Collaborative Lobster Enhancement Evaluation Workshop Outcome Summary
Stonington, Maine April 13-14, 2006

Compiled from a first draft of the report written by Catherine Schmitt, Maine Sea Grant

The two-day Collaborative Lobster Enhancement Evaluation Workshop resulted in a consensus recommendation that a Before-After-Control-Impact (BACI) design would address short-term goals of survival, and that a combination of late-stage tagging and genetic marking would address long-term goals of the Zone C Lobster Hatchery's impact on lobster populations. The workshop also recommended a limited scale experiment comparing survival rates of Stage IV and Stage V or older lobsters. All recommendations were outlined so that they could later be developed into full research proposals.

Short-term monitoring

The short-term goal of the hatchery is to learn whether it is possible to use hatchery-reared lobsters to re-establish or increase population density in locally depleted areas. Workshop participants agreed that a BACI experimental design coupled with genetic sampling would best answer the question of whether or not stocking an area with hatchery-raised Stage IV larvae has a localized, short-term impact on population densities.

The BACI will monitor the presence of hatchery-origin lobsters after their release, focusing on four release and four control sites. The results will help determine what proportion of marked individuals must be released into wild populations to allow later detection and to establish the survival rate that would justify use of a hatchery.

Before stocking, divers will survey and select the sites where juveniles will be released. Nursery areas have a natural gradient of larval densities. Studies have shown average carrying capacities of 3-5 lobsters per square meter. If pre-release sampling shows high densities of young wild lobsters at a given site, an alternate location having lower numbers of juveniles will be used to avoid saturating sites. Lobster juveniles will be suspended in ambient salt water and delivered directly onto or slightly above the substrate of a site via a weighted hose.

Divers will monitor the stocked sites at intervals of one day, 1 week, 1 month, 2 months, 6 months and 1 year after release, using 20 quadrat suction sampling. At each monitoring site, 50 individuals will be sampled for genetic screening. Genetic analysis will determine if the collected lobsters were of hatchery origin. Monitoring of experimental plots will continue in the second year of releases. Productive areas (as determined by sampling before the second year's release) will be reseeded. The cost estimate for monitoring the four release and control sites will be $80,000-$90,000 for one year.

Long-term monitoring

If the larger question of whether hatcheries can enhance wild stocks is to be resolved, the introduced lobsters must be monitored for a number of years. To accomplish this, lobsters must be tracked as they grow and move beyond the release site. Workshop participants agreed that physical tagging coupled with genetic analysis would best monitor lobster survival and movements to adulthood and proposed the following protocol after year one:

At either year two or three, when the lobsters are 25-50 mm and just before they start straying from the nursery area, ventless traps would be placed around each of the four experimental sites to catch young lobsters, each to be physically tagged and sampled for genetics; lobsters from the sites will also be tagged and sampled by divers during the course of routine surveying. A goal of up to 5,000 juvenile lobsters will be tagged and their genetic samples pooled to estimate what percentage were of hatchery origin. In subsequent years, lobsters that are caught will be retagged and genetically sampled.

At seven years, the lobsters will begin recruiting to the fishery. Tag data and characteristics of caught, tagged lobsters will be retrieved. Aliquot samples of 100 tagged adult lobsters will be genetically analyzed to determine what percentage came from the hatchery. Tag data (identification number, phone number, location, size, depth of water, and sample from animal) will be submitted and archived at the Penobscot East Resource Center.

While the primary goal is to determine the ratio between hatchery lobsters or natural recruits that had migrated into the area and been tagged, the collected data will also provide information about lobster movements and give insight into why some areas are not populated (e.g., lack of recruitment, poor environmental conditions.) The cost of this work will be determined during the process of developing a full-scale research proposal.

Stage V Experiment

A significant issue raised at the workshop was the benefit of raising lobsters to Stage V, while recognizing that the hatchery does not have the capacity to raise lobsters to that stage. Statistically, Stage V lobsters have a higher survival rate than Stage IV, and are large enough to be physically tagged. Dr. Brian Beal has been experimenting with raising Stage V lobsters, using small containers with holes that are placed in a controlled environment. Preliminary results show survival rates of 90 percent.

Participants agreed that a small experiment to grow Stage V lobsters should coincide with the release. Beal will work with engineers to design a structure to house Stage V lobsters. These structures would be placed in the water at a depth of 40 feet, suspended six feet from the bottom. The lobsters will remain in the structures until they are big enough to tag. The estimated cost for this experiment is approximately $5,000.

Genetic Analyses

There was consensus that baseline genetics would be a critical part of the study. Dr. Irv Kornfield recommended genetic screening using 3-4 hypervariable loci, which will be multiplexed together from 50 individuals per site per sampling (genotypes obtained simultaneously with low probability of being found in wild lobsters).

The estimated cost for the genetic analyses is $6,000 ($5,000 for the juveniles, $1,000 for the females supplying the eggs.)