Mystiery Snatts

MONITORING PROTOCOL



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BACKGROUND/OVERVIEW

The Chinese mystery snails and the banded mystery snails are non-native snails that have been found in a number of Wisconsin lakes. There is not a lot yet known about these species, however, it appears that they have a negative effect on native snail populations. The mystery snail's large size and hard operculum (a trap door cover which protects the soft flesh inside), and their thick hard shell make them less edible by predators such as rusty crayfish.

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 chinensis, pronounced bell-ah-MEE-ya chi-NEN-sus) is native to Asia, and is also called the Japanese or Oriental mystery snail. The banded mystery snail (Viviparus georgianus, pronounced vi-vi-PAIR-us jor-jee-AN-us) is native to the southeastern US. Mystery snails are called "mystery" snails because in the spring they give birth to young, fully developed snails that suddenly and mysteriously appear.

Chinese mystery snails are a source of food in Asia. They were first imported into the US in 1891 and sold in a Chinese marketplace in San Francisco (Wood, W.M. 1892). Some communities still harvest the Chinese mystery snail and use them as a food base. Their mode of spread throughout out the United States has not been well documented, but is probably in part due to human activities (aquarium releases, snails attached to plants that are transported on boats and trailers, etc.) There is little documentation on the introduction and spread of the banded mystery snails into Wisconsin. Introduction into the Hudson River has been documented, and then the spread thereafter is suspected to be the aquarium market and via natural spread.

Many lake residents are worried about mystery snails being carriers of the swimmer's itch parasite. In theory they are potential carriers, however, because they are an introduced species and did not evolve as part of the lake ecosystem, they are less likely to harbor the swimmer's itch parasites. This remains an open and important question that warrants more research. In 2006 the University of Wisconsin – Madison Center for Limnology dissected a number of Chinese mystery snails and none had the swimmer's itch parasite.

The list of waterbodies in Wisconsin where banded and Chinese mystery snails have been verified can be found at http://dnr.wi.gov/lakes/invasives/.



The female mystery snail gives birth to live crawling young. This may be an important factor in their spread as it only takes one impregnated snail to start a new population. 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 to 5 meters (1.5 to 15 feet). They tend to reach their maximum population densities around 1-2 meters (3-6 feet) of water depth. Mystery snails do not eat plants (macrophytes). Instead, they feed on detritus and in lesser amounts algae 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 related to the lake's 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.



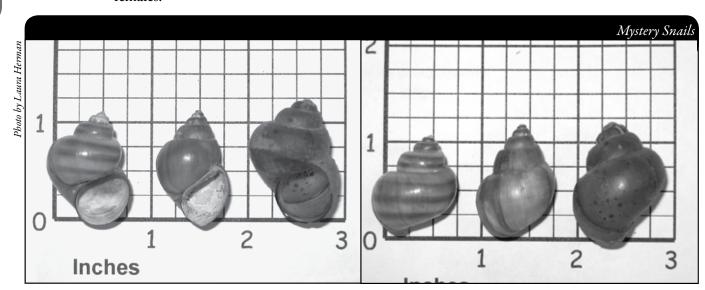
IDENTIFICATION

In your packet is a green grid that can be used to "measure" your mystery snails. This grid is also the grid you use when taking pictures of the snails. You need to send in pictures to verify the identification of the snails.

One of the main identification features of the mystery snails is their size. Adult snails of some species are over 1½ 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 softwater lakes.

Mystery snails have opercula (singular operculum), which are "trap doors" that can be closed. The mystery snail pulls its body back into the shell and closes it operculum to protect its soft body from danger. This operculum is darkly colored, solid in consistency and has concentric rings. Outside of the brown mystery snail, most native snails do not have opercula.

Since mystery snails give birth to live young, you may find small snails inside of the adult females.



From left to right: banded, brown and Chinese mystery snails.

CHINESE MYSTERY SNAIL - non-native:

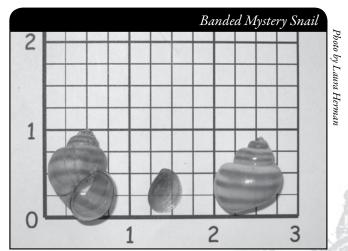
- Adult snails are often greater than 1.5 inches in length.
- Operculum (trap door) present
- Shell is typically light to dark olive green
- Uniform coloring on the shell (no banding)
- Chinese mystery snail is often wider than the brown mystery snail.



ventral view, operculum and dorsal view

BANDED MYSTERY SNAIL - non-native:

