Section 7

Mystery Snail Monitoring Protocol

Citizen Lake Monitoring Network

Mystery Snail Background.
There are three species of mystery snails in Wisconsin. Only one of these species, the brown mystery snail (*Campeloma decisum*), is native to Wisconsin. The Chinese mystery snail (*Bellamya japonica*) is also called the Japanese mystery snail as well as the Oriental mystery snail. The Chinese mystery snail is native to Asia. The banded mystery snail (*Viviparus georgianus*) is native to the southeastern US.

Mystery snails thrive in silt and mud areas although they can be found in lesser numbers in areas with sand or rock substrates. They are found in lakes, ponds, irrigation ditches, and slower portions of streams and rivers. They are tolerant of pollution and often thrive in stagnant water areas. Mystery snails can be found in water depths of 0.5 m to 5 m (1.5 to 15 feet). They tend to reach their maximum population densities around 1-2 m (3-6 feet) of water depth. Mystery snails do not seem to eat plants (macrophytes). Instead, they feed on detritus; and in lesser amounts algae on the mud and phytoplankton. Thus removal of plants in your shoreline area will not reduce the abundance of mystery snails.

Lakes with high densities of mystery snails often see large die-offs of the snails. These die-offs are probably related to the lakes warming coupled with low oxygen (related to algal blooms). Mystery snails cannot tolerate low oxygen levels. High temperatures by themselves seem insufficient to kill the snails as the snails could move into deeper water.

The female mystery snail gives birth to live, crawling young.

Chinese Mystery snails are a source of food in Asia. They were first imported into the US in 1892, and sold in a Chinese market in San Francisco (Wood 1892). Some communities still harvest the Chinese Mystery Snail and use them as a food base.

Monitoring Background
In 2006, the Center for Limnology has intensively surveyed 45 Wisconsin lakes for Chinese and banded mystery snails. These snails were present in nearly 40% of the sampled lakes! This way beyond what they had expected. They are now analyzing the data now to see how the snail's presence correlates with native snail abundance, water chemistry, etc. The Center for Limnology has also completed a large, outdoor experiment examining how Chinese mystery snails and rusty crayfish affect native snails. The preliminary results are clear-cut -- both invaders have strong negative effects on the natives. The Chinese mystery snail, owing to its larger size, is relatively immune from rusty crayfish attack while other snails are often fed on by the rusty crayfish.

The Center for Limnology is interested in any and all records of the mystery snails and their densities in Wisconsin lakes. They are also interested in lakes that do not have these mystery snails as they are beginning to assemble a database of invaded lakes in WI. The Center for Limnology is still learning about differences in densities through out a lake. Often we see areas of the lake with higher snail densities than other areas on the same lake. This may be related to calcium levels (higher is better) and food levels of that area.

Many lake residents are worried about mystery snails being carriers of the Swimmer's Itch parasite. In theory, they are potential carriers. However, as an invasive snail, they are less likely to harbor parasites because of a lack of evolutionary relationships. This remains an open and important question that warrants more research. The Chinese mystery snails that the Center for Limnology dissected (they were looking for parasites) did not have swimmer's itch parasites.

Control Options

There is no legal chemical control method for mystery snails in Wisconsin. Any chemical that have the potential to control Chinese and banded mystery snails would impact the native snails, clams and other organisms and is illegal. Some residents have raked the mystery snails out of their lake. This is legal. The lake residents then took the snails and buried them so that the snails did not stink when rotting. Some have also added lime to the hole to deter raccoons and skunks from digging up the snails. If you do bury the snails removed from your lake frontage; please bury them away from the lake so that you are not impacting your shoreline area.

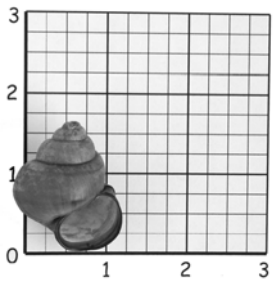
Identification

One of the main identification features of the mystery snails is their size. Adult sails of some species are over 1 ½ inches in length. Snail shell length is measured from the lip of the shell to the tip of the whorl. All mystery snail species will show corrosion ("chipping" and "weathering") on the top of the whorl of the shell. This is particularly true in soft-water lakes. Mystery snails have opercula (singular operculum) which are "trap doors" that can be closed. This operculum is darkly colored, solid in consistency with concentric rings. Most native snails do not have opercula. Since mystery snails give birth to live young, you may find these small snails "inside" of the adults.

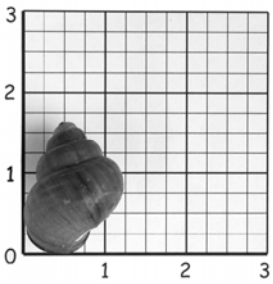
Chinese Mystery Snail – non-native

Identifying features Chinese mystery snail (see photos below):

- Adult snails are often over 1.5 inches in length.
- Operculum (trap door) present
- Typically light to dark olive green
- Uniform coloring on the shell (no banding)
- Chinese mystery snail is often wider than the brown mystery snail.



