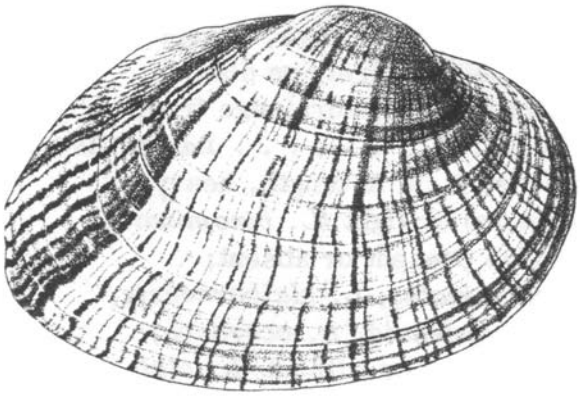
Conservation Assessment

The Wavyrayed Lampmussel, *Lampsilis fasciola* Rafinesque, 1820



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Executive Summary:

The Wavyrayed lampmussel, *Lampsilis fasciola*, Rafinesque, 1820 is a medium sized mussel of the central U.S. This moderately inflated mussel is often found in riffle habitat on meduim sized rivers. *Lampsilis fasciola* can be distinguished from other mussels by the numerous green rays that cover the disk. The historical range of this species included the Great Lakes drainages and the Ohio and Mississippi rivers south to Tennessee. Although widespread *L. fasciola* has been declining in parts of its range and is considered to be imperiled by several states. Host fishes identified to date include two species of *Micropterus*. The long-term survival of this species is dependent upon healthy populations of host fishes and the presence of suitable habitat. Factors considered detrimental to the persistence of this species are pollution particularly some metals such as copper, zebra mussels, and impoundments. . Additional information regarding life history and genetic variation in *L. fasciola* should be obtained prior to initiation of captive breeding and re-introduction or translocation projects.

Lampsilis fasciola Rafinesque, 1820 Wavyrayed Lampmussel

Synonomy:
Lampsilis fasciola Rafinesque, 1820; Rafinesque, 1820:299
Unio fasciolus (Rafinesque, 1820); Say, 1834:no pagination
Lampsilis (*Lampsilis*) *fasciola* Rafinesque, 1920; Frierson, 1927:69
Ligumia fasciola Rafinesque, 1820; Goodrich, 1932:109
Unio multiradiatus Lea, 1829; Lea, 1829:434, pl. 9, fig. 15
Margarita (*Unio*) *multiradiatus* (Lea, 1829); Lea, 1836:24
Margaron (*Unio*) *multiradiatus* (Lea, 1829); Lea, 1852c: 31
Lampsilis (*Lampsilis*) *multiradiatus* (Lea, 1829); Simpson, 1900a: 532
Lampsilis multiradiata (Lea, 1829); Sterki, 1907:388
Lampsilis (*Lampsilis*) *multiradiata* (Lea, 1829); Simpson, 1914:55
Margaron (*Unio*) *perradiatus* (Lea, 1858); Lea, 1870:37
Unio altilis Conrad, 1834; Reeve, 1865: pl. 23, fig. 109 [misidentification]
Unio perovalis Conrad, 1834; Sowerby, 1866: pl. 38, fig. 209 [misidentification]

Type Locality: Kentucky River.

Distribution: Great Lakes drainages including Lake Michigan, Lake Huron, Lake St. Clair and Lake Erie. Ohio and Mississippi drainages as far south as the Tennessee River.

Description: A medium sized and moderately inflated mussel. The shells range from thin to quite heavy. The beaks are only slightly elevated above the hinge-line, and the sculpture consists of indistinct ridges. The periostracum is usually yellow or light brown, sometimes with a greenish hue. A variable number of green rays radiate from the umbo across the disk. The rays are "staggered" at each growth line giving a wavy appearance. The nacre is white. The glochidia are described by Ortmann (1912) as higher (0.29mm) than long (0.25 mm) and are figured in Lea (1858, pl. 5, fig. 17).

