at Benchmark 17°57.3N, 65°51.5W during March 23 & 24, 1980.

Sevasau 5/4 "An ot" CEER ~ 0-78 DATA REPORT OHER — OTEC CRUISE March 22-27, 1980. CENTER FOR ENERGY AND ENVIRONMENT RESEARCH, UNIVERSITY OF PUERTO RICO — US, DEPARTMENT OF ENERGY

DATA REPORT WER ~ OTEC CRUISE March 22-27, 1980

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The ability to detect the effects of an OTEC plant on the marine environment is dependent upon the magnitude of its effects relative to the scale and intensity of variability within this ecosystem. The scale examined in this study is approximately 10 km², which has been estimated to be the area whose alteration by the operation of an OTEC plant can be physically measured. The purpose of this cruise was to determine the magnitude of variability to various ecosystem components within and between such areas. Small scale and large scale transects were run to determine the presence of environmental gradients, if any, and the magnitude of between-station variability. The cruise was conducted on the R/V Crawford during March 22 through 27, 1980. Two current meters (InterOcean Model 135) were also moored at depths of 50 and 150 meters at the benchmark buoy during the period of the cruise.

Hydrographic Data: Hydrocasts were made with 5 liter or 12 liter Niskin bottles, usually lowered to depths of 1000 m. Bottles were placed at nominal depths of 0, 10, 25, 50, 75, 100, 150, 200, 250, 300, 400, 500, 650, 800, 1000 m for determinations of temperature, salinity, oxygen, chlorophyll, phaeopigments and nutrients (nitrate-nitrite, phosphate, ammonia, silicate).

Temperature was measured with paired deep-sea reversing thermometers. The thermometers were recently calibrated at the Physical Chemical Oceanographic Data Facility (PCODP) at Scripps Institution of Oceanography and measurements were considered accurate to 0.01. Unprotected thermometers were placed on bottles sampling at depths of 100 meters or greater. Salinity was determined with a Hytech induction salinometer.

Readings are considered accurate to 0.003°. Dissolved oxygen was determined by the Winkler method as revised by Carpenter (1965) and modified by Anderson (1971). Measurements are accurate to 0.02 ml/l. Nutrients were measured with a Technicon Autoanalyzer using methods described by Strickland and Parsons (1968). Chlorophyll was measured with a Turner Model 11 fluorometer using methods described by Strickland and Parsons (1960). Station depths were obtained through an E.O.D. Depth Recorder permanently installed on the ship or estimated from a chart, NOS 26659. Sonic depths obtained in stations were converted to meters but were corrected for speed of sound variations. Chart depths are indicated by (C) and sonic depths by an (S) besides the number. All depths are in meters. Densities (σt) were calculated from a Handbook of Oceanographic Tables (Bialek, 1966). Station times are given in Greenwich Mean Time (GMT). Plankton Tow Times are in local time. Puerto Rico is 4 hours behind GMT.

Net tows Zooplankton tows were made with a 75 cm opening-closing net equipped with 202 um

mesh. Volume of water filtered was calculated from a flowmeter suspended off-center in the mouth of the net.

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Bialek, E.T. (compiler), 1966. Handbook of Oceanographic Tables. U.S. Naval Oceanographic Office, Washington, D.C. Special Publication.

Carpenter, D.H. 1965. The Chesapeake Bay Institute technique for Winkler dissolved oxygen method. Limnol. Oceanogr. 10; 141-143.

Strickland, J.D.H. and T.R. Parsons. 1968, A practical handbook of seawater analysis. Fish. Res. Board of Canada. Bull. No. 167: 31 pp.

HYDROGRAPHIC DATA

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Versus depth at Benchmark 17°57.2N, 65°51.5N during March 23 - 28, 1980.
PHOSPHATE UGAT PO4-P/L 24 46 8 40 12 14 16 18 20 100; DEPTH IN METERS 800. Figure 14. Mean Phosphate concentration versus depth at Benchmark 17°57.3N, 65°51.54 during March 23 -

24, 1980. 1006 1106
DEPTH IN METERS 104 200: 300 490: 500: 600 700 800 900 1000 1100 NITRATE/NITRITE UGAT N/L 204 6 8 10 2 WW 16 Figure 15. Mean Nitrate/Nitrite concentration versus depth at Benchmark 17°57.2N, 65°51.5H during March 23 & 24, 1980.
10 200 300 50 604 DEPTH IN METERS 70 90 1000 1100 SILICATE UGAT SI/L 2 4 6 8 10 12 14 16 18 20 22. Figure 16. Mean Silicate concentration versus depth at Benchmark 17°57.3N, 65°51.54 during March 23 - 28, 1980.
TEMPERATURE 22 20 PHOSPHATE GAT PO4-P/L 0 6 8 10 12 16 18 20 22 Figure 17. Phosphate concentration versus temperature at Benchmark 17°57.3N, 65°51.5 during March 23 & 24.
TEMPERATURE °C NITRATE/NITRITE UGAT N/L 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30. Figure 18. Nitrate/Nitrite concentration versus temperature at Benchmark 17°57.3N, 65°51.5N during March 23 & 24, 1980.
TEMPERATURE °C SILICATE UGAT SI/L 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 Figure 19. Silicate concentration versus temperature at Benchmark 17°57.3N, 65°51.5N during March 23 & 24, 1980.
PHOSPHATE UGAT PO4-P/L 02 04 06 08 10 12 14 16 18 20 DEPTH (M) Figure 20. Phosphate versus Depth in a transect south of Punta Tuna on March 23 & 24, 1980.
Depth (M) 100 200 300 400 500 600 700 800 900 1,000 1,100 NITRATE/NITRITE UGAT N/L 2 4 6 8 10 12 14 16 18 20 22 24 26 30 Figure 21. Nitrate/Nitrite versus Depth (m) in a transect south of Punta Tuna on March 25, 1980.
Depth (M) SILICATE UGAT SI/L.

