

MAWQATMUTI'KW



INVASIVE SPECIES

The Chinese Mystery **SNAIL PROJECT** by SARAH KINGSBURY

A citizen science project to monitor the spread of Chinese mystery snails, an aquatic invasive species present in the Maritimes.

The Chinese Mystery Snail Project aims to get citizens involved in the monitoring of Chinese mystery snails. The Chinese mystery snail (*Cipangopaludina chinensis*) is a non-native, freshwater snail that can be found throughout North America. Non-native species that are invasive, meaning they negatively effect native species, are a risk to biodiversity. The origin and spread of Chinese mystery snails within North America has yet to be well documented which leaves invaded ecosystems at risk for decline in biodiversity. The Chinese mystery snail originated from central Asia and first arrived in North America in 1890. Since it's first establishment, the snail has spread west to east and south to north. Now Chinese mystery snails can be found in 32 US states and 7 Canadian provinces which include New Brunswick., Nova Scotia, Prince

Edward Island, and Newfoundland & Labrador.

The issue with current knowledge of Chinese mystery snails in North America is there exist some gaps in available literature. Despite Chinese mystery snails having been established in North America for over 100 years, little is known about this species. Some research has been conducted south of the border and there are a few Canadian studies, but, in general, there is a lot of missing information. Unfortunately, most of the available literature shows that Chinese mystery snails are negatively impacting invaded ecosystems. Citizen scientist can help protect their local aquatic environments from Chinese mystery snail invasion by checking freshwater bodies in the vicinity. With a larger database of identified invaded waterbodies, invasive species managers (e.g. Department of Fisheries and Oceans Canada) can focus their limited resources at containing those population from further spreading.

Chinese mystery snails threaten freshwater



Picture of Chinese mystery snail shells collected during the summer of 2018 taken by Danielle Boudreau. That summer Sarah Kingsbury surveyed multiple lakes (5) and found a living population of Chinese mystery snails in each lake. Currently, Chinese mystery snails have been documented in 14 Nova Scotian waterbodies, 5 in New Brunswick, and 1 in Prince Edward Island. The spread of Chinese mystery snails is likely greater than these documented populations but are under reported due to lack of knowledge and interest on the species.

aquatic biodiversity. Invasive species are the second largest threat to natural biodiversity. The first greatest cause to loss of biodiversity is habitat destruction by humans. Chinese mystery snails outcompete native mollusc species (e.g. native snail and mussel species) for available food and space resources. Additionally, Chinese mystery snails can alter foodwebs by changing the type and location of benthic nutrients (benthic means bottom dwelling organisms). Foodwebs are the ways in which energy is transferred via nutrition within an ecosystem. Chinese mystery snails can switch their method of nutrient uptake between grazing (consuming nutrients by

scrapping zooplankton of the sediment, plants, etc.) and filter feeding (consuming suspended nutrients by breathing water). When the snails over consume available food resources through grazing they shift the location of available resources from being substrate based (meaning that it would be available on the sediment for other native species to graze) to nutrients being suspended in the water column which favours species that filter feed. Chinese mystery snails can alter the type of nutrients available because the changes in environmental conditions caused by the snail encourage diatoms (simple microalgae) growth over other types of algae which is the

snail's preferred food. Chinese mystery snails impact foodwebs by placing more pressure on native snail species, causing some native snail species to panic and overeat. The Chinese mystery snails are more resistant to predation than native snail species and so, the chance of a Chinese mystery snail forcing out native species due to the effects they have on the food dynamics alone are pretty high.

Moreover, Chinese mystery snails effect water quality in two ways: (1) by increasing the amount of nitrogen and phosphorous concentrations and (2) by using calcium sources that would have otherwise been used by native species. Chinese

mystery snails excrete a relatively high amount of fecal matter (i.e. they poop a lot!) which leads to a change in the water chemistry by increasing phosphorous and nitrogen concentrations. Phosphorous and nitrogen are two key ingredients that contribute to algal blooms. High amounts of algae can lead to eutrophication (the process of algae over growth that depletes water oxygen concentrations and lessen the sunlight that leeches into the water column). Chinese mystery snails, like all molluscs, need calcium for shell development. This means that a large population of Chinese mystery snails can deplete the amount of dissolved calcium present for other species to use.

