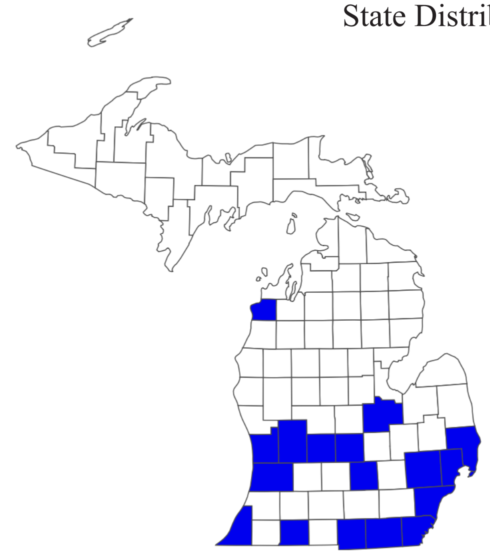
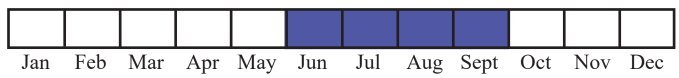
Toxolasma parvum Barnes **Lilliput**

Photo by Kurt Stepnitz

State Distribution



Best Survey Period



Status: State Endangered

Global and State Rank: G5 (Globally Secure) /S1 (State Critically Imperiled)

Family: Unionidae (Pearly mussels)

Synonyms: *Unio parvus* Barnes, *Mya parva*, *Margarita* (*Unio*) *parvus*, *Lampsilis parvus*, *Margaron* (*Unio*) *parvus*, *Lampsilis* (*Corunculina*) [*sic*] *parvus*, *Lampsilis* (*Carunculina*) *parvus*, *Eurynia* (*Carunculina*) *parvus*, *Carunculina parva*, *Unio pertennis*, *Toxolasma parvus*, *Carunculina parva cahni*, *Taxolasma parva* (MolluscaBase 2025, Watters et al., 2009)

Other Common Names: Lilliput, lilliput lamp mussel

Total Range: The global range of lilliput includes the United States east of the Rocky Mountains and Ontario, Canada. In Ontario, lilliput are limited to Lake St. Clair / Detroit River, Lake Erie, and Lake Ontario drainages. Lilliput can be found south into Texas and as far east as New York, USA. Across this range, however, recent estimates suggest that lilliput range has reduced by 44% (Fisheries and Oceans Canada 2020). While some populations appear to be stable, they often occur in small, degraded habitats that are threatened by pollution, management practices (including dredging), and droughts. In the United States of America, the lilliput is found throughout the Mississippi drainage from South Dakota to New York and south to Florida and west to Texas.

Lilliput are critically imperiled (S1) in Ontario, Canada, South Dakota, Iowa, Michigan, and Pennsylvania, USA. In addition, they are considered imperiled (S2) in Kansas, West Virginia, and New York, USA. Populations are either apparently secure (S4) or secure (S5) in Missouri, Illinois, Kentucky, Ohio, Tennessee, Georgia, Mississippi, and Louisiana, USA (NatureServe 2025).

State Distribution: While lilliput has a relatively large global distribution, within Michigan its distribution is limited to 17 counties across the state, including those to the south of Saginaw Bay and Benzie County along Lake Michigan, although the last record noted in Benzie County was in 1933. No records indicate this species can be found in the Upper Peninsula. Recent surveys (32 total surveys post 2010) demonstrated occurrences or shells of lilliput in the St. Joseph and Upper Grand Watersheds (Cohen et al. 2015, Lincoln et al. 2020, MNFI 2025). Knowledge of the true extent and distribution of this species require systematic surveys throughout the state.

Recognition: Lilliput are small unionid mussels, only reaching 4 cm (1.5 in). Generally oblong or cylindrical in shape, their ventral margin is straight to curved, with a rounded anterior end. The outer shell of the lilliput (periostracum) is cloth-like in texture, ranging from yellow/tan to green to brown/grey, eventually becoming black in older individuals. Green rays may also be present, particularly along the dorsal slope along with darker annular rings and lighter interannual rings. Lilliput have subtle sexual dimorphism: females tend to be more inflated than males and the posterior end is more squared in females and rounded in males. The beak of the lilliput is broad and slightly elevated, with four to six obliquely aligned concentric ridges.

The nacre (inside shell) of the lilliput tends to be white with some blue, with a shallow to moderately deep beak cavity. The pseudocardinal teeth of lilliput are erect and triangular. The lateral teeth are slightly curved, rough, and moderately long.

Lilliput are morphologically similar to the purple lilliput (*Toxolasma lividum*), although the nacre of purple lilliput is more purple in color and the lateral teeth are serrated (Mulcrone and Rathbun 2020, Watters et al. 2009). Two other similar species are the rayed bean and salamander mussel. Rayed bean (*Paetulunio fabalis*) is more "bean shaped" and has heavier hinge teeth. Salamander mussel (*Simpsonaias ambigua*) has a thinner shell, smaller pseudocardinal tooth, and lacks lateral teeth (Watters et al. 2009).

Best Survey Time: The best time of year to survey for lilliput is early June through the end of September. This, however, is weather dependent, as unionid mussels burrow deeper into substrate when temperatures cool in the fall, making them more difficult to detect. Periods of high water levels and turbidity after rain should be avoided to ensure detection rates are as high as possible. The small size of lilliput can make them particularly difficult to find during surveys. Targeted and detailed survey effort is required to help ensure they are detected.

