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ZEBRA MUSSEL IMPACTS ON ENDANGERED UNIONIDS

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## 1996 Annual Report

### Zebra Mussel Impacts on Endangered Unionids

Because this project is jointly funded by Tennessee and Kentucky and much of the work is interrelated, all data collected in both states has been consolidated in this report. This report is in three sections: Part I contains results of sampling unionid populations to determine zebra mussel infestations; Part II is in manuscript form (in press) and is a detailed analysis of dry tissue weights of *Fusconaia ebena* collected from the Tennessee River; and Part III is also in manuscript form (in press) and discusses survival of unionids held in captivity at four locations.

PART I.

## PART I. MUSSEL SAMPLING

### Tennessee River

Four sampling sites were established on the Tennessee River in 1993: TRM 18.3 (below Kentucky Dam), TRM 67.5 (near Paris Landing), TRM 109.3 (near mouth of the Duck River), and TRM 197.5 (near Diamond Island). In September 1995, 20 quadrat (0.25 m<sup>2</sup>) samples were collected at two sites by hand-excavating the substrate to a depth of about 10 cm. All excavated material was placed into 6 mm mesh dive bags, brought to the surface and sieved. Except for some small (<10 mm) juvenile unionids, all mussels were measured and identified. Mussel densities ranged from 3.2 to 135.0 individuals/m<sup>2</sup> (Table 1). A total of 16 species were collected. No zebra mussels were found in any of the samples. In addition to mussels collected during the quadrat sampling, we also collected a total of 668 mussels at TRM 197.5 in August 1995 as part of an unrelated translocation study. During that sampling, we found one live zebra mussel attached to a *Fusconaia ebena* and a second zebra mussel attached to a rock. In November 1995, we collected an additional 852 unionids from TRM 103.5 and found only two zebra mussels attached to unionids. Although zebra mussels were first found in Kentucky Lake in 1991, densities of adults remain low. We had to cancel sampling at two sites on the Tennessee River on three occasions in September 1995 due to weather conditions, generation schedules, and the physical condition of a diver. These two sites will be quantitatively sampled in 1996.

### Licking River

Four sites established on the Licking River in 1994 were quantitatively sampled in 1996 (sites numbered after Laudermilk 1990). At each site, 25 quadrat (0.25 m<sup>2</sup>) samples were collected. Twenty-five species of unionids were collected, with the greatest density and diversity occurring at the site near Butler, Pendleton Co., KY (Table 2). The population of *Cyprogenia stegaria* (federally endangered) appears to be healthy and reproducing. No zebra mussels were found at any site on the Licking River.

### Green River

The five sites established on the Green River in 1994, were resampled in 1995. At each site, 24 to 48 quadrat samples were collected. Densities of unionids ranged from 4.17 to 24.75 individuals per square meter (Table 3). Live *Cyprogenia stegaria* were collected at two of the sites. No zebra mussels were collected at any site.

### Duck River

Four sites on the Duck River were quantitatively sampled in 1996. Twenty-five quadrat samples were collected at each site. Based on previous work by TVA biologists, we did not expect to collect many unionids at the two sites upstream of Lillard's Mill; these two sites were established primarily to determine if colonization of the Duck River by zebra mussels would occur by a potential introduction into Normandy Reservoir. Sixteen species, including the endangered *Lemiox rimosus*, were collected downstream of Lillard's Mill in 1996 (Table 4). The two *Cyclonaias tuberculata* collected in 1996 at DRM 195.9 were marked, indicating that they had

been transplanted in 1988. Although most of the mussels translocated in 1988 disappeared from the transplant site due to downstream displacement during high flows, the continued presence of some translocated mussels and also individuals not translocated suggest that this reach of river is capable of supporting unionids. A large-scale effort to reestablish mussels in this section of river should be considered, if stable gravel bars can be located. No zebra mussels were found in any sample.

#### Rough River

In 1995, a single site was quantitatively sampled on the Rough River at the Highway 919 bridge. Seven species of unionids were collected in the 32 quadrat samples taken at this site (Table 5). No zebra mussels were found in the Rough River.

### SUMMARY AND RECOMMENDATIONS

No zebra mussels were collected during quantitative sampling of five rivers; however, a few zebra mussels were collected from the Tennessee River (Kentucky Lake) while qualitatively collecting unionids. We recommend suspending quantitative sampling in all rivers until there is evidence that zebra mussels have colonized these rivers or increased in abundance in the Tennessee River. In lieu of quantitative sampling, we recommend qualitative sampling in these rivers and increasing the number of streams monitored.

### REFERENCE

Laudermilk, E.L. 1990. A survey of the unionids (Bivalvia: Unionidae) of the mainstream Licking River and selected tributaries below Cave Run Reservoir, Kentucky. M.S. Thesis, Eastern Kentucky University, Richmond.

Table 1. Numbers and species of unionids collected in quantitative samples at sites on the Tennessee River 1995. (TRM = Tennessee River Mile).

Species	Site	
	TRM 67.5	TRM 197.5
<i>Amblema plicata</i>	10	--
<i>Cyclonaias tuberculata</i>	--	19
<i>Ellipsaria lineolata</i>	--	2
<i>Elliptio crassidens</i>	--	3
<i>Fusconaia ebena</i>	--	518
<i>Fusconaia flava</i>	--	1
<i>Leptodea fragilis</i>	1	2
<i>Ligumia recta</i>	--	2
<i>Megalonaias nervosa</i>	--	1
<i>Obliquaria reflexa</i>	3	34
<i>Potamilus alatus</i>	--	1
<i>Quadrula metanevra</i>	--	10
<i>Quadrula nodulata</i>	1	--
<i>Quadrula pustulosa</i>	--	73
<i>Quadrula quadrula</i>	1	1
<i>Truncilla donaciformis</i>	--	6
Unidentified juveniles	--	2
Total	16	675
Density (#/m <sup>2</sup> )	3.20	135.00

Table 2. Numbers and species of unionids collected in quantitative samples at four sites on the Licking River during 1996. Site numbers refer to Laudermilk 1990.

