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Endangered Species Grant Interim Report

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Propagation and restoration of mussel species of concern.
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Propagation and restoration of mussel species of concern.

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Summary

This report describes the first year of a 3-year project (E-1-42) to propagate and augment populations of mussel species of concern, including the federally endangered pink mucket (*Lampsilis abrupta*), and the federal candidate Neosho mucket (*Lampsilis rafinesqueana*). This project is a continuation of project E-1-35 (Barnhart 2003). Accomplishments for 2004 include the following:

1. Constructed and installed a recirculating system for mussel propagation at the Lost Valley Hatchery in Warsaw.
2. Propagated and released 1,230,000 juvenile mussels at 7 sites in the Meramec and Spring Rivers. These included 225,000 pink mucket, 345,000 black sandshell (*Ligumia recta*), and 660,000 Neosho muckets.
3. Carried out field work to locate broodstock of scaleshell. New localities in the Meramec River yielded 58 adults and 20 juveniles, but only 9 adult females of which 3 were brooding.
4. Tested river redhorse and blue catfish as possible hosts of scaleshell. These tests were unsuccessful. Drum is still the only known suitable host for this species.
5. Investigated effects of size & age on suitability of walleye as hosts for black sandshell and bass as hosts for pink mucket. Results suggest that year-old fish may be less suitable for propagation than young-of-the-year fish.
6. Tested smallmouth bass as host for pink mucket. Transformation success was as high or higher on smallmouth versus comparably sized largemouth bass.
7. Developed a compact, economical, recirculating system for rearing juvenile freshwater mussels. This system was used to culture juveniles of 8 mussel species for up to several months. It will facilitate future research on culture methods.
8. Provided juvenile mussels for toxicity testing by five USGS and university toxicology labs. These studies will be the basis of standardized tests and will contribute to the development of water quality standards protective of endangered species.
9. Tested possible treatments to control flatworm predators of juvenile mussels. Salt showed some promise, but the antihelminth drug Praziquantel did not.
10. Tested the immune response of largemouth bass to mussel glochidia. Bass that developed immunity to one species also showed resistance to other species across genera and subfamilies. Both antibodies and other mechanisms appear to contribute. Immunity declined with time but was still measurable after 10 months.
11. Tested effect of inoculation intensity on glochidia transformation success and acquired immunity. Transformation success was independent of the number of attached glochidia. Immune response results are not yet complete.
12. Information on mussel conservation was disseminated through publications, websites, public programs and consultations, and presentations at local and national meetings.

returned to the Meramec River at the Opechee Beach site on June 27, 2004. A portion of the glochidia were used to inoculate drum at Chesapeake Hatchery on June 1, 2004. Unfortunately, only 200 fish were available because of unexpected winter losses in the culture ponds at Langston University, and these fish proved to be unusually poor hosts. Transformation success was less than 35%. Approximately 800 juveniles were recovered from the RPS and were kept for grow-out experiments at SMSU (see below).

A portion of the glochidia from the SMSU female was sent to Dr. Greg Cope at North Carolina State University for toxicity testing experiments. The rest of the glochidia were used at SMSU for host tests of river redhorse and blue catfish. Both hosts failed to produce any juveniles. River redhorse were adult fish collected by electroshock from the lower James River. Six redhorse were inoculated with scaleshell glochidia on June 8. One redhorse died on June 10 and was examined for encysted glochidia. None were found. The other redhorse later succumbed to Ich infestation and no glochidia cysts or juveniles were recovered. Blue catfish were hatchery juveniles obtained from a state hatchery in Tennessee. A group of 12 fish was inoculated on June 8. Several of the blue cats were sacrificed on June 10 and no encysted glochidia were found.