These snails are the reproductive bunnies of freshwater ecosystems! The establishment of a large population can start from one snail because female snails can have over 100 offspring per brood. Female snails have multiple broods over their life cycle (females can live for 5 years and males for 3 years) and they start reproducing at 1 year old. Compared to native snail species, Chinese mystery snails have a relatively high reproductive rate and have greater reproductive success. Native snail species lay eggs in jelly-like capsules left on reeds or other structured surfaces which leaves native snail broods more vulnerable than

Chinese mystery snail offspring that are born fully developed via live birth. A female Chinese mystery snail gives birth to live, full-developed offspring. Females carry multiple young at various stages of development. The female snail's uterus looks similar to a factory of reproduction. The offspring furthest from the uterine opening are only fertilized eggs (think human fertilized egg) and the offspring closest to the opening have full shells, tentacles, and even an operculum. An operculum is a shell feature of the Viviparidae (live bearing) snail family that functions like a trapdoor. In times of high stress, Chinese mystery snails can seal their shell shut, this is one of the many reasons why this species is so adaptable.

Chinese mystery snails are very resilient invaders, not only do they out-compete native species, change the water chemistry, and shift foodwebs in invaded ecosystems, but adult snails can survive for four weeks without water or food. Chinese mystery snails are not easily eradicated using traditional species management approaches such as culling (juveniles burrow into the sediment and are very difficult to find), chemical treatments (they can seal their shells), or by raising the water temperature (their thermal tolerance range is from 0-45°C).

The effects of Chinese mystery snails on human populations

is not well understood, but what is known is that Chinese mystery snails can have financial implications in terms of the public sector (industry) and private sector (tax dollars). They enter waterpipes and clog those water intake systems which can slow industrial productions or fallow agricultural systems. Also, the cost of eradicating or containing an invasive species is expensive. Much of the limited available funding for invasive species comes from tax dollars. The longer an invasive species is present without proper management (e.g. containment) the more expensive the management will be once finally implemented.

Also, there is an issue of labelling invasive species. Different groups, governments, and organizations have different definition for what species are labelled as "invasive" and which are not. Or, like in the case of the proposed Nova Scotia Biodiversity Act (Bill 116), there exists no definition at all. There are five stages to invasion: arrival, establishment, reproduction and spread, displacement native species, and ecosystem dominance. The Chinese mystery snail is in its third stage of invasion (reproduction and spread). The known population sizes do not appear to be large enough to cause native species displacement, but that is not to say that Chinese mystery snail

populations in Atlantic Canada are not negatively impacting invaded systems. Currently, Chinese mystery snails are not labelled as invasive in North America. Instead, Chinese mystery snails are labelled as a non-native or non-indigenous aquatic species. Considering all the aforementioned negative effects Chinese mystery snails have on native species, the Chinese mystery snail does meet the criteria for an aquatic invasive species. Department of Fisheries and Oceans Canada defines an aquatic invasive species as a non-native species that negatively impacts native species through out-competition of native species, habitat degradation or destruction, degradation of water quality, alteration to infrastructure, or creating financial implications.

Federal and provincial governments are struggling in the determination and separation of responsibilities when concerning aquatic invasive species. In Canada, Fisheries and Oceans Canada and Border Services Canada are responsible for the management of aquatic invasive species. A recent report on aquatic invasive species by the Office of the Auditor General of Canada found that both of these groups were not adequately meeting their goals for aquatic invasive species management and prevention. However, it is important to realise that these federal organizations

have been severely under-funded for many years. For example, Fisheries and Oceans Canada (DFO) just setup their aquatic invasive species section in late 2017 and since their conception in the Maritimes, DFO has been working in collaboration with the Saint Mary's University on the Chinese Mystery Snail Project (DFO is also involved in Chain Pickerel research done through Saint Mary's University). At the provincial level, the department of Fisheries handle aquatic invasive species prevention and management. Both DFO and the Nova Scotia Department of Fisheries are contributors to invasive species research.

Each person is responsible for the stewardship of their environment. Everything is connected and the issue of aquatic invasive species affects the population as a whole either the allocation of tax dollars spent on invasive species management or through the degradation of natural habitats caused by invasive species. Certain groups of people are more affected by aquatic invasive species than others. Indigenous culture and traditional diets depend on certain staple species whose populations may be in decline due to the presence of an invasive species (e.g. Atlantic Salmon). The Chinese Mystery Snail Project gives communities the opportunity to protect their aquatic environments from

another invader. Through the creation of citizen science groups, it is possible to quickly shift between invasive species to look for (or look for more than one species at a time). Invasive species were brought to North America via the Asian food markets and since have spread through boater transfers and aquarium releases. Therefore, it is the responsibility of society to protect natural biodiversity from invasive species.

