

TECHNICAL REPORT

IN SITU STUDIES ON THE TROPICAL BENTHOS.

I. NARRATIVE INTRODUCTION TO CORAL REEF STUDIES BASED ON THE PERRY HYDRO LAB.

J. S. Bunt

INTRODUCTION

Large parts of the coral reef formations in the Florida Keys, the Bahamas and throughout the Caribbean lie at depths well in excess of 10 m, preventing or limiting intensive in situ investigation by surface-based SCUBA-equipped divers whose bottom time is restricted by the prolonged requirements of repeated decompression.

This report describes some of the logistic features of a series of saturation dives made in attempting to overcome barriers limiting access to the deeper reefs at a site off Grand Bahama Island. The Perry Hydro Lab was used as sea floor habitat, life support system and base of operations.

Mission Schedules and Personnel

The following listing does not include on-site operations preceding and following missions. In general, one day was allowed for preparation of the habitat although the period was sometimes extended by unfavorable weather. The post dive interval on site originally was 24 hours. However, this was later extended to two days for mission personnel to avoid decompression complications possibly associated with air travel.

June 1-6, 1972.

Objectives: studies of community structure
installation of a marked study area
photographic survey

Habitat Personnel:

J. Bunt (Principal Investigator, RSMAS)
D. Taylor (RSMAS)
T. Mount (RSMAS)
S. Pepper (RSMAS)

Surface Support:

I. Strickland
B. Soester (Student, Miami-Dade J.C.)
B. Chalker (Student, RSMAS)

R/V CALANUS anchored at the surface as support platform.

July 11-16, 1972.

Objectives: systematic sampling to establish standing stocks
topographic transect survey

Habitat Personnel:

J. Bunt (RSMAS)
M. Wells (NOAA)
A. Ikehara (RSMAS)
I. Strickland

Surface Support:

B. Soester (Student, Miami-Dade J.C.)
R. Trumbull (RSMAS)

August 31 - September 5, 1972.

Objectives: sampling to establish standing stock distributions
marking and measuring "hard" and "soft" corals
testing techniques for metabolic measurements, i.e.,
photosynthesis and respiration
sampling of sediments through study area
further community structure studies

Habitat Personnel:

J. Bunt (RSMAS)
C. C. Lee (RSMAS)
I. Strickland
D. Wilson

Surface Support:

S. Pepper (RSMAS)
B. Soester (Student, Miami-Dade J.C.)

November 15-21, 1972.

Objectives: detailed survey photography of marked areas
measurements of marked corals
oxygen exchange in reef sediments
photosynthesis and respiration in "hard" and "soft" corals

Habitat Personnel:

J. Bunt (RSMAS)
Z. Mount (RSMAS)
I. Strickland
B. Soester (Student, Miami-Dade J.C.)

Surface Support:

T. Mount (RSMAS)
A. Sendry (Student, Miami-Dade J.C.)

January 3-8, 1973.

Objectives: as November. Also detailed taxonomic survey for macroalgae and observations on fish behavior.

Habitat Personnel:

Z. Mount (RSMAS)
C. C. Lee (RSMAS)
T. Mount (RSMAS)
S. Earle (Los Angeles, County Museum)

Surface Support:

J. Bunt (RSMAS)
J. Vaught (RSMAS)
L. Vaught (RSMAS)
B. Soester (Student, Miami-Dade J.C.)

February 4-9, 1973.

Objectives: as November. Repeating measurements and observations to detect seasonal changes.

Habitat Personnel:

J. Banbury (RSMAS Student)
M. Bonsignore (Honeywell, Inc.)
R. (Rick) Smith
S. Cawthon (Miami-Dade J.C.)

Surface Support:

Z. Mount (RSMAS)
J. Wright

April 1-6, 1973.

Objectives: as for February.

Habitat Personnel:

Z. Mount (RSMAS)
D. Malloy
S. Exley
R. Frehsee

Surface Support:

J. Bunt (RSMAS)

June 3-8, 1973.

Objectives: as for February.

Habitat Personnel:

J. Bunt (RSMAS)
J. Banbury (RSMAS Student)
R. (Bob) Smith (Am. Inst. for Research)
R. Frehsee

Surface Support:

Z. Mount (RSMAS)
P. Reinholm (Student, Miami-Dade J.C.)

NOTE: Relevant affiliations listed.

Discussion

The Perry Hydro Lab, its construction, operation and management, have

been described in a manual for users prepared by Mr. R. Wicklund, manager of the facility. In the report which follows, an attempt has been made to set down some of the procedures developed or adopted specifically for our own needs with observations on problems associated in some way with logistics and current management. For convenience, the comments have been arranged in keeping with the format of the Hydro Lab operations manual.

Equipment

Hydro Lab. We have managed to accommodate four divers with acceptable comfort and efficiency, using air mattresses to augment the existing bunks. Some thought might be given to better use of the available space to provide shelving and, especially, work-bench space, however limited. It would be helpful if quick-snap hanging supports could be provided for O₂ masks. The present arrangement is makeshift. More important, a foolproof system is needed to distinguish external air and O₂ supply valves feeding from compressed cylinder gases outside the habitat. It would be useful, though not essential, to be able to monitor tank pressure in those supplies during decompression.

Due to the design of Hydro Lab it is not feasible at present to determine the activities of divers immediately outside the trunk. This would be useful to know when coordinating dive activity and when anticipating the arrival and needs of surface support. It might be feasible to provide a simple metal mirror to satisfy this need, either set up below the trunk or, better, appropriately mounted externally by one of the small ports at the entry end.

