HOT And COLD: A Trapper's Tale Of Two Oceans

by David M. Karl

It is apparent to all that deployment of sophisticated sediment trap moorings has become an integral part of JGOFS field studies. Less apparent is the stress and anxiety that attends this activity; the old sports cliché about "the thrill of victory and the agony of defeat" fits it well.

The stakes are high in long-term sediment trap deployments. In addition to the non-trivial financial investment in hardware and ship time, the results obtained from U.S. JGOFS trap deployments during process studies are used to extrapolate observations to longer time scales. Failure to recover moored trap arrays would be a disaster for these programs. For a long-term time-series program, loss of a year-long data set that happened to coincide with a rare event, such as an El Niño-Southern Oscillation cycle or an unusually heavy Antarctic ice pack, could set that program back by a decade. That is why most of the trap experts hire a Steve Manganini or a Craig Hunter to take on the burden of responsibility for the deployment and recovery details and to commiserate the occasional failure.

R/V Polar Duke enters Crystal Sound, Antarctica Photo by D. Karl

Most readers of U.S. JGOFS News know of the Hawaii Ocean Time-Series (HOT) program, sponsored by both U.S. JGOFS and the U.S. World Ocean Circulation Experiment (WOCE), but few are familiar with a complementary long-term Antarctic research program of mine that is titled Coupled Ocean-ice Linkages and Dynamics (COLD). In 1992, we established sediment trap moorings in conjunction with these research programs, both supported by the National Science Foundation. We have a perfect track record to date, but as the cruise reports that follow suggest, there is a thin line between success and failure in this business.

North Pacific Subtropical Gyre: *R/V Moana Wave*, October 1994

In October 1993, participants in the HOT program deployed four PARFLUX-style traps on a 4-kilometer mooring at Station ALOHA, located at 22°45'N, 158°W. They were scheduled for recovery in October 1994. This turnaround was to be our second recovery and redeployment of the ALOHA mooring, and we had prepared everything well in advance. Unfortunately, we had no control over the weather. As anyone who has worked in Hawaiian waters will agree, "Pacific" is a gross misnomer.

We arrived on station Oct. 20 with poor visibility, northeast trade winds blowing 30 knots or more and rough seas. The main deck was awash, and most of the scientists were in their bunks. The forecast was for more of the same. We quickly established acoustic contact with the release mechanism on the trap array and confirmed the position of the mooring. During breakfast, we discussed our options and decided to proceed with recovery operations despite marginal wind and sea conditions.

At 8 A.M. the release command was sent, and we received an encoded acoustic signal confirming that the command had been carried out. I announced that the mooring should be on the surface within the hour. In the meantime, all hands were mobilized to help with last-minute preparations. And then we waited.

Because the spar buoy is equipped with both a VHF radio and a strobelight, the array is usually easy to locate once it is on the surface. At 10:30 we returned to the precise mooring location to repeat the interrogation procedure in the event that there might have been a failure in the release mechanism. We had adopted a dual-release mechanism so that the mooring could be recovered even if one of the two releases failed. To our dismay, repeated attempts to establish contact with either acoustic release failed, so we left to speculate on the fate of our missing array.

After some discussion we concluded that the trap array must already be on the surface but out of VHF radio range (20 miles). Drawing upon our best knowledge of the surface currents and the prevailing wind and wave directions, we established a "most probable location" grid and began to conduct a comprehensive search.

Time, of course, was of the essence, and the weather remained miserable. For the next 18 hours we searched in and out of the troughs for the drifting array, but it was to no avail. Late on Oct. 21 we reluctantly decided to end our search and to declare the mooring a total loss. *R/V Moana Wave* set a course for Honolulu, and I retired to my bunk with a full appreciation of the agony of defeat. This was the low point of the otherwise successful HOT program.

En route to Honolulu and well outside our most probable search area, however, the mate called to announce that the VHF signal was audible. Within an hour, the mooring strobelight was visible against the dark horizon. Although the weather was still bad, the forecast was no better. We decided to make a midnight recovery. By breakfast time, we had the entire array and 81 out of 84 samples safely aboard. We were elated but exhausted after our nearly 48-hour ordeal on the high seas.

An initial inspection of the materials collected in the cups confirmed the unusual seasonal pattern of particulate flux that was reported in a previous issue of U.S. JGOFS News

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U.S. JGOFS Planning Office Has New Manager

Mary Zawoysky Photo by D. Kammer

Those who have called the U.S. JGOFS Planning Office recently in search of assistance or information have encountered a new voice on the phone. Since the retirement last November of Anne Edwards, executive secretary of the planning office since 1986, Woods Hole Oceanographic Institution research assistant Mary Zawoysky has assumed the task of taking care of the daily business of U.S. JGOFS.