Life History and Ecology:
The Wavy Rayed Lampmussel is typically found in small to medium sized rivers and is most common in riffles. The preferred substrate appears to be a mixture of sand, cobble and gravel (Gordon and Layzer, 1989). Parmalee and Bogan (1998) indicate that this

species may be a long-term brooder (bradytictic) although no studies have been published including this species to date. Only two host fishes have been identified to date, *Micropterus dolomieu*, and *M. dolomieu* (Zale and Neves, 1982; Neves, 1983). Female *L. fasciola* display a pigmented ribbon-like mantle margin which appears to vary in color and shape between populations. *Lampsilis fasciola* is a dioecious species and is thought to be bradytictic: spawning occurs in the summer, and the larvae are released the following spring.

Status: The Wavyrayed Lampmussel was listed as currently stable by Williams et al. (1993). Cummings and Mayer (1992) listed this species as widely distributed but uncommon across the Midwest. Strayer et al. (1991) and Strayer and Jirka (1997) reported that has declined across the upper Midwest and is rare throughout its range. Cummings and Mayer (1997) determined that *L. fasciola* has been extirpated from the Plaines River and tributaries of Lake Michigan, the Fox and Wabash rivers, and is now only occasionally found in the Vermilion River Drainage. Dennis (1984) noted range reductions for *L. fasciola* in Tennessee, Virginia and Pennsylvania. *Lampsilis fasciola* is considered an endangered species in Illinois, a threatened species by the state of Michigan. The state of Indiana considers *L. fasciola* a species of special concern and lists it as imperiled in the state but globally widespread (S2, G4) as does West Virginia. In Canada the range of *L. fasciola* is restricted to tributaries of the Great Lakes in Ontario and has declined in recent years (Metcalf-Smith et al. (2000). Specifically, populations of *L. fasciola* appear to be declining in the Thames, Sydenham and Ausable Rivers. The Grand River still maintains healthy populations and *L. fasciola* was assigned endangered species status by Canada in 1999 (Metcalf-Smith et al. (2000).

Limiting Factors:

Although *L. fasciola* appears to have been uncommon throughout much of the northern portions of its range, several recent surveys have identified what appear to be declining populations. It should be noted that several factors, acting in concert might be responsible for the observed reduction in the abundance of *L. fasciola* in different parts of its range.

Zebra Mussels:

The introduction of consequent spread of *Dreissena polymorpha* in the mid to late 1980's has severely impacted native mussel populations in the Lower Great Lakes region (Schlosser et al. 1996). Adverse effects on unionid mussels stem primarily from the attachment of *D. polymorpha* the valves native mussels. In sufficient numbers, *D. polymorpha* can interfere with feeding, respiration, excretion, and locomotion (Haag et al. 1993, Baker and Hornbach 1997). It has been estimated that the introduction of *D. polymorpha* into the Mississippi River basin has increased the extinction rates of native freshwater mussels from 1.2% of species per decade to 12% per decade. A study by Martel et al. (2001) found that *D. polymorpha* was responsible for the local extirpation of unionids from the Rideau River in eastern Ontario,

Native mussels have shown differential sensitivity to *D. polymorpha* infestations. Mackie et al. (2000) stated that smaller species with specific substrate requirements and few hosts and were long-term brooders were more susceptible than larger species with many hosts, that were short-term brooders. *Lampsilis fasciola* is a long-term brooder and is a small to medium sized mussel, which may increase its sensitivity to zebra mussels. Zebra mussels are responsible for the decimation of native mussels in Lake St. Clair (Nalepa et al. 1996) and western Lake Erie (Schloesser and Nalepa, 1994) which as noted by Metcalf-Smith et al. (2000) were historically part of *L. fasciola*'s range.

