
LAT 18-32.0 N	TEMP WET 25.0	CLOUD TYPE 8	WAVE DIREC 08	SONIC DEP 0375
LONG 066-28.4 W	REL HUMID 680	CLOUD AMT 2	WAVE HEIGHT 3	COLOR

CAST 1 MESS TIME 18.5 GMT, 1432 LOCAL MAX DEPTH 300 WIRE ANGLE 24
OXYGEN TITER 1.043 METER WHEEL FACTOR .997

DEPTH (M)					TEMP				OXYGEN					
WIRE	CZ	TZ	BN	TL	TM	TAVE	SALIN	SIG T	ML/L	MG/L	%SAT	PHOS	NITRA
0	0	0	11	25.55	0.00	25.55	35.681	23.71	4.87	6.96	100.09	.04	0.00
25	23	23	12	25.54	0.00	25.54	35.728	23.75	4.83	6.90	99.27	.04	0.00
50	46	48	10	25.52	0.00	25.52	35.757	23.77	4.84	6.92	99.49	.07	0.00
100	92	57	16	25.46	0.00	25.46	35.756	23.79	4.89	6.99	100.48	.04	0.00
150	137	147	1	23.80	0.00	23.80	36.613	24.94	4.65	6.65	89.91	.06	0.00
200	183	0	2	23.78	0.00	23.78	36.923	25.18	4.30	6.14	83.98	.10	0.00
250	228	235	3	18.74	0.00	18.74	36.548	26.29	4.22	6.02	74.57	.27	0.00
300	274	277	4	17.34	0.00	17.34	36.343	26.48	4.10	5.86	71.60	.38	0.00

038 657 STANDARD DEPTHS

0	25.55	35.681	23.71	4.87	6.96	0.00	0.04	0.00
10	25.55	35.701	23.72	4.85	6.93	0.00	0.04	0.00
20	25.54	35.722	23.74	4.84	6.91	0.00	0.04	0.00
30	25.53	35.739	23.76	4.83	6.91	0.00	0.05	0.00
50	25.52	35.757	23.78	4.84	6.92	0.00	0.07	0.00
75	25.49	35.756	23.78	4.87	6.96	0.00	0.06	0.00
100	25.16	35.897	23.99	4.86	6.95	0.00	0.04	0.00
150	23.79	36.759	25.05	4.54	6.49	0.02	0.07	0.00
200	21.95	36.813	25.63	4.25	6.08	0.00	0.16	0.00
250	17.83	36.439	26.43	4.16	5.95	0.00	0.33	0.00
300	16.55	36.227	26.58	4.04	5.77	0.00	0.44	0.00

R V PALUMBO CRUISE 038 STATION TOR-3A PRNC REFERENCE 038648

DATE 01 /29/74	BARO 1020.5	WEATHER 02	WIND VELOC 02	WAVE PERIOD 6
HOUR 12.5	TEMP DRY 0.0	VISIBILITY 7	WIND DIREC 08	TRANSPAR
LAT 18-29.1 N	TEMP WET 23.0	CLOUD TYPE 8	WAVE DIREC 07	SONIC DEP 0019
LONG 066-27.3 W	REL HUMID 820	CLOUD AMT 2	WAVE HEIGHT 2	COLOR

CAST 1 MESS TIME 12.5 GMT, 828 LOCAL MAX DEPTH 10 WIRE ANGLE 0
OXYGEN TITER 1.045 METER WHEEL FACTOR .997

DEPTH (M)			TEMP					OXYGEN					
WIRE	CZ	TZ	BN	TL	TM	TAVE	SALIN	SIG T	ML/L	MG/L	%SAT	PHOS	NITRA
0	0	0	11	24.55	0.00	24.55	35.560	23.92	4.83	6.90	95.64	.08	0.00
10	10	13	12	24.99	0.00	24.99	35.748	23.93	4.78	6.83	95.96	.11	0.00

038 648 STANDARD DEPTHS

0	24.55	35.560	23.92	4.83	6.90	0.00	0.08	0.00
10	24.99	35.748	23.93	4.78	6.83	0.00	0.11	0.00

R V PALUMBO CRUISE 038 STATION TOR-3B PRNC REFERENCE 038655

DATE 01 /29/74	BARO 1021.5	WEATHER 02	WIND VELOC 11	WAVE PERIOD 6
HOUR 16.9	TEMP DRY 0.0	VISIBILITY 7	WIND DIREC 08	TRANSPAR
LAT 18-30.7 N	TEMP WET 24.0	CLOUD TYPE 8	WAVE DIREC 08	SONIC DEP 0185
LONG 066-27.3 W	REL HUMID 810	CLOUD AMT 2	WAVE HEIGHT 3	COLOR

CAST 1 MESS TIME 16.9 GMT, 1255 LOCAL MAX DEPTH 100 WIRE ANGLE 11
OXYGEN TITER 1.043 METER WHEEL FACTOR .997

DEPTH (M)					TEMP					OXYGEN				
WIRE	CZ	TZ	BN	TL	TM	TAVE	SALIN	SIG T	ML/L	MG/L	%SAT	PHOS	NITRA
0	0	0	11	25.55	0.00	25.55	35.900	23.87	4.43	6.33	91.32	.04	0.00
25	25	31	12	25.54	0.00	25.54	35.926	23.89	4.86	6.95	100.14	.04	0.00
50	49	0	10	25.51	0.00	25.51	35.941	23.92	5.06	7.23	104.19	.05	0.00
100	98	0	16	25.55	0.00	25.55	36.064	24.00	4.86	6.95	100.32	.00	0.00

038 655 STANDARD DEPTHS

0	25.55	35.900	23.87	4.43	6.33	0.00	0.04	0.00
10	25.55	35.910	23.88	4.61	6.58	0.00	0.04	0.00
20	25.54	35.921	23.89	4.78	6.83	0.00	0.04	0.00
30	25.53	35.928	23.90	4.92	7.03	0.00	0.04	0.00
50	25.51	35.943	23.92	5.06	7.23	0.00	0.05	0.00
75	25.52	35.999	23.96	5.01	7.15	0.00	0.04	0.00
100	25.55	36.069	24.00	4.85	6.93	0.00	-0.00	0.00

R V PALUMBO CRUISE 038 STATION TOR-3C PRNC REFERENCE 038656

DATE 01/29/74	BARO 1021.5	WEATHER 02	WIND VELOC 11	WAVE PERIOD 6
HOUR 17.8	TEMP DRY 0.0	VISIBILITY 7	WIND DIREC 08	TRANSPAR
LAT 18-31.9 N	TEMP WET 24.0	CLOUD TYPE 8	WAVE DIREC 08	SONIC DEP 0365
LONG 066-27.3 W	REL HUMID 710	CLOUD AMT 2	WAVE HEIGHT 3	COLOR

CAST 1 MESS TIME 17.8 GMT, 1349 LOCAL MAX DEPTH 300 WIRE ANGLE 8
OXYGEN TITER 1.043 METER WHEEL FACTOR .997

DEPTH (M)				TEMP				OXYGEN					
WIRE	CZ	TZ	BN	TL	TM	TAVE	SALIN	SIG T	ML/L	MG/L	%SAT	PHOS	NITRA
0	0	0	1	25.53	0.00	25.53	35.698	23.73	4.86	6.95	99.07	.04	0.00
25	25	0	2	25.53	0.00	25.53	35.702	23.73	4.86	6.95	99.87	.08	0.00
50	50	0	3	25.57	0.00	25.57	35.759	23.76	4.87	6.96	100.21	.07	0.00
100	99	0	4	25.51	0.00	25.51	36.336	24.21	4.73	6.75	98.99	.07	0.00

038 656 STANDARD DEPTHS

0	25.53	35.698	23.73	4.86	6.95	0.00	0.04	0.00
10	25.53	35.700	23.73	4.86	6.95	0.00	0.06	0.00
20	25.53	35.701	23.73	4.86	6.95	0.00	0.07	0.00
30	25.54	35.708	23.73	4.86	6.95	0.00	0.08	0.00
50	25.57	35.759	23.76	4.87	6.96	0.00	0.07	0.00
75	25.55	36.015	23.96	4.81	6.87	0.00	0.07	0.00
100	25.51	36.348	24.22	4.72	6.75	0.00	0.07	0.00

R V PALUMBO CRUISE Ø38 STATION TOR-4A PRNC REFERENCE Ø38649

DATE Ø1 /29/74	BARO 1021.5	WEATHER Ø2	WIND VELOC Ø3	WAVE PERIOD 5
HOUR 12.7	TEMP DRY 0.0	VISIBILITY 7	WIND DIREC Ø7	TRANSPAR
LAT 18-24.7 N	TEMP WET 23.0	CLOUD TYPE 8	WAVE DIREC Ø7	SONIC DEP Ø021
LONG Ø66-26.3 W	REL HUMID 81Ø	CLOUD AMT 2	WAVE HEIGHT 3	COLOR

CAST 1 MESS TIME 12.7 GMT. 845 LOCAL MAX DEPTH 10 WIRE ANGLE Ø
OXYGEN TITER 1.043 METER WHEEL FACTOR .997

DEPTH (M)				TEMP					OXYGEN				
WIRE	CE	TE	BN	TL	TM	TAVE	SALIN	SIG T	ML/L	MG/L	%SAT	PHOS	NITRA
Ø	Ø	Ø	1Ø	25.ØØ	Ø.ØØ	25.ØØ	35.736	23.92	4.77	6.81	97.24	.12	Ø.ØØ
1Ø	1Ø	12	16	24.99	Ø.ØØ	24.99	35.731	23.92	4.78	6.83	95.88	.Ø8	Ø.ØØ

Ø38 649 STANDARD DEPTHS

Ø	25.ØØ	35.736	23.92	4.77	6.81	Ø.ØØ	Ø.12	Ø.ØØ
1Ø	24.99	35.731	23.92	4.78	6.83	Ø.ØØ	Ø.Ø8	Ø.ØØ

R V PALUMBO CRUISE 038 STATION TOR-4B PRNC REFERENCE 038653

DATE 01/29/74	BARO 1021.5	WEATHER 02	WIND VELOC 11	WAVE PERIOD 6
HOUR 14.8	TEMP DRY 0.0	VISIBILITY 7	WIND DIREC 08	TRANSPAR
LAT 18-31.7 N	TEMP WET 24.0	CLOUD TYPE 8	WAVE DIREC 08	SONIC DEP 0192
LONG 066-26.3 W	REL HUMID 690	CLOUD AMT 5	WAVE HEIGHT 3	COLOR

CAST 1 MESS TIME 14.9 GMT, 1051 LOCAL MAX DEPTH 100 WIRE ANGLE 17
OXYGEN TITER 1.043 METER WHEEL FACTOR .997

DEPTH (M)			TEMP					OXYGEN					
WIRE	CΣ	TΣ	BN	TL	TM	TAVE	SALIN	SIG T	ML/L	MG/L	%SAT	PHOS	NITRA
0	0	0	11	25.32	0.00	25.32	35.810	23.88	4.83	6.90	99.04	.05	0.00
25	24	28	12	25.24	0.00	25.24	35.799	23.89	4.82	6.89	98.70	.10	0.00
50	48	0	10	25.26	0.00	25.26	35.843	23.92	4.83	6.90	98.98	.18	0.00
100	96	0	16	24.98	0.00	24.98	35.850	24.01	4.85	6.93	97.87	.06	0.00

038 653 STANDARD DEPTHS

0	25.32	35.810	23.88	4.83	6.90	0.00	0.05	0.00
10	25.29	35.805	23.88	4.83	6.89	0.00	0.07	0.00
20	25.25	35.801	23.89	4.82	6.89	0.00	0.09	0.00
30	25.25	35.808	23.90	4.82	6.89	0.00	0.12	0.00
50	25.25	35.844	23.92	4.83	6.90	0.00	0.18	0.00
75	25.13	35.847	23.96	4.84	6.92	0.00	0.14	0.00
100	24.96	35.851	24.02	4.85	6.93	0.00	0.05	0.00

R V PALUMBO CRUISE 038 STATION TOR-4C PRNC REFERENCE 038654

DATE	01/29/74	BARO	1020.5	WEATHER	02	WIND VELOC	11	WAVE PERIOD	6
HOUR	15.8	TEMP DRY	0.0	VISIBILITY	6	WIND DIREC	08	TRANSPAR	
LAT	18-31.8 N	TEMP WET	24.0	CLOUD TYPE	8	WAVE DIREC	07	SONIC DEP	0384
LONG	066-25.3 W	REL HUMID	880	CLOUD AMT	6	WAVE HEIGHT	3	COLOR	

CAST 1 MESS TIME 15.8 GMT, 1150 LOCAL MAX DEPTH 300 WIRE ANGLE 17
OXYGEN TITER 1.043 METER WHEEL FACTOR .997

DEPTH (M)				TEMP					OXYGEN				
WIRE	CZ	TZ	BN	TL	TM	TAVE	SALIN	SIG T	ML/L	MG/L	%SAT	PHOS	NITRA
0	0	0	1	25.14	0.00	25.14	35.804	23.93	4.33	6.19	88.53	.00	0.00
25	24	30	2	25.14	0.00	25.14	35.814	23.93	4.86	6.95	99.42	.04	0.00
50	48	49	3	25.11	0.00	25.11	35.813	23.94	4.85	6.93	99.16	.03	0.00
100	96	99	4	25.41	0.00	25.41	36.493	24.36	4.75	6.78	97.54	.04	0.00
150	144	0	11	25.32	0.00	25.32	36.628	24.49	4.10	5.86	84.32	.06	0.00
200	191	203	12	19.97	0.00	19.97	36.800	26.16	4.11	5.87	74.11	.19	0.00
250	239	247	10	18.06	0.00	18.06	36.525	26.44	4.10	5.86	72.21	.30	0.00
038 654		STANDARD DEPTHS											
	0					25.14	35.804	23.93	4.33	6.19	0.00	0.05	0.00
	10					25.14	35.808	23.93	4.55	6.50	0.00	0.02	0.00
	20					25.14	35.813	23.93	4.78	6.83	0.00	0.03	0.00
	30					25.14	35.814	23.93	4.86	6.94	0.00	0.04	0.00
	50					25.12	35.838	23.96	4.85	6.93	0.00	0.03	0.00
	75					25.27	36.173	24.16	4.81	6.87	0.00	0.03	0.00
	100					25.40	36.514	24.38	4.69	6.70	0.00	0.04	0.00
	150					24.69	36.648	24.70	4.10	5.86	0.00	0.07	0.00
	200					19.34	36.783	26.31	4.11	5.87	0.00	0.21	0.00

R V PALUMBO CRUISE 038 STATION TOR-5A PRNC REFERENCE 038650

DATE 01 /29/74	BARO 1021.5	WEATHER 02	WIND VELOC 03	WAVE PERIOD 6
HOUR 13.0	TEMP DRY 0.0	VISIBILITY 7	WIND DIREC 07	TRANSPAR
LAT 18-29.6 N	TEMP WET 23.0	CLOUD TYPE 8	WAVE DIREC 07	SONIC DEP 0023
LONG 066-25.3 W	REL HUMID 810	CLOUD AMT 2	WAVE HEIGHT 3	COLOR

CAST 1 MESS TIME 13.0 GMT, 9 0 LOCAL MAX DEPTH 10 WIRE ANGLE 0
OXYGEN TITER 1.043 METER WHEEL FACTOR .997

DEPTH (M)					TEMP					OXYGEN				
WIRE	CZ	TZ	BN	TL	TM	TAVE	SALIN	SIG T	ML/L	MG/L	%SAT	PHOS	NITRA
0	0	0	11	24.77	0.00	24.77	35.632	23.91	4.97	7.09	98.91	.13	0.00
10	10	9	12	25.05	0.00	25.05	35.766	23.92	4.80	6.86	97.97	.11	0.00
038 650		STANDARD DEPTHS											
	0					24.77	35.632	23.91	4.97	7.09	0.00	0.13	0.00
	10					25.05	35.766	23.93	4.80	6.86	0.00	0.11	0.00

R V PALUMBO CRUISE 038 STATION TOR-58 PRNC REFERENCE 038651

DATE 01 /29/74	BARO 1021.5	WEATHER 02	WIND VELOC 03	WAVE PERIOD 6
HOUR 13.4	TEMP DRY 0.0	VISIBILITY 7	WIND DIREC 07	TRANSPAR
LAT 18-31.2 N	TEMP WET 23.0	CLOUD TYPE 8	WAVE DIREC 07	SONIC DEP 0182
LONG 066-25.3 W	REL HUMID 800	CLOUD AMT 2	WAVE HEIGHT 3	COLOR

CAST 1 MESS TIME 13.4 GMT, 925 LOCAL MAX DEPTH 100 WIRE ANGLE 19
OXYGEN TITER 1.043 METER WHEEL FACTOR .997

DEPTH (M)				TEMP				OXYGEN					
WIRE	CZ	TZ	BN	TL	TM	TAVE	SALIN	SIG T	ML/L	MG/L	%SAT	PHOS	NITRA
0	0	0	11	25.03	0.00	25.03	35.794	23.95	4.86	6.95	99.24	.06	0.00
25	24	32	12	25.03	0.00	25.03	35.793	23.95	4.87	6.96	99.45	.09	0.00
50	48	54	10	25.11	0.00	25.11	35.908	24.01	4.83	6.90	98.80	.07	0.00
100	95	0	16	25.10	0.00	25.10	35.839	23.96	4.92	7.03	100.66	.06	0.00

038 651 STANDARD DEPTHS

0	25.03	35.794	23.95	4.86	6.95	0.00	0.06	0.00
10	25.03	35.794	23.95	4.87	6.95	0.00	0.07	0.00
20	25.03	35.793	23.95	4.87	6.96	0.00	0.09	0.00
30	25.05	35.819	23.97	4.86	6.95	0.00	0.09	0.00
50	25.11	35.905	24.01	4.83	6.90	0.00	0.07	0.00
75	25.10	35.892	24.00	4.87	6.96	0.00	0.06	0.00
100	25.10	35.832	23.96	4.93	7.05	0.00	0.06	0.00

