CEER-O-056

DATA REPORT

OHER = OTEC Cruise, 8-12 Novenber 1979

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DATA REPORT

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?TABLE OF CONTENTS,

INTRODUCTION, we ee

PRELIMINARY AVALYSIS = = «

IMPLICATIONS FOR FUTURE CRUISES

BIBLIOGRAPHY = ws eee

STATION PLAN vee eae

CURRENT METER ge ee ee ee

DROGUE TRACK eee

eT see tee ee eens

_HYDROCAST DATA = T,S, Op» CHLOROPHYLL. .

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NUTRIENTS DATA

ZOOPLANKTON DATA ee ee eee eee

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INTRODUCTION

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 seal

?and intensity of variability (pattern) within this ecosystem,
The scale of pattern examined in this study is approximately 10 kn 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 of varfous ecosystem com Ponents within and between such areas. Also, the effect of different sampling procedures within station variability was examined. One within station study was centered around a fixed geographical locale, the buoy

?moored at the benchmark site and the other around a drogue at a depth of 90 meters. For the remainder of the cruise, longshore and offshore transects were run to determine the presence of environnental gradients, if any, and the magnitude of between station variability.

?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.

ETHODS

Hydrographic Data

Hydrocasts were made with § liter Niskin bottles usually lowered to depths of 500m. Bottles were placed at nominal depths of 0, 10, 25, 50, 75, 100, 150, 200, 300, 400, 500 m for determinations of tenperature, salinity, oxygen, chlorophyll and nutrients (nitrate-nitrite, phosphate,

amonia, silicate).

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Temperature was measured with paired deep sea reversing thermoneters. The thermometers were recently calibrated at the Physical Chemical Oceanographic Data Facility (PCODF) at Scripps Institution of Oceenography and measurements were considered accurate to 0.01°C. Unprotected ther-oneters 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 mt/2. Nutrients were measured with a Technicon Auto-analyzer using methods described by Strickland and Parsons (1968), Chorophy11 was measured with a Turner Model 111 fluorometer using nethods described by Strickland end Parsons.

Net Tows

Zooplankton tows were made with a 75 cm opening-closing net equipped with 202 ym mesh. Volume of water filtered was calculated froma flow meter suspended off center in the mouth of the net.

PRELIMINARY ANALYSIS AND RESULTS

Initial analysis of the cruise data indicates the following properties

of ecosystem variability in the Punta Tuna area:

1. No consistent difference in variability of hydrocast (temperature, salinity, oxygen) and net tow data was found between the drogue and benchmark stations. In

other words, the precision of measurement was not

appreciably improved by following @ tagged

ter mass.

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3.

Contrary to expectations, variability of hydrocast data did not always decrease with depth, For instance, at tthe benchnark site the standard deviation of temperature at the surface and 500 mwas .07° and .18°C respectively. T-S plots of all hydrocast data showed a consistent relationship indicating that variability of physical parameters at depth can be explained by vertical water motion rather than horizontal advection of water masses. A plot of isotherms taken during the first two days suggest a semidiurnal (tidal?) period of vertical

water motion,

Temperature and current velocities measured by the

deep current meter (150 m) also show a 12.3 hour

(tida1) periodicity. The shallow (50 m) current meter

indicated two periodicities of 11.2 and 13.3 hours,

respectively.

sriodicity in current direction is

not analyzed at present. (Analysis of periodicity

was done by a analysis of variance (ANOVA) technique.)

Both the hydrocast and current meter data indicate

?the major component of deeper water (260 m) motion

during the cruise was due to internal waves of tidal

periodicity.

Drogue movement was consistent with current meter

measurements at 50 m.

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7. No consistent difference was found in variability of

?the between (transect) stations compared to the within

stations. This indicates that the magnitude of within

station varfability may make difficult the ability to

detect spatial patterns on a scale of 10 ka?,

Nitrate and phosphate profiles indicate that relatively

low nutrient concentrations prevail in the surface

waters. These increase progressively below 200 to

300 m. Analysis of additional samples is in progress.

IMPLICATIONS FOR FUTURE CRUISES

?The lack of consistent difference in variability of the

rogue and benchnark station indicates that neither is more preferable

to the other in terms of sampling precision. Consequently, either one

or the other (but not both) should be performed on future cruises.

