

Scientific Name: *Viviparus georgianus* Lea, 1834

Common Name: (banded) mystery snail, banded apple snail, pond snail

Taxonomy: Available through ITIS

Identification: *Viviparus georgianus* has a relatively globose, dextral shell with 4–5 whorls separated by distinct sutures. The outer lip of the shell is quite thin (Jokinen 1992) and the overall coloration is yellow-green. There are abundant rows of hairs with distinctly hooked ends and ridges on the periostracum. The umbilicus is narrow or not apparent, and the operculum is round to oval with concentric circular markings that radiate from an off-centre origin located towards the top left. There are always 4 darkly pigmented bands that wrap around the shell spirally, but which are sometimes only visible from inside (Macki et al. 1980; Jokinen 1984; Jokinen 1992).

Size: One-year old snails are 12–17 mm high; at 2 years, 17–21 mm high; and at 3 years, 21–30 mm high (Lee et al. 2002). The maximum height is 45 mm (Jokinen 1992).

Native Range: The banded mystery snail is native to North America, generally found from the northeastern United States to Florida and the Gulf of Mexico (Jokinen 1992). Massachusetts, Indiana and Connecticut are probably some of the states marking the northern limit of this species' native range (Jokinen and Pondick 1981; Mills et al. 1993). The recent study that found that *V. georgianus* is a species complex in North America found that *V. limi* is native to the Ochlockonee River and southwestern Georgia, while *V. goodrichi* is in the Florida panhandle and southwestern Georgia and *V. georgianus* is in eastern and southern Florida as well as the Altamaha River in Georgia (Katoh and Foltz 1994). Other populations in the Altamaha, Mississippi and St. Lawrence River basins have not been studied yet with respect to their specific genetic make-up and for are named as part of the *V. georgianus* species complex (Katoh and Foltz 1994).

Nonindigenous Occurrences: The first record of this introduced species in the Great Lakes basin is from the Hudson River drainage, connected to the Erie Canal and Mohawk River, in 1867. It was later reported from the Lake Michigan watershed by 1906 and Lake Erie by 1914. Other records are from 1931 near Buffalo, Lake Erie and the Niagara River (Mills et al. 1993). The New York State Museum has records from the 1950s and 1960s from 11 counties (Jokinen 1992). Mackie et al. (1980) list this species as recorded from Lake Huron but do not give date of establishment or any references.

Means of Introduction: The earliest introduction of this species to the Hudson River drainage was made by an amateur conchologist who purposefully released around 200 of these snails simultaneously into the river (Jokinen 1992; Mills et al. 1993). The snail probably dispersed by itself following this event, but more recent introductions were likely made via release from aquaria (Mills et al. 1993).

Status: This species is considered established in the drainage systems of Lakes Michigan, Erie and Ontario (Mills et al. 1993).

Ecology: *Viviparus georgianus* is dioecious, iteroparous and ovoviviparous, laying eggs singly in albumen-filled capsules (Browne 1978; Lee et al. 2002; Rivist and Vanderpool 1986). It breeds and lives in shallow waters, often amongst macrophytes, in spring to fall, then moves out to deeper areas in the fall in order to overwinter away from shore (Jokinen et al. 1982; Lee et al. 2002; Wade 1985a). In more open waters, fall migration begins earlier than in smaller lakes and ponds (Lee et al. 2002). Most growth generally occurs when waters become warmer in spring and summer, although reduced growth continues in winter (Browne 1978; Jokinen et al. 1982). Females generally brood eggs for 9–10 months (Jokinen et al. 1982; Rivist and Vanderpool 1986). Fecundity is generally between 4 and 81 young/female, but on average is closer to 11 young/female (Jokinen 1992; Vail 1978). Females can brood more than one batch of young at a time and the number of young in one brood is positively related to the size of the female (Vail 1977). Reproductive females are usually larger than 16 mm (Buckley 1986). Female banded mystery snails live 28 – 48 and males live 18 – 36 months (Jokinen et al. 1982; Lee et al. 2002).

This species thrives in eutrophic lentic environments such as lakes, ponds and some low-flow streams (Lee et al. 2002). It is usually absent from larger, faster flowing rivers (Kato and Foltz 1994); however, it is able to survive conditions of high water velocity in the St. Lawrence River, and may even be better adapted than the introduced *Bithynia tentaculata* to such habitat (Vincent 1979). Individuals are generally found in a range of habitats, including: regions with silt and mud substrate; communities dominated by diatoms and filamentous algae (not blue-green algae); shallow waters with sand or gravel substrate; soft and hard water; waters with pH between 6.3 and 8.5; freshwater habitats only; river reaches more than meanders (Duch 1976; Jokinen 1992; Jokinen and Pondick 1981; Lee et al. 2002; Pace and Szuch 1985; Vincent 1979; Wade and Vasey 1976).

V. georgianus is known to be a facultative or even obligate filter-feeding detritivore and thus can be used as a bioindicator of sediment contamination by oil and fertilizer, because growth, survival and histology are significantly affected by ingestion of contaminated sediments (Browne 1978; Lee et al. 2002). This species grazes on diatom clusters found on silt and mud substrates, but may require the ingestion of some grit to break down algae (Duch 1976).

The banded mystery snail often lives at high densities, sometimes up to around 864/m² (Lee et al. 2002; Pace and Szuch 1985). It is host to many parasites in its native habitat, including cercaria, metacercaria, ciliated protozoans, annelids, and chironomid larvae (Wade 1985b).

Impact of Introduction

A) Realized: At present there are no known impacts associated with this introduced species in the Great Lakes basin.

B) Potential: *Viviparus georgianus* has been shown to significantly reduce survival of largemouth bass eggs in guarded nests both in the laboratory and in ponds, and may

contribute to high incubation mortality seen in natural field settings (Eckblad and Shealy 1972).

Remarks: This species is considered rare in the states of Connecticut and Massachusetts (Jokinen and Pondick 1981). It is possible that some introduced populations could actually be *V. viviparus*, which is a European species that is indistinguishable from *V. georgianus* (Mills et al. 1993).

A recent study that found that *V. georgianus* in its native range in the United States is actually a species complex that includes the genetically distinct *V. georgianus*, *V. goodrichi* and *V. limi* (Katoh and Foltz 1994). Each species displays morphological differences in shell shape, aperture shape and extent of sexual dimorphism (Katoh and Foltz 1994).

Voucher Specimens:

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Other Resources:

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Group: Mollusks – Gastropods (Snails)

Lake(s): Lakes Michigan, Erie and Ontario Drainages

Genus: *Viviparus*

Species: *georgianus*

Common Name: (banded) mystery snail, banded apple snail, pond snail

Status: Established

Freshwater/Marine: Freshwater

Pathway: Stocked (originally; 200 or so individuals deliberately released by an amateur conchologist); Aquarium Release (later introductions)

Exotic/Transplant: Native Transplant