R V PALUMBO CRUISE 038 STATION TOR-5C PRNC REFERENCE 038652

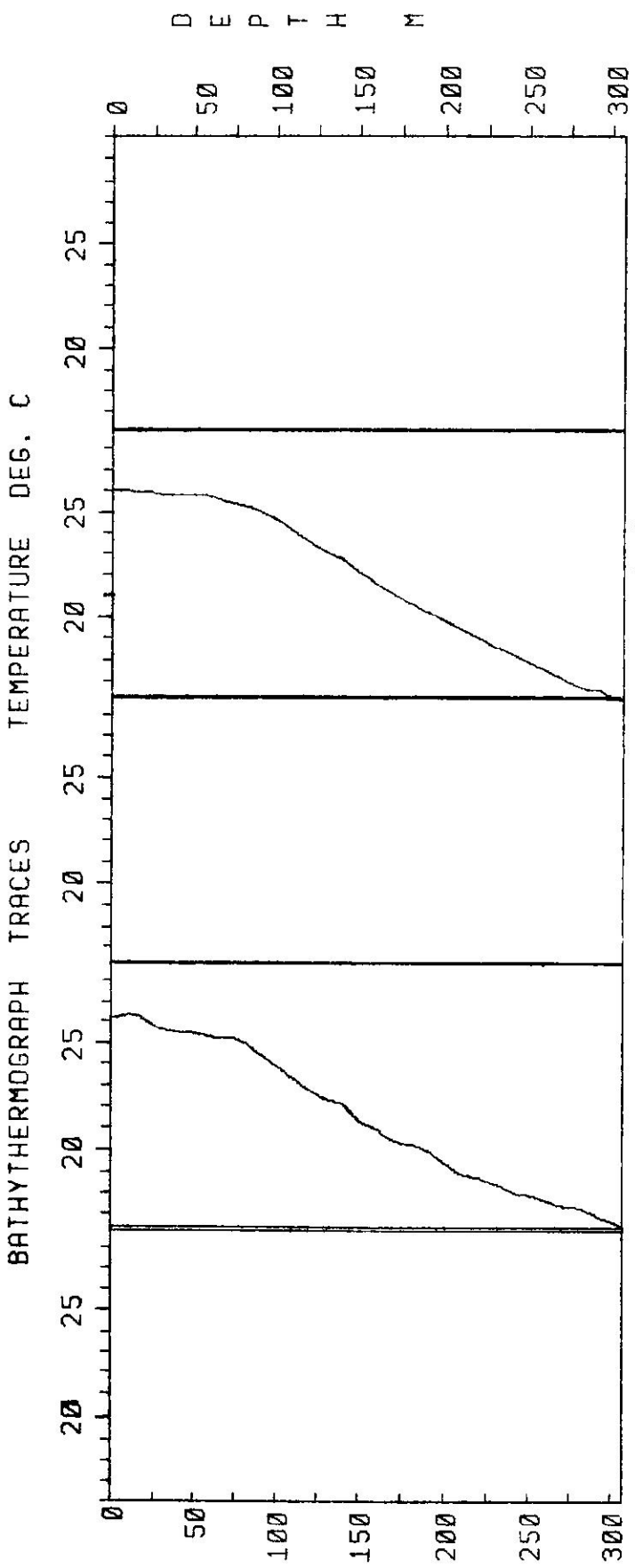
DATE	01 /29/74	BARO	1022.5	WEATHER	02	WIND VELOC	10	WAVE PERIOD	6
HOUR	14.1	TEMP DRY	0.0	VISIBILITY	7	WIND DIREC	08	TRANSPAR	
LAT	18-31.7 N	TEMP WET	24.0	CLOUD TYPE	8	WAVE DIREC	08	SONIC DEP	0375
LONG	066-25.3 W	REL HUMID	810	CLOUD AMT	5	WAVE HEIGHT	3	COLOR	

CAST 1 MESS TIME 14.0 GMT, 10 3 LOCAL MAX DEPTH 300 WIRE ANGLE 20
OXYGEN TITER 1.043 METER WHEEL FACTOR .997

DEPTH (M)				TEMP				OXYGEN					
WIRE	CZ	TZ	BN	TL	TM	TAVE	SALIN	SIG T	ML/L	MG/L	%SAT	PHOS	NITRA
0	0	0	1	25.10	0.00	25.10	35.871	23.99	4.97	7.09	101.53	.05	0.00
25	24	24	2	25.09	0.00	25.09	35.782	23.92	4.87	6.96	99.53	.05	0.00
50	47	50	3	25.10	0.00	25.10	35.803	23.94	4.87	6.96	99.56	.05	0.00
100	94	96	4	25.37	0.00	25.37	36.588	24.45	4.71	6.72	96.75	.07	0.00

038 652 STANDARD DEPTHS

0	25.10	35.871	23.99	4.97	7.09	0.00	0.05	0.00
10	25.10	35.834	23.96	4.93	7.04	0.00	0.05	0.00
20	25.09	35.795	23.93	4.89	6.98	0.00	0.05	0.00
30	25.09	35.787	23.93	4.87	6.96	0.00	0.05	0.00
50	25.11	35.838	23.96	4.86	6.95	0.00	0.05	0.00
75	25.24	36.211	24.20	4.79	6.84	0.00	0.06	0.00
100	25.40	36.688	24.51	4.68	6.69	0.00	0.07	0.00



Cruise No. PA043
May 22, 1974

R V PALUMBO CRUISE 043 STATION TOR-2A PRNC REFERENCE 043751

DATE 05 /22/74	BARO 1016.6	WEATHER 02	WIND VELOC 02	WAVE PERIOD 4			
HOUR 8.4	TEMP DRY 23.0	VISIBILITY 7	WIND DIREC 10	TRANSPAR			
LAT 18-29.1 N	TEMP WET 0.0	CLOUD TYPE 0	WAVE DIREC 09	SONIC DEP 0024			
LONG 066-28.5 W	REL HUMID 088	CLOUD AMT 2	WAVE HEIGHT 1	COLOR			

CAST 1 MESS TIME 8.4 GMT, 426 LOCAL MAX DEPTH 10 WIRE ANGLE 0
OXYGEN TITER .670 METER WHEEL FACTOR .997

DEPTH (M)				TEMP				OXYGEN					
WIRE	CZ	TZ	BN	TL	TM	TAVE	SALIN	SIG T	ML/L	MG/L	%SAT	PHOS	NITRA
0	0	4	1	26.22	0.00	26.22	35.900	23.66	4.77	6.82	99.39	.04	0.00
10	10	5	2	26.24	0.00	26.24	35.940	23.69	4.81	6.87	100.19	.03	0.00

043 751 STANDARD DEPTHS

0	26.22	35.900	23.66	4.77	6.82	0.00	0.04	0.00
10	26.24	35.940	23.69	4.81	6.87	0.00	0.03	0.00

R V PALUMBO CRUISE 043 STATION TOR-2B PRNC REFERENCE 043752

DATE	05 /22/74	BARO	1016.5	WEATHER	02	WIND VELOC	02	WAVE PERIOD	4
HOUR	8.8	TEMP DRY	23.0	VISIBILITY	7	WIND DIREC	09	TRANSPAR	
LAT	18-30,3 N	TEMP WET	0.0	CLOUD TYPE	0	WAVE DIREC	09	SONIC DEP	0162
LONG	066-28,5 W	REL HUMID	089	CLOUD AMT	2	WAVE HEIGHT	1	COLOR	

CAST 1 MESS TIME 8,9 GMT, 453 LOCAL MAX DEPTH 100 WIRE ANGLE 5
OXYGEN TITER ,670 METER WHEEL FACTOR ,997

DEPTH (M)				TEMP				OXYGEN					
WIRE	CZ	TZ	BN	TL	TM	TAVE	SALIN	SIG T	ML/L	MG/L	%SAT	PHOS	NITRA
0	0	1	1	26.19	0,00	26,19	35.936	23,70	3,76	5,38	78,34	,03	0,00
25	25	18	2	26,06	0,00	26,06	35,963	23,76	4,81	6,88	100,07	,00	0,00
50	50	49	3	26,00	0,00	26,00	36,002	23,81	4,81	6,87	99,89	,00	0,00
100	100	99	4	24,15	0,00	24,15	36,580	24,81	4,83	6,90	93,37	,00	0,00

043 752 STANDARD DEPTHS

0	26,19	35,936	23,70	3,76	5,38	0,00	0,04	0,00
10	26,14	35,947	23,72	4,18	5,98	0,00	0,03	0,00
20	26,08	35,957	23,75	4,63	6,61	0,00	0,05	0,00
30	26,04	35,970	23,77	4,81	6,88	0,00	0,05	0,00
50	26,00	36,002	23,81	4,81	6,87	0,00	0,05	0,00
75	25,36	36,208	24,16	4,81	6,88	0,00	0,05	0,00
100	24,15	36,580	24,81	4,83	6,90	0,00	0,04	0,00

R V PALUMBO CRUISE 043 STATION TOR-2C PRNC REFERENCE 043753

DATE	05 /22/74	BARO	1016.6	WEATHER	02	WIND VELOC	02	WAVE PERIOD	4
HOUR	9.7	TEMP DRY	23.0	VISIBILITY	7	WIND DIREC	10	TRANSPAR	
LAT	18-31.4 N	TEMP WET	0.0	CLOUD TYPE	0	WAVE DIREC	09	SONIC DEP	0365
LONG	067-28.5 W	REL HUMID	089	CLOUD AMT	2	WAVE HEIGHT	1	COLOR	

CAST 1 MESS TIME 9.7 GMT, 542 LOCAL MAX DEPTH 300 WIRE ANGLE 7
OXYGEN TITER .670 METER WHEEL FACTOR .997

DEPTH (M) WIRE	CZ	TZ	BN	TL	TEMP TM	TAVE	SALIN	OXYGEN SIG T	ML/L	MG/L	%SAT	PHOS	NITRA
0	0	0	10	26.27	0.00	26.27	35.881	23.63	4.77	6.82	99.43	.14	0.00
25	25	0	11	26.11	0.00	26.11	35.915	23.71	4.82	6.89	100.21	.10	0.00
50	50	52	12	25.80	0.00	25.80	36.015	23.88	4.84	6.91	100.13	.05	0.00
100	99	0	16	23.88	0.00	23.88	36.649	24.94	4.87	6.96	94.24	.25	0.00
150	149	149	1	21.58	0.00	21.58	36.888	25.79	4.35	6.21	83.28	.06	0.00
200	198	195	2	19.59	0.00	19.59	36.766	26.23	3.87	5.53	69.46	.18	0.00
250	248	244	3	18.24	0.00	18.24	36.580	26.44	4.00	5.71	70.59	.36	0.00
300	297	295	4	17.09	0.00	17.09	36.393	26.58	4.21	6.01	73.44	.38	0.00

043 753 STANDARD DEPTHS

0	26.27	35.881	23.63	4.77	6.82	0.00	0.14	0.00
10	26.21	35.895	23.66	4.79	6.85	0.00	0.12	0.00
20	26.14	35.907	23.69	4.81	6.88	0.00	0.11	0.00
30	26.07	35.925	23.73	4.83	6.89	0.00	0.09	0.00
50	25.80	36.015	23.88	4.84	6.91	0.00	0.05	0.00
75	24.95	36.327	24.38	4.85	6.93	0.00	0.15	0.00
100	23.83	36.658	24.96	4.86	6.94	0.00	0.25	0.00
150	21.53	36.888	25.80	4.33	6.19	0.00	0.06	0.00
200	19.53	36.759	26.25	3.88	5.54	0.00	0.19	0.00
250	18.19	36.572	26.45	4.01	5.72	0.00	0.36	0.00
300	17.02	36.382	26.59	4.22	6.03	0.00	0.38	0.00

R V PALUMBO CRUISE 043 STATION TOR-4A PRNC REFERENCE 043750

DATE 05/22/74	BARO 1016.5	WEATHER 02	WIND VELOC 02	WAVE PERIOD 4
HOUR 7.9	TEMP DRY 23.0	VISIBILITY 7	WIND DIREC 10	TRANSPAR
LAT 18-29.6 N	TEMP WET 0.0	CLOUD TYPE 0	WAVE DIREC 09	SONIC DEP 0023
LONG 066-26.3 W	REL HUMID 089	CLOUD AMT 2	WAVE HEIGHT 2	COLOR

CAST 1 MESS TIME 7.9 GMT, 356 LOCAL MAX DEPTH 10 WIRE ANGLE 0
OXYGEN TITER .670 METER WHEEL FACTOR .997

DEPTH (M)				TEMP					OXYGEN				
WIRE	CE	TE	BN	TL	TM	TAVE	SALIN	SIG T	ML/L	MG/L	%SAT	PHOS	NITRA
0	0	0	1	26.19	0.00	26.19	35.919	23.69	4.73	6.75	98.39	.06	0.00
10	10	5	2	26.21	0.00	26.21	35.945	23.70	4.69	6.71	97.77	.05	0.00

043 750' STANDARD DEPTHS

0	26.19	35.919	23.69	4.73	6.75	0.00	0.06	0.00
10	26.21	35.945	23.70	4.69	6.71	0.00	0.05	0.00

R V PALUMBO CRUISE 043 STATION TOR-48 PRNC REFERENCE 043749

DATE 05 /22/74	BARO 1016,5	WEATHER 02	WIND VELOC 02	WAVE PERIOD 4
HOUR 7.4	TEMP DRY 24.0	VISIBILITY 7	WIND DIREC 09	TRANSPAR
LAT 18-31,1 N	TEMP WET 0.0	CLOUD TYPE 0	WAVE DIREC 09	SONIC DEP 0180
LONG 067-26,5 W	REL HUMID 089	CLOUD AMT 2	WAVE HEIGHT 2	COLOR

CAST 1 MESS TIME 7.4 GMT, 324 LOCAL MAX DEPTH 100 WIRE ANGLE 0
OXYGEN TITER .670 METER WHEEL FACTOR .997

DEPTH (M)				TEMP				OXYGEN					
WIRE	CZ	TZ	BN	TL	TM	TAVE	SALIN	SIG T	ML/L	MG/L	%SAT	PHOS	NITRA
0	0	0	1	26.57	0.00	26,57	35.923	23,57	4,87	6,96	101,95	,08	0,00
25	25	20	2	26,14	0,00	26,14	35.942	23,72	4,79	6,84	99,61	,05	0,00
50	50	52	3	26,02	0,00	26,02	35.991	23,79	4,82	6,89	100,19	,05	0,00
100	100	100	4	24,42	0,00	24,42	36,515	24,68	4,88	6,97	94,31	,06	0,00

043 749 STANDARD DEPTHS

0	26,57	35.923	23,57	4,87	6,96	0,00	0,08	0,00
10	26,40	35,931	23,63	4,84	6,91	0,00	0,07	0,00
20	26,22	35,938	23,69	4,80	6,86	0,00	0,06	0,00
30	26,08	35,949	23,74	4,79	6,84	0,00	0,05	0,00
50	26,02	35.991	23,80	4,82	6,89	0,00	0,05	0,00
75	25,45	36,182	24,12	4,85	6,93	0,00	0,05	0,00
100	24,42	36,515	24,68	4,88	6,97	0,00	0,06	0,00

R V PALUMBO CRUISE 043 STATION TOR-4C PRNC REFERENCE 043748

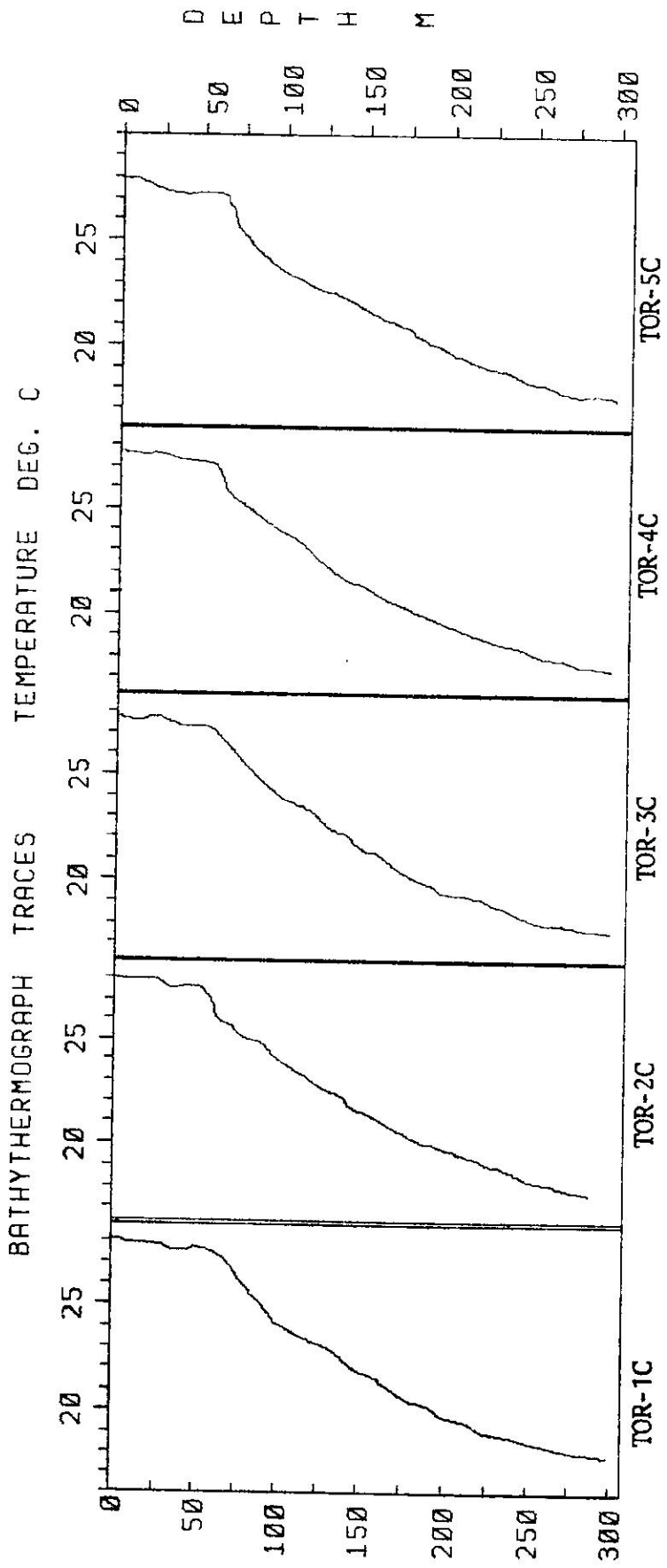
DATE 05 /22/74	BARO 1017.0	WEATHER 02	WIND VELOC 03	WAVE PERIOD 5			
HOUR 6.8	TEMP DRY 23.0	VISIBILITY 7	WIND DIREC 10	TRANSPAR			
LAT 18-32.0 N	TEMP WET 0.0	CLOUD TYPE 0	WAVE DIREC 09	SONIC DEP 0402			
LONG 066-26.5 W	REL HUMID 089	CLOUD AMT 2	WAVE HEIGHT 2	COLOR			

