Maine DEP WEBBER POND Report (Fall 2011)
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Maine DEP conducted a limited comparison study between several lakes with re-introduced alewives (Sebasticook Lake, Webber and Threemile ponds) and China Lake (no alewives) to look for signs of food chain (plankton) effects.

Plankton Study

Plankton naturally occurs as important biological components of aquatic ecosystems. All lakes have algae (phytoplankton) growth during the summer, which is naturally kept in balance in part by tiny grazing animals (zooplankton). The important species are larger ones such as *Daphnia*. The sizes and species in the zooplankton community can indicate effects by fish, among other factors. Problems with water quality and human use can arise when there is either an overabundance of nutrients and/or too few zooplankton to control algal growth. This latter condition can be caused by the over abundance of zooplanktivorous fish, such as juvenile white perch and/or alewives.

Phytoplankton – Generally, differences in phytoplankton species composition and relative abundance were not observed between alewife-restored lakes (Sebasticook Lake, Webber and Threemile ponds) and China Lake (no alewives). The University of Maine (Dr. Jasmine Saros) reviewed the algae sample results and noted that Sebasticook Lake had more blue green algae and fewer diatoms in 2009 than in 2008. The China Lake data did not appear to be different between the two years. This might suggest that introduction of alewives in significant numbers can indeed shift the algae population to less desirable (blue green) types. However, results were not clear between study lakes. Thus, the data gathered does not provide a strong indication that zooplankton differences are clearly driving phytoplankton populations to the degree we suspected.

Zooplankton – There was a considerable observed reduction in the mean length and density of large body-size zooplankton in the presence of high-density stocks of alewives. Dr. Kevin Simon (University of Maine, Orono) notes that "… results are fairly consistent with what we have seen in our long-term alewife monitoring study. We typically see a collapse in mean cladoceran body size in our alewife lakes (including Sebasticook Lake and Webber Pond), while non-alewife lakes (including China Lake) shift from around 0.8 to 0.6 mm or so. Per Dr. Simon, that's also the range observed in Connecticut and New York lakes. The timing of the cladoceran size shift varies somewhat across lakes." Dr. Simon suspects this variation has much to do with the changing size of the juvenile alewife population in any given year (Table 4).

Table 4. Zooplankton measures (mm) of mean cladoceran body lengths 2008 to 2010 from July to September, including monthly range of values for the three-year period.

ZOOPLANKTON: July, August, September	Mean Cladoceran Body Length		
	2008	2009	2010
China Lake (SE Basin) - control	0.59	0.68	0.63
Sebasticook Lake (alewives)	0.52	0.72	**0.35**
Webber Pond (alewives)	0.66	No data	**0.49**
Threemile Pond (alewives)	0.56	No data	**0.51**
MONTHLY RANGE OF VALUES	**2008**	**2009**	**2010**
China Lake (SE Basin) - control	0.54 - 0.64	0.66 - 0.71	0.59 - 0.66
Sebasticook Lake (alewives)	0.50 - 0.54	0.52 - 1.09	0.24 - 0.46
Webber Pond (alewives)	0.54 - 0.75	No data	0.47 - 0.54
Threemile Pond (alewives)	0.52 - 0.60	No data	0.46 - 0.55

Zooplankton technician/analyst, Dennis Anderson (University of Maine, Orono) noted that the data suggest more intense fish predation last summer (2010) in the alewife restored lakes, especially Sebasticook Lake but also including Webber and Threemile ponds. In contrast, China Lake zooplankton appeared relatively stable across all three years (2008-2010). It is interesting that *Daphnia* (a major grazer of algae) consistently seemed to be smaller in size in the August sample in China Lake for all three years. In Sebasticook Lake, *Daphnia* decreases in size each successive month, although September 2010 shows a small rebound in size, possibly because the juvenile alewives have successfully emigrated.

These results are consistent with the principle that alewives and other fish have profound effects on the structure of the zooplankton community, shifting it toward smaller individuals less capable of grazing down algae, especially the types normally dominant during the bloom-prone summer months. Whether this effect is significant enough to show up in the algae community depends on several things. In the case of this limited project the effects on algae were not obvious and could have been obscured by other factors.