Ventral view (scale is inches)



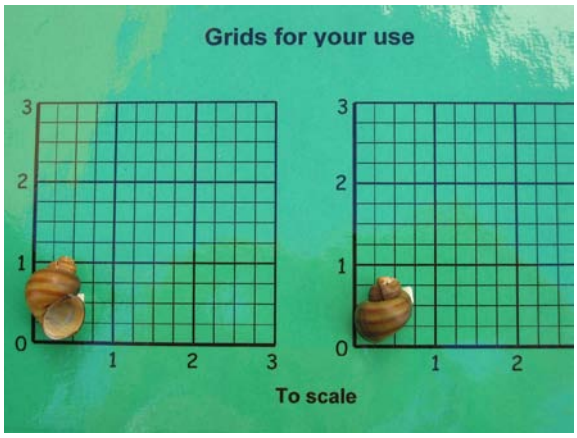
Dorsal view (scale is inches)

Ventral view and operculum

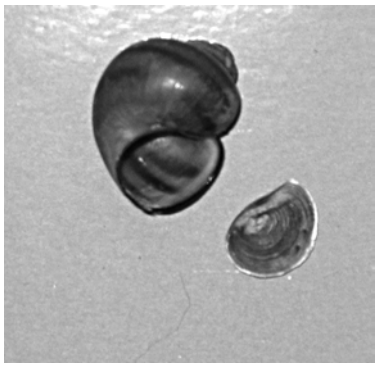
Banded Mystery Snail – non-native

Identifying features of the banded mystery snail:

- Can get up to 1.5 inches in length
- Distinct reddish-brown bands along the shell. This feature is VERY obvious in bleached shells, but a little more subtle among living snails.



Ventral view Dorsal view

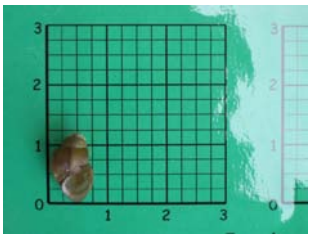


Ventral view with operculum

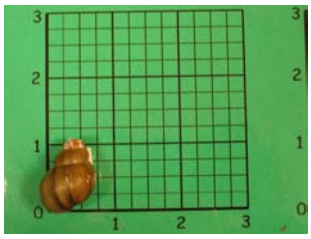
Brown Mystery Snail - native

Identifying features of the Brown Mystery snail (see photo below):

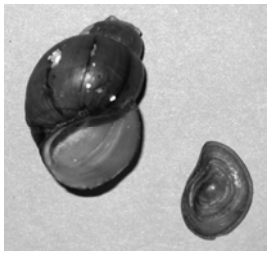
- Rarely reaches 1.5 inches in length.
- Operculum (trap door) present
- Typically olive green
- The width to height ratio is smaller in the brown mystery snail than in the Chinese mystery snail (the brown mystery snail is narrower than is Chinese mystery snail - which tends to be very wide).



Ventral view (scale is inches)



Dorsal view (scale is inches)



Ventral view with operculum

Monitoring Protocol:

- The best time of the year to monitor for the mystery snails is late summer, but monitoring can take place anytime you are on the water.
- Look for the “large” snails along the shoreline. Shells of dead snails are often found near the high water mark of the lake, particularly on the downwind side of the lake.

- Mystery snails can be found in the shallows out into the lake where the water depth reaches 15 feet. You may want to look for them while boating. Take a landing net to collect snails in deeper water.
- Mystery snails are often found in areas with mud and / or sand. They seldom are found in rocky areas or areas with a lot of plants.
- Collect the largest snails present. Small snails are hard to differentiate by picture alone. If you only find small snails, preserve them as directed in (2) below. Banded snails are often smaller than Chinese mystery snails, but careful inspection will usually reveal the telltale stripes without a problem.
- Conduct a 10 minute "rapid assessment" of lakes near the boat landing, walking the shore looking for shells on the shoreline and in the shallow water area. If you find snails, there is no need to continue monitoring for the full 10 minutes. Fill out the data form and keep this record with the snails. Stop monitoring if you do not find snails after 10 minutes of looking and send in the data form letting us know that you monitored but did not see any mystery snails.

If you find what you suspect is a mystery snail you can do one of two things.

(1). Take digital pictures of the snail next to a ruler or on the green paper grid system provided and email that pictures as well as the information requested on the mystery snail reporting form (appendix 5) to Dr. Pieter Johnson (pieter.johnson@colorado.edu) with the heading “MYSTERY SNAIL”.

TIPS:

- To reduce glare, take pictures of dry shells;
- The marking of the shells shows up better in pictures if you take the pictures of shells without the bodies inside. You can freeze the snails to kill them. Defrost the snail, and the snail bodies can be pulled from the shell quite easily (a lot easier than if you kill the snails with alcohol).
- The camera flash will cause glare - take several pictures to get glare off of shell or leave the flash off (take pictures outside for more light).
- Take ventral and dorsal pictures.
- You will want to keep the shells until Dr. Johnson lets you know what species you have. If the pictures do not work out, the Center for Limnology may need to see the shell.

(2). Place several snail shells in a ziplock bag and deliver them and the data reporting form (appendix 5) to your local CLMN contact (page vii). If there are still live snails in the shells, you can freeze the snails and then deliver the frozen snails to the staff. By freezing the snails, the snail bodies can be pulled from the shell. If the snails are killed by placing them in alcohol, the snail bodies cannot be pulled from the shells easily.

For more information on Chinese mystery snails, please refer to: Wood, W.M. 1892. Paludina japonica Mart. For sale in the San Francisco Chinese markets. Nautilus 5:114-115. http://nis.gsmfc.org/nis_factsheet2.php?toc_id=125.