CAST 1 MESS TIME 6.9 GMT, 252 LOCAL MAX DEPTH 300 WIRE ANGLE 5
OXYGEN TITER .670 METER WHEEL FACTOR .997

DEPTH (M)				TEMP					OXYGEN					
WIRE	CZ	TZ	BN	TL	TM	TAVE	SALIN	SIG T	ML/L	MG/L	%SAT	PHOS	NITRA
0	0	0	10	26.30	0.00	26.30	35.904	23.64	4.81	6.88	100.36	.05	0.00
25	25	0	11	26.14	0.00	26.14	35.910	23.70	4.87	6.96	101.23	.09	0.00
50	50	52	12	25.99	0.00	25.99	35.966	23.79	4.86	6.95	100.93	.06	0.00
100	100	0	16	24.56	0.00	24.56	36.429	24.57	4.94	7.05	95.08	.28	0.00
150	149	154	1	22.10	0.00	22.10	36.859	25.62	4.50	6.43	86.55	.05	0.00
200	199	194	2	20.10	0.00	20.10	36.786	26.11	4.07	5.82	77.04	.14	0.00
250	249	246	3	18.23	0.00	18.23	36.543	26.41	4.06	5.81	71.69	.37	0.00
300	298	300	4	16.98	0.00	16.98	36.374	26.59	4.16	5.94	72.55	.50	0.00

043 748 STANDARD DEPTHS

0	26.30	35.904	23.64	4.81	6.88	0.00	0.05	0.00
10	26.24	35.906	23.66	4.84	6.91	0.00	0.07	0.00
20	26.17	35.909	23.69	4.86	6.94	0.00	0.08	0.00
30	26.11	35.916	23.71	4.87	6.95	0.00	0.08	0.00
50	25.99	35.966	23.79	4.86	6.95	0.00	0.06	0.00
75	25.44	36.170	24.11	4.88	6.98	0.00	0.12	0.00
100	24.56	36.429	24.57	4.94	7.05	0.00	0.28	0.00
150	22.06	36.858	25.63	4.49	6.41	0.00	0.05	0.00
200	20.06	36.782	26.12	4.07	5.81	0.00	0.14	0.00
250	18.20	36.539	26.42	4.07	5.81	0.00	0.37	0.00
300	16.93	36.367	26.60	4.16	5.95	0.00	0.51	0.00



Cruise No. PA045
August 14, 1974

R V PALUMBO CRUISE 045 STATION TOR-1A PRNC REFERENCE 045795

DATE	08 /14/74	BARO	1020.5	WEATHER	00	WIND VELOC	04	WAVE PERIOD	5
HOUR	14.6	TEMP DRY	29.0	VISIBILITY	7	WIND DIREC	09	TRANSPAR	
LAT	18-29.0 N	TEMP WET	0.0	CLOUD TYPE	8	WAVE DIREC	08	SONIC DEP	0027
LONG	066-29.6 W	REL HUMID	073	CLOUD AMT	2	WAVE HEIGHT	3	COLOR	

CAST 1 MESS TIME 14.5 GMT, 1028 LOCAL MAX DEPTH 10 WIRE ANGLE 3
OXYGEN TITER .686 METER WHEEL FACTOR .997

DEPTH (M)				TEMP					OXYGEN					
WIRE	CZ	TZ	BN	TL	TM	TAVE	SALIN	SIG T	ML/L	MG/L	%SAT	PHOS	NITRA
0	0	0	1	28.09	0.00	28.09	35.422	22.70	4.70	6.72	99.29	.04	0.00
10	10	0	2	27.98	0.00	27.98	35.435	22.75	4.60	6.57	97.03	.04	0.00
045 795		STANDARD DEPTHS											
	0					28.09	35.422	22.70	4.70	6.72	0.00	0.04	0.00
	10					27.98	35.435	22.75	4.60	6.57	0.00	0.04	0.00

R V PALUMBO CRUISE 045 STATION TOR-1B PRNC REFERENCE 045796

DATE 08 /14/74	BARO 1021.6	WEATHER 02	WIND VELOC 06	WAVE PERIOD 5
HOUR 14.8	TEMP DRY 29.0	VISIBILITY 7	WIND DIREC 09	TRANSPAR
LAT 18-30.4 N	TEMP WET 0.0	CLOUD TYPE 8	WAVE DIREC 08	SONIC DEP 0186
LONG 066-29.6 W	REL HUMID 073	CLOUD AMT 2	WAVE HEIGHT 4	COLOR

CAST 1 MESS TIME 14.9 GMT, 1051 LOCAL MAX DEPTH 100 WIRE ANGLE 5
OXYGEN TITER .686 METER WHEEL FACTOR .997

DEPTH (M)				TEMP				OXYGEN					
WIRE	CZ	TZ	BN	TL	TM	TAVE	SALIN	SIG T	ML/L	MG/L	%SAT	PHOS	NITRA
0	0	0	1	28.07	0.00	28.07	35.424	22.71	4.71	6.73	99.42	.04	0.00
25	25	0	2	27.95	0.00	27.95	35.660	22.93	4.61	6.59	98.00	.05	0.00
50	50	52	6	27.66	0.00	27.66	36.330	23.53	4.72	6.74	97.68	.05	0.00
100	100	101	4	24.46	0.00	24.46	36.549	24.69	4.92	7.02	95.13	.04	0.00

045 796 STANDARD DEPTHS

0	28.07	35.424	22.71	4.71	6.73	0.00	0.04	0.00
10	28.02	35.518	22.80	4.67	6.67	0.00	0.04	0.00
20	27.98	35.604	22.88	4.63	6.61	0.00	0.05	0.00
30	27.91	35.786	23.04	4.62	6.61	0.00	0.05	0.00
50	27.66	36.330	23.53	4.72	6.74	0.00	0.05	0.00
75	26.50	36.439	23.98	4.82	6.88	0.00	0.05	0.00
100	24.46	36.549	24.70	4.92	7.02	0.00	0.04	0.00

R V PALUMBO CRUISE 045 STATION TOR-1C PRNC REFERENCE 045797

DATE 08 /14/74	BARO 1022.0	WEATHER 02	WIND VELOC 06	WAVE PERIOD 5
HOUR 15.6	TEMP DRY 30.0	VISIBILITY 7	WIND DIREC 09	TRANSPAR
LAT 18-31.9 N	TEMP WET 0.0	CLOUD TYPE 8	WAVE DIREC 08	SONIC DEP 0402
LONG 066-29.6 W	REL HUMID 075	CLOUD AMT 5	WAVE HEIGHT 3	COLOR

CAST 1 MESS TIME 15.5 GMT, 1131 LOCAL MAX DEPTH 300 WIRE ANGLE 3
OXYGEN TITER .686 METER WHEEL FACTOR .997

DEPTH (M)				TEMP					OXYGEN				
WIRE	CZ	TZ	BN	TL	TM	TAVE	SALIN	SIG T	ML/L	MG/L	%SAT	PHOS	NITRA
0	0	0	1	27.96	0.00	27.96	35.377	22.71	4.72	6.75	99.42	.04	0.00
25	25	0	2	27.95	0.00	27.95	35.564	22.86	4.65	6.64	98.42	.06	0.00
50	50	53	6	27.71	0.00	27.71	36.358	23.53	4.66	6.65	96.50	.03	0.00
100	100	102	4	24.00	0.00	24.00	36.587	24.86	5.06	7.23	97.80	.06	0.00
150	150	0	5	21.72	0.00	21.72	36.774	25.66	4.53	6.47	86.76	.05	0.00
200	200	198	7	19.69	0.00	19.69	36.697	26.15	4.24	6.05	75.87	.10	0.00
250	249	248	8	18.26	0.00	18.28	36.518	26.38	4.09	5.84	72.03	.29	0.00
300	299	0	16	17.12	0.00	17.12	36.413	26.59	4.10	5.86	71.64	.49	0.00

045 797 STANDARD DEPTHS

0	27.96	35.377	22.71	4.72	6.75	0.00	0.04	0.00
10	27.96	35.452	22.77	4.69	6.71	0.00	0.05	0.00
20	27.95	35.527	22.83	4.66	6.66	0.00	0.06	0.00
30	27.93	35.709	22.97	4.65	6.64	0.00	0.06	0.00
50	27.71	36.358	23.53	4.66	6.65	0.00	0.03	0.00
75	26.03	36.472	24.15	4.79	6.85	0.00	0.04	0.00
100	24.00	36.587	24.86	5.06	7.23	0.00	0.06	0.00
150	21.72	36.774	25.66	4.53	6.47	0.00	0.05	0.00
200	19.69	36.697	26.16	4.24	6.05	0.00	0.10	0.00
250	18.26	36.516	26.39	4.09	5.84	0.00	0.29	0.00
300	17.10	36.411	26.59	4.10	5.86	0.00	0.49	0.00

R V PALUMBO CRUISE 045 STATION TOR-2A PRNC REFERENCE 045794

DATE 08 /14/74	BARO 1021.5	WEATHER 02	WIND VELOC 05	WAVE PERIOD 5
HOUR 14.2	TEMP DRY 29.0	VISIBILITY 7	WIND DIREC 09	TRANSPAR
LAT 18-20,9 N	TEMP WET 0.0	CLOUD TYPE 8	WAVE DIREC 08	SONIC DEP 0026
LONG 066-28,5 W	REL HUMID 073	CLOUD AMT 3	WAVE HEIGHT 3	COLOR

CAST 1 MESS TIME 14.2 GMT, 1010 LOCAL MAX DEPTH 10 WIRE ANGLE 3
OXYGEN TITER .686 METER WHEEL FACTOR .997

DEPTH (M)			TEMP					OXYGEN					
WIRE	CZ	TZ	BN	TL	TM	TAVE	SALIN	SIG T	ML/L	MG/L	%SAT	PHOS	NITRA
0	0	1	6	28.06	0,00	28,06	35,434	22,72	4,72	6,74	99,58	,04	0,00
10	10	12	4	27,99	0,00	27,99	35,435	22,75	4,61	6,58	97,19	,05	0,00

045 794 STANDARD DEPTHS

0	28,06	35,434	22,72	4,72	6,74	0,00	0,04	0,00
10	27,99	35,435	22,75	4,61	6,58	0,00	0,05	0,00

R V PALUMBO CRUISE 045 STATION TOR-2B PRNC REFERENCE 045790

DATE	08 /14/74	BARO	1020.5	WEATHER	02	WIND VELOC	06	WAVE PERIOD	5
HOUR	12.4	TEMP DRY	26.0	VISIBILITY	7	WIND DIREC	09	TRANSPAR	
LAT	18-30.3 N	TEMP WET	0.0	CLOUD TYPE	8	WAVE DIREC	08	SONIC DEP	0201
LONG	066-28.4 W	REL HUMID	088	CLOUD AMT	6	WAVE HEIGHT	4	COLOR	

CAST 1 MESS TIME 12.4 GMT, 826 LOCAL MAX DEPTH 100 WIRE ANGLE 6
OXYGEN TITER .686 METER WHEEL FACTOR .997

DEPTH (M)				TEMP					OXYGEN				
WIRE	CZ	TZ	BN	TL	TM	TAVE	SALIN	SIG T	ML/L	MG/L	%SAT	PHOS	NITRA
0	0	0	1	27.87	0.00	27.87	35.383	22.75	4.64	6.63	97.61	.04	0.00
25	25	0	2	28.02	0.00	28.02	35.557	22.83	4.68	6.69	99.21	.09	0.00
50	50	47	6	27.71	0.00	27.71	36.365	23.54	4.65	6.64	96.38	.09	0.00
100	100	99	4	24.13	0.00	24.13	36.582	24.82	4.96	7.08	95.87	.05	0.00

045 790 STANDARD DEPTHS

0	27.87	35.383	22.75	4.64	6.63	0.00	0.04	0.00
10	27.93	35.453	22.78	4.66	6.66	0.00	0.06	0.00
20	27.99	35.522	22.81	4.68	6.68	0.00	0.08	0.00
30	28.01	35.703	22.94	4.68	6.68	0.00	0.09	0.00
50	27.71	36.365	23.54	4.65	6.64	0.00	0.09	0.00
75	26.41	36.473	24.04	4.74	6.77	0.00	0.08	0.00
100	24.13	36.582	24.82	4.96	7.08	0.00	0.05	0.00

R V PALUMBO CRUISE 045 STATION TOR-2C PRNC REFERENCE 045789

DATE 08 /14/74	BARO 1019.5	WEATHER 02	WIND VELOC 06	WAVE PERIOD			
HOUR 10.9	TEMP DRY 25.0	VISIBILITY 7	WIND DIREC 09	TRANSPAR			
LAT 18-31.8 N	TEMP WET 0.0	CLOUD TYPE 8	WAVE DIREC 09	SONIC DEP 0365			
LONG 066-28.5 W	REL HUMID 095	CLOUD AMT 6	WAVE HEIGHT 1	COLOR			

CAST 1 MESS TIME 11.0 GMT, 659 LOCAL MAX DEPTH 300 WIRE ANGLE 8
OXYGEN TITER .686 METER WHEEL FACTOR .997

DEPTH (M)				TEMP				OXYGEN					
WIRE	CZ	TZ	BN	TL	TM	TAVE	SALIN	SIG T	ML/L	MG/L	%SAT	PHOS	NITRA
0	0	0	1	27.95	0.00	27.95	35.342	22.69	4.63	6.61	97.28	.00	0.00
25	25	0	2	27.69	0.00	27.69	35.583	22.95	4.72	6.74	99.58	.04	0.00
50	50	0	5	27.80	0.00	27.80	36.293	23.45	4.66	6.65	96.34	.06	0.00
100	99	0	4	24.28	0.00	24.28	36.568	24.76	5.07	7.24	98.02	.07	0.00
150	149	0	6	21.49	0.00	21.49	36.753	25.71	4.55	6.50	86.98	.03	0.00
200	198	195	7	19.71	0.00	19.71	36.706	26.16	4.24	6.05	75.91	.13	0.00

045 789 STANDARD DEPTHS

0	27.95	35.342	22.69	4.63	6.61	0.00	0.04	0.00
10	27.85	35.438	22.80	4.66	6.66	0.00	0.02	0.00
20	27.73	35.525	22.90	4.70	6.72	0.00	0.03	0.00
30	27.71	35.715	23.05	4.71	6.72	0.00	0.05	0.00
50	27.80	36.293	23.45	4.66	6.65	0.00	0.06	0.00
75	26.26	36.531	24.13	4.78	6.83	0.00	0.07	0.00
100	24.22	36.573	24.79	5.06	7.23	0.00	0.07	0.00
150	21.44	36.752	25.72	4.54	6.49	0.00	0.03	0.00
200	19.64	36.704	26.17	4.22	6.04	0.00	0.13	0.00

R V PALUMBO CRUISE 045 STATION TOR-3A PRNC REFERENCE 045793

DATE 08 /14/74	BARO 1021.3	WEATHER 02	WIND VELOC 05	WAVE PERIOD 5
HOUR 13.7	TEMP DRY 29.0	VISIBILITY 7	WIND DIREC 09	TRANSPAR
LAT 18-29.1 N	TEMP WET 0.0	CLOUD TYPE 8	WAVE DIREC 08	SONIC DEP 0023
LONG 066-27.3 W	REL HUMID 068	CLOUD AMT 3	WAVE HEIGHT 2	COLOR

CAST 1 MESS TIME 13.8 GMT, 948 LOCAL MAX DEPTH 10 WIRE ANGLE 3
OXYGEN TITER .686 METER WHEEL FACTOR .997

DEPTH (M)				TEMP					OXYGEN				
WIRE	CZ	TZ	BN	TL	TM	TAVE	SALIN	SIG T	ML/L	MG/L	%SAT	PHOS	NITRA
0	0	0	1	28.01	0.00	28.01	35.400	22.71	4.71	6.73	99.27	.04	0.00
10	10	0	2	27.95	0.00	27.95	35.481	22.79	4.64	6.63	98.01	.04	0.00

045 793 STANDARD DEPTHS

0	28.01	35.400	22.71	4.71	6.73	0.00	0.04	0.00
10	27.95	35.481	22.79	4.64	6.63	0.00	0.04	0.00

R V PALUMBO CRUISE 045 STATION TOR-38 PRNC REFERENCE 045788

DATE 08 /14/74	BARO 1019.5	WEATHER 02	WIND VELOC 06	WAVE PERIOD 5
HOUR 10.1	TEMP DRY 25.0	VISIBILITY 7	WIND DIREC 09	TRANSPAR
LAT 18-30.8 N	TEMP WET 0.0	CLOUD TYPE 8	WAVE DIREC 09	SONIC DEP 0183
LONG 066-27.4 W	REL HUMID 093	CLOUD AMT 2	WAVE HEIGHT 1	COLOR

CAST 1 MESS TIME 10.0 GMT, 6 1 LOCAL MAX DEPTH 100 WIRE ANGLE 4
OXYGEN TITER .686 METER WHEEL FACTOR .997

DEPTH (M)				TEMP				OXYGEN					
WIRE	CZ	TZ	BN	TL	TM	TAVE	SALIN	SIG T	ML/L	MG/L	%SAT	PHOS	NITRA
0	0	0	1	27.80	0.00	27.80	35.317	22.72	4.65	6.64	97.47	.00	0.00
25	25	0	2	27.99	0.00	27.99	35.599	22.87	4.71	6.73	99.89	.00	0.00
50	50	51	3	27.70	0.00	27.70	36.270	23.47	4.68	6.69	96.81	.00	0.00
100	100	0	4	24.30	0.00	24.30	36.562	24.75	5.04	7.20	97.48	.00	0.00

