NOAA Teacher at Sea
Margaret Flanagan
Onboard NOAA Ship OSCAR ELTON SETTE
June 12 – July 12, 2007

NOAA Teacher at Sea: Maggie Flanagan
NOAA ship OSCAR ELTON SETTE
Mission: Lobster Survey
10 July 2007
In transit from the Northwestern Hawaiian Islands to the Main Hawaiian Islands

Project Log – Lobster Lessons

NOAA Teacher at Sea Maggie Flanagan measures a lobster carapace.

We've hauled back our last string of traps and have begun the transit back to Pearl Harbor. Our Northwestern Hawaiian Island (NWHI) lobster survey has provided the 2007 data for a record that goes back 30 years. Our Chief Scientist, Bob Moffitt, is a biologist with the National Marine Fisheries Service within NOAA. Bob completed his first lobster survey in 1977, and has been continually involved with the project. The model we still use was established in 1985-86, and there has been survey data nearly every year since then.
The two sites we monitor are Necker Island (Mokumanamana, in Hawaiian) and Maro Reef (Nalukakala, in Hawaiian). Necker Island is closer to the Main Hawaiian Islands, 430 miles from Honolulu. Maro Reef is farther out the NWHI, 850 miles from Honolulu. Target species are spiny lobsters (*Panulirus marginatus*) and slipper lobsters (*Scyllarides squammosus*).

Initial analysis of the data includes computing our catch per unit effort (CPUE), which is the total number of lobsters in traps divided by the number of traps. The data are separated by site, by species - spiny or slipper lobster, and by number of traps in the string, - 8 or 20. (Strings of 20 are often set in deeper water.) The mean for all strings of a type in a year is used for comparisons. Bob works up the numbers each evening to keep us posted.

You can't draw conclusions from just a few numbers, but a sample of CPUE information is below.

	Earliest recorded mean CPUE	Lowest mean CPUE	Highest mean CPUE	Mean CPUE 2007
Spiny lobsters				
Necker 20s	2.53 in 1987	0.20 in 2006	5.77 in 1990	0.17*
Necker 8s	2.35 in 1985	0.40 in 2005	4.00 in 1993	0.19*
Maro 20s	1.16 in 1987	0.11 in 1996	1.16 in 1987	0.64
Maro 8s	4.10 in 1977	0.13 in 1998	4.10 in 1977	1.06
Slipper lobsters				
Necker 20s	0.73 in 1987	0.19 in 2004	0.73 in 1987	0.14*
Necker 8s	0.32 in 1985	0.04 in 1990	0.50 in 1998	0.16*
Maro 20s	0.89 in 1986	0.66 in 1995	2.42 in 2001	1.30
Maro 8s	0.30 in 1987	0.25 in 1990	4.97 in 2001	3.10

* In 2007, Necker Island sampling was suspended for several days and the data may be biased towards historically less productive quadrants.

Graphing the entire data set reveals that Necker Island experienced a sharp decline in the presence of both types of lobsters during the mid to late 1990's, and the numbers have remained low. Graphs of Maro Reef data show a more complex story. There, spiny lobsters dropped dramatically in 1989. Spiny lobster numbers remained low, as slipper lobster numbers increased. It's proposed that as spiny lobsters were decreasing, slipper lobsters could access more resources, such as food and habitat, which expanded their numbers. The spiny lobster has had more commercial value because it looks prettier, and so was probably targeted more by fisherman.

Teacher at Sea Maggie Flanagan holds spiny lobsters while "cracking" – recovering lobsters from traps.

Commercial fishing for lobsters in the Northwestern Hawaiian Islands began with multi-purpose vessels which would keep the lobsters live for market. About 1981, fisherman started landing only the lobster tail, which was frozen at sea. This greatly increased the capacity for the taking of lobsters. Data showed decline, fisheries scientists became concerned, and the fishery was closed in 1993, then opened with very low quotas. By 1997, research data still showed

decline and the NWHI commercial lobster fishery was closed again in 2000. Models at that time showed that NWHI lobster overfishing (meaning the size and take of the fleet) wasn't problematic and research that focused on the lobsters themselves would be needed.

When lobsters are tiny, in the phylosome stage, they are transported by currents. Spiny lobsters spend 12 months in this stage and have been caught in plankton tows 60 miles out at sea. So, lobsters can settle in sites far away from their parents. This recruitment may or may not influence the population numbers of lobsters in the NWHI, but as a real possibility, is a topic for research. Bob Moffitt's data, with that of other NWHI scientists, could contribute to a metapopulation model that could estimate the density of lobsters throughout all the NWHI over time. This could be designed to scientifically predict the affects of fishing and recruitment. DNA analysis could also reveal information on the transportation of lobsters when juvenile.

A slipper lobster as compared to a pencil.

In 2006, all the NWHI were included in the creation of the Papahānaumokuākea Marine National Monument, which will be closed to all fishing. The Monument is the largest marine protected area in the U.S., but the research questions on what will help Hawaiian lobster populations still remain to be answered. Ocean currents in the area generally run to the west and south, and if juvenile lobsters are transported, they would be traveling those currents. But the marine protected area is already west of the Main Hawaiian Islands, so recruitment out to restore other areas seems unlikely, though not yet tested. There is reason to celebrate our new Marine National Monument, but there is no conclusive scientific evidence that it will help lobster populations recover.

Personal Log

With all fisheries closed in the NWHI, what will happen to the fisheries research that has contributed much to the understanding of marine populations? Will scientists be allowed to continue pursuing research questions, or will they be considered irrelevant? Approval for access to the NWHI under the Monument status now involves an arduous permit process, even for scientists. Bob Moffitt's work has provided an extensive time series of data, and is considered worth continuing as ecosystem monitoring. Hopefully in the future, scientific work will continue and guide policy making for protected areas.