Pollution:

Chemical pollution from domestic, agricultural, and domestic sources were responsible for the localized extinctions of native mussels in North America throughout the 20th century (Baker, 1928, Bogan, 1993). According to Neves et al. (1997) the eutrophication of rivers was a major source of unionid decline in the 1980's, while Havlik and Marking (1987) showed that many types of industrial and domestic substances: heavy metals, pesticides, ammonia, and crude oil were toxic to mussels. There is also evidence that the glochidial stage mussels are particularly sensitive to heavy metals (Keller and Zam,

1990). Jacobsen et al. (1997) found that of the five species tested glochidia of *L. fasciola* was the most sensitive to copper (LC50 = 26-48ug/L).

Dams/Impoundments:

Impoundments whether for navigational purposes or for the generation of power can dramatically affect the habitat of freshwater mussels. Impoundments alter flow, temperature, dissolved oxygen, substrate composition (Bogan, 1993). In addition, they can isolate freshwater mussels from their host fishes thereby disrupting the reproductive cycle. Changes in water temperature can suppress or alter the reproductive cycle and delay maturation of glochidia and juvenile mussels (Fuller, 1974, Layzer et al. 1993). Because *L. fasciola* inhabits clear, hydrologically stable rivers the creation of impoundments may adversely affect the long-term survival of this species through destruction of it preferred habitat. In addition, the creation of impoundments provide habitat for zebra mussels which have been implicated in the extirpation of mussels in the Great Lakes region.

Population Biology and Viability:

Based on currently available information *L. fasciola* appears to be in decline throughout much of its range. Midwestern populations are the more significantly impacted, and substantial populations are confined to tributaries where favorable conditions persist. The southeastern populations appear to be more robust although as in the Midwest populations are primarily confined to the upper reaches of the Tennessee/Cumberland System in Tennessee, Virginia and West Virginia. As with many species of freshwater mussel, no genetic surveys have been conducted on this species and little is known about its life history relative to other mussel species. Museum records indicate that specimens of *L. fasciola* have been collected in each of the following states in the last 10 years: Illinois, Indiana, and Ohio.

Special Significance Of The Species:

Like many species of *Lampsilis*, the Wavyrayed Lampmussel attracts potential fish hosts by displaying a modified mantle margin that resembles a small fish. Anecdotal information indicates that the mantle margin of this species is extremely polymorphic, with multiple colors and shapes of margins observed in a single population. Further examination of these populations may reveal previously unrecognized species or genetically distinct populations. The remaining populations of *L. fasciola* are fragmented, and the potential for their loss due to catastrophic accidents, such as chemical spills such as the one which occurred on the Clinch River in 1998 is possible (USGS, 2000).

Management Recommendations:

Plans for the conservation of North American freshwater mussels have generally taken one of two approaches: 1.) the preservation of existing populations and allow the mussels to re-invade historical ranges naturally and 2.) to actively expand the existing ranges by re-introducing mussels through translocation from "healthy" populations or from captive rearing programs (NNMCC, 1998). The second strategy is the more pro-active, and may ultimately prove to be effective, however several important factors should not be over-looked. Before translocations or re-introductions occur it should be established that conditions at the re-introduction site are suitable for the survival of mussels. Mussel translocation projects have had mixed success (Sheehan et al. 1989, Cope and Waller, 1995). Re-introducing mussels into still contaminated or otherwise un-inhabitable habitat is a waste of resources and can confound attempts to obtain unbiased estimates of the survival of species after re-introduction. Additionally, the genetic variation across and within populations should be assessed prior to the initiation of a reintroduction/translocation scheme (Lydeard and Roe, 1998). Evaluation of the genetic variation is crucial to establishing a captive breeding program that maintains the maximal amount of variation possible and avoid excessive inbreeding (Templeton and Read, 1984) or outbreeding depression (Avise and Hamrick, 1996).

Additional information about the life-history variation across populations of *L. fasciola* would also prove important to assess prior to initiating a translocation project. Differences in the timing of various aspects of reproduction such as the release of

gametes by males and the movement of eggs into the demibranchs of females are critical for successful reproduction as is the presence of a suitable host fish. Whereas some host suitability studies have been conducted for this species, variation in the utilization of host fishes across the ranges of many species is still poorly understood.