We gather many mission teams have adopted the practice but note here that use of the portable toilet has been reserved for emergency. Short "head run" excursion dives are generally preferable.

From experience in the mission of June, 1973, we support current radio monitoring procedures whereby divers are not required to maintain watches and initiate calls. The additional rest greatly improves performance in the water.

PUTS. These stations are extremely useful and, in fact, it would be valuable to install units at strategic locations over the area to be worked during each mission. Not only does a PUTS allow efficient discussion of problems that arise in situ but the air space would allow some technical procedures that would not be easy to arrange in the water. Further, a unit such as the present PUTS or perhaps a little larger, could be used to effect pretreatment and storing samples awaiting transfer to the surface, for some operations involving volatile chemicals that cannot be used in Hydro Lab and for various types of preparation activity not convenient underwater. Such a structure would require a bench, storage racks and perhaps a supply of freshwater.

Life Support. There has been long agreement over the advantage to be gained in providing a means to fill tanks on site. We support this attitude although there would be little point in the arrangement unless compressions could be achieved with substantially the same speed as is currently possible ashore.

Transfer Pots. Since these units are used quite frequently and since repeated transfers are needed at the start and end of missions, it would increase efficiency if quick release closures could be designed or adopted and if pots could be made to better suit the geometry of the trunk.

Pre-Dive Information

In our experience, at least 24 hours is required on site in preparation for each mission. During the winter, especially, periods of strong wind are

common in the Bahamas and these conditions can slow or delay entry to Hydro Lab. Lead time allowed has to be weighed against its cost.

Augmenting the basic supply of dehydrated food has been found especially important for personnel making repeated dives. For researchers on their first saturation dive, the general novelty of the surroundings more than compensates for the simple diet. After a number of dives, however, the introduction of a little variety has a remarkably good effect on general morale and overall performance. Note that the habitat is too warm to hold perishables from day to day. A list of Bahamian holidays and store hours would assist incoming mission personnel with advance planning and local purchasing.

We would suggest that users of the Hydro Lab make the most careful advance plans possible for their mission and that they have available one or more alternative courses of action with provision for an abbreviated schedule and an ordering of priorities. Circumstances sometimes arise which interfere with planning and valuable time can be lost unless problems are anticipated. In our experience, it is particularly important to understand the physical and other limitations of each mission team and to adjust the work load with these facts in mind. Reliability of performance cannot be maintained well if the schedule creates undue demands and stress.

In connection with health, some of our divers have found that avoiding soap when showering after dives definitely appears to reduce bacterial skin infections. Others take exactly the opposite views. However, it is important to wash wet suits thoroughly at least once each day and to hang these up where excess water can drain away. Some prefer to leave their suits secured outside the habitat. We advise against stowing water clothing and other dive accessories in the trunk. Fins have been lost due to surge action in rough weather and in any case, hygiene is difficult to maintain.

Divers new to saturation should be reminded that the boiling point of water is elevated under pressure so that due care may be taken from the outset in preparing meals.

The Dive

For the purposes of our program, it was necessary to mark out a study area or transect for extended reference. With multiple program use of Hydro Lab, there would appear to be sound reasons for introducing a procedure to keep investigators informed of the existence of such areas to assure collaboration, avoid interference and permit optimal use of the site. It may be that study areas should be assigned with suitable markings, where necessary, to warn against disturbance. Perhaps path-finding transects or trails should be distinct from study transects. Investigators then would require a suitably marked map of the area.

To avoid undue waste of time, we have found it important to schedule dives so that only one pair of divers prepares to enter or leave the water at any one time. Further, the schedule of work should be arranged to allow maximum possible water time/dive. Repeatedly entering and leaving the habitat wastes a great deal of time. We have found a daily routine of 3 two hour excursions most productive with an additional hour allowed in the late afternoon and perhaps another dive at night for general observation. We recognize that the requirements of individual programs must vary considerably.

Should it be necessary to wait more than a few minutes to be joined in the water by a partner, and if a long excursion is planned, it is worth spending the delay in the PUTS to conserve air. We note that a larger PUTS would allow for storage of full and empty tanks, simplify entries and exits, possibly aid surface support and perhaps reduce regulator maintenance.

General

Given an adequate support base, we consider there exists good justification for the following:

1. An additional surface support boat. At present, habitat servicing and related needs must take priority over scientific activity. A second boat would make it possible to keep the research schedule moving independently of facility maintenance and support. If it becomes possible to make deeper and more distant excursions, this type of extra support presumably would become essential.

2. Improvement in shore facilities. The present shore laboratory satisfies only minimal needs. It would be reasonable to offer two rooms; one for rough preparative work and the other for more demanding laboratory operations. The present refrigerator is scarcely able to satisfy needs. Both deep freezer and regular refrigeration should be available.

Investigators making repeated missions usually need storage for equipment. Although there are at present several rooms set aside for this purpose, it would be preferable to offer more secure facilities. The Lerner Marine Laboratories at Bimini provide well ventilated but weatherproof enclosures for each visiting investigator.

In conclusion, it should be stated with emphasis that, notwithstanding suggestions for refinement, we have found Hydro Lab an extremely effective means of advancing our studies. We are convinced that a comparable yield of information with the same outlay in effort and dollar support would not have been possible with operations from the surface. In this regard, we feel also that our efficiency increased with experience over the six missions. Any opportunity to re-employ the same personnel both in the habitat and at the surface further improved the situation.

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