045 788 STANDARD DEPTHS

0	27.80	35.317	22.72	4.65	6.64	0.00	0.04	0.00
10	27.88	35.430	22.78	4.67	6.68	0.00	0.04	0.00
20	27.96	35.535	22.83	4.70	6.71	0.00	0.03	0.00
30	27.98	35.726	22.97	4.71	6.72	0.00	0.05	0.00
50	27.70	36.270	23.47	4.68	6.69	0.00	0.06	0.00
75	26.47	36.416	23.97	4.79	6.85	0.00	0.07	0.00
100	24.30	36.562	24.75	5.04	7.20	0.00	0.07	0.00

R V PALUMBO CRUISE 045 STATION TOR-3C PRNC REFERENCE 045787

DATE	08 /14/74	BARO	1019.5	WEATHER	02	WIND VELOC	05	WAVE PERIOD	5
HOUR	9.2	TEMP DRY	25.0	VISIBILITY	7	WIND DIREC	09	TRANSPAR	
LAT	18-31.8 N	TEMP WET	0.0	CLOUD TYPE	8	WAVE DIREC	09	SONIC DEP	0365
LONG	066-27.4 W	REL HUMID	093	CLOUD AMT	1	WAVE HEIGHT	2	COLOR	

CAST 1 MESS TIME 9.2 GMT, 511 LOCAL MAX DEPTH 300 WIRE ANGLE 3
OXYGEN TITER .686 METER WHEEL FACTOR .997

DEPTH (M)			TEMP					OXYGEN					
WIRE	CZ	TZ	BN	TL	TM	TAVE	SALIN	SIG T	ML/L	MG/L	%SAT	PHOS	NITRA
0	0	0	1	27.76	0.00	27.76	35.289	22.71	4.72	6.74	98.78	.03	0.00
25	25	0	2	27.90	0.00	27.90	35.595	22.90	4.77	6.81	100.92	.03	0.00
50	50	53	5	27.69	0.00	27.69	36.420	23.58	4.66	6.65	96.67	.00	0.00
100	100	100	4	23.98	0.00	23.98	36.562	24.85	5.08	7.26	98.10	.00	0.00
150	150	149	6	21.61	0.00	21.61	36.822	25.73	4.43	6.33	84.80	.03	0.00
200	200	197	7	19.44	0.00	19.44	36.655	26.19	4.31	6.15	76.83	.12	0.00
250	249	247	8	18.20	0.00	18.20	36.518	26.40	4.29	6.12	75.51	.20	0.00
300	299	0	16	17.58	0.00	17.58	36.432	26.49	4.40	6.29	77.12	.36	0.00

045 787 STANDARD DEPTHS

0	27.76	35.289	22.71	4.72	6.74	0.00	0.03	0.00
10	27.82	35.411	22.79	4.74	6.77	0.00	0.03	0.00
20	27.88	35.523	22.85	4.76	6.79	0.00	0.03	0.00
30	27.90	35.752	23.02	4.74	6.78	0.00	0.03	0.00
50	27.69	36.420	23.58	4.66	6.65	0.00	0.03	0.00
75	26.03	36.491	24.17	4.76	6.80	0.00	0.03	0.00
100	23.98	36.562	24.85	5.08	7.26	0.00	0.03	0.00
150	21.61	36.822	25.73	4.43	6.33	0.00	0.03	0.00
200	19.44	36.655	26.19	4.31	6.15	0.00	0.12	0.00
250	18.18	36.516	26.40	4.29	6.12	0.00	0.20	0.00
300	17.57	36.430	26.49	4.40	6.29	0.00	0.36	0.00

R V PALUMBO CRUISE 045 STATION TOR-4A PRNC REFERENCE 045792

DATE 08 /14/74	BARO 1021.0	WEATHER 02	WIND VELOC 04	WAVE PERIOD 5
HOUR 13.6	TEMP DRY 26.0	VISIBILITY 7	WIND DIREC 09	TRANSPAR
LAT 18-29.7 N	TEMP WET 0.0	CLOUD TYPE 8	WAVE DIREC 08	SONIC DEP 0024
LONG 066-26.2 W	REL HUMID 076	CLOUD AMT 4	WAVE HEIGHT 3	COLOR

CAST 1 MESS TIME 13.5 GMT, 927 LOCAL MAX DEPTH 10 WIRE ANGLE 4
OXYGEN TITER .686 METER WHEEL FACTOR .997

DEPTH (M)				TEMP				OXYGEN					
WIRE	CZ	TZ	BN	TL	TM	TAVE	SALIN	SIG T	ML/L	MG/L	%SAT	PHOS	NITRA
0	0	0	4	27.90	0.00	27.90	35.375	22.73	4.72	6.74	99.20	.04	0.00
10	10	0	6	27.94	0.00	27.94	35.376	22.72	4.64	6.62	97.52	.04	0.00
045 792				STANDARD DEPTHS									
	0					27.90	35.375	22.73	4.72	6.74	0.00	0.04	0.00
	10					27.94	35.376	22.72	4.64	6.62	0.00	0.04	0.00

R V PALUMBO CRUISE 045 STATION TOR-4B PRNC REFERENCE 045785

DATE 08 /14/74	BARO 1019.5	WEATHER 02	WIND VELOC 04	WAVE PERIOD 5
HOUR 7.8	TEMP DRY 25.0	VISIBILITY 7	WIND DIREC 09	TRANSPAR
LAT 18-31.1 N	TEMP WET 0.0	CLOUD TYPE 8	WAVE DIREC 08	SONIC DEP 0162
LONG 066-26.3 W	REL HUMID 092	CLOUD AMT 1	WAVE HEIGHT 2	COLOR

CAST 1 MESS TIME 7.7 GMT, 344 LOCAL MAX DEPTH 100 WIRE ANGLE 3
OXYGEN TITER .686 METER WHEEL FACTOR .997

DEPTH (M)				TEMP				OXYGEN					
WIRE	CZ	TZ	BN	TL	TM	TAVE	SALIN	SIG T	ML/L	MG/L	%SAT	PHOS	NITRA
0	0	0	1	27.87	0.00	27.87	35.331	22.71	4.67	6.67	98.02	.06	0.00
25	25	0	2	27.93	0.00	27.93	35.646	22.92	4.71	6.73	99.96	.00	0.00
50	50	52	3	27.65	0.00	27.65	36.120	23.37	4.63	6.61	99.24	.00	0.00
100	100	99	4	24.34	0.00	24.34	36.552	24.73	4.99	7.12	96.40	.07	0.00

045 785 STANDARD DEPTHS

0	27.87	35.331	22.71	4.67	6.67	0.00	0.06	0.00
10	27.89	35.457	22.79	4.69	6.69	0.00	0.04	0.00
20	27.92	35.580	22.88	4.70	6.72	0.00	0.03	0.00
30	27.91	35.739	23.00	4.71	6.72	0.00	0.04	0.00
50	27.65	36.120	23.37	4.63	6.61	0.00	0.05	0.00
75	26.45	36.422	23.98	4.72	6.74	0.00	0.06	0.00
100	24.34	36.552	24.73	4.99	7.12	0.00	0.07	0.00

R V PALUMBO CRUISE 045 STATION TOR-4C PRNC REFERENCE 045786

DATE	08 /14/74	BARO	1019.0	WEATHER	02	WIND VELOC	04	WAVE PERIOD	5
HOUR	8.4	TEMP DRY	25.0	VISIBILITY	7	WIND DIREC	09	TRANSPAR	
LAT	18-31.8 N	TEMP WET	0.0	CLOUD TYPE	8	WAVE DIREC	08	SONIC DEP	0365
LONG	066-26.4 W	REL HUMID	093	CLOUD AMT	1	WAVE HEIGHT	2	COLOR	

CAST 1 MESS TIME 8.4 GMT, 423 LOCAL MAX DEPTH 300 WIRE ANGLE 11
OXYGEN TITER .686 METER WHEEL FACTOR .997

DEPTH (M)				TEMP				OXYGEN					
WIRE	CZ	TZ	BN	TL	TM	TAVE	SALIN	SIG T	ML/L	MG/L	%SAT	PHOS	NITRA
0	0	0	1	27.73	0.00	27.73	35.300	22,73	4.70	6.72	98,49	,08	0,00
25	25	0	2	27.92	0.00	27.92	35.611	22,90	4.71	6.73	99,84	,07	0,00
50	49	51	5	27.72	0.00	27.72	36.238	23,44	4.64	6.63	95,87	,00	0,00
100	98	107	4	23.88	0.00	23,88	36,619	24,92	5.05	7.22	97,72	,00	0,00
150	147	157	6	21.28	0.00	21.28	36.861	25,85	4.29	6.13	82,02	,03	0,00
200	196	203	7	19.38	0.00	19.38	36,666	26,21	4.13	5.91	73,77	,16	0,00
250	245	255	8	18.42	0.00	18.42	36.544	26,37	4.22	6.03	74,58	,25	0,00
300	294	0	16	17.53	0.00	17.53	36.429	26,50	4,37	6,24	76,50	,36	0,00

045 786 STANDARD DEPTHS

0	27.73	35.300	22.73	4.70	6.72	0,00	0,08	0,00
10	27.81	35.424	22,80	4,71	6,72	0,00	0,08	0,00
20	27.89	35.542	22,86	4,71	6,73	0,00	0,07	0,00
30	27.92	35.736	23,00	4,70	6,72	0,00	0,07	0,00
50	27.66	36.253	23,47	4,64	6,63	0,00	0,06	0,00
75	25.89	36.524	24,24	4,77	6,81	0,00	0,05	0,00
100	23.75	36.635	24,97	5,03	7,18	0,00	0,04	0,00
150	21.14	36.854	25,88	4,27	6,10	0,00	0,04	0,00
200	19.28	36.655	26,23	4,14	5,91	0,00	0,17	0,00
250	18.33	36.532	26,38	4.24	6.05	0,00	0,26	0,00
300	17.42	36.415	26,52	4.39	6.26	0,00	0,37	0,00

R V PALUMBO CRUISE 045 STATION TOR-5A PRNC REFERENCE 045791

DATE 08 /14/74	BARO 1021.0	WEATHER 02	WIND VELOC 04	WAVE PERIOD 5
HOUR 13.1	TEMP DRY 27.0	VISIBILITY 7	WIND DIREC 09	TRANSPAR
LAT 18-29.9 N	TEMP WET 0.0	CLOUD TYPE 8	WAVE DIREC 08	SONIC DEP 0024
LONG 066-25.2 W	REL HUMID 088	CLOUD AMT 6	WAVE HEIGHT 3	COLOR

CAST 1 MESS TIME 13.1 GMT, 9 7 LOCAL MAX DEPTH 10 WIRE ANGLE 0
OXYGEN TITER .686 METER WHEEL FACTOR .997

DEPTH (M)				TEMP				OXYGEN					
WIRE	CZ	TZ	BN	TL	TM	TAVE	SALIN	SIG T	ML/L	MG/L	%SAT	PHOS	NITRA
0	0	0	1	27.90	0.00	27.90	35.362	22.72	4.72	6.75	99.30	.00	0.00
10	10	0	2	27.89	0.00	27.89	35.402	22.75	4.64	6.63	97.69	.04	0.00
045 791		STANDARD DEPTHS											
	0					27.90	35.362	22.72	4.72	6.75	0.00	0.08	0.00
	10					27.89	35.402	22.75	4.64	6.63	0.00	0.08	0.00

R V PALUMBO CRUISE 045 STATION TOR-58 PRNC REFERENCE 045784

DATE 08 /14/74	BARO 1020.5	WEATHER 02	WIND VELOC 04	WAVE PERIOD 5
HOUR 7.1	TEMP DRY 26.0	VISIBILITY 7	WIND DIREC 09	TRANSPAR
LAT 18-31.2 N	TEMP WET 0.0	CLOUD TYPE 8	WAVE DIREC 08	SONIC DEP 0201
LONG 066-25.3 W	REL HUMID 092	CLOUD AMT 1	WAVE HEIGHT 2	COLOR

CAST 1 MESS TIME 7.1 GMT, 3 3 LOCAL MAX DEPTH 100 WIRE ANGLE 5
OXYGEN TITER .686 METER WHEEL FACTOR .997

DEPTH (M)				TEMP				OXYGEN					
WIRE	CE	TE	BN	TL	TM	TAVE	SALIN	SIG T	ML/L	MG/L	%SAT	PHOS	NITRA
0	0	0	1	27.95	0.00	27.95	35.474	22.79	4.64	6.63	97.99	.05	0.00
25	25	0	2	27.93	0.00	27.93	35.597	22.89	4.71	6.73	99.81	.05	0.00
50	50	43	3	27.60	0.00	27.60	36.118	23.39	4.65	6.64	99.59	.08	0.00
100	100	98	4	24.11	0.00	24.11	36.593	24.83	4.94	7.05	95.50	.05	0.00

045 784 STANDARD DEPTHS

0	27.95	35.474	22.79	4.64	6.63	0.00	0.05	0.00
10	27.94	35.523	22.83	4.67	6.67	0.00	0.05	0.00
20	27.93	35.572	22.87	4.70	6.71	0.00	0.05	0.00
30	27.90	35.688	22.97	4.70	6.71	0.00	0.06	0.00
50	27.60	36.118	23.39	4.65	6.64	0.00	0.08	0.00
75	26.33	36.450	24.04	4.72	6.75	0.00	0.08	0.00
100	24.11	36.593	24.83	4.94	7.05	0.00	0.05	0.00

R V PALUMBO CRUISE 045 STATION TOR-5C PRNC REFERENCE 045783

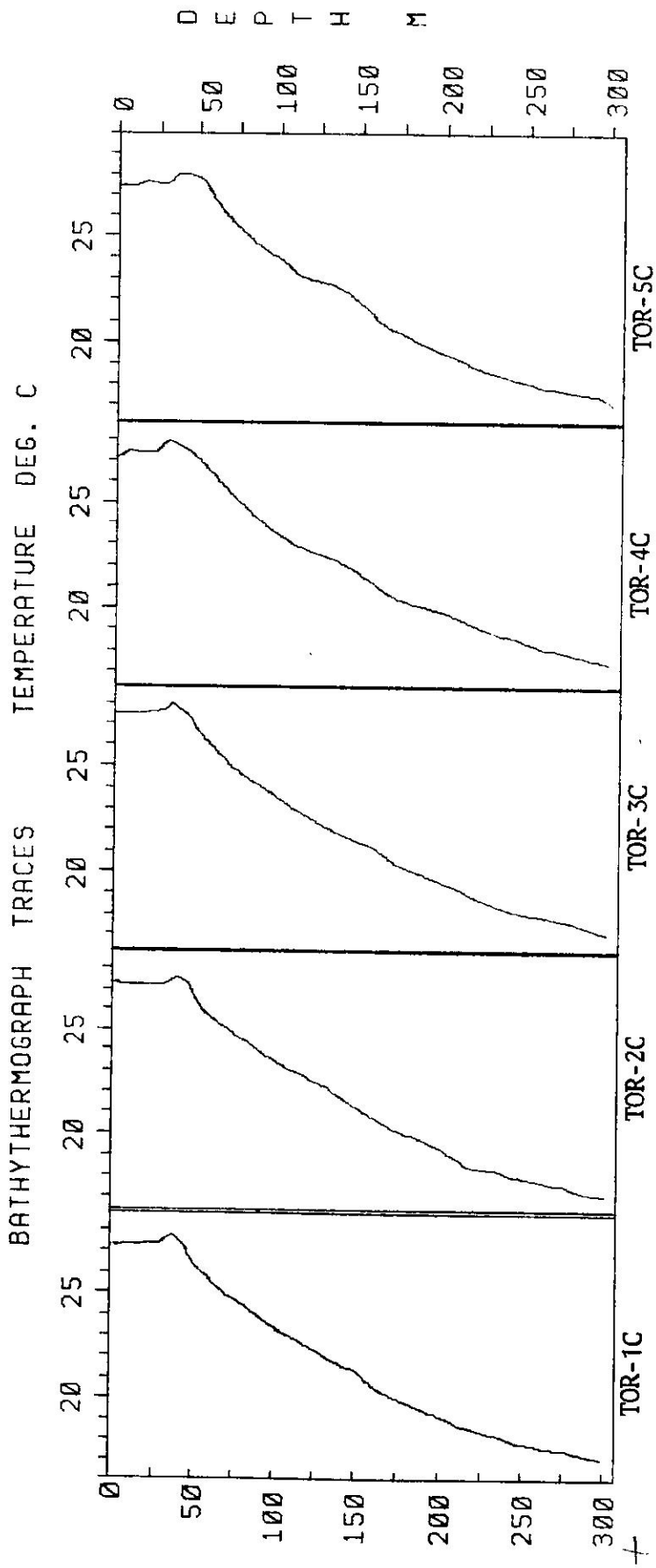
DATE 08 /14/74	BARO 1019.5	WEATHER 02	WIND VELOC 04	WAVE PERIOD 5
HOUR 6.4	TEMP DRY 26.0	VISIBILITY 7	WIND DIREC 09	TRANSPAR
LAT 18-31,6 N	TEMP WET 0.0	CLOUD TYPE 8	WAVE DIREC 08	SONIC DEP 0366
LONG 066-25,3 W	REL HUMID 092	CLOUD AMT 1	WAVE HEIGHT 2	COLOR

CAST 1 MESS TIME 6.4 GMT, 221 LOCAL MAX DEPTH 300 WIRE ANGLE 3
OXYGEN TITER .686 METER WHEEL FACTOR .997

DEPTH (M)				TEMP				OXYGEN					
WIRE	CZ	TZ	BN	TL	TM	TAVE	SALIN	SIG T	ML/L	MG/L	%SAT	PHOS	NITRA
0	0	0	1	27.92	0.00	27.92	35.398	22.74	4.71	6.73	99.15	.07	0.00
25	25	0	2	27.83	0.00	27.83	35.717	23.01	4.74	6.78	100.78	.09	0.00
50	50	48	3	27.60	0.00	27.60	36.065	23.35	4.79	6.84	102.36	.19	0.00
100	100	98	4	23.61	0.00	23.61	36.674	25.04	4.98	7.11	96.28	.06	0.00
150	150	148	5	21.77	0.00	21.77	36.873	25.72	4.31	6.15	82.62	.05	0.00
200	200	200	6	19.74	0.00	19.74	36.714	26.15	4.23	6.04	75.83	.13	0.00
250	249	245	7	18.60	0.00	18.60	36.591	26.36	4.30	6.14	76.11	.18	0.00
300	299	295	8	17.59	0.00	17.59	36.438	26.49	4.33	6.19	75.94	.38	0.00

