HAWAI'I UNDERSEA RESEARCH LABORATORY

QUICK LOOK REPORT
DIVE: P5-754

MISSION STATUS

Location: Au'au Channel, south of Maui, Hawaii

Latitude: 20° 46.306N **Longitude:** 156° 40.298W

Mission Date: 27 February 2011 **Duration:** 8 hours 31 mins

Maximum Depth: 134 m

Project Title: CRES 2007: Investigating Deep (50-100 m) Coral Reefs in Hawai'i

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Pilot 1: Terry Kerby **Pilot 2:** None

Scientific Data Acquired: Prepare an abstract outlining your objectives, techniques, findings, etc.

Objectives: The primary goal of this dive was to begin an a pulse-chase experiment to study *Leptoseris hawaiiensis* coral feeding patterns by exposing colonies to ^{13}C inorganic carbon and ^{15}N inorganic as well as ^{13}C-labeled rotifers (the "pulse" part), in an effort to understand the ratio of zooxanthellae photosynthesis *vs*. plankton feeding by the corals. What makes this particular dive different is that we coordinated *Pisces V* submersible operations with a team of four mixed gas rebreather divers at a depth of ~90 m, in a way that best leveraged the strengths of both of these advanced technologies. Subsequent combined rebreather submersible dives at this site will collect samples several times over the course of the next 10 days (the "chase" part). These experiments required that the submersible locate a site suitable for the experiment, deploy a float that allowed the mix-gas rebreather divers to quickly find the site and begin the experiment. These special operations took advantage of the dexterity of the divers and the extended bottom

time of the submersible. The divers who had only 20 minutes to complete their work included Christina Bradley and David Pence from the University of Hawaii and Drs. Richard Pyle and Ken Longenecker from the Bishop Museum. To our knowledge these were the first submersible rebreather diver underwater scientific operations and they were successful. After the divers left the area the submersible located a suitable coral head for a later staining experiment designed to determine the growth rate of these corals and to collected *L hawaiiensis* coral samples for shipboard physiological analyses. The submersible returned to the experiment site after 3 hours, ended the pulse portion of the experiment and collected the initial samples.

Observations, findings, etc:

Our first attempt at combined rebreather diver submersible operations allowed us to establish the communications between the *Pisces* submersible, KOK Tracking Room, Dive Boat Captain and Divers. We recommend that the following general protocol be followed:

Before the submersible is launched:
1. Dive boat will hail KOK on Channel 16 when it approaches.
2. KOK will notify dive boat of appropriate working channel for further communications

After the submersible has been launched:
1. KOK will notify dive boat when *Pisces* has found a suitable site and provide information on depth, topography and coordinates.
2. When submersible is ready, *Pisces* will ask the KOK tracking room to request permission from the dive boat to release a marker buoy.
3. After permission has been granted from dive boat, *Pisces* releases the marker buoy and KOK tracking will notify dive boat that the marker buoy has been released.
4. After marker buoy hits surface, dive boat will notify KOK when marker is sighted, and will approach marker buoy. This message will be relayed by KOK tracking to the *Pisces*.
5. When divers are ready to dive, dive boat will request permission from KOK tracking for X number of divers to enter water. KOK tracking will call *Pisces* to determine if they are in a stable position and ready for the divers to descend.
6. When the submersible is ready for the divers to descend, *Pisces* will call KOK tracking who will relay permission to the dive boat for divers to enter the water.
7. Dive boat will notify KOK tracking when divers are in the water, and will explicitly state the total number of divers. KOK tracking will rely this information to *Pisces*.
8. Dive boat will notify KOK tracking when divers have begun descent, and will re-confirm the total number of divers. KOK tracking will rely this information to *Pisces*.
*9. Submersible will turn on lights to serve as beacon for divers.
*10. Pisces will call KOK tracking when divers have reached bottom and KOK tracking will rely this information to the dive boat. Submersible will turn off lights.
11. Upon reaching bottom, divers will send anchor for marker buoy to the surface.
*12. If *Pisces* can observe the marker buoy leaving the bottom, *Pisces* will call KOK tracking who will notify the Dive Boat that the marker buoy anchor has been sent to the surface.
13. When maker buoy anchor reaches the surface, dive boat will notify KOK tracking that it has sighted the marker buoy anchor, and that it will recover marker buoy, anchor, and line.

