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NAVAL UNDERWATER SYSTEMS CENTER NEWPORT RI  
OCEAN ACRE CRUISE NUMBER 14, 4 - 12 JUNE 1972. (11)  
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NAVAL UNDERWATER SYSTEMS CENTER

9 Technical Memorandum

6 OCEAN ACRE CRUISE 14  
4 - 12 JUNE 1972

11 Date: 24 January 1973

Prepared by Thomas A. Bender, Jr.  
Ocean Sciences Department

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### INTRODUCTION

Ocean Acre Cruise No. 14 forms an integral part of the continuing study, on a seasonal basis for the past 5 years of the one degree rectangle southeast of Bermuda bounded by 31° 30'N to 32° 30'N and 63° 30'W to 64° 30'W. This cruise consisted of sampling the above area with mid-water trawls using Isaac-Kidd net embodying a 4-chambered cod end; taking reverberation measurements at 12 hour intervals employing transducers suspended from the Wellen Davits on both side of the ship, as well as using the ships 3.85 khz dome.

### OBJECTIVES

1. Sample the midwater fauna at 12 selected depths both day and night with a 10 foot (3 meter) Isaac-Kidd Midwater Trawl.
2. Make neuston tows (air-water interface) as often as possible, concurrently with the mid-water trawls.
3. Make XBT casts at regular intervals.
4. Make acoustic measurements for correlation with biological data, noon and midnight.

### SCIENTIFIC PERSONNEL

C. L. Brown, Jr., Biologist	Project Leader	NUSC/NL
T. A. Bender, Jr., Oceanographer	Coordinator	NUSC/NL
A. L. Brooks, Biologist	Asst. Project Leader	NUSC/NL
F. Corona, Electronic Technician		NUSC/NL
R. Dullea, Electronic Engineer		NUSC/NL
E. Jones, Oceanographer		NUSC/NL
J. Syck, Oceanographer		NUSC/NL
C. F. Roper, Biologist	Chief Scientist	Smithsonian Inst.
R. D. Gatton, Biologist		Smithsonian Inst.
C. Karnella, Biologist		Smithsonian Inst.
W. H. Howell, Biologist		Smithsonian Inst.
R. Kleckner, Biologist		Smithsonian Inst. & University of R. I.
D. Bengston, Biologist		University of R. I.
J. Green, Biologist		University of R. I.

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#### GENERAL INFORMATION

With the arrival of personnel in Bermuda on 3 June unpacking and preparation of equipment began. The Isaac-Kidd net was assembled and the electronic package tested. The 1-meter neuston net was rigged out on the port and side of the fantail. The XBT chart recorder and launcher, as well as the companion digitizing tape machine were readied and tested.

The SANDS departed the U. S. Naval Station, Port Royal Bay, Bermuda at 0800 on 4 June 1972 for the operations area. The first net tow, to 300 meters was in the water at 1345 on 4 June and out at 1800. Following this, 30 more tows were made ranging from 25 to 1500 meters (just under 3000 meters of .660 in wire out with a 60° wire angle) in depth.

#### MATERIAL AND METHODS

Principal equipment utilized was a:

1. Ten foot Isaacs-Kidd Midwater Trawl (IKMT) with a 4 chambered discrete-depth cod-end.
2. Benthos Time-Depth Recorder.
3. Giffit Precision Graphic Recorder.
4. UQN/AT200A Transducer operated at 13.5 and 15.5 kHz.
5. Transducer array in a hull-mounted dome operated at 3.85 kHz.
6. Sippican expendable bathythermograph system (XBT).
7. Net-mounted submarine photometer.
8. Net-mounted instrument package for cod-end gate closure and environmental parameter monitoring.
9. 1 meter, #2 plankton net.

