Conservation Assessment
for
The Ohio Pigtoe (Pleurobema cordatum) Rafinseque, 1820

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Kevin J. Roe
Department of Biological Sciences
Saint Louis University
St. Louis, MO 63103-2010

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EXECUTIVE SUMMARY

The Ohio Pigtoe, *Pleurobema cordatum* (Rafinseque, 1820) is a small to medium sized mussel that is an inhabitant of large rivers. *Pleurobema cordatum* can be distinguished from other *Pleurobema* by its triangular shape, forward curving beak, median sulcus and rounded anterior. The historic range of this species includes the upper Mississippi River drainage, and St. Lawrence River drainage from western New York to western Michigan, south to Arkansas and Alabama. *Pleurobema cordatum* is not listed by the U. S. Fish and Wildlife Service as threatened or endangered, although it is considered to be extirpated from Pennsylvania and is listed in several states.

Pleurobema cordatum is tachytictic (glochidia do not overwinter in the marsupia). Only two species of fishes have been identified as potential hosts for this species. Factors considered detrimental to the persistence of this species are the introduction of non-native species, pollution, siltation and habitat perturbation such as gravel mining or the construction of new impoundments. Additional information regarding life history and genetic variation in *P. cordatum*, particularly additional testing of fishes for host suitability should be obtained prior to initiation of captive breeding and re-introduction or translocation projects.

Pleurobema cordatum (Rafinseque, 1820) Ohio Pigtoe

SYNONYMY

Unio obliqua Lamarck, 1819; Lamarck, 1819:72
Margarita (*Unio*) *obliqua* (Lamarck, 1819); Lea, 1836:20
Unio obliquus Lamarck, 1819, Hanley, 1842a:186
Margarita(*Unio*) *obliquus* (Lamarck, 1819); Lea, 1838a:17
Margaron (*Unio*) *obliquus* (Lamarck, 1819); Lea, 1852c:25
Quadrula obliqua (Lamarck, 1819); Simpson, 1900a:788
Pleurobema obliquum (Lamark, 1819); Ortmann, 1912a:264
**Obovaria cordata* Rafinseque, 1820; Rafinesque, 1820:312
Obovaria cordata var. *rosea* Rafinseque, 1820; Rafinesque, 1820:312
Unio cordatus (Rafinesque, 1820); Conrad, 1836:48
Pleurobema obliquum cordatum (Rafinesque, 1820); Ortmann, 1918:548
Pleurobema cordatum (Rafinesque, 1820); Ortmann, 1924a:34
Fusconaia cordata (Rafinseque, 1820); Morrison, 1942: 354
Quadrula (*Obliquata*) *cordata* (Rafinseque, 1820); Frierson, 1927:53
Quadrula (*Obliquata*) *cordata cordata* (Rafinseque, 1820); Haas, 1969a:297
Pleurobema cordatum cordatum (Rafinesque, 1820); Burch, 1973:15. fig. 38
Unio mytiloides (Rafinesque, 1820); Short and Eaton, 1831:74 [misidentification]