045 783 STANDARD DEPTHS

0	27.92	35.398	22.74	4.71	6.73	0.00	0.07	0.00
10	27.88	35.526	22.85	4.72	6.75	0.00	0.08	0.00
20	27.85	35.653	22.96	4.74	6.77	0.00	0.09	0.00
30	27.80	35.786	23.07	4.75	6.79	0.00	0.11	0.00
50	27.60	36.065	23.35	4.79	6.84	0.00	0.19	0.00
75	25.76	36.402	24.19	4.86	6.95	0.00	0.14	0.00
100	23.61	36.674	25.04	4.98	7.11	0.00	0.06	0.00
150	21.77	36.873	25.72	4.31	6.15	0.00	0.05	0.00
200	19.74	36.714	26.16	4.23	6.04	0.00	0.13	0.00
250	18.58	36.588	26.36	4.30	6.14	0.00	0.18	0.00
300	17.57	36.435	26.49	4.33	6.19	0.00	0.38	0.00



Cruise No. PA050
October 30, 1974

R V PALUMBO CRUISE 050 STATION TOR-1A PRNC REFERENCE 25:908

DATE	10 /30/74	BARO	1018.7	WEATHER	00	WIND VELOC	02	WAVE PERIOD	4
HOUR	13.8	TEMP DRY	29.0	VISIBILITY	7	WIND DIREC	09	TRANSPAR	
LAT	18-29.0 N	TEMP WET	0.0	CLOUD TYPE	8	WAVE DIREC	06	SONIC DEP	0216
LONG	066-29.6 W	REL HUMID	071	CLOUD AMT	4	WAVE HEIGHT	4	COLOR	

CAST 1 MESS TIME 13.8 GMT, 949 LOCAL MAX DEPTH 10 WIRE ANGLE 2
OXYGEN TITER .718 METER WHEEL FACTOR .997

DEPTH (M)				TEMP					OXYGEN					
WIRE	CE	TE	BN	TL	TM	TAVE	SALIN	SIG T	ML/L	MG/L	%SAT	PHOS	NITRA
0	0	1	3	27.87	0.00	27.87	34.841	22.34	4.78	6.83	98.81	.12	0.00
10	10	11	4	27.84	0.00	27.84	34.888	22.38	4.84	6.91	100.12	.08	0.00
050 908		STANDARD DEPTHS											
	0					27.87	34.841	22.34	4.78	6.83	0.00	2.12	0.00
	10					27.84	34.888	22.38	4.84	6.91	0.00	2.28	0.00

R V PALUMBO CRUISE 050 STATION TOR-18 PRNC REFERENCE 050906

DATE	10 /30/74	BARO	1018.3	WEATHER	02	WIND VELOC	02	WAVE PERIOD	4
HOUR	12.6	TEMP DRY	29.0	VISIBILITY	7	WIND DIREC	08	TRANSPAR	
LAT	18-30,3 N	TEMP WET	0.0	CLOUD TYPE	8	WAVE DIREC	06	SONIC DEP	0196
LONG	066-29,6 W	REL HUMID	082	CLOUD AMT	5	WAVE HEIGHT	3	COLOR	

CAST 1 MESS TIME 12.6 GMT, 839 LOCAL MAX DEPTH 100 WIRE ANGLE 1
OXYGEN TITER ,718 METER WHEEL FACTOR ,997

DEPTH (M)				TEMP				OXYGEN					
WIRE	CZ	TZ	BN	TL	TM	TAVE	SALIN	SIG T	ML/L	MG/L	%SAT	PHOS	NITRA
0	0	0	1	27.42	0,00	27,42	33.450	21,44	4,81	6,87	99,05	,24	0,00
25	25	0	2	27.79	0,00	27,79	35.336	22,74	4,69	6,70	98,31	,24	0,00
50	50	51	3	28.30	0,00	28,30	36,366	23,34	4,69	6,70	97,42	,25	0,00
100	100	101	4	24,48	0,00	24,48	36,625	24,75	4,88	6,97	94,74	,24	0,00

050 906 STANDARD DEPTHS

0	27,42	33.450	21,44	4,81	6,87	0,00	0,24	0,00
10	27,57	34,204	21,96	4,76	6,80	0,00	0,16	0,00
20	27,71	34,976	22,49	4,71	6,73	0,00	0,08	0,00
30	27,88	35,612	22,92	4,69	6,70	0,00	0,04	0,00
50	28,30	36,366	23,34	4,69	6,70	0,00	0,05	0,00
75	27,20	36,496	23,80	4,75	6,79	0,00	0,05	0,00
100	24,48	36,625	24,75	4,88	6,97	0,00	0,04	0,00

R V PALUMBO CRUISE 050 STATION TOR-1C PRNC REFERENCE 353897

DATE	10 /30/74	BARO	1017.5	WEATHER	02	WIND VELOC	02	WAVE PERIOD	4
HOUR	6.7	TEMP DRY	23.0	VISIBILITY	7	WIND DIREC	09	TRANSPAR	
LAT	18-31.8 N	TEMP WET	0.0	CLOUD TYPE	8	WAVE DIREC	08	SONIC DEP	0457
LONG	066-29.6 W	REL HUMID	096	CLOUD AMT	8	WAVE HEIGHT	3	COLOR	

CAST 1 MESS TIME 6.6 GMT, 238 LOCAL MAX DEPTH 300 WIRE ANGLE 7
OXYGEN TITER .718 METER WHEEL FACTOR .997

DEPTH (M)				TEMP				OXYGEN					
WIRE	CZ	TZ	BN	TL	TM	TAVE	SALIN	SIG T	ML/L	MG/L	%SAT	PHOS	NITRA
0	0	0	1	27.34	0.00	27.34	33.334	21.38	4.88	6.97	130.14	.25	0.00
25	25	0	2	27.76	0.00	27.76	35.826	23.11	4.78	6.83	101.76	.05	0.00
50	50	50	3	27.14	0.00	27.14	36.390	23.74	4.92	7.00	101.43	.07	0.00
100	99	100	4	23.65	0.00	23.65	36.710	25.06	4.93	7.04	95.51	.04	0.00
150	149	152	5	21.20	0.00	21.20	36.768	25.80	4.65	6.64	80.69	.09	0.00
200	198	198	6	19.14	0.00	19.14	36.630	26.25	4.35	6.21	77.37	.16	0.00
250	248	251	7	17.84	0.00	17.84	36.477	26.46	4.34	6.20	76.27	.26	0.00
300	297	296	8	16.92	0.00	16.92	36.339	26.58	4.35	6.21	75.81	.46	0.00

050 897 STANDARD DEPTHS

0	27.34	33.334	21.38	4.88	6.97	0.00	0.00
10	27.51	34.331	22.07	4.84	6.91	0.00	0.00
20	27.70	35.366	22.79	4.80	6.85	0.00	0.00
30	27.72	36.052	23.30	4.80	6.85	0.00	0.00
50	27.14	36.390	23.74	4.90	7.00	0.00	0.00
75	25.48	36.635	24.45	4.92	7.02	0.00	0.00
100	23.59	36.714	25.08	4.93	7.04	0.00	0.00
150	21.15	36.766	25.81	4.64	6.63	0.00	0.00
200	19.08	36.624	26.26	4.34	6.20	0.00	0.00
250	17.80	36.471	26.47	4.34	6.20	0.00	0.00
300	16.86	36.331	26.58	4.35	6.21	0.00	0.00

R V PALUMBO CRUISE 050 STATION TOR-2A PRNC REFERENCE 050909

DATE	10 /30/74	BARO	1000.0	WEATHER	02	WIND VELOC	02	WAVE PERIOD	4
HOUR	14.4	TEMP DRY	28.0	VISIBILITY	7	WIND DIREC	09	TRANSPAR	
LAT	18-28.6 N	TEMP WET	0.0	CLOUD TYPE	8	WAVE DIREC	07	SONIC DEP	0012
LONG	066-28.6 W	REL HUMID	080	CLOUD AMT	5	WAVE HEIGHT	3	COLOR	

CAST 1 MESS TIME 14.3 GMT, 1018 LOCAL MAX DEPTH 10 WIRE ANGLE 0
OXYGEN TITER .718 METER WHEEL FACTOR .997

DEPTH (M)				TEMP				OXYGEN					
WIRE	CZ	TZ	BN	TL	TM	TAVE	SALIN	SIG T	ML/L	MG/L	%SAT	PHOS	NITRA
0	0	0	1	27.81	0.00	27.81	34.829	22.35	4.77	6.81	98.44	.09	0.00
10	10	0	2	27.84	0.00	27.84	34.979	22.45	4.77	6.82	99.06	.05	0.00

050 909 STANDARD DEPTHS

0	27.81	34.829	22.35	4.77	6.81	0.00	0.09	0.00
10	27.84	34.979	22.45	4.77	6.82	0.00	0.05	0.00

R V PALUMBO CRUISE 050 STATION TOR-2B PRNC REFERENCE 750905

DATE	10 /30/74	BARO	1018.0	WEATHER	02	WIND VELOC	02	WAVE PERIOD	4
HOUR	12.2	TEMP DRY	29.0	VISIBILITY	7	WIND DIREC	27	TRANSPAR	
LAT	18-30.2 N	TEMP WET	0.0	CLOUD TYPE	8	WAVE DIREC		SONIC DEP	0175
LONG	066-28.5 W	REL HUMID	081	CLOUD AMT	2	WAVE HEIGHT	3	COLOR	

CAST 1 MESS TIME 12.2 GMT, 810 LOCAL MAX DEPTH 100 WIRE ANGLE 2
OXYGEN TITER .710 METER WHEEL FACTOR .997

DEPTH (M)				TEMP				OXYGEN					
WIRE	CZ	TZ	BN	TL	TM	TAVE	SALIN	SIG T	ML/L	MG/L	%SAT	PHOS	NITRA
0	0	0	1	27.52	0.00	27.52	34.201	21.97	4.84	6.91	101.85	.05	0.00
25	25	0	2	27.84	0.00	27.84	35.058	22.51	4.74	6.78	98.71	.07	0.00
50	50	41	3	27.77	0.00	27.77	35.556	22.91	4.67	6.66	98.50	.06	0.00
100	100	90	4	25.18	0.00	25.18	36.514	24.45	4.84	6.92	99.43	.04	0.00

050 905 STANDARD DEPTHS

0	27.52	34.201	21.97	4.84	6.91	0.00	0.05	0.00
10	27.65	34.544	22.19	4.80	6.86	0.00	0.06	0.00
20	27.78	34.894	22.41	4.76	6.80	0.00	0.07	0.00
30	27.83	35.177	22.61	4.72	6.75	0.00	0.07	0.00
50	27.77	35.556	22.91	4.67	6.66	0.00	0.06	0.00
75	26.88	36.041	23.56	4.70	6.71	0.00	0.05	0.00
100	25.18	36.514	24.45	4.84	6.92	0.00	0.04	0.00

R V PALUMBO CRUISE 050 STATION TOR-2C PHNC REFERENCE 050898

DATE	10 /30/74	BARO	1017.5	WEATHER	02	WIND VELOC	02	WAVE PERIOD	4
HOUR	7.4	TEMP DRY	23.0	VISIBILITY	7	WIND DIREC	09	TRANSPAR	
LAT	18-31.8 N	TEMP WET	0.0	CLOUD TYPE	8	WAVE DIREC	08	SONIC DEP	0422
LONG	066-28.6 W	REL HUMID	095	CLOUD AMT	8	WAVE HEIGHT	3	COLOR	

CAST 1 MESS TIME 7.3 GMT, 319 LOCAL MAX DEPTH 300 WIRE ANGLE 2
OXYGEN TITER .718 METER WHEEL FACTOR .997

DEPTH (M)				TEMP				OXYGEN					
WIRE	CZ	TZ	BN	TL	TM	TAVE	SALIN	SIG T	ML/L	MG/L	%SAT	PHOS	NITRA
0	0	0	1	27.31	0,00	27,31	33,882	21,80	4,87	6,95	101,24	,05	2,00
25	25	0	2	27,78	0,00	27,78	35.798	23.09	4.72	6,75	100,48	,06	0,00
50	50	52	3	27,25	0.00	27,25	36.386	23,70	4,92	7,03	101,92	,06	0,00
100	100	100	4	23.77	0,00	23,77	36.703	25,02	4,92	7,03	95,42	,07	0,00
150	150	152	5	21,34	0,00	21,34	36.774	25,77	4.49	6.42	85,77	,10	0,00
200	200	198	6	19,00	0,00	19,00	36.601	26,26	4.39	6,26	77,85	,17	0,00
250	250	252	7	17,85	0,00	17,85	36.478	26,46	4,34	6,20	76,27	,32	0,00
300	299	294	8	16,94	0,00	16,94	36,343	26,58	4,34	6,20	75,69	,38	2,00

050 898 STANDARD DEPTHS

0	27,31	33.882	21,80	4.87	6,95	0,00	0,05	0,00
10	27,50	34.648	22,31	4,81	6,87	0,00	0,05	0,00
20	27.71	35.441	22,84	4.74	6,78	0,00	0,06	0,00
30	27,76	35.998	23,24	4,75	6,79	0,00	0,06	0,00
50	27,25	36,386	23,70	4.92	7,03	0,00	0,06	0,00
75	25,65	36,631	24,39	4,92	7,03	0,00	0,06	0,00
100	23,77	36.703	25,02	4,92	7.03	0,00	0,07	0,00
150	21,34	36,774	25,77	4,49	6,42	0,00	0,10	0,00
200	19,00	36,601	26,26	4.39	6.26	0,00	0,17	0,00
250	17,85	36,478	26,46	4,34	6,20	0,00	0,32	0,00
300	16,92	36.340	26,58	4.34	6.20	0,00	0,38	0,00

R V PALUMBO CRUISE 050 STATION TOR-3A PRNC REFERENCE 250910

DATE 10 /30/74	BARO 1019.5	WEATHER 02	WIND VELOC 02	WAVE PERIOD 4
HOUR 14.8	TEMP DRY 28.0	VISIBILITY 7	WIND DIREC 09	TRANSPAR
LAT 18-29.0 N	TEMP WET 0.0	CLOUD TYPE 8	WAVE DIREC 06	SONIC DEP 2010
LONG 066-27.0 W	REL HUMID 078	CLOUD AMT 5	WAVE HEIGHT 4	COLOR

CAST 1 MESS TIME 14.8 GMT, 1046 LOCAL MAX DEPTH 10 WIRE ANGLE 0
OXYGEN TITER .718 METER WHEEL FACTOR .997

DEPTH (M)				TEMP				OXYGEN					
WIRE	CZ	TZ	BN	TL	TM	TAVE	SALIN	SIG T	ML/L	MG/L	%SAT	PHOS	NITRA
0	0	3	3	27.79	0.00	27.79	34.682	22.25	4.85	6.93	99.75	.04	0.10
10	10	10	4	27.72	0.00	27.72	34.937	22.46	4.73	6.76	97.95	.05	0.69

050 910 STANDARD DEPTHS

0	27.79	34.682	22.25	4.85	6.93	0.00	0.04	0.10
10	27.72	34.937	22.46	4.73	6.76	0.00	0.05	0.69

R V PALUMBO CRUISE 050 STATION TOR-3B PRNC REFERENCE 050904

DATE 10/30/74	BARO 1018.3	WEATHER 02	WIND VELOC 02	WAVE PERIOD 4
HOUR 11.6	TEMP DRY 24.0	VISIBILITY 7	WIND DIREC 27	TRANSPAR
LAT 18-30.8 N	TEMP WET 0.0	CLOUD TYPE 8	WAVE DIREC 01	SONIC DEP 0102
LONG 066-27.7 W	REL HUMID 084	CLOUD AMT 2	WAVE HEIGHT 3	COLOR

CAST 1 MESS TIME 11.5 GMT, 732 LOCAL MAX DEPTH 100 WIRE ANGLE 3
OXYGEN TITER .718 METER WHEEL FACTOR .997

DEPTH (M)				TEMP				OXYGEN					
WIRE	CZ	TZ	BN	TL	TM	TAVE	SALIN	SIG T	ML/L	MG/L	%SAT	PHOS	NITRA
0	0	0	1	27.05	0.00	27.05	34.181	22.11	4.84	6.92	101.14	.05	0.06
25	25	0	2	27.80	0.00	27.80	35.299	22.71	4.75	6.79	99.56	.05	0.25
50	50	50	3	28.13	0.00	28.13	36.191	23.27	4.67	6.67	96.48	.04	0.30
100	100	101	4	24.54	0.00	24.54	36.593	24.70	4.89	6.99	94.93	.06	0.37

050 904 STANDARD DEPTHS

0	27.05	34.181	22.11	4.84	6.92	0.00	0.05	0.06
10	27.35	34.628	22.35	4.81	6.87	0.00	0.05	0.06
20	27.66	35.080	22.59	4.77	6.81	0.00	0.05	0.05
30	27.91	35.508	22.83	4.73	6.76	0.00	0.05	0.09
50	28.13	36.191	23.27	4.67	6.67	0.00	0.04	0.30
75	27.04	36.392	23.77	4.72	6.74	0.00	0.04	0.34
100	24.54	36.593	24.70	4.89	6.99	0.00	0.06	0.37

R V PALUMBO CRUISE 050 STATION TOR-3C PRNC REFERENCE 052899

DATE	10 /30/74	BARO	1017.0	WEATHER	02	WIND VELOC 02	WAVE PERIOD 4
HOUR	8.1	TEMP DRY	23.0	VISIBILITY	7	WIND DIREC 09	TRANSPAR
LAT	18-31.7 N	TEMP WET	0.0	CLOUD TYPE	8	WAVE DIREC	SONIC DEP 0594
LONG	066-27.2 W	REL HUMID	092	CLOUD AMT	8	WAVE HEIGHT 3	COLOR