2. Since the magnitude of within to between station variability

was roughly equivalent, it may be difficult to distinguish pattern on this

scale. T-S plots were quite similar throughout the cruise. This suggests

that water mass properties are quite uniform over the spatial scales examined. This suggests that hydrocasts taken on such a scale may be overly redundant for sampling purposes. Hydrocasts taken at greater Spatial separation (10 mi.) may reveal larger scale regional differences and may be useful for geostrophic flow calculations.

Although no spatial pattern was detected for zooplankton, it must be noted that thus far identification has only proceeded to large taxonomic Tevels (kingdom or phylum). Until the samples are processed to this degree,

?it would seem advisable to continue sampling at the present spatial scales.

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?CRUISE PLAN

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11800

336

DAY 1 = Intensive Studtes (Benchmark stte)

Depart Yabucoa

Arrive Benchmark site

Deploy current meters

Hydrocast* (11 depths to. $00 m)

Net tow (0 = 100, 100 ~ 200 m

Net, tow ve

Light profile + seccht

Hydrocast (11 depths to 500 n), seccht

Net tow (0 ~ 100-m, 100 - 200 m)

Hydrocast (11 depths to 500 m }, seccht

Depart for Yabucoa

*(0, 10, 25, 50, 75, 100, 150, 200, 300 400, 500 m; for chlorophy11,

nutrients, D0, salinity),

700

0705

0730

13200

1300

1600

1730

DAY 2 - Intensive Studtes (Drogue Station)

Depart: Yabucoa

Arrive Benchmark site

Deploy drogues

Hydrocast (10 depths, 500 m), seccht

Net tow (0 - 199, 100 ~ 200 ml

Net tow (0 - 100, 100 - 200 m!

Light proftle, secchi

Hydrocast (10"depths, 500m), seccht

Net tow (0 100 m, f00 ~ 208 m)

Hydrocast (10 depths, 500 m), seccht

Depart for Yabucoa

DAY 3 = Offshore Transect

Depart Yabucoa

fecive Stat,

Hydrocast (0, 10 m) + secchi

Net tow (0-10 m)

Depart for Sta. 0-2

Hydrocast (0, 10, 20 m) + secchi

Net tow (0-26 m)

Depart for Sta. 0-3

Arrive Sta, 0-3

Hydreast (to 200 m) + seccht

Net tow (0-200 m)

Depart for Benchmark Station

Hydrocast (to 500 m) + seccht

Light profile

et tow (0-200 m)

---Page Break---

DAY 3 (continued)

1245 Depart for sta, 0-8

1315 Hydrocast (to 200 m), secchi

1400 Net tow (to 200 m)

1430 Depart sta. 0-5

1515 Hydrocast (to 200 m), secchi

1600 Net tow

1630 Depart for Sta. 0-6

1730 Arrive Sta, 0-6

1730 Hydrocast (to 200 m), secchi

1815 Net tow (to 200 m)

1845 Depart for Yabucoa

DAY 4 = Longshore Transect

9600 Depart Yabucoa

?0800 Arrive Station Lal

?0800 Hydrocast (to 200 m), secchi

0845 Net tow (to 200 m)

o9rs Depart for Sta. L-2*

(0930 Arrive L-2

0930 Hydrocast (to 200 m), secchi

1015 Net tow (to 200 m)

1045 Depart? for Sta. L-3

1100 Arrive -3

i100 Hydrocast (to 200 m), secchi

1145 Net tow

1215 Depart for Fenchnark

1230 Arrive Benchmark

1230 Hydrocast (to 500 m), secchi

1400 Light profile

1430 Net tow

1500 Depart for L-4

1515 Arrive L-4

1600 Hydrocast (to 500 m), secchi

1645 Net tow

as Depart for L-5

1730 Arrive L-5

1730 Hydrocast (to 200 m), seccht

1815 Net. tow

1845 Depart? for Yabucoa

---Page Break---

DAY 5 ~ Longshore transect

Depart Yabucoa

Arrive Benchmark

Retrieve current meters

Net tow, XBT, secchi

Steam West

Net tow, XBT, secchi

Steam West

Net tow, SBT, secchi

Steam West

Net tow, SBT, secchi

Steam West

Net tow, SBT, secchi

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Net tow, SBT, secchi

Steam West

Net tow, SBT, seccht

?Steam West

---Page Break---