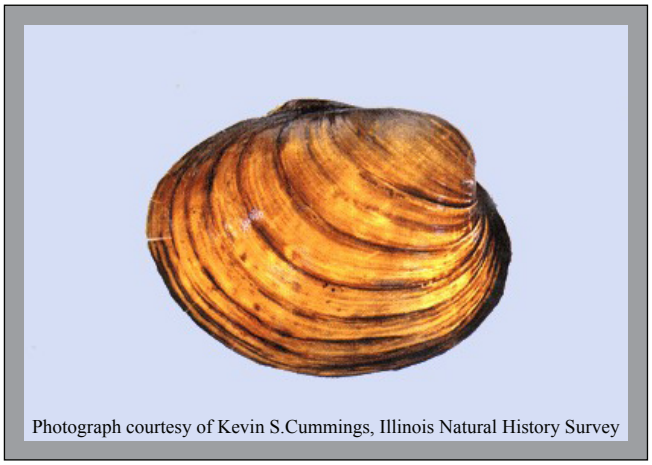
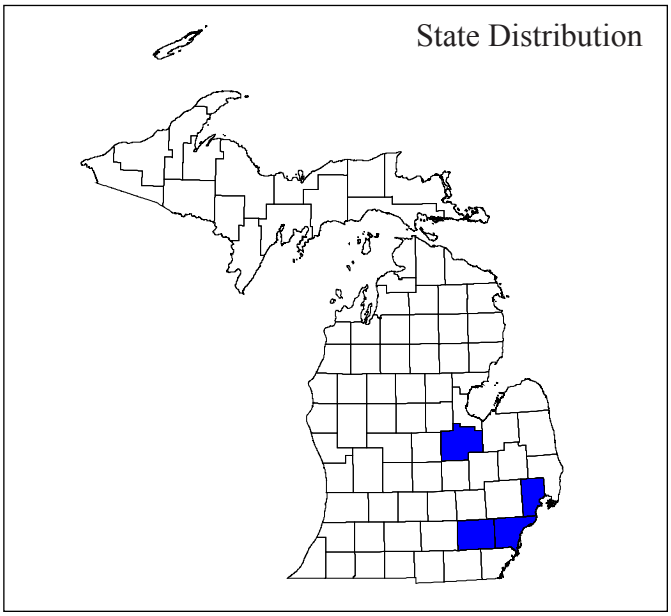
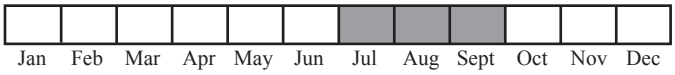
Obovaria olivaria Rafinesque — Hickorynut



Photograph courtesy of Kevin S.Cummings, Illinois Natural History Survey



Best Survey Period



Status: State endangered

Global and state ranks: G4/S2S3

Family: Unionidae (Pearly mussels)

Total range: The global range of the hickorynut is restricted to eastern North America, from Western Pennsylvania and New York to Missouri, Iowa and Kansas, south to Alabama and Arkansas and north to Michigan and the St. Lawrence drainage (Burch 1975).

State distribution: The historic range of the hickorynut in Michigan included the Kalamazoo, Grand, Menominee, Saginaw, and Detroit Rivers, as well as Lake Erie and Lake St. Clair. The most recent occurrences of live individuals were reported in 1983 from the Detroit River and Lake St. Clair.

Recognition: The hickorynut has an oval or oblong outline with a smooth, yellowish brown or greenish outer surface. Faint rays are visible on young individuals. This species is somewhat inflated and has large beaks. Beak sculpture consists of four or five subtle double-loops and is usually visible only on very young individuals. Pseudocardinal teeth are relatively small, triangular, and are aligned horizontally. The nacre is white and the beak cavities are shallow. Maximum length is approximately 4 inches (102mm). Shells of males and females are morphologically similar (Cummings and Mayer 1992, Watters 1995).

Similar species found in Michigan include the round hickorynut (*Obovaria subrotunda*) which has a more round outline and pseudocardinal teeth aligned vertically; the round pigtoe (*Pleurobema sintoxia*) which is darker colored, more compressed, and has smaller beaks; and the mucket (*Actinonaias ligamentina*) which usually has green rays and heavy, well developed teeth.

Best survey time: Surveys for the hickorynut, as with most freshwater mussels, are best performed in the summer when water levels are low and water clarity is high. Low water levels make it easier to spot mussels and can expose muskrat middens containing empty freshwater mussel shells. In water that is less than two to three feet deep, a glass-bottomed bucket is an efficient tool for finding live mussels. In deeper habitats SCUBA is often needed to perform accurate surveys.

Habitat: The hickorynut is found in large rivers and lakes in sand or sand/gravel substrates (Cummings and Mayer 1992). Suitable habitat for fish host species must also be present for hickorynut reproduction to be

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successful (see Biology).

