Progress Update

Ecological Role of Adult and Juvenile Anadromous Forage Fish in Downeast Maine Estuaries: Sea-Run Alewife and Groundfish Predators

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Submitted by

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Major accomplishments and milestones

- Environmental Assessment completed February 2006.
- Video equipment, camera box and fish chute purchased through independent contract with UNH beginning May 1st, 2006.
- Subaward agreement finalized in mid-July 2006.
- Sampled Denny's Bay and Gleason Cove/Passamaquoddy Bay for potential alewife predators and their diets in May, July and August. Collected diets of 177 potential fish predators in Gleason Cove/Passamaquoddy Bay and Dennys Bay.
- Tested the efficacy of stomach flush methods. In general the flushing method was highly effective, ranging from 86 to 100% effective depending on the fish species (Table 1). We found that harder and larger items, e.g., whole urchins, could be felt in the stomach and additional effort flushed the items out. The presence of these items was also evident from crab legs and urchin spines that flushed out easily. We concluded that this method is effective in flushing fish stomachs of the species tested.
- Installed fish chute and video equipment in the Little River for one month to test equipment and chute in preparation for Spring 2007 alewife run. This work was done in collaboration with the Passamaquoddy Tribe, who will be responsible for counting adult alewife at the fish ladder in 2007.

Unexpected difficulties and project alterations

1. Lack of large fish predators: Previous years to the contrary, our target alewife predator, cod, never moved into Passamaquoddy Bay in appreciable numbers. Despite considerable effort, we were unable to catch cod on hook and line, and other fishers (both recreational and subsistence) in the area had the same results. In fact, very few fish species were present in Gleason Cove until the August sampling date. This suggests two issues: (1) that marine fish

predators large enough to consume spawning alewife in the spring are rare or no longer present in these nearshore waters, leaving seals, gulls, cormorants, osprey and humans as the major nearshore predators of spawning alewife. And (2) that the role of alewife as forage fish for nearshore commercially important fish species may be greatest in the late summer and fall when small, easily consumed young-of-year alewife migrate to the ocean. Thus we will drop our July sampling date, and instead focus on late May/Early June and Late August, September and October.

2. Maneuverability issues in small, highly tidal estuaries: Accessing the more brackish water areas of the estuaries with large boats, or even smaller boats, was difficult and time-limited due to the constricted nature of the estuaries and extreme tidal fluctuations of the area (18-20 ft on average). Most areas were accessible only at high tide and our collaborators were unwilling to move their larger purseseiner into the area. Consequently we did very little fishing far up in the estuaries.

3. Finally, we found that we were unable to count alewife moving into the Denny's river because the existing Atlantic salmon counting weir is licensed only to count salmon and cannot restrict the movement of alewife. Because this is a DPS river with a listed run of Atlantic salmon, installing our own weir or modifying the Atlantic Salmon Commission's weir would require a complete NEPA and ESA review. We did arrange to count fish entering Meddybemps Lake, the largest lake in the drainage, but these counts would miss any fish moving into the other branch of the drainage (Cathance Lake). Coupled with low to zero catches of fish using hand lines in the Denny's River Estuary, we feel that it would be best to drop this estuary from the study.

Alteration to project plans

Our original objectives were to compare the diets of potential predators in one high alewife estuary to one low alewife estuary per summer, with a total of four estuaries in the experimental design. We propose two changes: (1) to compare Gleason Cove/Little River to a midcoast estuary (Damariscotta area) with large alewife runs and more potential predators, and (2) to repeat the sample an additional year to accommodate natural variability. Although this change in study design losses the replicate systems, we feel that the lack of a more diverse community of potential alewife predators makes it difficult for an appropriate estimate of alewife importance in the estuarine food web in the Passamaquoddy Bay region.

	High alewife numbers	**Low alewife numbers**
2006	Denny's Bay	Gleason Cove
2007 (using remaining funds from 2006)	Damariscotta River Estuary, Muscongus Bay, John's Bay	Gleason Cove/mouth of Passamaquoddy Bay
2008 (possible no cost extension from 2007?)	(repeat)	(repeat)

Next steps/tasks for next 6 months

- Continue processing preserved diets from 2006.
- Prepare video equipment for 2007 field season. We will insure that fish video equipment is installed and functional at:
    1. the Little River (Gleason Cove) in collaboration with Passamaquoddy Tribe. The Passamaquoddy Tribe will be providing equipment; we will provide technical assistance.
    2. the Damariscotta fish ladder in collaboration with Ridgewood Power and the Fish Advisory Committee of Newcastle/Nobleboro.
- Find collaborators for work in the Midcoast region.
- Hire a technician with industry ties to coordinate data collection and sample processing.

Impacts of the project to fishermen/fishing community, and scientist/science community

Thus far, our largest impact on the fishing community may be one of raising awareness of alewife runs and their potential impact on marine fisheries resources. The process of arranging to count alewife runs has brought us as scientists in contact with many members of the local community and proven to be a foray into a politically charged fishery with many competing interests. We hope to increase the educational aspect of this effort by involving more fishermen in midcoast sampling. Sampling in the midcoast area has also created opportunities for collaboration with municipalities in Nobleboro, Newcastle, Warren, and Waldoboro, community groups with a resource focus (e.g., Quebec Laborador Foundation/Atlantic Center for the Environment), and schools in the watersheds where we will be counting alewife.

Signature and date

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Karen A. Wilson Date

Attachments: An electronic copy of our NEC 2006 poster is available by request, as are numerous photos.

Table 1. Effectiveness of the stomach flush on the three most abundant species caught in downeast estuaries. To test the efficacy of the stomach flush methods, fish were lightly sedated before their stomach was flushed with fresh seawater; diet items were collected on a 500 μm sieve. We killed individuals with both (apparently) empty and full stomachs, and dissected the stomach to determine if the flush was effective. In general the stomach flushing method was highly effective and only missed a few large hard items including an urchin (2 inch dia) and a green crab carapace.

		Dissected stomachs		
Fish species	**Total fish sampled**	**Empty**	**Not empty**	**% effectiveness**
sculpin	21	18	3	86
mackerel	23	21	2	91
dogfish	3	3	0	100