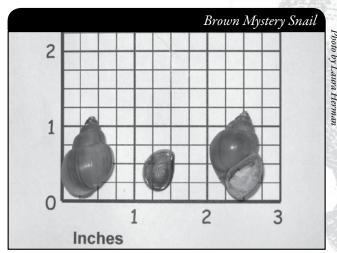
- Often smaller than Chinese mystery snails
- Adult snails can get up to 1.5 inches in length
- Operculum (trap door) present
- Shells have distinct reddish-brown bands circling the shell. This feature is obvious in empty shells, but more subtle on living snails.
- Banded mystery snail is often wider than the brown mystery snail



ventral view, operculum and dorsal view

Brown Mystery Snail – native: Adult snails rarely reach 1.5 inches in length.

- Operculum (trap door) present
- Shell is typically olive green
- The width to height ratio is smaller in the brown mystery snail than in the Chinese or banded mystery snails (the brown mystery snail is proportionally narrower than the Chinese or banded mystery snails - which tend to be very wide).



dorsal view, operculum and ventral view



MYSTERY SNAIL MONITORING

Monitoring Background

In 2006, the University of Wisconsin - Madison Center for Limnology surveyed 45 Wisconsin lakes for Chinese and banded mystery snails. These snails were present in nearly 40% of the sampled lakes! This was way beyond what was expected. Center for Limnology staff 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 native snails. The Chinese mystery snails, owing to their large size and hard opercula (trap doors that protect the soft flesh inside), are relatively immune from rusty crayfish attack, so rusty crayfish more often feed on native snails.

The goal of the Citizen Lake Monitoring Network is to collect any and all records of mystery snails in Wisconsin lakes. It is also important to know which lakes do not currently have mystery snails. Researchers are still learning about differences in densities throughout a lake. Often, some areas of a lake will have higher snail densities than other areas on the same lake. This may be related to calcium levels (higher is better for snail development and survival) and food levels of that area.

When to Monitor

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.

Where Do I Look for Mystery Snails?

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. You may also want to look for them while boating. Mystery snails can be found in the shallows and out into the lake where the water depth reaches 15 feet.

Mystery snails are often found in areas with mud and/or sand. They are seldom found in rocky areas or areas with a lot of plants.

How to Monitor

Conduct a 10 minute "rapid assessment" of the lake shoreline. Walk the shore and look 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.

If you want to monitor while boating, take a landing net to collect snails in deeper water. Stop monitoring if you do not find snails after 10 minutes of looking.

Equipment Needed

- ☐ Landing net (if you will be monitoring in deeper water)
- ☐ Green paper grid system (optional in the back of your manual)
- ☐ A copy of appropriate report form(s) (found at the end of this section and at http://dnr.wi.gov/lakes/monitoring/forms.aspx), depending on the type of monitoring you are conducting:
 - ► Aquatic Invasives Surveillance Monitoring Report, Form 3200-133
 - Aquatic Invasive Animal Incident Report Form, 3200-126

SETTING UP A MONITORING TEAM

Often it is easier to "divide" up the work than to rely on one volunteer to monitor an entire lake for invasives. Designate a team leader (and maybe an assistant) who is willing to keep track of what areas are being monitored and who is doing monitoring. The team leader can also be the person who enters the monitoring results on the CLMN website http://dnr.wi.gov/lakes/CLMN and the person to whom other volunteers can bring suspect species. If assistance in identification is needed, the team leader can take the species to DNR, UW-Extension, or the County Land and Water Conservation staff for vouchering. Be creative and most importantly, do not burn out your team leaders!

Consider having a mini-training session for your team. The CLMN Coordinator for your area may be able to assist you with a training session. If not, contact your local CLMN contact to see if an Aquatic Invasive Species training session will be scheduled for your area. These sessions are often set up in conjunction with local lake fairs and conventions. AIS workshops / training sessions are also listed at http://www.uwsp.edu/cnr/uwexlakes/CLMN/training.asp.

MAPPING

A map is a very quick and reliable way to assure that everyone knows the place you are talking about when you describe a certain point on your lake. A map will assist you in locating sampling areas. At the end of the season, you can map all of the areas sampled.

If you have a team of monitors, a map will also assist your team in deciding who will monitor where. Once you have your "team" together, print out a map so that you can mark which areas each volunteer is monitoring. Your team leader should keep the master copy of the map. It may be easiest to have volunteers monitor the areas by their homes or where they spend time on the lake. Assigning smaller (1/2 or 1-mile) stretches of shoreline per volunteer will be less overwhelming than monitoring larger areas of the lake.