14. Dive boat will notify KOK tracking when marker buoy, anchor, and line have all been recovered.
*15. When divers have completed bottom time, at least one diver will indicate to the center port of the submersible that the divers are beginning ascent.
*16. *Pisces* will call KOK tracking who will notify dive boat that divers have begun ascent.
17. Dive boat will notify KOK when diver floats have reached the surface; dive boat will move to floats and remain within close proximity for as long as divers are in the water.
18. Dive boat will notify KOK when the safety diver has entered the water.
19. If possible, Dive boat will report to KOK an estimate of total remaining decompression time (when available).
20. Dive boat will notify KOK when divers are at the surface.
21. Dive boat will notify KOK when all divers are out of the water.
22. Dive boat will coordinate with KOK on returning marker buoy and anchor to KOK.
23. Dive boat will notify KOK when it is returning to the harbor.

*Indicates steps that apply only to cases when divers and submersible plan to work together on the bottom.

Samples of *Leptoseris hawaiiensis* coral colonies were collected from several locations ranging from 90-95 m. Most of these locations contained 100% coral cover.

A steep wall approximately 10 m in height with the top at ~90 m was located at 20° 46.714'N 156° 40.476'W. The wall appeared to be a wave cut bench with extremely abundant fish life.

Species list:

Leptoseris hawaiiensis
Ulvales alga

MISSION EVALUATION:

Limitations, failures, or operational problems noted:

Communication between the submersible, KOK tracking room, dive boat captain and the divers could be improved particularly when the divers first entered the water and began their descent. The above general protocol should alleviate any ambiguity in communications and assure safety of the divers and the occupants of the submersible.

Recommendations for corrective action or improvement:

Follow the communication protocols listed above.

In your opinion, did the mission essentially achieve its purpose? Compare actual work accomplished with the work that was expected to be accomplished.

The mission was a resounding success. All primary and secondary objectives were met.

List specimens or samples collected on the mission.

20° 46.800'N 156° 40.481'W 88 m - Two domes (one clear, one dark) were deployed on the seafloor and ^{15}N and ^{13}C label was injected at 11:15 HST. The submersible returned to the site and at 14:10 the clear dome was removed and 4 specimens of *L. hawaiiensis* were collected. At 14:50 the dark dome was removed and 4 specimens of *L. hawaiiensis* were collected.

20° 46.760'N 156° 40.481'W 89 m - An acoustic pinger (70 KHz) was deployed to mark a *L hawaiiensis* coral colony for staining.

20° 46.739'N 156° 40.480'W 95 m - A colony of *L. hawaiiensis* was collected in 100% coral cover near the edge of a Halimeda sand patch.

20° 46.764'N 156° 40.485'W 93 m - A colony of *L. hawaiiensis* was collected in 100% coral cover near the edge of a Halimeda sand patch.

20° 46.754'N 156° 40.497'W 95 m - A colony of *L. hawaiiensis* was collected in 100% coral cover near the edge of a Halimeda sand patch.

20° 46.721'N 156° 40.507'W 95 m - A colony of *L. hawaiiensis* was collected in 100% coral cover near the edge of a Halimeda sand patch.

20° 46.721'N 156° 40.507'W 95 m - Two specimens of a Ulvales alga were collected in 100% coral cover near the edge of a Halimeda sand patch..

20° 46.714'N 156° 40.476'W 90 m - A colony of *L. hawaiiensis* was collected in 100% coral cover near the edge of a Halimeda sand patch.

DATA RELEASE

Data may be retained by the project leader for up to 2 years after the mission date with the following exception. NOAA may request to use photos for publication or publicity purposes at any time.

Fill in the appropriate statement below and sign this form.

I hereby release the data archived by HURL for public consumption following mission (project title)

CRES 2007: Investigating Deep (50-100 m) Coral Reefs in Hawai‘i

held on 27 February 2011 (date) in the following way:

a. CTD data by 27 February 2013 (date)

b. video and images by 27 February 2013 (date)

c. other 27 February 2013 (date)

d. I will give my written consent to individuals wishing to use these data prior to the above dates depending on the nature of the request(s).

Brian N. Popp Principal Investigator