Habitat: Lilliput can be found in a variety of habitats, from small creeks to large rivers to the shallows of lakes, ponds, reservoirs, and wetlands. Regardless of the habitat, lilliput prefer substrates that are predominantly mud, clay, silt, sand, fine gravel, or detritus (Parmalee and Bogan 1998). Though they likely prefer smaller substrates, lilliput have been found in areas with larger substrates, such as cobble and boulder (Bouvier et al. 2014).

Lilliput can quickly colonize new flowing (lotic) and still (lentic) environments. They are also commonly found in highly disturbed habitats, often as the only species present at the site (Haag 2012). These environments include wetlands with the potential for drying. In the lab, lilliput survived 30 days at 100 percent relative humidity out of water (Holland 1991).

Biology: There is evidence that the lilliput is hermaphroditic (Haag 2012, Utterback 1916). When populations are small, this allows the lilliput to effectively double the potential breeding population, particularly when few individuals have colonized a new habitat (Haag 2012). Lilliput tend to spawn in the summer (typically June and August) and the glochidia (larval stage) overwinter in females and are expelled in the spring (bradytictic). Compared to other unionid mussels, lilliput have relatively low fecundity (Haag 2012). There is some evidence that suggests lilliput use lures, or modified parts of their mantel, to draw in fish hosts for their glochidia to attach to fish gills or fins (Watters 2009).

Glochidia of lilliput tend to be sub-elliptical with a short and straight dorsal margin, curved anterior and posterior margins, and rounded ventral margin. They are clumped together with mucus (conglutinates), forming a white, club shaped structure (Utterback 1916). Baker (1928) found these conglutinates can persist to the following July if they are not taken up by a fish host. Known fish hosts for the lilliput are green sunfish (*Lepomis cyanellus*), warmouth (*L. gulosus*), orangespotted sunfish (*L. humilis*), bluegill (*L. macrochirus*), white crappie (*Pomoxis annularis*), and Johnny darter (*Etheostoma nigrum*; Fuller 1980, Hove 1995, Mermilliod 1974, Watters et al. 2005, Wilson 1916).

Like other unionid mussels, the lilliput experiences rapid growth early in their life cycle (one to two years) before growth dramatically slows. The lilliput has an opportunistic life history, reaching sexual maturity in their first year, quicker than most other mussels, with one of the shortest life spans of the unionid mussels (although some individuals can live up to 12 years, Haag 2012). Like all mussels, lilliput are filter feeders, siphoning water and extracting particulate organic matter, algae and diatoms from river currents.

Conservation/Management: Freshwater mussels are particularly threatened: approximately two-thirds to three-quarters of native mussel species are either extinct, listed as endangered or threatened, or need conservation status across North America (Stein et al. 2009). The main threats of lilliput are contaminants and toxic substances, nutrient loading, sediment loading, turbidity, invasive species, habitat removal or alteration (including dredging and altered flow regimes), and host fish decline (Fisheries and Oceans Canada 2020). Freshwater mussels are particularly sensitive to ammonia (Wang et al. 2007), chlorine (Valenti et al. 2006), and heavy metals, including copper (March et al. 2007; Valenti et al. 2006, Wang et al. 2007). Glochidia may be unable to attach to host species due to even low levels of heavy metals, disrupting life cycles (Heubner and Pynnönen 1992). Glochidia and juvenile mussels are also sensitive to increases in salinity, primarily due to runoff of salts used for clearing roads in the winter (Pandolfo et al. 2012). Eutrophication of water bodies, caused by increased nutrient inputs and resulting in increased algal and plant growth, can lead to decreased dissolved oxygen levels, either directly impacting mussels or their host fish.

In addition, sediment loading can reduce dissolved oxygen levels in the substrate, bury mussels, or clog their gills, decreasing feeding and respiration rates (Fisheries and Oceans Canada 2020). As a result of sediment loading, increased turbidity reduces visibility, decreasing the likelihood that fish can see and ingest conglutinates, reducing the likelihood of glochidia attaching to their host species. Invasive species, such as the zebra and quagga mussels (*Dreissena polymorpha, Dreissena bugensis*), can have high densities, resulting in reduced native populations. In Canada, there is evidence that the common carp (*Cyprinus carpio*) can alter habitats with their feeding behavior, including directly consuming mussels (Fisheries and Oceans Canada 2020). Freshwater habitats can be altered in a variety of ways, including changing flow regimes (via dams or other barriers) and agricultural dredging. As adult mussels are relatively immobile, they are particularly sensitive to altered habitats. The factors above can also impact host fish, impacting the mussel life cycle.

Due to its opportunistic life history (quick maturation rates, short life span) and ability to colonize new and degraded habitats quickly, lilliput are thought to be more tolerant of impoundments and channelization, unlike most other mussel species (Haag 2012). While lilliput may be less sensitive to such habitat disturbances, their fish hosts and food resources can be impacted by these disturbances.

Research Needs: As with other mussel species, targeted surveys are needed to better understand the historical and current distribution of lilliput. Understanding how ranges change over time provides a better understanding of the threats and pressures to specific species. In addition, targeting suitable habitats for surveys may result in finding previously undetected populations. Increased surveys will further refine our understanding of lilliput habitat, enabling targeted management. Lilliput are small and therefore hard to detect, particularly when water is more turbid. More targeted and detailed survey efforts, with the ability to reliably detect small species, are needed to increase our knowledge of the status and range of lilliput.

More research into understanding the conditions under which glochidia and juvenile mussels are either unable to attach to host species or continue to develop are needed, particularly sensitivities to contaminates and pollution (Fisheries and Oceans Canada 2020). Understanding these sensitivities will result in better and more effective management and conservation strategies.

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