You can get maps from your local DNR office, Fishing Hot Spots, fishing map books, etc. Basic lake maps can also be generated through the DNR web site: http://dnr.wi.gov/lakes/lakepages/search.aspx. Type in the name of the lake and choose the county, then click "search." Click on the lake name (if there are two or more lakes with the same name in the same county, select the lake you are after). This site will give you a plethora of information about your lake, but to find a map, scroll down to the map section and either click on "Contour (Bathymetric) Map" for a printable version, or click on "Interactive Map." The interactive map (in the Surface Water Viewer) allows you to add in "layers" such as invasive species or monitoring sites.

Mystery Snails Use a map source that is most convenient for you. Make sure the following information is on your lake map: lake name, county, sites monitored, date(s), volunteer(s), and any additional observations.

If you have a GPS unit, you may want to mark locations monitored and then load this data into a mapping program and print out locations of areas monitored.

REPORTING

What would all the work that goes into gathering accurate information be worth if others could not read, review and act on it? Reporting is one of the most important parts of monitoring for invasive species. Knowing where species are not, as well as where they are, is extremely important in being able to track and understand their spread. Knowing how often monitors are looking for species and what they are finding is very important information.

The DNR, lake managers, researchers, and others use the data that is reported through the CLMN to study lakes and better understand aquatic invasive species. The information reported by volunteers is also provided to the state legislature, federal, tribal and local agencies/organizations who in turn may use this data to help determine funding for invasive species grants and programs.

You can enter your monitoring results on the CLMN website: http://dnr.wi.gov/lakes/CLMN (click "Enter Data" on the left side bar). If you don't yet have a user id & password, click 'Request a Wisconsin User ID and Password'. Then email Jennifer at jennifer.filbert@wisconsin.gov with your User ID and what monitoring you are involved in. Jennifer will set up your accounts and email you back. Once you receive an email back, you can log in. Once you're logged in, go to the Submit Data tab and click "Add New" to start entering data. Choose the AIS monitoring project for your lake in the Project dropdown box.

- For prevention monitoring, report your results using the: Aquatic Invasives Surveillance Monitoring Report, Form 3200-133.
- If you find Chinese or banded mystery snails for the first time on your lake, report your results using the: Aquatic Invasive Animal Incident Report, Form 3200-126.

You can report your results as often as you wish, but be sure to at least report results once a year, at the end of the monitoring season. If you have any questions about reporting, contact your local DNR CLMN contact (page viii).

You should also provide your local CLMN contact with a lake map showing the location of the monitoring site(s). The mystery snail monitoring site(s), along with the names and addresses of the monitors, are maintained and updated periodically.

Remember, for tracking the movement of mystery snail infestations, a report of 'no mystery snails' at a location is just as important as finding mystery snails. One cannot confidently state that mystery snails are not present in an area if no one has looked.

What to do with Suspect Specimens

If you find what you suspect is a Chinese or banded 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 the pictures as well as the date, lake name, county and your contact information to Dr. Pieter Johnson (pieter.johnson@colorado.edu) with an email subject heading of "MYSTERY SNAIL". Dr. Johnson is working on mystery snail identification as well as mystery snail distribution in Wisconsin. Be sure to fill out the reporting form on the CLMN website: http://dnr.wi.gov/lakes/CLMN (click "Enter Data" on the left side bar).



PICTURE TAKING TIPS

- To reduce glare, take pictures of dry shells
- The marking of the shells shows up better in pictures if you take 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).
- Use large snails, small snails are hard to differentiate by picture alone. (If you only find small snails, see option 2).
- 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 (the underside and the topside of the snail). See the examples in the identification section.
- 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
 University of Wisconsin Madison Center for Limnology may
 need to see the shell. Dr. Johnson will email you back and let you
 know if he was able to do the identification via the pictures.



2. Place several snail shells in a ziplock bag and deliver them and a copy of a completed Aquatic Invasive Animal Incident Reporting Form, #3200-126 (found at the end of this section and at http://dnr.wi.gov/lakes/monitoring/forms.aspx) to your local CLMN contact. If there are still live snails in the shells when you collect them, freeze them first. 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.



PREVENTION STARTS WITH US

If you have an aquarium at home or your child brings home a snail from school, a lake, or a river, please do not release the snail into the environment. The snail could be an invasive species. Remember female mystery snails give birth to live young. So even adding one snail may cause problems.

