

## MEMO:

To: Rachel Feeney, Northeast Consortium

Date: December 15, 2011

From: Karen Wilson and Theodore Willis, University of Southern Maine

RE: Response to technical evaluations of the collaborative research project, "Ecological role of adult & juvenile anadromous forage fish in downeast Maine estuaries: sea-run alewife and groundfish prey" final report.

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This is a response and epilogue for the alewife food web study carried out by Dr. Karen Wilson and Dr. Theodore Willis of the University of Southern Maine in 2006, 2007 and 2008.

We have read the reviews submitted to NEC and passed on to us. Our belief is that the observations made, particularly by the more critical reviewer (#1), were not inaccurate. There were a number of difficulties in carrying out the project that necessitated focusing effort on some aspects of the project at the expense of others. However, we do not agree that the report has no value to managers. In short:

1. We documented that the nearshore Gulf of Maine is largely devoid of the large commercial predators that were the New England fishing industry's foundation.
  - a. All of the fishermen we worked with agreed that what we found, using multiple types of gear (long lines, traps, hook and line), disturbed them considering how little direct fishing pressure on cod there has been in the nearshore since the early 1980s.
2. Through the diets of those fish we see that fish prey is a rarely encountered diet item except in seasonal and short pulses. Otherwise these species are subsisting on a relatively energy poor diet of invertebrates, that includes lobster.
3. We confirmed that sculpin are a major portion of the fish biomass north of Passamaquoddy Bay and Pollock and small mackerel south, and that sculpin likely have a larger effect on the lobster fishery through predation than cod.
4. We noted that the opportunity to employ other gear in the nearshore GOM is dictated by the density of lobster gear.

Interim reports submitted to the state were incomplete and designed to meet the minimum requirements for sampling permits. The full final report was submitted to Maine DMR in 2010 with that year's sampling permit request.

We did very little direct work with alewife over the course of this project, though not for a lack of trying. At the time there was no indication that the alewife fisheries in southern New England would close, or that alewife would be under review for ESA listing. At the time there was minimal coordination between alewife harvesters across Maine or with the state besides adhering to minimal reporting requirements. There seemed to be more urgency around investigating groundfish foodweb ecology than alewife ecology, which certainly colored our decisions.

Our difficulties coordinating the alewife side of the project occurred right from the outset. Our Passamaquoddy Bay fishermen, as listed on the proposal, did not participate in the project at all. He handed the effort over to his brother, who was also a relative novice at sea sampling and who had to

acquire a skiff to cater to the project. Both admitted, and we eventually agreed, that shutting off coves to sample large aggregations of alewives was impractical (there were no large aggregations) and difficult (the average 18' tide in Passamaquoddy Bay was too large to consistently deploy the stop seines). Our partners at Boyden Lake, the Perry fisherman and the Pleasant Point Passamaquoddy Tribe, could not work with each other or us to accomplish any kind of enumeration. Records from the Perry alewife harvest were not made available to us despite repeated requests. When the project expanded into central Maine where there were presumably more alewife and more cod, we encountered resistance to setting up our own counting programs. Towns were willing to entertain our efforts, but the fishermen themselves did not encourage our efforts or presence.

Sampling adult alewife in spring in salt water could have been an option for pursuing the diet component of the project. However, alewives were patchy in spring until they massed below fish ladders to ascend to their natal lakes and intercept fisheries were illegal in both the Damariscotta and St. George Rivers. The nearshore trawl survey was an option for sampling adult alewife on their spawning migration, but the outside researcher slots were taken in 2007 and 2008. The activities we chose were, in many ways, the only avenues available to us to meet some of the objectives in the proposal. In truth, we were both ambitious and naïve in the scope of the original proposal. It relied heavily on being able to shut off coves and find alewife *in situ* and predators in abundance nearby. We now know that cod and striped bass abundances were declining throughout the period we executed this project.

Hook and line sampling for cod and other groundfish fulfilled a number of requirements in the project, which included meeting some of the food web objectives laid out in the original proposal, and it was the best way we saw to meet the 3:1 spending ratio specified in the NEC award. We agree that the method chosen was not unbiased; hook and line targets hungry and/or aggressive fish, possibly at the risk of over estimating empty stomachs or underrepresenting large prey items.

The focus on diets of all species caught in the estuaries of the three rivers was a logical extension of the work when we discovered how low cod abundance was in spring. We did find a predator – prey connection for alewife, but it was with juveniles rather than adults as a component of the nearshore food web in the fall. As described in lore, the mechanism of alewife leading groundfish predators into shore in spring is effectively broken. If it can be reestablished, the link does not appear to be a linear one; alewife abundance will have to exceed some threshold value before cod, haddock, whiting and halibut pursue them into Maine State waters again. We do not know what that threshold would be. Nor do we know if densities of groundfish are sufficient for a response to be detected.

On the alewife side, we were building research coalitions from scratch. Eventually we would have working relationships with many alewife harvesters and their sponsoring municipalities, and hold a seat on the Alewife Harvesters of Maine board. A community based counting project did occur on the St. George River (miles upstream from the harvest site), which dovetailed with the NEC project. We did complete an independent assessment of alewife counting efforts on the Damariscotta run using video equipment that compared favorably to the counts carried out by the dam owner at Damariscotta Mills. Those eventual accomplishments aside, describing alewife diet habits in the nearshore was to use fish

caught by stop seines and gut contents analysis; when we chose to focus on predator fish diets this objective became moot.

The project epilogue includes a number of additional products and additional funding. We leveraged the NEC monies into an additional \$150,000 for ancillary projects, including the aforementioned St. George River counting project, a genetics project to identify differences in genetic fingerprints by river, and a small tagging/ homing project in the Kennebec River watershed. We sponsored a MS student at UMaine who summarized several alewife harvesting data sets into coherent long-term time series that considered the effects of available spawning habitat and harvesting effort. We assigned a USM undergraduate to the task of creating distribution maps based on the ME/NH trawl survey data. The majority of that process was massaging the data into a platform and format amenable to spatial analysis. We are continuing to work with these data to explore alewife – groundfish associations through collaborations with the EPSCOR SSI project at UMaine, Bowdoin College, and Penobscot East Resource Center. The diet analysis led to a submission summarizing cod diet habits, currently in review at Marine Ecology Progress Series. We have a full food web analysis paper, similar to the NEC final report, in preparation and plans for a stable isotope food web analysis paper that will include comparisons of onshore and offshore cod.

In summary, questions as complex as food-web linkages and datasets as complicated as commercial landings and index trawls take time and experience to determine what questions can be asked of them, let alone what answers they have to give. We have continued to pursue the objectives laid out in the original NEC proposal, but as smaller steps leading to the broad questions we asked in 2005.