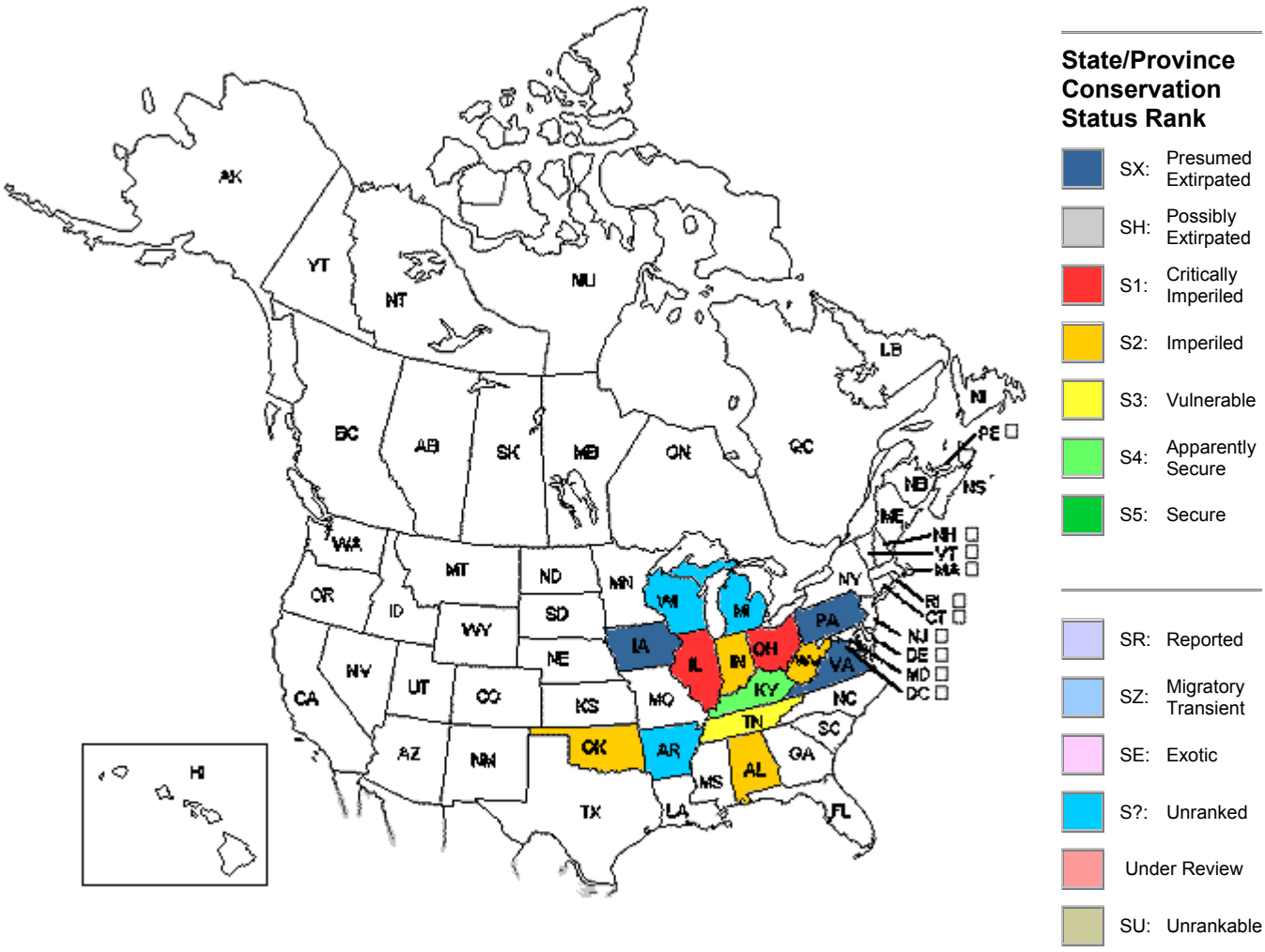
*Because of confusion concerning the correct identification of the type specimen of *Unio obliqua* Lamarck, 1819, It has been suggested by Ortmann and Walker (1922) that the next available name, *Obovaria cordata* be used.

Type Locality: Ohio River

DISTRIBUTION

Upper Mississippi River drainage, and St. Lawrence River drainage from western New York to western Michigan, south to Arkansas and Alabama. Alabama (S2), Arkansas (S?), Illinois (S1), Indiana (S2), Iowa (SX), Kentucky (S4S5), Michigan (S?), Ohio (S1), Oklahoma (S2), Pennsylvania (SX), Tennessee (S3), Virginia (SX), West Virginia (S2), Wisconsin (S?).

Figure 1. Distribution of *Pleurobema cordatum*.