Whether you are out monitoring, or just boating for fun, be sure to remove all aquatic plants and animals from boating equipment, including your trailer, boat, motor/propeller and anchor before launching and after leaving the water. Snails, mussels and other organisms are often found attached to plants that have been removed from boating equipment. By removing aquatic plants and animals from boating equipment and encouraging others to do the same, you can help protect Wisconsin lakes from Chinese and banded mystery snails.





Mystery Snail Control Options

Additional Sources of Information

References

REPORTING FORMS

AQUATIC INVASIVES SURVEILLANCE MONITORING REPORT

- SINGLE LOCATION, MULTIPLE DATES
- MULTIPLE LOCATIONS, ONE DATE

AQUATIC INVASIVE ANIMAL INCIDENT REPORT



CONTROL OPTIONS

There is no legal chemical control method for mystery snails in Wisconsin. Any chemical that has the potential to control Chinese and banded mystery snails would impact native snails, clams and other organisms and is illegal.

Some residents have raked mystery snails out of the lake from in front of their property. This is legal. The lake residents then took the snails and buried them so that the snails did not smell 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; please bury them away from the lake so that you are not impacting your shoreline area.

Additional Sources of Information

For more information on Chinese mystery snails, please refer to: http://www.gsarp.org/

References

Wood, W.M. 1892. Paludina japonica Mart. For sale in the San Francisco Chinese markets. Nautilus vol. 5, issue 10: pages114-115.

State of Wisconsin Department of Natural Resources Wisconsin Lakes Partnership

Aquatic Invasives Surveillance Monitoring End of Season Report

Form 3200-133 (02/10) Previously Form 3200-124

This monitoring is designed to help detect new invasive species on your lake, so DNR can be alerted and lake residents and/or professionals can respond appropriately. The purpose of the DNR collecting this data is to let us know what methods trained citizens and professionals use when actively looking for aquatic invasive species. You are often the ones to alert us of new invasives in our waters. Remember for surveillance monitoring, a report of "no invasive" at a location is just as important as finding an invasive. One cannot confidently state that the invasive is not present in an area if no one has looked and reported their findings. Knowing where invasives are not, as well as where they are, is extremely important in being able to track and understand their spread. Knowing how often monitors are looking for species and what they are finding is very important information.

Notice: Information on this voluntary form is collected under ss. 33.02 and 281.11, Wis. Stats. Personally identifiable information collected on this form will be incorporated into the DNR Surface Water Integrated Monitoring System (SWIMS) Database. It is not intended to be used for any other purposes, but may be made available to requesters under Wisconsin's Open Records laws, ss. 19.32 - 19.39, Wis. Stats.

Data Collectors							
Primary Data Collector Name			Phone Number	Emai	I		
Additional Data Collector Names	3			•			
Total Paid Hours Spent (# peopl	le x # hours each)		Total Volunteer Hours Sp	ent (# people x # h	ours ead	ch)	
Monitoring Location							
Waterbody Name	Township I	Name	County	Boat Landing (if	you only	/ monit	or at a boat landing)
Dates Monitored							
Start Date (when you first monite	ored this season)		End Date (when you last	monitored this sea	son)		
Did at least some data collectors	s monitor in May?	June? July? August	? (circle all that apply)				
Did you monitor			Did you				
All Beaches and Boat Landings?			Walk along the shoreline?				
Frequently Sor	ne of the Time	Not Often/Never	Frequently Sor	ne of the Time	Not	Often	/Never
Perimeter of whole lake? Frequently Sor	me of the Time	Not Often/Never	Observe entire shallow was Frequently Sor	\ .		,	/Never
Docks or piers? Frequently Sor	me of the Time	Not Often/Never	Use rake to extract plant samples? Frequently Some of the Time Not Often/Never				
			Check underwater solid s Frequently Son			-	ks)? 'Never
Other:			Other:				
Did you find(even if no	ot a new finding	g for the lake or st	ream)				
Banded Mystery Snail?	Yes No	Did not look for	Hydrilla?		Yes	No	Did not look for
Chinese Mystery Snail?	Yes No	Did not look for	Purple Loosestrife?		Yes	No	Did not look for
Curly-Leaf Pondweed?	Yes No	Did not look for	Rusty Crayfish?		Yes	No	Did not look for
Eurasian Water Milfoil?	Yes No	Did not look for	Spiny Waterfleas?		Yes	No	Did not look for
Fishhook Waterfleas?	Yes No	Did not look for	Zebra Mussels?		Yes	No	Did not look for
Freshwater Jellyfish?	Yes No	Did not look for	Other?:				

If you find an aquatic invasive

If you find an aquatic invasive and it is not listed at http://dnr.wi.gov/lakes/AIS fill out an incident report for the species. Then bring the form, a voucher specimen if possible, and a map showing where you found it to your regional DNR Citizen Lake Monitoring Coordinator as soon as possible (to facilitate control if control is an option).