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#### Methods:

In a typical towing pattern the ship adjusted to a course that positioned the wind off the starboard quarters and to a speed of advance of 50 rpm. The net vane was lowered into the water with the U-trawl; then, followed by the cod end sampler which in turn pulled the rest of the net after it. The vane was towed at the surface until the depth frequency readout in the dry laboratory was checked and noted. The net was now streamed aft, at first slowly and finally at a speed not exceeding 40 meters per minute. The ship continued on course at about 2.5 knots (75 rpm) with the net being maintained at the required depth by increasing or decreasing the ships speed by 5 to 10 rpm. After closing the gates of the cod end sampler at the required times (one hour for each chamber, thus giving 3 discrete-same depth samples) the net was brought back to the surface. With the vane breaking the surface the depth frequency was again noted. The vane was now brought aboard, followed by the cod end sampler and the rest of the net.

The gates of the cod end sampler, now on the washing table, were opened and the contents of the four chambers (A, B, C, M) washed into drawers which were then removed from the washing table and emptied into laboratory pans. Following the examination of the age rings in the ear bones of the larger fishes 10% formalin solution was added to just cover the samples in each pan. After fixing for an hour the samples were sorted into groups of fish, leptocephalus (eel larva), cephalopods (squid and octopus) and other remaining sea life in the pan (mostly prawn-shrimp). The volume of each group was measured and recorded.

The final net tow was aboard at 0050 on 13 June 1972. At 0930, 12 June, the ship was again anchored off the U. S. Naval Station in Port Royal Bay, Bermuda.

#### Equipment Performance

Benefiting from past difficulties with the various gear spare parts were readily available. Thus, delays due to equipment malfunction were less than for any previous cruise.

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### WEATHER CONDITIONS

Weather conditions during the cruise did not adversely affect scientific operations. Winds were generally below 20 knots and a sea state  $2\frac{1}{2}$  or less.

### RESULTS

#### Brief Summary of Data and Tows

The following table summarized the distribution of net hauls with respect to the specific diurnal migrations.

TABLE I

<u>DEPTH.m</u>	<u>DAY</u>	<u>NIGHT</u>	<u>CREPUSCULAR</u>
* 0	14	24	
** 25	2	1	
** 50	3	2	1
** 100	3	2	
** 150	3	2	
** 200	3	2	1
** 300	3	3	
** 350	3		
** 400	3	3	
** 500	3	3	
** 600	3	3	
** 700	3		
** 800	2	3	
** 900	3		
**1000	3	3	
**1250	3	3	
**1500	3		

\* neuston

\*\* IKMT

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TABLE II

Depth distribution of discrete-depth samples by volume (ml) hour. Figures in parentheses are adjusted to per hour volumes. (Preliminary analysis; subject to slight change).

<u>DEPTH.m</u>	<u>DAY</u>		<u>NIGHT</u>	
	<u>FISH</u>	<u>INVERT.</u>	<u>FISH</u>	<u>INVERT.</u>
25	4(8)	10(20)	(225)	(225)
50	10(58)	46(58)	41(94)	83(201)
100	7	55	114(228)	52(104)
150	6	11	69(96)	114(155)
200	4	18	37(44)	111(129)
300	2	115	88	102
350	12	92		
400	33	21	78	63
500	25	56	91	97
600	89	69	266	176
700	100	70		
800	310	197	64	93
900	121	157		
1000	214	158	300	98
1250	169	113	287	131
1500	60	173		
Totals	1166(22)	1361(78)	1435(687)	1120(814)