CAST 1 MESS TIME 8.0 GMT, 4 1 LOCAL MAX DEPTH 300 WIRE ANGLE 3
OXYGEN TITER .718 METER WHEEL FACTOR .997

DEPTH (M)			TEMP				OXYGEN					
WIRE	CZ	TZ	BN	TL	TM	TAVE	SALIN	SIG T	ML/L	MG/L	%SAT	PHOS	NITRA
0	0	0	1	27.56	0.00	27.56	34.402	22.11	4.87	6.95	99.14	.06	0.66
25	25	0	2	27.75	0.00	27.75	35.800	23.10	4.69	6.71	99.86	.05	0.00
50	50	51	3	26.87	0.00	26.87	36.351	23.80	4.79	6.84	98.84	.06	0.29
100	100	99	4	23.47	0.00	23.47	36.739	25.13	4.89	6.99	94.79	.06	0.33
150	150	149	5	21.48	0.00	21.48	36.771	25.73	4.37	6.24	83.52	.10	1.90
200	200	198	6	19.31	0.00	19.31	36.631	26.20	4.37	6.24	77.84	.14	4.76
250	249	255	7	18.01	0.00	18.01	36.501	26.43	4.35	6.21	76.51	.32	11.36
300	299	296	8	16.96	0.00	16.96	36.347	26.57	4.33	6.19	75.58	.39	14.96

050 899 STANDARD DEPTHS

0	27.56	34.402	22.11	4.87	6.95	0.00	0.06	0.66
10	27.64	34.961	22.51	4.80	6.85	0.00	0.06	0.39
20	27.71	35.537	22.91	4.72	6.75	0.00	0.05	0.32
30	27.65	35.965	23.25	4.70	6.71	0.00	0.05	0.31
50	26.87	36.351	23.80	4.79	6.84	0.00	0.06	0.29
75	25.22	36.627	24.52	4.85	6.93	0.00	0.06	0.30
100	23.47	36.739	25.13	4.89	6.99	0.00	0.06	0.33
150	21.48	36.771	25.73	4.37	6.24	0.00	0.10	1.90
200	19.31	36.631	26.20	4.37	6.24	0.00	0.14	4.76
250	17.99	36.498	26.44	4.35	6.21	0.00	0.32	11.42
300	16.94	36.344	26.58	4.33	6.19	0.00	0.39	15.03

R V PALUMBO CRUISE 050 STATION TOR-4A PRNC REFERENCE 050911

DATE 10 /30/74	BARO 1019.6	WEATHER 02	WIND VELOC 02	WAVE PERIOD 4			
HOUR 15.2	TEMP DRY 27.0	VISIBILITY 2	WIND DIREC 09	TRANSPAR			
LAT 18-29.6 N	TEMP WET 0.0	CLOUD TYPE 8	WAVE DIREC 06	SONIC DEP 0016			
LONG 066-26.1 W	REL HUMID	CLOUD AMT 8	WAVE HEIGHT 4	COLOR			

CAST 1 MESS TIME 15.1 GMT, 11 9 LOCAL MAX DEPTH 10 WIRE ANGLE 0
OXYGEN TITER .718 METER WHEEL FACTOR .997

DEPTH (M)				TEMP				OXYGEN					
WIRE	CZ	TZ	BN	TL	TM	TAVE	SALIN	SIG T	ML/L	MG/L	%SAT	PHOS	NITRA
0	0	0	1	27.53	0.00	27.53	34.649	22.31	4.79	6.85	98.34	.06	0.00
10	10	0	2	27.67	0.00	27.67	34.802	22.37	4.77	6.82	98.41	.04	0.00

050 911 STANDARD DEPTHS

0	27.53	34.649	22.30	4.79	6.85	0.00	0.06	0.
10	27.67	34.802	22.37	4.77	6.82	0.00	0.04	0.

R V PALUMBO CRUISE 050 STATION TOR-48 PRNC REFERENCE 050903

DATE 10 /30/74	BARO 1017.5	WEATHER 02	WIND VELOC 02	WAVE PERIOD 4
HOUR 10.9	TEMP DRY 24.0	VISIBILITY 7	WIND DIREC	TRANSPAR
LAT 18-31.1 N	TEMP WET 0.0	CLOUD TYPE 8	WAVE DIREC	SONIC DEP 0160
LONG 066-26.4 W	REL HUMID 091	CLOUD AMT 3	WAVE HEIGHT 3	COLOR

CAST 1 MESS TIME 11.0 GMT, 659 LOCAL MAX DEPTH 100 WIRE ANGLE
OXYGEN TITER .718 METER WHEEL FACTOR .997

DEPTH (M)				TEMP				OXYGEN					
WIRE	CZ	TZ	BN	TL	TM	TAVE	SALIN	SIG T	ML/L	MG/L	%SAT	PHOS	NITRA
0	0	0	1	27.47	0.00	27.47	34.686	22.35	4.84	6.92	99.44	.05	0.00
25	25	0	2	27.77	0.00	27.77	35.549	22.90	4.73	6.76	99.84	.06	0.00
50	50	51	3	28.17	0.00	28.17	36.323	23.35	4.66	6.65	96.63	.00	0.00
100	100	97	4	24.72	0.00	24.72	36.599	24.65	4.91	7.01	95.33	.03	0.00

050 903 STANDARD DEPTHS

0	27.47	34.686	22.35	4.84	6.92	0.00	0.05
10	27.59	35.031	22.57	4.80	6.86	0.00	0.05
20	27.71	35.378	22.80	4.75	6.79	0.00	0.06
30	27.84	35.726	23.01	4.71	6.73	0.00	0.06
50	28.17	36.323	23.35	4.66	6.65	0.00	0.05
75	27.15	36.461	23.79	4.72	6.74	0.00	0.05
100	24.72	36.599	24.65	4.91	7.01	0.00	0.03

R V PALUMBO CRUISE 050 STATION TOR-4C PRNC REFERENCE 050900

DATE	10/30/74	BARO	1016.7	WEATHER	02	WIND VELOC	02	WAVE PERIOD	4
HOUR	9.1	TEMP DRY	23.0	VISIBILITY	7	WIND DIREC	09	TRANSPAR	
LAT	18-31.8 N	TEMP WET	0.0	CLOUD TYPE	8	WAVE DIREC	05	SONIC DEP	0410
LONG	066-26.1 W	REL HUMID	089	CLOUD AMT	8	WAVE HEIGHT	3	COLOR	

CAST 1 MESS TIME 8.8 GMT, 448 LOCAL MAX DEPTH 300 WIRE ANGLE 5
OXYGEN TITER .718 METER WHEEL FACTOR .997

DEPTH (M)				TEMP				OXYGEN					
WIRE	CZ	TZ	BN	TL	TM	TAVE	SALIN	SIG T	ML/L	MG/L	%SAT	PHOS	NITRA
0	0	0	1	27.21	0.00	27.21	33.890	21.84	4.92	7.03	102.31	.12	0.00
25	25	0	2	27.76	0.00	27.76	35.732	23.04	4.82	6.88	102.23	.03	0.00
50	50	51	3	27.41	0.00	27.41	36.345	23.62	4.83	6.90	99.95	.04	0.00
100	100	100	4	23.47	0.00	23.47	36.714	25.11	4.85	6.93	93.88	.05	0.00
150	149	152	5	21.11	0.00	21.11	36.751	25.81	4.47	6.39	85.19	.07	0.00
200	199	200	6	19.51	0.00	19.51	36.683	26.19	4.42	6.32	79.01	.12	0.00
250	249	253	7	17.86	0.00	17.86	36.278	26.30	4.37	6.24	76.34	.31	0.00
300	298	305	8	17.01	0.00	17.01	36.445	26.64	4.41	6.30	77.02	.31	0.00

050 900 STANDARD DEPTHS

0	27.21	33.890	21.84	4.92	7.03	0.00	0.12
10	27.43	34.627	22.32	4.88	6.97	0.00	0.08
20	27.67	35.388	22.82	4.84	6.91	0.00	0.05
30	27.69	35.932	23.22	4.82	6.88	0.00	0.03
50	27.41	36.345	23.62	4.83	6.90	0.00	0.04
75	25.61	36.622	24.40	4.84	6.92	0.00	0.05
100	23.47	36.714	25.11	4.85	6.93	0.00	0.05
150	21.07	36.751	25.82	4.47	6.38	0.00	0.07
200	19.47	36.674	26.19	4.42	6.31	0.00	0.12
250	17.84	36.279	26.31	4.37	6.24	0.00	0.31
300	16.98	36.452	26.65	4.41	6.30	0.00	0.31

R V PALUMBO CRUISE 050 STATION TOR-5A PRNC REFERENCE 050912

DATE 10/30/74	BARO 1019.5	WEATHER 02	WIND VELOC		WAVE PERIOD 4
HOUR 15.5	TEMP DRY 27.0	VISIBILITY 6	WIND DIREC 09		TRANSPAR
LAT 18-29.9 N	TEMP WET 0.0	CLOUD TYPE 8	WAVE DIREC 07		SONIC DEP 0217
LONG 066-25.4 W	REL HUMID 080	CLOUD AMT 5	WAVE HEIGHT 5		COLOR

CAST 1 MESS TIME 15.5 GMT, 1128 LOCAL MAX DEPTH 10 WIRE ANGLE 0
OXYGEN TITER .710 METER WHEEL FACTOR .997

DEPTH (M)		TEMP				OXYGEN					
WIRE	CZ	TZ	BN	TL	TM	TAVE	SALIN	SIG T	ML/L	MG/L	%SAT	PHOS	NITRA
0	0	2	3	27.82	0.00	27.82	34.668	22.23	4.82	6.89	99.14	.04	0.00
10	10	12	4	27.73	0.00	27.73	35.000	22.50	4.61	6.59	95.76	.03	0.00

050 912 STANDARD DEPTHS

0	27.82	34.668	22.23	4.82	6.89	0.00	0.04	M.
10	27.73	35.000	22.50	4.61	6.59	0.00	0.03	M.

R V PALUMBO CRUISE 050 STATION TOR-5B PRNC REFERENCE 05%902

DATE	10 /30/74	BARO	1017.5	WEATHER	02	WIND VELOC	WAVE PERIOD 4
HOUR	10.6	TEMP DRY	24.0	VISIBILITY	7	WIND DIREC	TRANSPAR
LAT	18-31.0 N	TEMP WET	0.0	CLOUD TYPE	6	WAVE DIREC	SONIC DEP 0165
LONG	066-25.4 W	REL HUMID	093	CLOUD AMT	3	WAVE HEIGHT 3	COLOR

CAST 1 MESS TIME 10.5 GMT, 629 LOCAL MAX DEPTH 100 WIRE ANGLE 2
OXYGEN TITER .718 METER WHEEL FACTOR .997

DEPTH (M)				TEMP				OXYGEN					
WIRE	CZ	TZ	BN	TL	TM	TAVE	SALIN	SIG T	ML/L	MG/L	%SAT	PHOS	NITRA
0	0	0	1	27.47	0.00	27.47	34.640	22.32	4.83	6.90	99.02	.04	0.00
25	25	0	2	27.76	0.00	27.76	35.501	22.87	4.72	6.75	99.53	.04	0.00
50	50	51	3	27.93	0.00	27.93	36.263	23.39	4.64	6.62	95.90	.04	0.00
100	100	102	4	24.44	0.00	24.44	36.619	24.75	4.88	6.97	94.69	.03	2.00

050 902 STANDARD DEPTHS

0	27.47	34.640	22.32	4.83	6.90	0.00	0.04	
10	27.59	34.984	22.54	4.79	6.84	0.00	0.04	
20	27.70	35.331	22.76	4.74	6.78	0.00	0.04	
30	27.81	35.674	22.99	4.70	6.71	0.00	0.04	
50	27.93	36.263	23.39	4.64	6.62	0.00	0.04	
75	26.82	36.441	23.88	4.69	6.70	0.00	0.04	
100	24.44	36.619	24.75	4.88	6.97	0.00	0.03	

R V PALUMBO CRUISE 050 STATION TOR-5C PRNC REFERENCE 050901

DATE 10/30/74	BARO 1017.0	WEATHER 02	WIND VELOC 02	WAVE PERIOD 4			
HOUR 10.1	TEMP DRY 23.0	VISIBILITY 7	WIND DIREC 09	TRANSPAR			
LAT 18-31.6 N	TEMP WET 0.0	CLOUD TYPE 8	WAVE DIREC 06	SONIC DEP 0430			
LONG 066-25.4 W	REL HUMID 092	CLOUD AMT 5	WAVE HEIGHT 4	COLOR			

CAST 1 MESS TIME 9.7 GMT. 545 LOCAL MAX DEPTH 300 WIRE ANGLE 0
OXYGEN TITER .718 METER WHEEL FACTOR .997

DEPTH (M)			TEMP				OXYGEN					
WIRE	CZ	TZ	BN	TL	TM	TAVE	SALIN	SIG T	ML/L	MG/L	%SAT	PHOS	NITRA
0	0	0	1	27.26	0.00	27.28	34.303	22.13	4.88	6.97	102.61	.07	0.00
25	25	0	2	27.75	0.00	27.75	35.695	23.02	4.71	6.73	99.81	.04	0.00
50	50	52	3	27.99	0.00	27.99	36.421	23.49	4.81	6.87	100.00	.05	0.00
100	100	100	4	23.92	0.00	23.92	36.679	24.95	4.90	7.00	95.02	.03	0.00
150	150	153	5	21.63	0.00	21.63	36.763	25.68	4.51	6.45	86.34	.10	0.00
200	200	200	6	19.38	0.00	19.38	36.633	26.19	4.36	6.22	77.63	.07	0.00
250	250	253	7	18.12	0.00	18.12	36.502	26.41	4.39	6.26	77.19	.25	0.00
300	300	0	0	16.98	0.00	16.98	36.468	26.66	4.36	6.23	76.29	.29	0.00

050 901 STANDARD DEPTHS

0	27.28	34.303	22.13	4.88	6.97	0.00	0.07
10	27.47	34.860	22.48	4.81	6.87	0.00	0.06
20	27.66	35.430	22.85	4.74	6.77	0.00	0.05
30	27.82	35.892	23.14	4.72	6.74	0.00	0.04
50	27.99	36.421	23.49	4.81	6.87	0.00	0.05
75	26.22	36.660	24.24	4.87	6.96	0.00	0.05
100	23.92	36.679	24.96	4.90	7.00	0.00	0.03
150	21.63	36.763	25.68	4.51	6.45	0.00	0.10
200	19.38	36.633	26.19	4.36	6.22	0.00	0.07
250	18.12	36.502	26.41	4.39	6.26	0.00	0.25
300	16.98	36.468	26.66	4.36	6.23	0.00	0.29

APPENDIX 4.1A

Data Reduction Program-12 Mar. 75
TAB

```
      REAL*8 ST,STNEW
      DIMENSION TABLE(25,18,36),IT(25),ST(18),DATA0(15),DATAN(18)
     1,TITLE(8,34), TITL(16)
  100 FORMAT(I6,3X,A6,5X,F5.0,F5.3,3F10.3,2X,14X,A1,I5)
  101 FORMAT(15X,A5,15F4.0)
  102 FORMAT(16A5)
  103 FORMAT('1',17X,'TABLE',I3,', ',8A5//20X,16A5///30X,'STATIONS'////
     1 18X,' DATE       ',10A10)
  104 FORMAT('0',I23,13F10.3)
  105 FORMAT('0',I23,13F10.0)
  106 FORMAT('0',I23,13F10.1)
  107 FORMAT('2', I6,3X,A6,5X,5F10.3,I10)
  108 FORMAT(' ',A5, 15F6.0)
  109 FORMAT('1',16A5)
      DATA DATAN, TABLE/9018*0./
      DATA ((TITLE(I,J),I=1,8),J=1,17) /
     1'TOTAL BIOMASS OF ZOOPLANKTON (ML/100M3) ',
     2'TOTAL NUMBER OF ZOOPLANKTON PER 100M3   ',
     3'TOTAL NUMBER OF COPEPODS PER 100M3      ',
     4'TOTAL NUMBER OF CHAETOGNATHS PER 100M3  ',
     5'TOTAL NUMBER OF LARVACEANS PER 100M3    ',
     6'TOTAL NUMBER OF CLADOCERANS PER 100M3   ',
     7'TOTAL NUMBER OF PTEROPODS PER 100M3     ',
     H'TOTAL NUMBER OF OTHER PER 100M3         ',
     8'TOTAL # OF VELIGER LARVAE PER 100M3     ',
     9'TOTAL # OF CIRRIPEDE NAUPLII PER 100M3  ',
     A'TOTAL # OF CIRRIPEDE CYPRIS PER 100M3   ',
     B'TOTAL # OF PENAEID LARVAE PER 100M3     ',
     C'TOTAL # OF BRACHYURAN LARVAE PER 100M3  ',
     D'TOTAL NUMBER OF OTHER PER 100M3         ',
     E'TOTAL NUMBER OF FISH EGGS PER 100M3     ',
     F'TOTAL NUMBER OF FISH LARVAE PER 100M3   ',
     G'TOTAL NUMBER OF HOLOPLANKTON PER 100M3  '/
      DATA ((TITLE(I,J),I=1,8),J=18,34)/
     1'TOTAL NUMBER OF MEROPLANKTON PER 100M3  ',
     2'PERCENTAGE OF COPEPODS                  ',
     3'PERCENTAGE OF CHAETOGNATHS              ',
     4'PERCENTAGE OF LARVACEANS                ',
     5'PERCENTAGE OF CLADOCERANS               ',
     6'PERCENTAGE OF PTEROPODS                 ',
     H 'PERCENTAGE OF OTHER                    ',
     7'PERCENTAGE OF VELIGER  LARVAE           ',
     8'PERCENTAGE OF CIRRIPEDE NAUPLII         ',
     9'PERCENTAGE OF CIRRIPEDE CYPRIS          ',
     A'PERCENTAGE OF PENAEID LARVAE            ',
     B'PERCENTAGE OF BRACHYURAN LARVAE         ',
     C'PERCENTAGE OF OTHER                     ',
     D'PERCENTAGE OF FISH EGGS                 ',
     E'PERCENTAGE OF FISH LARVAE               ',
     F'PERCENTAGE OF HOLOPLANKTON              ',
     G'PERCENTAGE OF MEROPLANKTON              '/
C        READ TITLE.
1     READ (2,102,END=98) TITL
```

```
      PRINT 109,TITL
      ITIME=1
      IS=1
      ISTATN=1
      TABLE (1,1,35)=1.
C        READ FIRST CARD.
      READ 100,IT(1),ST(1),DILUT,PIR2,REVSPM,REVS,WET, AS,IREP
      DO 50 I=1,10000
      PRINT 107,IT(ITIME),ST(ISTATN),DILUT,PIR2,REVSPM,REVS,WET,IREP
      Z=PIR2*REVS/REVSPM/100.
      DILDZ=DILUT/Z/IREP
      TABLE(ITIME,ISTATN,1)=TABLE(ITIME,ISTATN,1)+WET/Z
      DO 30 J=1,IREP
      READ 101,TOW,DATAO
      PRINT 108,TOW,DATAO
      DO 28 K=2,16
      DATAN(K)=DATAN(K)+DATAO(K-1)
28    CONTINUE
30    CONTINUE
C        SUM HOLOPLANKTON.
      DO 22 K=2,7
      DATAN(17)=DATAN(K)+DATAN(17)
22    CONTINUE
C        SUM MEROPLANKTON.
      DO 25 K=8,13
      DATAN(18)=DATAN(K)+DATAN(18)
25    CONTINUE
      TABLE(ITIME,ISTATN,36)=TABLE(ITIME,ISTATN,36)+DATAN(2)
      DO 32 K=19,34
      TABLE(ITIME,ISTATN,K)=TABLE(ITIME,ISTATN,K)+DATAN(K-16)
   32 CONTINUE
      DO 31 K=2,18
      TABLE(ITIME,ISTATN,K)=TABLE(ITIME,ISTATN,K)+DATAN(K)*DILDZ
      DATAN(K)=0.
31    CONTINUE
C        CHECK FOR END OF A DATA SET.
      IF (AS.EQ.1H*) GO TO 99
      READ 100,IT(ITIME+1),STNEW,DILUT,PIR2,REVSPM,REVS,WET,AS,IREP
      IF(IT(ITIME+1).NE.IT(ITIME)) ITIME=ITIME+1
      DO 33 ISTATN=1,IS
      IF (STNEW.EQ.ST(ISTATN)) GO TO 34
   33 CONTINUE
C        NEW STATION.
      IS=IS+1
      ISTATN=IS
      ST(IS)=STNEW
   34 TABLE(ITIME,ISTATN,35)=TABLE(ITIME,ISTATN,35)+1.
50    CONTINUE
C        PRINT TITLES.
99    DO 82 I=1,18
      PRINT 103,I,(TITLE(J,I),J=1,8),TITL,(ST(K),K=1,IS)
      DO 82 J=1,ITIME
      DO 55 K=1,IS
```

```
C          DIVIDE BY NUMBER OF TOWS.
      IF(TABLE(J,K,35).EQ.0.) GO TO 55
      TABLE(J,K,I) =TABLE(J,K,I) /TABLE(J,K,35)
55    CONTINUE
      IF (I.GT.1) GO TO 81
      PRINT 104,IT(J),(TABLE(J,K,I),K=1,IS)
      GO TO 82
81    PRINT 105,IT(J),(TABLE(J,K,I),K=1,IS)
   82 CONTINUE
      DO 84 I=19,34
      PRINT 103,I,(TITLE(J,I),J=1,8),TITL,(ST(K),K=1,IS)
      DO 84 J=1,ITIME
      DO 60 K=1,IS
C          CONVERT TO PERCENTAGES.
      IF(TABLE(J,K,36).EQ.0.) GO TO 60
      TABLE (J,K,I) =TABLE(J,K,I)/TABLE(J,K,36)*100.
60    CONTINUE
      PRINT 106,IT(J),(TABLE(J,K,I),K=1,IS)
   84 CONTINUE
      DO 90 I=1,36
      DO 90 J=1,ITIME
      DO 90 K=1,IS
      TABLE(J,K,I)=0.
   90 CONTINUE
      GO TO 1
98    CALL EXIT
      END
```