Species	Site			
	24	43	91	164
<i>Actinonaias ligamentina</i>	43	7	1	21
<i>Alasmidonta marginata</i>	--	--	--	3
<i>Amblema plicata</i>	7	1	3	7
<i>Cyclonaias tuberculata</i>	2	--	--	10
<i>Cyprogenia stegaria</i>	--	--	--	4
<i>Elliptio dilatata</i>	19	4	1	17
<i>Fusconaia flava</i>	--	--	1	--
<i>Fusconaia subrotunda</i>	1	--	--	--
<i>Lasmigona complanata</i>	--	--	--	1
<i>Lasmigona costata</i>	--	--	1	9
<i>Leptodea fragilis</i>	1	--	--	--
<i>Megalonaias nervosa</i>	1	--	--	8
<i>Obliquaria reflexa</i>	1	--	1	2
<i>Pleurobema coccineum</i>	2	--	--	--
<i>Potamilus alatus</i>	--	--	1	3
<i>Ptychobranthus fasciolaris</i>	10	4	--	4
<i>Quadrula metanevra</i>	--	--	--	2
<i>Quadrula nodulata</i>	--	--	--	1
<i>Quadrula pustulosa</i>	4	1	--	7
<i>Quadrula quadrula</i>	1	--	--	--
<i>Strophitus undulatus</i>	--	--	--	1
<i>Tritogonia verrucosa</i>	2	--	--	--
<i>Truncilla donaciformis</i>	--	--	1	3
<i>Truncilla truncata</i>	1	--	--	1
Unidentified juveniles	--	--	--	1
Total	95	17	10	105
Density (#/m <sup>2</sup> )	15.20	2.72	1.60	16.80



Table 3. Numbers and species of mussels collected in quantitative samples from five sites on the Green River during 1995.

Species	Site				
	1	2	3	4	5
<i>Actinonaias ligamentina</i>	17	28	159	163	2
<i>Amblema plicata</i>	4	24	6	2	1
<i>Cyclonaias tuberculata</i>	--	5	12	3	--
<i>Cyprogenia stegaria</i>	--	--	1	2	--
<i>Ellipsaria lineolata</i>	--	--	--	--	2
<i>Elliptio crassidens</i>	--	--	--	--	1
<i>Elliptio dilatata</i>	1	1	3	11	--
<i>Fusconaia flava</i>	--	1	--	--	--
<i>Lampsilis cardium</i>	--	--	--	--	1
<i>Lampsilis ovata</i>	--	--	1	5	--
<i>Lasmigona costata</i>	--	1	--	--	--
<i>Leptodea fragilis</i>	--	--	--	--	2
<i>Ligumia recta</i>	--	--	3	--	--
<i>Megalonaias nervosa</i>	--	7	6	--	--
<i>Obliquaria reflexa</i>	--	--	--	--	5
<i>Plethobasus cyphus</i>	--	--	1	--	--
<i>Pleurobema coccineum</i>	1	1	6	4	2
<i>Pleurobema cordatum</i>	--	--	2	1	4
<i>Potamilus alatus</i>	--	--	2	--	--
<i>Ptychobranthus fasciolaris</i>	1	--	2	2	5
<i>Quadrula metanevra</i>	--	--	3	--	--
<i>Quadrula pustulosa</i>	1	1	3	3	7
<i>Tritogonia verrucosa</i>	--	--	1	1	1
<i>Truncilla truncata</i>	--	2	--	1	9
Total	25	71	209	198	42
Number of Samples	24	25	48	32	25
Density (#/m <sup>2</sup> )	4.17	11.36	17.42	24.75	6.72

Table 4. Numbers and species of unionids collected in quantitative samples at four sites on the Duck River in 1996. (DRM = Duck River Mile).

Species	Site			
	DRM 135.5	DRM 171.6	DRM 195.9	DRM 239.7
<i>Amblema plicata</i>	6	1	--	--
<i>Cyclonaias tuberculata</i>	8	2	2	--
<i>Elliptio dilatata</i>	--	1	--	--
<i>Lampsilis fasciola</i>	1	2	1	--
<i>Lampsilis ovata</i>	--	1	--	--
<i>Lasmigona costata</i>	--	1	--	--
<i>Lemiox rimosus</i>	--	1	--	--
<i>Leptodea fragilis</i>	--	1	--	--
<i>Megalonaias nervosa</i>	2	2	--	--
<i>Obliquaria reflexa</i>	8	--	--	--
<i>Potamilus alatus</i>	1	--	--	--
<i>Quadrula pustulosa</i>	8	1	--	--
<i>Truncilla donaciformis</i>	1	--	--	--
<i>Truncilla truncata</i>	5	--	--	--
<i>Tritogonia verrucosa</i>	1	--	--	--
<i>Villosa taeniata</i>	--	--	1	--
Total	41	13	4	0
Density (#/m <sup>2</sup> )	6.56	2.08	0.64	0.00

Table 5. Numbers and species of mussels collected in quantitative samples from the Rough River at the Highway 919 bridge in 1995.

Species	Number
<i>Actinonaias ligamentina</i>	19
<i>Elliptio dilatata</i>	2
<i>Megalonaias nervosa</i>	63
<i>Ptychobranhus fasciolaris</i>	2
<i>Quadrula pustulosa</i>	5
<i>Tritogonia verrucosa</i>	6
<i>Truncilla truncata</i>	7
Total	104
Number of Samples	32
Density (#/m <sup>2</sup> )	13.00

PART II.