Unfortunately, the funding needed to properly manage aquatic invasive species such as the Chinese mystery snail is not in place. It falls to the community to create a base of citizen scientists to monitor the spread of invasive species and to educate the public about invasive species, their implications on the environment, and how to prevent the spread of invasive species.

The Chinese Mystery Snail Project uses citizen scientists to report Chinese mystery snail presence and absence in freshwater bodies. The data collected on Chinese mystery snail occurrence is available to the public and Sarah Kingsbury, a Saint Mary's University graduate student, offers free public lectures in Nova Scotia, New Brunswick, and Prince Edward Island. To get involved in the project visit the projects website at <http://bit.do/mysterysnails>.

OUR CONNECTION

"When the Well is Dry, We'll Know the Worth of Water."

– *Benjamin Franklin*

WE CELEBRATE WATERS DAY ON 22ND MARCH every year. As we all know, no one can live without water and this is the first need of any living being. We should understand the importance of water in our life, nature, and the future. So, save the water, don't waste it.

MAWQATMUTI'KW (*We All Live Together*) is a journal published jointly by IKANAWTIKET Environmental Incorporated* and the Maritime Aboriginal Aquatic Resources Secretariate (MAARS). Mawqatmuti'kw is produced and available to donors, sponsors and citizens interested about Mother Earth and efforts made to learn and respect our living environment.

Mawqatmuti'kw is also produced to feature articles and information about MAARS work to promote knowledge about aquatic resources, ocean management, communal commercial fisheries, collaborative partnerships and governance.

Publisher

IKANAWTIKET Environmental Incorporated and Maritime Aboriginal Aquatic Resources Secretariate (MAARS)

Editorial Committee

Roger Hunka, Anna Nibby-Woods, Rebecca Hunka, Joshua McNeely.

Address

IKANAWTIKET

PO Box 1515

Truro, NS

B2N 5V2

Tel: 902 895-2982

Fax: 902 895-3844

E-mail: contact@ikanawtiket.ca

Web: www.ikanawtiket.ca



MAARS

172 Truro Heights Road

Truro Heights, NS

B6L 1X1

Tel: 902 895-2982

Fax: 902 895-3844

E-mail: frontdesk@mapcorg.ca

Web: www.mapcmaars.ca

Layout & Design

Nibby Graphics

annamnibbywoods@gmail.com

Subscription

Free on request in hard copy or you can download a high definition digital format on-line.

Disclaimer

The views expressed and the information shared herein reflect those solely of the writers and do not necessarily attest to accuracy or represent the views of IKANAWTIKET or MAARS, or any sponsors, advertisers or persons affiliated or associated with the producers of Mawqatmuti'kw.

Editorial Contributions

The publisher welcomes articles.

Use of Articles

Articles written by our staff may be reproduced with appropriate acknowledgement to Mawqatmuti'kw with proper citation [*IKANAWTIKET & MAARS, Mawqatmuti'kw, date, issue*]. All other articles, materials, art, photographs, drawings may not be reproduced without prior written consent of the appropriate author.

Front Cover Credit

PHOTO CREDIT: Tom Harkness ASF. Head shot of a mature male Atlantic salmon. Notice the large, pronounced hook in the lower jaw, known as a kype. Only mature male salmon develop this feature.

IKANAWTIKET

environmental respect l'environnement

The objective of IKANAWTIKET Environmental Incorporated is: to promote the preservation of the natural environment by educating and informing the public about environmental issues, biodiversity in the Maritime Provinces, Aboriginal culture, Aboriginal worldview, and traditional knowledge in relation to the environment.

IKANAWTIKET advances education by undertaking research which is made available to the public, providing training and instruction, offering courses, seminars, convening conferences, meetings and developing educational tools related to understanding and respecting the environment.

The charitable work of IKANAWTIKET Environmental Incorporated benefits the community by preserving and protecting the environment through the preservation, protection, and restoration of habitats, and increasing the public's understanding about the environment and its importance to all life.

"Is controlling nature worth destroying our environment and our biodiversity, killing our young, and poisoning our food, water, and air?"

IKANAWTIKET
Environmental
Incorporated

*Canadian Charitable Registration
Number 85219 3465 RR0001

www.ikanawtiket.ca