? Point1 0.5 miles from coast, Point2 3.5 miles from coast, Point3 15.5 miles from coast, Point4 31.5 miles from coast. Figure 22. Distance versus depth in a transect. Points taken on March 36, 1980.

DAY 0 1600 DAY 1 0600 1000 1100 1200 1300 1400 1500 1600 1700 1930 2030 2130 2230 2330 Day 2 0030 0130 0330 0530 0630 0830 MARCH 1980 CRUISE PLAN (CRUISE 8003)

DAY 2 (cont) 0915 1000 1085 1130 ais 1300 1345 1430 1515 1600 1605 1730 1930 2000 2100 2200 2400 Day 3 0000 100 0200 oblique net tow (0-100n) station S-1 steam for S-2 station S-2. 17°54.3N 65°57.4W oblique net tow (0-100) steam for S-3 Station S-3 17°56.0N 65°46,7¥ ‘oblique net tow (0-100) steam for S-4 station S-4 17°56.2N65°55.44 oblique net tow (0-100n).

Steam for Station S-5 (Benchmark) 17°57.3" 65°52.0W, oblique net tow. Steam for Station S-6, 17°58.8N 65°48.24, oblique net tow. Return to benchmark hydrocast, begin night series 17°52.5N 65°53.64. Steam for S-1, oblique net tow (0-100m). Steam for S-2, oblique net tow (0-100m) 17°54" 65°50W. Steam for Station S-3, oblique net tow (0-100m) 17°55.9N 65°46.4M. Hydrocast, steam for Station S-4 17°56.1N 65°55.36, oblique net tow (0-100m). Steam for Station S-5 (Benchmark), oblique net tow (0-100m) 17°57.3N 65°52.0W. Steam for Station S-6, oblique net tow (0-100m). Steam to Vieques. Begin large scale study.

Day 3 (cont.) 0220 0345 0515 0830 1200 1500 1750 2000 2300.

Day 4: 100 0200. BT (underway) arrive station Vel 18°08.4N 65°32.6, hydrocast (2 depths), shallow net tow. Steam for Station V-2 18°03.6N 65°32.6, shallow net tow. Steam for Station V-3 18°01.8N 65°32.7, hydrocast, oblique net tow (0-100). Steam for Station V-4 17°57.7N 65°32.64, oblique net tow (0-100m). Steam for Station V-5 17°48.5N 65°32.64, oblique net tow (0-100m), hydrocast.

Day 4 (cont.) 0830 0830 0930 1000 1035 1300 1430 1700 1800 1930 2100 2230 0200.

Arrive at PT-2 17°58.1N 65°53, oblique net tow. Steam for PT-1, arrive PT-1 17°58.2'N 65°53'W, shallow hydrocast (2 depths), shallow net tow. Steam for J-1, arrive J-1 17°54.8°N 66°16.N, shallow hydrocast (2 depths), shallow net tow. Steam for J-2, arrive J-2 17°53.7°N 66°16.1°W, oblique net tow. Steam for J-3, arrive J-3 17°48.7'N 66°16.1N, oblique net tow (0-100m). Steam for J-4, arrive J-4 17°47.7N 66°16.0W, oblique net tow (0-100m). Steam for J-5, arrive J-5 17°39.7N 66°26.08, oblique net tow (0-100m). Steam for J-6, arrive J-6 17:24.5N 66°16.0W.

Hydrocast oblique net tow (0-100) Depart for 6-6 XBT (underway). Arrive at G-6, located at 17°26.5'N 66°45'W. Carry out oblique net tow (0-100m) and hydrocast. Depart for 6-5 and arrive at G-5, located at 17°41.6'N 66°45'W. Perform hydrocast and oblique net tow (0-100m). Depart for Gt 59.

Day 4 (continued)

0830: Depart
0600: Arrive at Gt, located at 17°49.3'N 66°45'W. Perform oblique net tow (0-100m).
0730: Depart for 6-3
0815: Arrive at G-3, located at 17°53.4'N 66°45'W. Perform oblique net tow (0-100m) and hydrocast.
0015: Depart for G-2

Arrive at G-2, located at 17°56.9'N 66°45'W. Perform oblique net tow. Depart for G-1. Arrive at G-1, located at 17°56'N 66°45'W. Perform oblique net tow and carry out shallow hydrocast. Depart for 6-0 and arrive at G0, located at 17°58'N 66°45.7'W. Perform oblique net tow and depart for Malecón 60.

List of Participants for the Crawford Cruise (22-27 March 1960):

1. José M. Lopez - Chief Scientist
2. Juan 6. González - Scientist
3. Paul M. Yoshioka - Scientist
4. Daniel Pesante - Scientist
5. George Anderson - Head Technician
6. José A. Ramirez - Technician
7. Jorge Capella - Technician
8. Jorge García - Technician
9. Angel Nazario - Technician
10. Dennis Corales - Technician

11. Edwin González - Technician
12. Carlos Bonafé - Technician
13. Carlos Aranda - Technician
14. Nana Pérez - Technician
15. Nigdalia Alvarez - Technician

Weather Conditions:

- Clear (no cloud at any level)
- Partly cloudy (scattered or broken clouds)
- Continuous layer(s) of clouds
- Sandstorm, dust storm, or blowing snow
- Fog, thick dust, or haze
- Drizzle
- Rain
- Snow, or rain and snow mixed
- Showers
- Thunderstorms