Biology: Like most freshwater mussels of the family Unionidae, this species requires a fish host to complete its life cycle. Eggs are fertilized and develop into larvae within the female. These larvae, called glochidia, are released into the water and must attach to a suitable fish host to survive. The females of some unionids have structures resembling small fish, crayfish, or other prey that are displayed when the larvae are ready to be released. Other unionids display conglutinates, packets of glochidia that are trailed out in the stream current, attached to the unionid by a clear strand. These "lures" may entice fish into coming into contact with glochidia, increasing the chances that glochidia will attach to a suitable host. The hickorynut is not known to have a lure. Some unionids are winter breeders that carry eggs, embryos, or glochidia through the winter and into the spring, while others are summer breeders whose eggs are fertilized and glochidia released during one summer. The hickorynut is a winter breeder (Oesch 1984). Glochidia remain on the fish host for a couple weeks to several months depending on the unionid species and other factors. During this time the glochidia transforms into the adult form then drops off its host (Kat 1984). Although the advantages of having fish hosts are not fully understood, two factors are known to provide benefits. Similar to animal facilitated seed dispersal in plants, fish hosts allow mussels that are relatively sessile as adults to be transported to new habitat and allow gene flow to occur among populations. The fish host also provides a suitable environment for glochidia to transform in. Some unionid species are able to utilize many different fish species as hosts while others have only one or two known hosts. The shovelnose sturgeon (*Scaphirhynchus platorynchus*) is documented as a host for the hickorynut (Watters 1995), as well as freshwater drum (*Apoldinotus grunniens*) (Clarke 1981). Host suitability has largely been determined by laboratory experiments. It is possible that additional species are utilized as hosts in natural environments. Maximum life-span for some unionids is over 50 years.

Conservation/Management: Eastern North America is the global center of diversity for freshwater mussels with over 290 species representing the family Unionidae. In a review of the status of U.S. and Canadian unionids by the American Fisheries Society one third (97) of these were considered endangered (Williams et al. 1993). Thirty-five unionids are thought to have gone extinct in recent times (Turgeon et al. 1998). There are 45 species native to Michigan. Nineteen of these are state-listed as endangered, threatened, or special concern.

The decline of this group over the last couple hundred years has been attributed mainly to our direct and indirect impacts to aquatic ecosystems. Threats include habitat and water quality degradation from changes in water temperature and flow, the introduction of heavy metals, organic pollution such as excessive nutrients from fertilizers, pesticides and herbicides, dredging, and increased sedimentation due to excessive erosion (Fuller 1974, Bogan 1993, Box and Mossa 1999). High proportions of fine particles (sand and silt) were found to be a limiting factor for unionid density and species richness across several watersheds in Lower Michigan (Badra and Goforth 2002). Using certain agricultural practices such as conservation tillage, grass filter strips between fields and streams, and reforestation in the floodplain can help reduce the input of silt and other pollutants. Forested riparian zones help maintain a balanced energy input to the aquatic system, provide habitat for fish hosts in the form of large woody debris, reduce the input of fine particles by stabilizing the stream banks with roots, and provide shade which regulates water temperature. Due to the unique life cycle of unionids, fish hosts must be present in order for reproduction to occur. The loss of habitat for these hosts can cause the extirpation of unionid populations. Barriers to the movement of fish hosts such as dams and impoundments also prevent unionid migration and exchange of genetic material among populations that helps maintain genetic diversity within populations.

The zebra mussel (*Dreissena polymorpha*) and the Asian clam (*Corbicula fluminea*) are exotics from Eurasia that have spread quickly throughout the Great Lakes region. While the Asian clam has no clear harmful effects, zebra mussels are known to have severe negative impacts on native unionids. Zebra mussels require stable, hard substrates for attachment and often use unionid mussels as substrate. Unionids can get covered with enough zebra mussels that they cannot reproduce or feed, eventually killing the unionid. This exotic has had a dramatic effect on native unionid communities in habitats where it has been introduced. The continued range expansion of the zebra mussel into streams and lakes remains a serious threat. Boaters can reduce the spread of zebra mussels by making sure they

do not transport water (which can contain zebra mussel larvae) from one water body to another. Washing boat and trailer or letting both dry overnight reduces the potential for spreading zebra mussels. Zebra mussels are present in the St. Joseph River where live purple wartybacks were found. At one site, one out of twenty purple warty backs had zebra mussels attached.

Because unionid conservation involves such a wide range of issues they are useful umbrella taxa for the conservation of aquatic ecosystems as a whole. By working towards solutions to threats to freshwater mussels we improve our management of the streams and lakes they inhabit.

Research needs: Studies are needed to determine which fish species act as hosts for the hickorynut. The status of fish host populations need to be investigated to more accurately assess hickorynut population viability. Hickorynut populations that are threatened by zebra mussels should be monitored. Methods for preventing future invasive species from being introduced need to be developed. The hickorynut is often found in lakes or rivers that are subject to cumulative impacts from upstream. Creative solutions are needed to promote the reduction of impacts that occur throughout entire watersheds while allowing for profitable agricultural, development, and other landuses. Cultural, economic, and ecological perspectives need to be integrated into management plans for each watershed.

Related abstracts: Northern clubshell (*Pleurobema clava*), Purple wartyback (*Cyclonaias tuberculata*), White catspaw (*Epioblasma obliquata perobliqua*), Northern riffleshell (*Epioblasma torulosa rangiana*), Snuffbox (*Epioblasma triquetra*), and Rayed bean (*Villosa fabalis*)

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