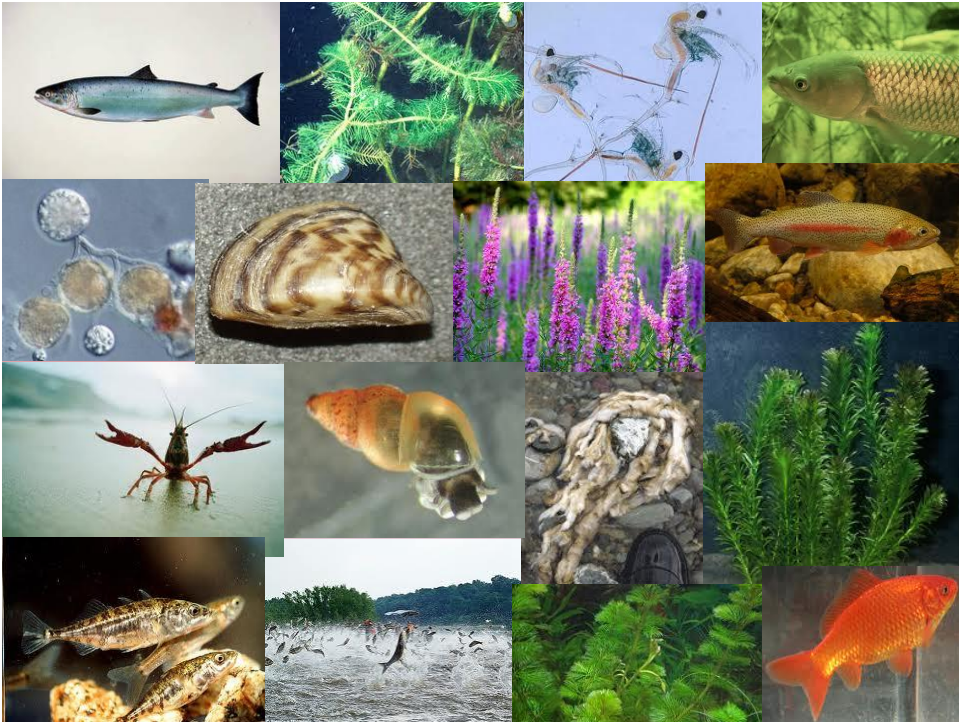


# Aquatic Invasive Species



It's a small world after all.

presented by Maria Leung





# Northern Snakehead

*Channa argus*




[www.fish.state.pa.us/water/fish/snakehead/snakehead.htm](http://www.fish.state.pa.us/water/fish/snakehead/snakehead.htm)



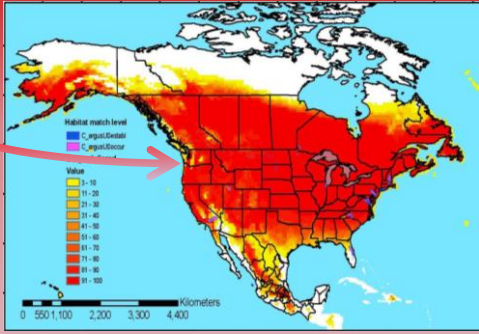
[www.aquariumdomain.com](http://www.aquariumdomain.com)

- obligate air-breather
- overland migration possible but limited
- 1300 to 1500 buoyant eggs per spawn
- grows up to 1.8m
- lives up to 15 years

### Potential distribution of Northern Snakehead in North America



Native distribution of northern snakehead (Channa argus)



Habitat match level

- C. argus/Channa
- C. argus/Channa

Value

- 0-10
- 11-20
- 21-30
- 31-40
- 41-50
- 51-60
- 61-70
- 71-80
- 81-90
- 91-100

0 550 1,100 2,200 3,300 4,400 Kilometers

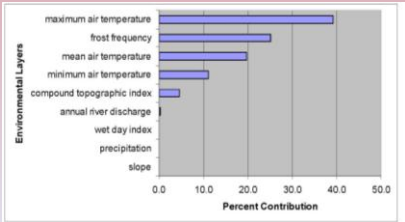
**Source of Introduction**

- live food market

**Potential Damage**

- eats native species including fish
- outcompetes native fish for food resources

