ZEBRA MUSSEL MONITORING IN LAKE PEPIN - A SUMMARY

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The following is a summary of results for the 1996 and 1997 zebra mussel data collection effort in Lake Pepin, Minnesota and Wisconsin.

Zebra mussel density in Lake Pepin generally increases from the upstream quarter of the lake to the downstream quarter. Density varies from side to side and from site to site on the lake. Zebra mussel abundance is generally increasing throughout the lake and distribution is advancing upstream and into deeper water. Veliger numbers in 1996 were greatest at the outlet of the lake and in the downstream quarter.

For sampling purposes, the lake was divided into four sections longitudinally and samples were collected from within one meter depth contour areas at sites along each shore (see methods).

Examples from data collected: (fewer sites were sampled in 1997, comparisons were made between sites that were the same or close to sites sampled in 1996)

Section I - Minnesota side - UPPER PEPIN

1996 - no zebra mussels collected

1997 - four individuals collected attached to a native mussel
no evidence of recruitment in September.

Section I - Wisconsin side -

1996 - no zebra mussels collected

1997 - zebra mussels present in 0-1 and 1-2 meter contours, maximum mean density in 0-1 meter contour = $4/m^2$
no evidence of recruitment in September.

Section II - Minnesota side -

1996 - no zebra mussels collected

1997 - zebra mussels present in 0-1 through 4-5 meter depth contours, maximum mean density = $27/m^2$ in 2-3 meter contour. New cohort (6-14mm length) about one half as abundant as existing population.

Section II - Wisconsin side -

1996 - zebra mussels present in 0-1 and 1-2 meter depth contours, maximum mean density in 1-2 meter contour = $181/m^2$.

1997 - zebra mussels present in 0-1 through 2-3 meter depth contours, maximum mean density = $356/m^2$
New cohort recruited by September (6-14mm length) approximately equal in abundance to existing adults.

Section III - Minnesota side -

1996 - zebra mussels present in 1-2 through 4-5 meter depth contours, maximum mean density in 3-4 meter depth contour = 142/m^2 .

1997 - zebra mussels present in 0-1 through 5-6 meter depth contours, maximum mean density in 1-2 meter contour = 1800/m^2, 438 in 0-1 and 316 in 5-6 meter contours.

New cohort recruited by September (4-14mm length) slightly less abundant than existing adults.

Section III - Wisconsin side -

1996 - zebra mussels present in 0-1 through 2-3 meter depth contours, maximum mean density = 97/m^2

1997 - zebra mussels present to 3-4 meter depth contour, but mean density reduced to less than 10/m^2.

New cohort recruited by September (6-14mm) about one half as abundant as existing adults.

Substrate is limiting in this area of the lake, sand bottom leaves only native mussels available as substrate, distribution very patchy.

Section IV - Minnesota side - area of greatest zebra mussel abundance in lake. Table below describes changes. Lower Pepin

Section IV - MN depth contour	1996 zebra mussel mean number/m^2	1997 zebra mussel mean number/m^2	new cohort recruited by September 1997
0-1 meters	2,079	2,963	(2-12mm length)
1-2 meters	11,106	22,595	about ½ existing pop.
2-3 meters	6,915	13,120	
3-4 meters	697	10,803	
4-5 meters	188	3,424	
5-6 meters	0	3,962	
6-7 meters	0	1,048	
7-8 meters	0	684	
8=9 meters	0	34	

Zebra mussels in this area are advancing into deeper water by attaching to one another.

Section IV - Wisconsin side -

1996 - zebra mussels present from 0-1 through 4-5 meter depth contour, densities up to 176/m^2. Sandy bottom with native mussels and shells as substrate.

1997 - zebra mussels present from 0-1 through 5-6 meter depth contour, maximum mean density = 2242/m^2 in 5-6 meter depth contour.

New cohort recruited by September about equal in abundance to exiting population.

A dramatic increase in density and range in the downstream section of the lake was observed in 1997. All available rock substrate was colonized along the rip-rap areas of this section forming an undulating carpet of zebra mussels. Although I have not received veliger data for 1997 season, it is reasonable to assume (based on observed recruitment in September) that zebra mussel densities will increase again in 1998 and that colonized areas will continue to expand into deeper areas, primarily using themselves as substrate. Zebra mussels are also likely to continue to slowly extend their range upstream in Lake Pepin. Zebra mussels grow to a length of 35-40 mm in Lake Pepin, then die. However, most of the population is about 1-year away from attaining that size as of 1997, therefore the death of the oldest cohort will not likely decrease the overall population significantly in 1998. This could change in 1999 as a significant portion of the existing population (1996 cohort) reaches their limit of life expectancy and expires.

In other areas of the Mississippi River low dissolved oxygen levels (< 3ppm) were measured last fall where zebra mussels populations had exceeded 15,000/m^2. This occurred in Pools 9-11 in the main channel and channel borders. It is conceivable that Lake Pepin could experience episodes of low dissolved oxygen as biological demand by zebra mussels increases or as large, ageing zebra mussel cohorts expire and begin to decay. This situation could be expected to be at its worst in the downstream quarter of the lake and should be monitored closely for the next few years. Low oxygen levels could also trigger the release of Phosphorous from lake sediments, fuel algae blooms, and create still greater demand for oxygen.

Some predation of zebra mussels was observed in 1997, however it does not appear to be an important controlling factor on their population so far. Low river flows, such as those experienced in 1988, could become the most important limiting factor for zebra mussels. The stratification resulting from such low flows results in anoxic conditions in deeper areas of the lake and would probably kill zebra mussels living beyond the oxygenated wave surge areas along the lake shore (usually shallower than 3 meters). Native mussels appear to be limited by this cyclic condition in parts of the lake.