Pink mucket propagation

From 5/11/04 to 6/9/04 eight female pink muckets were brought to SMSU to obtain glochidia for propagation (Tables 3-4). Four specimens were from the Pacific Palisades area of the Meramec River, 2 from the "Show" site, and 2 from Opechee Beach. These sites are all within a reach of 3 miles. Of these eight females 6 were brooding and were marked 04-1 (=PP7), 04-2 (=BM1), 04-5, 04-6, 04-7(=PP5), and 04-8. The 2 non-brooding mussels were marked 04-3 and 04-4. These 8 mussels were returned to the Opechee Beach site on 6/27/04.

Glochidia from 4 of the pink muckets (04-1, 04-2, 04-5, 04-6) were placed on hosts on 6/24/04 at Lost Valley Hatchery (Table 5). Glochidia from two of the females (04-7 and 04-8) were placed on hosts on 6/25/04 at Chesapeake Hatchery (Table 6). Both batches of fish were later moved to SMSU for recovery of juveniles. On July 15, a total of 225,000 juveniles derived from the 6 females were released at 4 sites in the Meramec (Table 1). A subset of approximately 4,500 juveniles was held at SMSU for grow-out experiments and for use in toxicity testing by USGS.

Comparison of older and younger bass as hosts for pink mucket

The bass inoculated with pink muckets on 6/24/04 at Lost Valley were about 1 year old, and it is interesting to compare the propagation results on older and younger fish (Table 5). The large bass had mean mass of 115 g and attachment of glochidia was 2,611 per fish or 22.7 per gram. A group of YOY (young of the year) largemouth with mean 2.3 gram mass carried 262 glochidia per fish, or 114 per gram. Thus, it appears that the small fish carried about 5 times more glochidia per gram body mass. Transformation success also appeared to be higher on the smaller fish. The yield from the large bass in the RPS was only 603 juveniles per fish. The apparent transformation success was only 23%, less

than half that observed on the smaller largemouth bass. The low yield may be at least partly artifact. It appears that a proportion of the juveniles were lost because the fish were already shedding juveniles when moved to the RPS on day 13 (Figure 6). However, it is also possible that transformation success was lower on the larger fish, as it appeared to be for black sandshell on older walleye (see below).

Smallmouth bass as hosts for pink mucket

Two groups of YOY largemouth bass and smallmouth bass from Lost Valley were inoculated with pink mucket on 6/24/04 and monitored in the AHAB. We have used largemouth and walleye for propagating pink mucket but have not previously compared transformation on smallmouth. MDC stocking of smallmouth in SE Missouri rivers raises the possibility of placing pink mucket glochidia on these fish before release. The AHAB results show that smallmouth is a suitable host for pink mucket (Table 5). Transformation success of these glochidia was 64% and was higher than that on comparable size largemouth (48%). The difference was nearly significant ($p=0.07$ by T-test).

Black sandshell propagation

Black sandshell were placed on 1-year-old (approximately 50 grams body mass) walleye at Lost Valley on 6/18/04 (Tables 7-9). This was the first time that 1-year-old walleye were used as hosts. Attachment success appears to have been good at about 45%. The number attached per fish was 833/fish, or about 17/gram. Recovery of juveniles was carried out using the new RPS system at Lost Valley. The RPS catch was 345,000 juveniles, or 431 per fish. Comparison of attachment with the RPS catch indicates a transformation success of about 52%.

Most of these black sandshell juveniles were released at 4 sites in the Meramec River along with the pink muckets (Table 1). A few thousand juveniles were used in grow-out tests (see Appendix A) and were sent to NCSU for toxicology testing.

Comparison of older and younger walleye as hosts for black sandshell

A group of 12 YOY walleye was also inoculated with the same black sandshell glochidia described above and monitored in the AHAB system. Attachment was 165 glochidia/fish and 66.4 glochidia/gram, about 4 times more than the larger fish. Transformation success on the smaller fish was also higher (average 87%) and they produced an average of 144 juveniles per fish (Table 9C). These results seem to indicate that the younger fish may be better hosts, similar to the comparison with pink muckets YOY and 1-year-old largemouth bass (see above.).

Neosho mucket propagation

Two rounds of Neosho mucket propagation were carried out, each with glochidia from 3 females (6 females propagated this year total). The source population was the Spring