APPENDIX 4.2A

Major zooplankton groups at each station and for each sampling date.

Explanatory notes for computer printouts,

PTEROPODS: non-coiled species (e.g., Creseis acicula)

SIPHONOPHORES: siphonophore bracts, not whole animals

THALIACEA: includes salps and doliolids

ZOOPLANKTON TORTUGUERO 14 MAY /74

BIOMASS IN ML/100 CUBIC METERS
ABUNDANCE IN #/CUBIC METER

	STATION 1 (2 TOWS)	STATION 2 (3 TOWS)	STATION 3 (2 TOWS)	OFFSHORE (2 TOWS)
BIOMASS	9	12	16	11
TOTAL	1206	1646	1111	1515
COPEPODS	785	1116	688	1032
CHAETOGNATHS	36	64	31	55
LARVACEANS	26	12	5	10
PTEROPODS	9	18	21	6
OSTRACODS	135	79	15	94
CLADOCERANS	2	3	16	0
MEDUSAE	3	2	9	13
SIPHONOPHORES	6	1	3	5
CTENOPHORES	0	0	0	0
THALIACEA	2	0	0	1
ANNELID LARVAE	7	22	32	6
CIRRIPEDE LAR	5	2	5	1
ECHINODERM LAR	6	6	11	4
ECTOPROCT LAR	4	1	1	2
BIVALVE LARVAE	0	8	10	0
GASTROPOD VEL	43	92	175	58
FORAMINIFERA	3	5	0	5
MALACOSTRACANS	25	47	21	24
FISH LARVAE	3	3	7	4
FISH EGGS	44	57	39	79

ZOOPLANKTON TORTUGUERO 15 AUGUST /74

BIOMASS IN ML/100 CUBIC METERS
ABUNDANCE IN #/CUBIC METER

	STATION 1 (1 TOW)	STATION 2 (3 TOWS)	STATION 3 (1 TOW)	OFFSHORE (1 TOW)
BIOMASS	17	20	17	20
TOTAL	688	894	422	894
COPEPODS	495	669	273	653
CHAETOGNATHS	27	58	10	41
LARVACEANS	30	28	69	15
PTEROPODS	0	0	0	1
OSTRACODS	0	3	0	0
CLADOCERANS	0	0	0	0
MEDUSAE	1	6	1	7
SIPHONOPHORES	1	4	0	1
CTENOPHORES	0	0	0	0
THALIACEA	1	0	1	4
ANNELID LARVAE	4	4	2	2
CIRRIPEDE LAR	1	1	3	0
ECHINODERM LAR	3	3	0	4
ECTOPROCT LAR	0	1	1	1
BIVALVE LARVAE	4	2	0	1
GASTROPOD VEL	30	13	14	14
FORAMINIFERA	7	3	2	9
MALACOSTRACANS	18	13	10	13
FISH LARVAE	0	3	0	3
FISH EGGS	70	75	54	100

ZOOPLANKTON TORTUGUERO 31 OCT...

BIOMASS IN ML/100 CUBIC METERS
ABUNDANCE IN #/CUBIC METER

	STATION 1 (1 TOW)	STATION 2 (3 TOWS)	STATION 3 (1 TOW)	OFFSHORE (1 TOW)
BIOMASS	19	18	16	19
TOTAL	3892	1472	1680	1282
COPEPODS	3510	1206	1341	948
CHAETOGNATHS	93	56	47	25
LARVACEANS	29	16	35	42
PTEROPODS	0	0	3	5
OSTRACODS	5	0	0	2
CLADOCERANS	5	4	3	2
MEDUSAE	5	5	6	0
SIPHONOPHORES	0	3	0	5
CTENOPHORES	0	0	0	0
THALIACEA	0	0	0	0
ANNELID LARVAE	20	9	9	7
CIRRIPEDE LAR	0	2	3	2
ECHINODERM LAR	0	8	31	35
ECTOPROCT LAR	15	2	0	0
BIVALVE LARVAE	5	5	9	2
GASTROPOD VEL	44	9	69	35
FORAMINIFERA	5	3	6	0
MALACOSTRACANS	20	42	19	12
FISH LARVAE	0	4	0	2
FISH EGGS	117	60	75	122

ZOOPLANKTON TORTUGUERO 14 MAY /74

BIOMASS IN ML/100 CUBIC METERS
ABUNDANCE IN NUMBERS/CUBIC METER

STATION 2
3 REPLICATES

	MEAN	VARIANCE	.95 C.I.
BIOMASS	12	0	11 TO 12
TOTAL	1646	518425	0 TO 3433
COPEPODS	1116	265560	0 TO 2096
CHAETOGNATHS	64	2374	0 TO 185
LARVACEANS	12	321	0 TO 57
PTEROPODS	18	169	0 TO 50
OSTRACODS	79	3432	0 TO 225
CLADOCERANS	3	10	0 TO 11
MEDUSAE	2	3	0 TO 6
SIPHONOPHORES	1	4	0 TO 6
CTENOPHORES	0	0	0 TO 0
THALIACEA	0	0	0 TO 0
ANNELID LARVAE	22	46	5 TO 38
CIRRIPEDE LAR	2	3	0 TO 6
ECHINODERM LAR	6	53	0 TO 24
ECTOPROCT LAR	1	1	0 TO 4
BIVALVE LARVAE	8	12	0 TO 16
GASTROPOD VEL	92	2277	0 TO 211
FORAMINIFERA	5	7	0 TO 11
MALACOSTRACANS	47	135	18 TO 75
FISH LARVAE	3	14	0 TO 12
FISH EGGS	57	142	28 TO 87

ZOOPLANKTON TORTUGUERO 15 AUGUST /74

BIOMASS IN ML/100 CUBIC METERS
ABUNDANCE IN NUMBERS/CUBIC METER

STATION 2
3 REPLICATES

	MEAN	VARIANCE	.95 C.I.
BIOMASS	20	4	15 TO 25
TOTAL	894	46952	356 TO 1432
COPEPODS	669	33246	217 TO 1122
CHAETOGNATHS	58	794	0 TO 128
LARVACEANS	28	190	0 TO 62
PTEROPODS	0	0	0 TO 2
OSTRACODS	3	9	0 TO 11
CLADOCERANS	0	0	0 TO 0
MEDUSAE	6	9	0 TO 13
SIPHONOPHORES	4	1	1 TO 7
CTENOPHORES	0	0	0 TO 0
THALIACEA	0	0	0 TO 0
ANNELID LARVAE	4	26	0 TO 17
CIRRIPEDE LAR	1	2	0 TO 5
ECHINODERM LAR	3	1	1 TO 6
ECTOPROCT LAR	1	1	0 TO 4
BIVALVE LARVAE	2	7	0 TO 8
GASTROPOD VEL	13	5	8 TO 18
FORAMINIFERA	3	3	0 TO 8
MALACOSTRACANS	13	2	9 TO 16
FISH LARVAE	3	2	0 TO 6
FISH EGGS	75	453	22 TO 128

ZOOPLANKTON TORTUGUERO 31 OCTOBER /74

BIOMASS IN ML/100 CUBIC METERS
ABUNDANCE IN NUMBERS/CUBIC METER

STATION 2
3 REPLICATES

	MEAN	VARIANCE	.95 C.I.
BIOMASS	18	1	15 TO 20
TOTAL	1472	26481	1068 TO 1876
COPEPODS	1206	22948	830 TO 1582
CHAETOGNATHS	56	106	31 TO 82
LARVACEANS	16	76	0 TO 37
PTEROPODS	0	0	0 TO 0
OSTRACODS	0	0	0 TO 0
CLADOCERANS	4	5	0 TO 9
MEDUSAE	5	4	0 TO 10
SIPHONOPHORES	3	10	0 TO 11
CTENOPHORES	0	0	0 TO 0
THALIACEA	0	0	0 TO 0
ANNELID LARVAE	9	76	0 TO 30
CIRRIPEDE LAR	2	2	0 TO 5
ECHINODERM LAR	8	26	0 TO 20
ECTOPROCT LAR	2	6	0 TO 8
BIVALVE LARVAE	5	1	4 TO 7
GASTROPOD VEL	9	12	3 TO 18
FORAMINIFERA	3	8	0 TO 10
MALACOSTRACANS	42	71	21 TO 63
FISH LARVAE	4	6	0 TO 10
FISH EGGS	60	194	25 TO 94

APPENDIX 4.2B

Copepod species at each station
and for each sampling date.

Explanatory notes for computer printouts.

T. TURBINATA: *Temora turbinata*

T. STYLIFERA: *Temora stylifera*

SM CALANOIDS: Includes *Paracalanus aculeatus*
Paracalanus parvus
Clausocalanus furcatus
Mecynocera clausi
Calocalanus sp.
Acrocalanus sp.

other calanoid juveniles

COPEPODS TORTUGUERO 14 MAY /74

ABUNDANCE IN #/CUBIC METER

	STATION 1 (2 TOWS)	STATION 2 (3 TOWS)	STATION 3 (2 TOWS)	OFFSHORE (2 TOWS)
T. TURBINATA	219	477	198	374
T. STYLIFERA	9	12	5	34
SM CALANOIDS	279	263	246	257
NANNOCALANUS	2	3	3	4
CALANOPIA	11	5	6	4
ACARTIA	10	32	13	8
LUCICUTIA	7	1	1	16
FARRANULA	15	39	10	39
CORYCAEUS	67	31	17	143
OITHONA	136	131	83	9
ONCAEA	7	12	1	224

COPEPODS TORTUGUERO 15 AUGUST /74

ABUNDANCE IN #/CUBIC METER

	STATION 1 (1 TOWS)	STATION 2 (3 TOWS)	STATION 3 (1 TOWS)	OFFSHORE (1 TOWS)
T. TURBINATA	3	181	4	39
T. STYLIFERA	Ø	10	2	2
SM CALANOIDS	351	277	205	405
NANNOCALANUS	6	6	Ø	20
CALANOPIA	Ø	12	Ø	Ø
ACARTIA	10	12	Ø	9
UNDINULA	6	1	1	17
EUCHAETA	1	4	3	3
EUCALANUS	7	12	5	10
FARRANULA	19	17	7	21
CORYCAEUS	10	13	6	28
OITHONA	57	68	15	86
ONCAEA	18	30	17	42

COPEPODS TORTUGUERO 31 OCTOBER /74

ABUNDANCE IN #/CUBIC METER

	STATION 1 (1 TOWS)	STATION 2 (3 TOWS)	STATION 3 (1 TOWS)	OFFSHORE (1 TOWS)
T. TURBINATA	514	595	317	264
T. STYLIFERA	0	6	3	10
SM CALANOIDS	2590	322	719	526
NANNOCALANUS	0	3	0	5
CALANOPIA	20	6	22	2
ACARTIA	29	21	16	7
EUCALANUS	0	5	9	2
FARRANULA	49	24	50	42
CORYCAEUS	73	43	50	30
OITHONA	186	139	135	65
ONCAEA	29	15	22	47

COPEPODS TORTUGUERO 14 MAY /74

ABUNDANCE IN NUMBERS/CUBIC METER

STATION 2
3 REPLICATES

	MEAN	VARIANCE	.95 C.I.
T. TURBINATA	477	132777	Ø TO 1382
T. STYLIFERA	12	1	9 TO 14
SM CALANOIDS	263	5236	84 TO 443
NANNOCALANUS	3	3	Ø TO 7
CALANOPIA	5	40	Ø TO 20
ACARTIA	32	184	Ø TO 66
LUCICUTIA	1	4	Ø TO 6
FARRANULA	39	3256	Ø TO 181
CORYCAEUS	31	89	8 TO 55
OITHONA	131	6468	Ø TO 331
ONCAEA	12	84	Ø TO 34

COPEPODS TORTUGUERO 15 AUGUST /74

ABUNDANCE IN NUMBERS/CUBIC METER STATION 2
3 REPLICATES

	MEAN	VARIANCE	.95 C.I.
T. TURBINATA	181	19505	0 TO 527
T. STYLIFERA	10	56	0 TO 28
SM CALANOIDS	277	1830	171 TO 383
NANNOCALANUS	6	4	0 TO 11
CALANOPIA	12	122	0 TO 39
ACARTIA	12	105	0 TO 38
UNDINULA	1	1	0 TO 4
EUCHAETA	4	14	0 TO 13
EUCALANUS	12	92	0 TO 36
FARRANULA	17	9	10 TO 25
CORYCAEUS	13	10	5 TO 21
OITHONA	68	373	20 TO 116
ONCAEA	30	9	23 TO 38

COPEPODS TORTUGUERO 31 OCTOBER /74

STATION 2
3 REPLICATES

ABUNDANCE IN INDIVIDUALS/CUBIC METER

	MEAN	VARIANCE	.95 C.I.
T. TURBINATA	595	6283	401 TO 788
T. STYLIFERA	6	11	0 TO 15
SM CALANOIDS	322	1965	211 TO 432
NANNOCALANUS	3	6	0 TO 9
CALANOPIA	6	1	4 TO 8
ACARTIA	21	372	0 TO 69
EUCALANUS	5	4	0 TO 10
FARRANULA	24	20	12 TO 35
CORYCAEUS	43	148	12 TO 73
OITHONA	139	52	121 TO 157
ONCAEA	15	56	0 TO 34

APPENDIX 4.3A*

Benthic Stations at the Tortuguero Bay Site

Station T1	Transect
Location:	Midway between Pta. Boquilla and Pta. Marchiquita
Depth:	15 m - 6 m
Date	2/1/73
Investigator:	S. Martin
Station 2	Station Dive
Location:	Off Pta. Marchiquita
Depth:	10 m
Date:	30/10/74
Investigator:	P. Yoshioka
Station 3	Station Dive
Location:	East of Pta. Marchiquita
Depth:	10 m
Date:	10/5/73
Investigator:	V. Vicente
Station T4	Transect
Location:	Offshore of the Power Plant Site
Depth:	28 m - 5 m
Date:	11/5/73
Investigator	V. Vicente
Station 5	Station Dive
Location:	Off Plant Site
Depth:	14 m
Date:	1/29/73
Investigator:	S. Martin
Station 6	Station Dive
Location:	Off Power Plant Site
Depth:	7 m
Date:	1/30/73
Investigator:	S. Martin
Station 7	Intertidal
Location:	Sandy beach near Plant Site
Date:	8/29/72
Investigator:	S. Kolehmainen
Station 8	Station Dive
Location:	East of Tow Plant Site
Depth:	12 - 17 m
Date:	6/5/74, 13/8/74
Investigator	P. Yoshioka

*Refer to Figure 4.3-F1

APPENDIX 4.3A (continued)

Station 9	Intertidal
Location:	Rock beach
Date:	8/29/72
Investigator:	S. Kolemainen
Station 10	Shallow Subtidal Station
Location:	East of Power Plant Site
Depth:	2 - 5 m
Date:	8/29/72
Investigator:	S. Kolehmainen
Station T11	Transect
Location:	Between Pta. Chivato and Power Plant Site
Depth:	28 m - 14 m
Date:	6/4/74
Investigator:	P. Yoshioka
Station 12	Shallow Subtidal
Location:	Tortuguero Beach
Depth:	1 - 2 m
Date:	8/9/72
Investigator:	S. Kolehmainen
Station 13	Station Dive
Location:	Between Power Plant Site and Pta. Chivato
Depth:	20 m
Date:	10/30/74
Investigator:	P. Yoshioka
Station 14	Station Dive (Permanent Station)
Location:	Between Power Plant Site and Pta. Chivato
Depth:	12 m
Date:	5/22/74, 6/5/74, 8/13/74, 10/30/74
Investigator:	P. Yoshioka
Station 15	Station Dive
Location:	Between Power Plant Site and Pta. Chivato
Depth:	9 m
Date:	8/13/74
Investigator:	P. Yoshioka
Station	Transect
Location:	Between Power Plant Site and Pta. Chivato
Depth:	18 m to 12 m
Date:	3/29/74
Investigator:	P. Yoshioka

APPENDIX 4.3A (continued)

Station	Transect
Location:	Between Power Plant Site and Pta. Chivato
Depth:	18 m - 12 m
Date:	3/29/74
Investigator:	P. Yoshioka
Station 17	Station Dive
Location:	Between Power Plant Site and Pta Chivato
Depth:	17 m
Date:	3/29/74
Investigator:	P. Yoshioka
Station T18	Transect
Location:	Between Power Plant Site and Pta. Chivato
Depth:	22 m - 2 m
Date:	5/10/73
Investigator:	V. Vicente
Station 19	Station Dive
Location:	Near Pta. Chivato
Depth:	13 m
Date:	1/30/73
Investigator:	S. Martin
Station 20	Station Dive
Location:	Near Pta. Chivato
Depth:	3 m
Date:	1/30/73
Investigator:	S. Martin
Station T21	Transect
Location:	Leeward side of Pta. Chivato
Depth:	7 m - 2 m
Date:	5/11/73
Investigator:	V. Vicente

APPENDIX 4.3B

Tortuguero Bay - Intertidal

PLANT KINGDOM

Chlorophyta

Dictyosphaeria cavernosa
Valonia ocellata

Rhodophyta

Jania adherens
Hypnea spinella
Laurencia sp.
Polysiphonia howei
Polysiphonia sphaerocarpa
Polysiphonia sp.