DESCRIPTION

The shells of this mussel are heavy and obliquely triangular in shape. The beak is elevated above the hinge line and curves anteriorly. The anterior end is rounded, and a sulcus is present anterior to the posterior ridge. The periostracum is brown, and the hinge teeth are heavy. The nacre is white or pink. The glochidia are probably similar to *P. coccineum* (Conrad) which were described by Ortmann (1912) as "small, subovate, without hooks. The length and height were "about the same: 0.15 mm."

LIFE HISTORY AND ECOLOGY

As with many species of mussel, little is known of the natural history of this species. *Pleurobema cordatum* is generally considered an inhabitant of large rivers (Buchanan, 1980; Gordon and Layzer, 1989). According to Gordon and Layzer (1989) it is somewhat tolerant of more lentic environments, although Parmalee and Bogan (1998) state that in Tennessee is has not adapted well to reservoirs. It can be found in strong currents on substrates of sand and gravel. Only two species have been identified as potential hosts: *Lepomis macrochirus* and *Lythrurus ardens* (Yokeley, 1972; Fuller, 1974). *Pleurobema cordatum* is according to Parmalee and Bogan (1998) "apparently tachytictic", females with glochidia have been observed in June.

STATUS

The Ohio Pigtoe was listed as special concern by Williams et al. (1993). It is listed as state endangered in Illinois, Ohio, and Virginia and as a species of special concern in Indiana. West Virginia gives this species a rank of S2, or imperiled in the state. It is considered to have been extirpated in the state of Pennsylvania. The Ohio Pigtoe is not listed by the state of Tennessee, although, Ahlstedt and McDonough (1994) indicate that only relictual populations persist upstream of Chattanooga. This species is harvested commercially for the production of shell blanks for the cultured pearl industry, it is unclear what effect commercial harvesting of *P. cordatum* has on population levels of this taxon.

Limiting Factors:

Approximately 67% of freshwater mussel species are vulnerable to extinction or are already extinct (NNMCC, 1998). Factors implicated in the decline of freshwater bivalves include the destruction of habitat by the creation of impoundments, siltation, gravel mining, and channel modification; pollution and the introduction of non-native species such as the Asiatic clam and the Zebra Mussel.

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.

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, than were short-term brooders. *Dreissena polymorpha* has become widespread throughout the Ohio River system, and have the potential to seriously impact the native mussels in that system.

Siltation:

Accumulation of sediments has long been implicated in the decline of native mussels. Fine sediments can adversely affect mussels in several ways they can interfere with respiration, feeding efficiency by clogging gills and overloading cilia that sort food. It can reduce the supply of food by interfering with photosynthesis. Heavy sediment loads can also smother juvenile mussels. In addition, sedimentation can indirectly affect mussels by affecting their host fishes (Brim-Box and Mossa, 1999). Strayer and Fetterman (1999) have suggested that fine sediments may be more harmful to mussels in lower gradient streams where sediments can accumulate. *Pleurobema cordatum* favors large rivers with strong currents (Parmalee and Bogan, 1998) and therefore may be sensitive to the effects of stream modifications that alter these conditions, such as the constructions of impoundments which decreases current velocity and increases sedimentation.

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. The overall reduction in the range of *P. cordatum* may in part be due to the adverse effects of poor water quality.

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). As stated earlier, the construction of impoundments appear to produce conditions unfavorable for to *P. cordatum*.

POPULATION BIOLOGY AND VIABILITY

Although *P. cordatum* appears to be doing well in certain portions of its range, the listing by several states and the extirpation in Pennsylvania may be indicative of a trend that if unchecked could result in the extirpation of this species. The combination of environmental insults such as pollution, non-native species and siltation and commercial harvesting may are quite likely responsible for the apparent decline in this species.

SPECIAL SIGNIFICANCE OF THE SPECIES

This species has some significance to the commercial shell industry.

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 of *P. cordatum* would prove important for designing a conservation program for this species. Additional investigation into potential host fishes should also be a priority.

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