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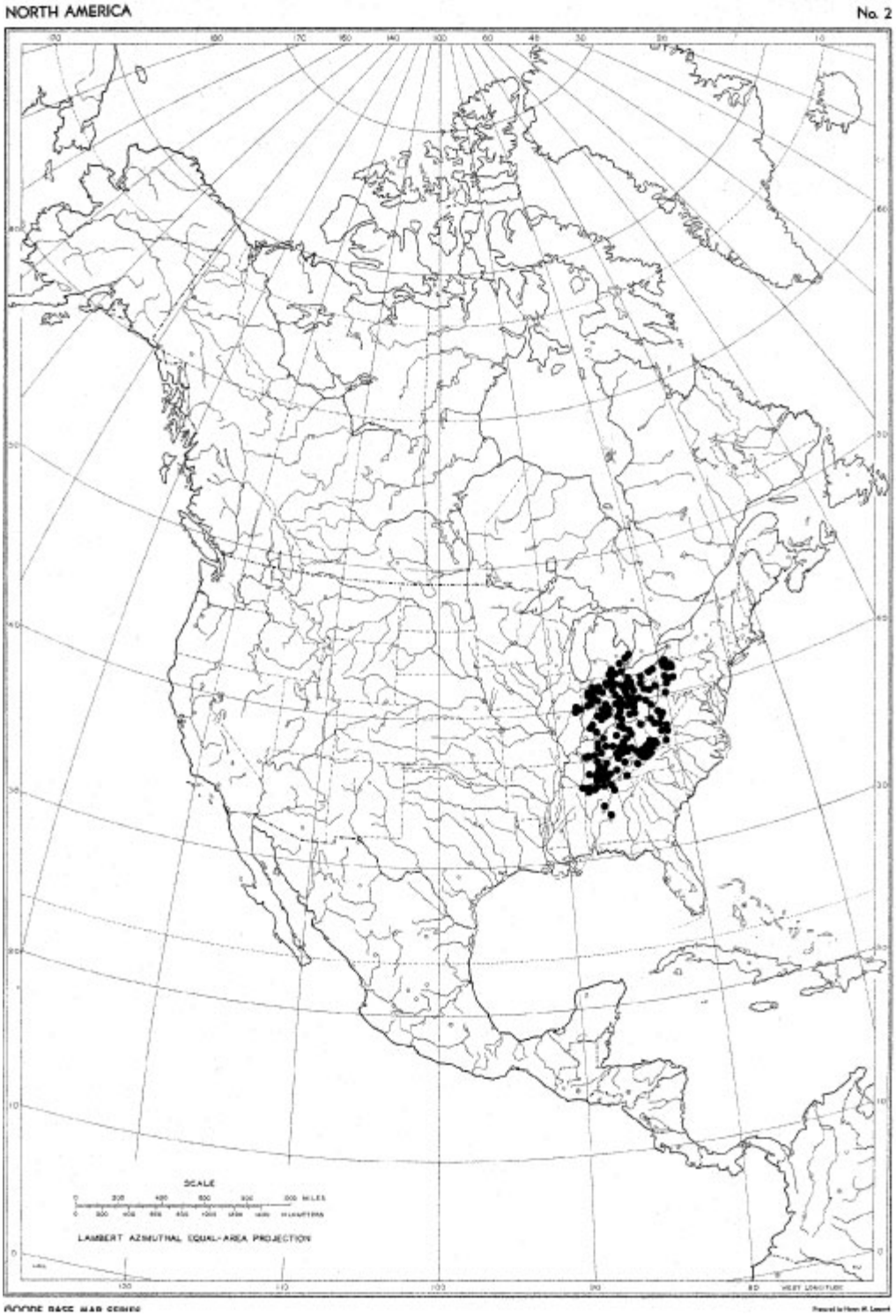
Figure 1. Distribution of *Lampsilis fasciola* by county based on museum records. Records from the Mobile Drainage are most likely mis-identifications.


NORTH AMERICA
No. 2
SCALE
LAMBERT AZIMUTHAL EQUAL-AREA PROJECTION