Zawoysky received her undergraduate degree in art and business from Carlow College in Pittsburgh in 1980. After her graduation from Carlow, she worked in Pittsburgh as assistant director of a gallery specializing in Russian art and took a series of science courses. Her growing interest in science led next to a job with a company that conducted archaelogical excavations.

Zawoysky first came to WHOI in 1989 to work for Jean Whelan, a senior research specialist in the department of marine chemistry and geochemistry. She also worked for former senior scientist and associate director Derek Spencer, assisting both Whelan and Spencer with books and conferences as well as research projects. In 1993, she helped organize an international conference on radioactivity and environmental security in the oceans. Chairman of the planning committee for the conference was Hugh Livingston, who also serves as executive scientist for U.S. JGOFS.

What led her to the U.S. JGOFS office? "Variety and diversity," Zawoysky said. "I enjoy working on a variety of tasks and using my talents for organizing projects."

The largest project of the moment is the Arabian Sea Expedition, which got underway last October. Zawoysky is responsible for keeping track of travel plans and obtaining visas for participants in the series of cruises that begin and end in Oman over the next year.

That is just the beginning of the tasks that fall to the person who sits in the U.S. JGOFS office. "It's a many-faceted job," Zawoysky observed, "and I don't yet know what all the facets will be."❖❖

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(vol. 5, no. 4); export pulses reach two peaks, one during the late winter and the other in late summer. This data set should prove very interesting once all the analyses have been completed.

Crystal Sound, Antarctica: *R/V Polar Duke*, December 1994

Although the coastal regions of the Antarctic Peninsula are among the most productive of ocean waters, the dynamics of the spring-summer phytoplankton bloom that takes place in these waters remain poorly described. As part of the Palmer Station Long-Term Ecological Research (LTER) program, scientists from the University of Hawaii deployed three moored sediment trap arrays to document the development and demise of the bloom and to measure particle fluxes during the austral winter.

Crystal Sound was selected as a site that might be representative of the ice-covered waters in this part of the world. When we began this experiment in January 1994, we had no idea that this would be one of the heaviest ice years of modern time. We came to appreciate that fact, however, during the sediment trap recovery cruise aboard *R/V Polar Duke* last December.

We first encountered the heavy pack ice approximately 25 miles from our station, located at 66°10'S, 66°25'W. From that point to the trap deployment site, the pack ice covered an average of 90% of the sea surface, and the visibility was generally poor. We crept forward at a speed of less than 1 mile an hour.

We finally arrived on station in the early afternoon on Dec. 17 and immediately established contact with the acoustic release. Unfortunately, the study area was completely covered by ice, making recovery of the bottom-moored array nearly impossible. After discussing the options, we decided to proceed with recovery operations. The captain attempted to clear a recovery area by breaking up large ice floes. This effort was largely successful, but the pack was already tight and could not be cleared permanently.

I sent the release command and hoped for the best, but nothing happened. The sediment trap was nowhere to be seen. Using acoustic triangulation, we eventually located the ice floe that concealed it, and the bridge carefully honed on it until the bright yellow floats emerged from the abyss. We lowered a workboat to assist in recovery, and by evening the array and samples were safely aboard.

We decided against a second one-year deployment in Crystal Sound, opting instead to use the mooring for short-term particle collections in Paradise Harbor. Nevertheless, the data set that was collected should provide useful information on under-ice processes that will undoubtedly direct our future JGOFS-related field experiments in the Southern Ocean. ❖❖

SeaSoar (Cont. from page 14)

board both ships. Following the transfer of water samples, we performed side-by-side tows of the SeaSoar from *R/V Thompson* and the Undulating Oceanographic Recorder from *RRS Discovery* over a 10-hour period. Scientists got a chance to visit between ships and to compare data on Dec. 19 after both ships reached the port at Muscat.

The success of the cruise owes much to the efficiency of Susan Kadar, coordinator of field logistics for the overall expedition, and to Captain Alan McClenaghan and the crew of *R/V Thompson* for their support in making it a pleasant and productive experience.

(Editor's note: David Young and John Kindle are with the oceanography division of the Naval Research Laboratory, Stennis Space Center, and Robert Arnone is with the remote sensing applications branch. Kenneth Brink is a senior scientist in the department of physical oceanography at Woods Hole Oceanographic Institution.)