If you don't find an aquatic invasive

If you submit your data online, that is all you need to do. Otherwise, please mail a copy to your regional DNR Citizen Lake Monitoring Coordinator. http://dnr.wi.gov/lakes/contacts

Aquatic Invasives Surveillance Monitoring

State of Wisconsin Department of Natural Resources Wisconsin Lakes Partnership

Form 3200-130 (R 2/10)

Multiple Locations, One Date

This monitoring is designed to help you detect new invasive species on your lake, so you can then alert the DNR and so lake residents and/or professionals can respond appropriately. The purpose of the DNR collecting this data is to let us know what methods trained citizens and professionals use when actively looking for aquatic invasive species. You are often the ones to alert us of new invasives in our waters. Remember for prevention monitoring, a report of "no invasive" at a location is just as important as finding an invasive. One cannot confidently state that the invasive is not present in an area if no one has looked and reported their findings. Knowing where invasives are not, as well as where they are, is extremely important in being able to track and understand their spread. Knowing how often monitors are looking for species and what they are finding is very important information.

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Aquatic Invasive Animal Incident Report

State of Wisconsin Department of Natural Resources Wisconsin Lakes Partnership

Form 3200-126 (R 02/10)

The purpose of this form is to notify DNR of a new species of AIS in a waterbody. Only use if you found an aquatic invasive species on a lake where it hasn't been found previously.

To find where aquatic invasives have already been found, visit: http://dnr.wi.gov/lakes/ais.

Notice: Information on this voluntary form is collected under ss. 33.02 and 281.11, Wis. Stats. Personally identifiable information collected on this form will be

		Open Records laws, ss. 1	9.32 - 19.39, Wis. Staf	its.
Primary Data Collec	tor			
Name			Phone Number	Email
Monitoring Location	n			<u> </u>
Vaterbody Name		Township Name	County	Boat Landing (if you only monitor at a boat landing
Date and Time of M				
Nonitoring Date	Start Time	End Time		
		Animal Found (Fill	out one form for	r each species found.)
Which aquatic invasive did	d you find? Zebra			ny Waterflea Freshwater Jellyfish
New Zealan	d Mud Snail Ba	anded Mystery Snail	Chinese Mystery	Snail Rusty Crayfish Red Swamp Crayf
Where did you find the inv	asive animal?			
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Measurements from		ive was found (opti		
Water Temperature	Degrees F / Degre	ees C (circle one)	Dissolved Oxygen (m	ng/l)
Estimated percent of	cover in the area	where the invasive	was found (optic	onal)
Substrate cobble, %		Substrate boulders, %	Substrate sand, %	Bottom covered with plants, %
f you found Zebra I	Mussel(s)			
Water depth where Zebra		Feet / Mete	ers (circle one)	Total Number of Zebra Mussels Found
Other:	Rocks Plants		Plate Sampler(s)	
Size of Largest Zebra Mus	sel Found	Size of Smallest Zebra in	Aussel Founa (Inaiviau	ual measurements on back of page)
Voucher Sample				
Did you collect a sample (voucher specimen) and	bring it to your local DNF	R office? If so, which o	office?
Rhinelander	Spooner Gree	en Bay 🗌 Oshkosh	Did not take sar	mple to a DNR office
Fitchburg	Waukesha Eau	ı Claire Superior	Other Office:	
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· ·			nExperts.pdf)	
(for list see http://dnr.wi.go	ov/invasives/aquatic/wha	attodo/staff/AisVerification	nExperts.pdf) Yes No	If no, what was it?
Statewide taxanomic expe (for list see http://dnr.wi.gc Was the specimen confirm Museum where specimen	ov/invasives/aquatic/wha	attodo/staff/AisVerification		If no, what was it? Museum Specimen ID:
(for list see http://dnr.wi.go Was the specimen confirm	ov/invasives/aquatic/whaned as the species indicular is housed:	attodo/staff/AisVerification cated above?		

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Length of Zebra or Quagga Mussels from Sample (if applicable)

If more than 20 zebra or quagga mussels are found, measure 20 mussels chosen randomly from the sample. If less than 20 mussels are found, measure all mussels.

Number	Length (mm)
1	<u> </u>
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	
13	
14	
15	
16	
17	
18	
19	
20	

Note: All initial discoveries should be placed in rubbing alcohol until verification by an expert is obtained.