ANIMAL KINGDOM

Mollusca

Nodolittorina tuberculata
Littorina ziczac
Nerita peloronta
Nerita versicolor
Purpura patula
Fissurella nodosa
Acmaea antillarum
Cittarium pica
Chiton squamosus
Chiton marmoratus
Chiton viridis
Acanthopleura granulata
Petaloconchus sp.

Arthropoda
Class Crustacea

Coenobita clypeatus
Hippa cubensis
Tetraclita squamosa
Plagusia depressa
Grapsus grapsus
Balanus sp.
Callinectes sp.

APPENDIX 4.3C

Shoreline fish of Tortuguero Bay

FAMILY	2 Feb 72	14 June 73	12 Mar 74	9 Apr 74
Anguillidae				
Anguilla rostrata	3			
Xenocongridae				
Kaupichthys disdontis				1
Muraenidae				
Echidna catenata		7		1
Echelycore nigricans		2		
Gymnothorax funebris		1		
Clupeidae				
Harengula clupeola		58		
Gobiesocidae				
Arcos macrophtalmus		3		
Arcos rubrigenosus		43		
Tomicodon fasciatus		9	19	2
Atherinidae				
Melanorhinus microps		5		1
Scorpaenidae				
Pontinus		1		
Grammistidae				
Rypticus bistripennis				1
Holocentridae				
Adioryx vexillarius		9		
Lutjanidae				
Lutjanus apodus	2			
Pomacentridae				
Abudefduf saxatilis		8		
Pomacentrus fuscus		8		
Pomacentrus leucostictus				5

APPENDIX 4.3C (continued)

FAMILY	2 Feb 74	14 June 73	12 Mar 74	9 Apr 74
Mugiledae				
Agonostomus monticola	28			
Labridae				
Thalassoma bifasciatum		4		
Scaridae				
Sparisoma chrysopterum		1		
Dactyloscopidae				
Gillelus rubrocinctus		5		
Blenniedae				
Blennius cristatus		28	6	
Entomacrodus nigricans		36	4	23
Clinidae				
Labrisomus nigricinctus		2		
Labrisomus nuchipinnis		6		
Malacoctenus aurolineatus		1		
Malacoctenus macropus		48		
Malacoctenus triangulatus		6		1
Malacoctenus versicolor			6	1
Paraclinus fasciatus		3	1	
Stathmonotus hemphilli		1		
Gobiidae				
Bathygobius soporator		15	11	

APPENDIX 4.3D

Tortuguero - Shallow Subtidal

	Station 9	Station 12	Station 10
PLANT KINGDOM			
Chlorophyta			
Acetabularia polyphysoides		X	
Anadyomene stellata	X	X	
Caulerpa racemosa	X		
Rhipocephalus phoenix		X	
Valonia ventricosa	X	X	
Phaeophyta			
Dictyopteris delicatusa	X	X	
Padina sp.	X		
Stypopodium zonale		X	
Turbinaria turbinata	X	X	
Rhodophyta			
Amphiroa sp.	X	X	X
Chondria tenuissima	X		
Gigartina acicularis	X		
Gigartina sp.		X	X
Gracilaria sp.	X	X	
Jania adherens	X		
Spermatophyta			
Family Hydrocharitaceae			
Thalassia testudinum	X		

APPENDIX 4.3D (continued)

ANIMAL KINGDOM	Station 9	Station 12	Station 10
Porifera			
Chondrilla nucula	X		X
Geodia gibberosa	X	X	
Pellina carbonaria	X	X	
Terpios sp.	X		
Tethya sp.	X		
Verongia fistularis		X	
Cnidaria			
Acropora palmata			X
Asteractis expansa	X		
Cordylactis gigantea			X
Diploria spp.	X		
Eunicea sp.		X	
Gorgonia mariae	X	X	X
Manicina areolata	X		
Meandrina spp.			X
Millepora alcicornis			X
Montastrea annularis			X
Montastrea spp.		X	
Palythoa caribaea		X	
Porites asteroides	X		X
Porites porites			X
Siderastrea radians		X	X
Zoanthus pulchellus		X	X
Zoanthus sociatus			X

APPENDIX 4.3D (continued)

	Station 9	Station 12	Station 10
ANIMAL KINGDOM			
Sipunculoidea			
Various species	X		
Annelida			
Class Polychaeta			
Leodice sp.		X	
Nereis sp.	X	X	X
Sabella melanostigma	X		
Sabella sp.			X
Sabellastarte magnifica		X	
Spirobranchus giganteus	X		
Mollusca			
Astraea caelata		X	
Brachidontes exustus	X		
Columbella mercatoria	X		
Hemitoma octoradiata	X		
Isognomon radiatus		X	
Lima pellucida		X	
Petaloconchus mcgintyi			X
Thais floridana		X	
Arthropoda			
Class Crustacea			
Gonodactylus oersteidii		X	
Panulirus argus			X
Panulirus guttatus			X
Stenorhynchus seticornis	X		
Synalpheus curacaoensis		X	
Synalpheus longicarpus		X	
Synalpheus sp.		X	
Synalpheus minus		X	

APPENDIX 4.3D (continued)

ANIMAL KINGDOM	Station 9	Station 12	Station 10
Echinodermata			
Diadema antillarum		X	X
Echinometra lucunter		X	
Ophiocoma echinata		X	
Ophiotrix angulata		X	
Chordata			
Class Ascidacea			
Ascidia interrupta			X
Pyura vittata		X	X
Styela partita	X		
Class Pisces			
Abudefduf saxatilis			X
Abudefduf sp.		X	
Acanthurus spp.	X	X	X
Bodianus rufus			X
Unid. Balistid			X
Cephalopholis fulva		X	X
Chaetodon spp.			X
Haemulon spp.			X
Unid. Holocentrid		X	X
Unid. Labrid	X		X
Pempheris schomburgki			X
Pempheris sp.		X	
Pomacanthus spp.			X
Unid. Pomacentrid			X
Priacanthus arenatus			X
Priacanthus sp.		X	
Unid. Scarid			X

APPENDIX 4.3E

	STATIONS					
	T11,T16 T18,T4	7	15	5	8	13
ANIMAL KINGDOM						
Phylum Porifera						
Angelas sp.		X	X			
Anthosigmella varians	X	X	X	X	X	X
Callyspongia vaginalis		X	X	X	X	
Chondrilla nucula						
Cliona sp.		X	X	X		
Cinachyra cavernosa		X	X	X	X	
Haliclona sp.						X
Ircinia sp.	X				X	X
Ircinia compana			X	X		
Ircinia strobilina		X	X	X		
Neofibularia massa			X	X		
Sphaeciospongia vesparia			X			
Verongia lacunosa		X	X	X		
Verongia fistularis	X	X	X	X		
Verongia longissima				X		
Verongia sp.	X					X
Xestospongia muta	X	X	X	X	X	X
Phylum Cnidaria						
Class Anthozoa						
Subclass Octocorallia						
Eunicea laxispica	X	X	X	X	X	X
Eunicea sp.	X	X	X	X	X	X
Gorgonia sp.		X		X	X	
Muricea sp.	X	X		X		X
Muriceopsis sp.	X	X	X	X		X

APPENDIX 4.3E (continued)

	STATIONS					
	T11,T16 T18,T4	7	15	5	8	13
Plexaura flexuosa	X	X	X	X		X
Plexaura homomalla	X	X	X	X		
Plexaurella sp.	X	X	X	X	X	X
Pseudoplexaura sp.	X	X	X	X		
Pseudopterogorgia sp.	X	X	X	X	X	
Pterogorgia sp.	X	X	X	X		X
Subclass Zoantharia						
Acropora cervicornis		X	X	X		
Agaricia sp.	X	X	X	X		X
Dichocoenia stokesii	X	X	X	X	X	X
Diploria labyrinthiformis		X		X	X	
Diploria sp.	X	X	X	X	X	X
Eusmilea fastigiata	X			X	X	X
Isophyllia maltiflora	X					X
Madracis sp.		X	X	X		
Meandrina sp.	X	X	X	X		X
Millepora sp.		X	X	X	X	X
Montastrea cavernosa	X				X	X
Mussa angulosa	X			X		
Mycetophyllia sp.	X	X	X	X		
Palythoa sp.						
Porites asteroides	X			X		X
Porites porites	X					
Siderastrea radians				X		
Siderastrea siderea	X	X	X	X		X
Siderastrea stellata	X					
Stephanocoenia michelinii	X			X		X

APPENDIX 4.3E (continued)

	STATIONS					
	T11,T16 T18,T4	7	15	5	8	13
Phylum Chordata Subphylum Vertebrata Class Pisces						
Family Dasyatidae						
Unid. Dasyatid	X					
Family Muraenidae						
Gymnothorax moringa	X			2,*	X	
Family Branchiostegidae						
Malacanthus plumieri			3			
Family Holocentridae						
Myripristis jacobus				3		
Holocentrus sp.	X	1,2,3,4		2,3	4	4
Family Aulostomidae						
Aulostomus maculatus				2,3		4
Family Sphyraenidae						
Sphyraena barracuda	X			2		
Family Serranidae						
Cephalopholis fulva		2,3,4	3	2,3	4	4
Epinephelus striatus	X					
Unid. Serranid	X	3		2		
Family Grammidae						
Gramma loreto	X			2,3		
Family Grammistidae						
Rypticus sp.					4	
Family Echeneidae						
Echeneis naurates		4				

APPENDIX 4.3E (continued)

	T11,T16 T18,T4	STATIONS 7	15	5	8	13
Family Carangidae						
Caranx crysos	X					
Caranx ruber	X	1,4		2,3		
Seriola dumerlii					4	
Family Lutjanidae						
Lutjanus apodus	X			2,3		
Lutjanus mahogoni	X			2,3		
Ocyurus chrysurus	X			2		
Unid. lutjanid				3		
Family Pomadasyidae						
Anisotremus virginicus				2,3		
Anisotremus surinamensis				2		
Haemulon flavolineatum		1		2,3		
Haemulon macrostomum				2,3		
Haemulon plumieri				3		
Haemulon bonariensis				2		
Haemulon sp.						4
Family Sciaenidae						
Equetus sp.				3		
Family Sparidae						
Calamus bajonado						
Family Mullidae						
Pseudupeneus maculatus	X		3			4
Mulloidichthys martinicus	X			2		
Family Kyphosidae						
Kyphosus sp.	X			2		
Family Ephippidae						
Chaetodipterus faber	X			2		

APPENDIX 4.3E (continued)

	T11,T16 T18,T4	STATIONS 7	15	5	8	13
Family Chaetadontidae						
Chaetodon ocellatus		4				
Chaetodon capistratus	X	3,4				4
Chaetodon striatus	X	3	3	2,3	4	4
Holocanthus tricolor	X	1,2,3,4	3	3	4	4
Pomacanthus pacu		2	3	2,3		
Pomacanthus arcuatus				2,3		4
Family Pomacentridae						
Chromis cyaneus	X	1,2,3,4		3		4
Chromis multilineatus	X			3		4
Pomacentrus partitus	X	1,2,3,4	3	3	4	4
Family Labridae						
Bodianus rufus	X	3		3		4
Lachnolaimus maximus				3		
Thalassoma bifasciatum	X	1,2,3,4	3	3	4	4
Halichoeres sp.						
Unid. labrid		3	3	3		
Family Scaridae						
Scarus guacamaia	X	1		2,3		
Scarus vetula				3		
Unid. scarid		2,3,4		3		4
Family Acanthuridae						
Acanthurus coeruleus	X	2			4	4
Acanthurus sp.	X	1,2,3,4	3	3	4	4
Family Balistidae						
Unid. balistid	X			2	4	
Balistes vetula			2			
Melichthys niger		1,2,4		3	4	4
Family Ostraciontidae						
Unid. ostraciontid	X	4		3		

*1= 22 May 1974
2= 5 June 1974
3= 12 August 1974
4= 30 October 1974

APPENDIX 4.3F (continued)

	Station 19 1/30/73	Station 20 1/30/73	Station 5 1/29/73	Station 6 1/30/73
Phylum Porifera (continued)				
Spheriospongia vesparia	X			
Unidentified sp.	X		X	
Fragments		X		
Phylum Coelenterata				
Class: Hydrozoa				
Millepora alcicornis				X
Millepora squarrosa	X	X		
Millepora sp.		X		
Class: Anthozoa				
Subclass Octocorallia				
Eunicea mammosa			X	
Gorgonia mariae		X		
Phylum Annelida				
Class: Polycheata				
Eulalia quinquelineata		X		
Eunice sp.		X	X	
Eunice rubra	X			
Glycera tesselata		X		
Hermenia verruculosa		X	X	X
Leodicidae (unid. fam)	X			
Leodice binominata				X
Leodice mutilata				X
Lumbrinereis sp.		X		
Lysidice sp.		X		
Lysidice sulcata		X	X	
Marphysa sp.		X		
Marphysa regalis	X			
Nereis bairdii	X			
Nereis dumerilii	X			
Nereis glandulata		X		
Nereis versipedata	X			
Nicidion sp.			X	
Nicidion kimbergii	X		X	
Onuphis sp.		X		
Paramarphysa sp.	X			

	Station 19 1/30/73	Station 20 1/30/73	Station 5 1/29/73	Station 6 1/30/73
Class: Polycheata (continued)				
Sabellid sp.			X	
Syllidae sp.			X	
Syllis sp.		X	X	
Syllis prolifera	X	X		
Unidentifed polychaete pieces	X	X	X	X
Unidentified polychaete pieces	X			
Phylum Sipunculida				
Unidentified sp.		X	X	
Phylum Mollusca				
Class: Amphineura				
Acanthochitona pygmaea		X		
Balcis sp.			X	
Columbella mercatoria	X			
Hipponix subrufus subrufus		X		
Modulus sp.	X			
Astraea sp.	X			
Class: Pelecypoda				
Barbatia domingensis		X		X
Chama macerophylla		X		X
Codakia costata	X			
Echinochama arcinella				X
Phylum Arthropoda				
Class: Crustacea				
Subclass: Malacostraca				
Gonodactylus oerstedii	X			
Order: Isopoda				
Accalathura crenulata	X			
Cirolana parva		X		

APPENDIX 4.3F (continued)

	Station 19 1/30/73	Station 20 1/30/73	Station 5 1/29/73	Station 6 1/30/73
Suborder: Amphipoda (continued)				
Order: Decapoda				
Suborder: Natantia				
Tribe: Macrura				
Alpheus sp.			X	
Alpheus barbadensis		X		
Synalpheus bousfieldi	X			
Synalpheus mcclendon	X			
Synalpheus pectiniger	X			
Synalpheus pandiones	X			
Synalpheus tanneri	X			
Tribe: Brachyura				
Actaea acantha				X
Tribe: Anomura				
Calcinus tibicen	X			
Pachycheles ackleianus	X			
Phylum Echinodermata				
Class: Echinoidea				
Eucidaris tribuloides	X		X	
Class: Ophiuroidea				
Amphiurid brittle star	X	X		
Ophiactis savignyi			X	X
Ophiactis mulleri		X		X
Ophiocoma echinata		X		
Ophiocoma pumila		X	X	X
Ophioderma rubicundum			X	
Ophiomyxa flaccida		X		
Ophionereis reticulata	X			
Ophionereis squamulosa				
Ophiothrix angulata				X
Ophiothrix suensonii			X	

APPENDIX 4.4A

COMMON PLANT SPECIES LIST FOR TORTUGUERO BAY AREA

Grasses, Vines, Herbs:

Bidens pilosa

Borreria verticillata

Burserea simaruba

Chrysobalanus sp.

Coccoloba uvifera

Cocos nucifera

Crotalaria retusa

Diodia maritima

Erithalis fructicosa

Ipomea sp.

Kyllinga peruviana

Lantana involucrata

Plumiera alba

Psychotria undata

Randia sp.

Rauwolfia tetraphylla

Remirea maritima

Scaevola plumieri

Sideroxylon foetidissimum

Smilax sp.

Sporobolus virginicus

Tabebuia pallida

Zamia latifoliolata