ACKNOWLEDGEMENT

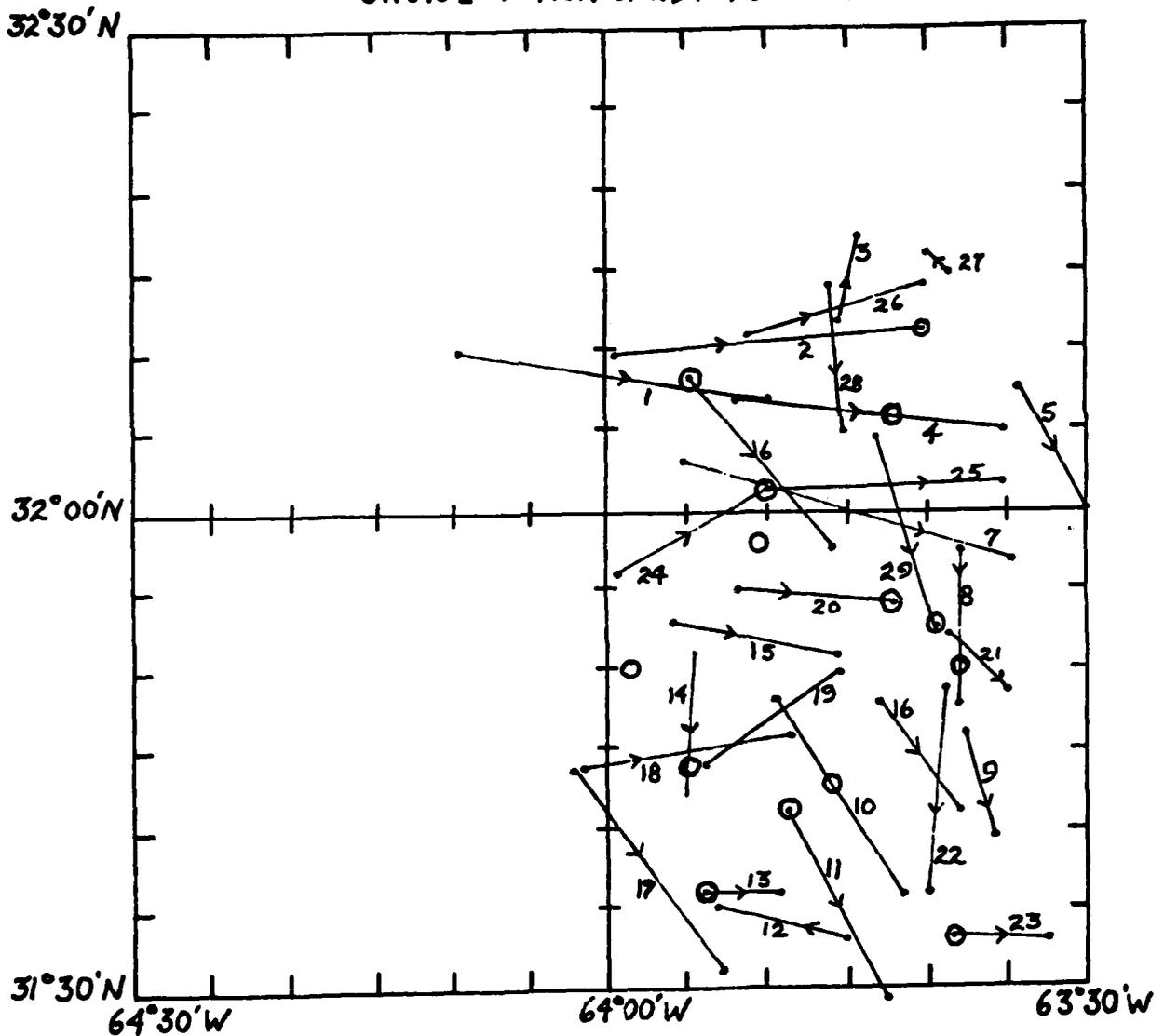
The willing assistance of the officers and crew of the USNS SANDS, together with the wholehearted cooperation of the scientific group made this an excellent ocean acre cruise. Also greatly appreciated was the assistance furnished by the Bermuda Tudor Hill Detachment, both military and civilian.

TABLE III NET HAULS - OCEAN ACRE 14

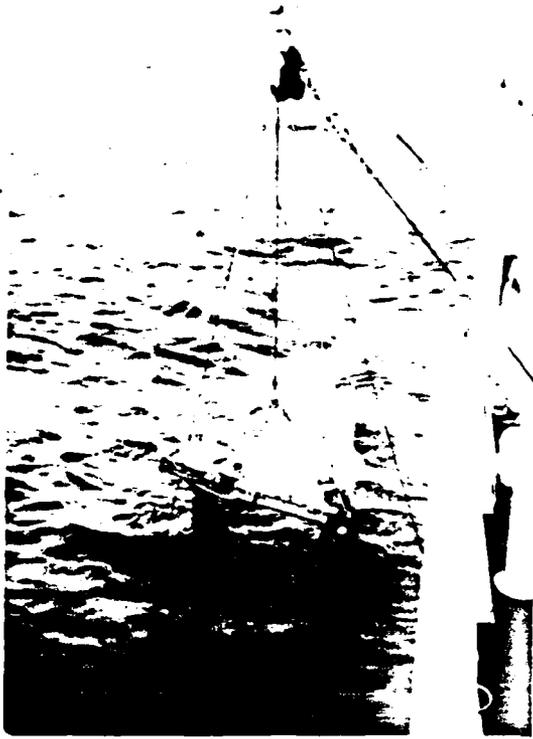
DEPTH METERS	0730	1630	1930	0430	0730
	DAY	PM MIGRATION	NIGHT	AM MIGRATION	
0					
50	27		25		
100	26 →		21		← 26
150	4 →		3		← 4
200	18 →		9		← 18
250		← 15 →	13		
300		← 1 →	2		
350	19				
400		← 5 →	8		
450					
500	14 →		20		← 14
600	10 →		17		← 10
700	23				
800	6 →		12		← 6
900		← 28 →			
1000		← 7 →	16, 24		
1100					
1200		← 11 →	29		
1300					
1400					
1500	22 →				← 22
1600					
1700					
1800					

Figure No. 1 below shows the location of the net tows. The apparent cluster of tows in the eastern half of the rectangle is explained by an effort to avoid the recurrence of a net loss which occurred in Acre No. 10 when a sharp turn was made in shoaling water on the western edge of the Acre.

FIGURE 1  
OCEAN ACRE NO. 14 4-12 JUNE 1972  
CRUISE TRACK & XBT POSITIONS



OPEN CIRCLES INDICATE POSITIONS OF XBT'S



Net trailing ship at  
surface

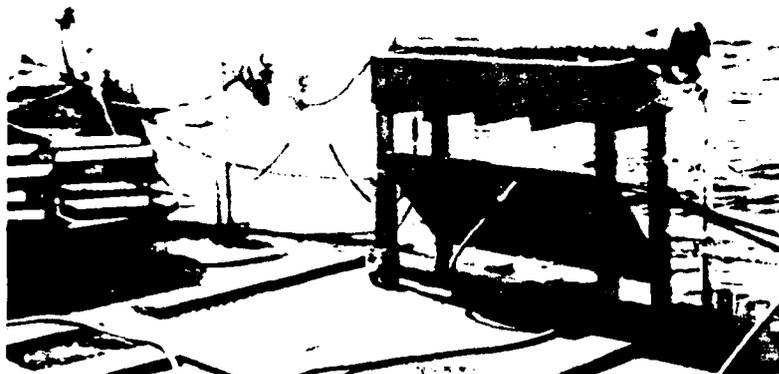


Vane and electronic packages  
mid-way between ship and surface

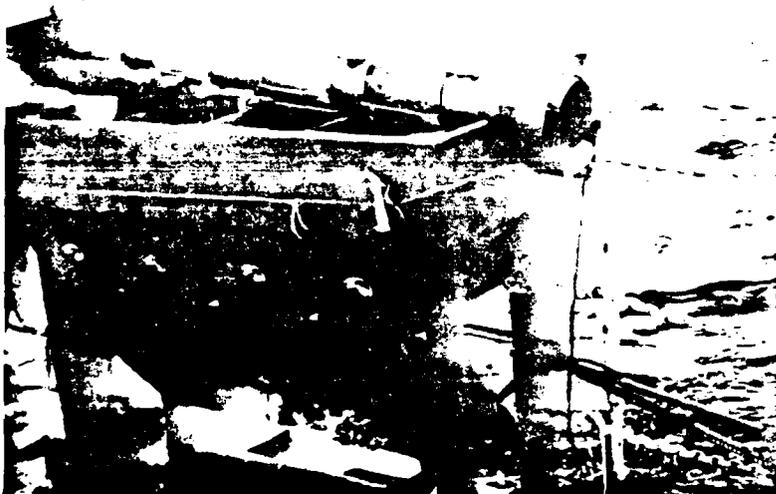


Vane aboard under U-Trawl

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IKMT net on fantail  
with cod-end sampler  
resting on washing  
table.



Closeup of cod-end  
sampler and washing  
table



Sample in laboratory  
pan.