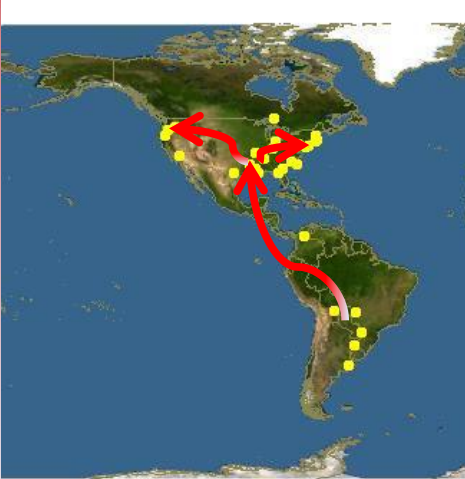
Cudmore and Mandrak 2006




Environmental Layer	Percent Contribution
maximum air temperature	~40
frost frequency	~30
mean air temperature	~25
minimum air temperature	~15
compound topographic index	~10
annual river discharge	~5
wet day index	~5
precipitation	~5
slope	~5

## Fanwort

*Cabomba caroliniana*



www.discoverlife.org



www.fallingwaterdesigns.com

**Source of introduction**

- aquarium trade
- aquatic plant nurseries

**Potential Damage**

- shades out native plants
- accelerates eutrophication
- reduces aesthetic value of landscape

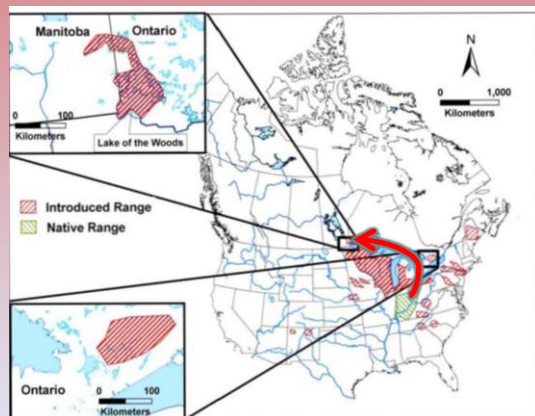
## Rusty Crayfish

*Orconectes rusticus*

- up to 200 eggs carried by females
- maternal care of offspring
- can move 100m per day
- densities of 60 per m<sup>2</sup> or more



Peters and Lodge 2010



Philips 2010

Source of introduction

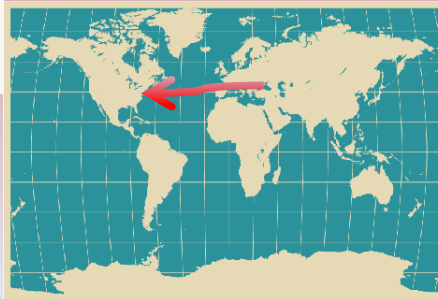
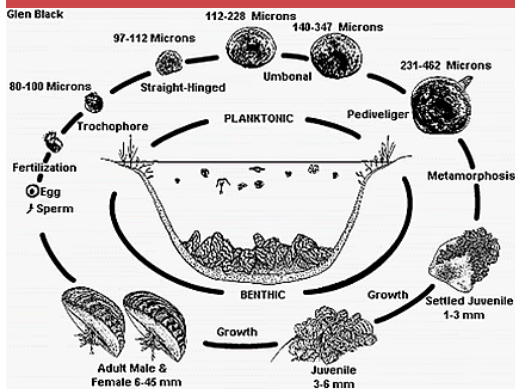
- live bait
- aquaculture, pet trade

Potential Damage

- eliminates macrophyte beds
- outcompetes native fauna for food

## Zebra Mussel and Quagga Mussel

*Dreissena polymorpha* & *Dreissena bugensis*



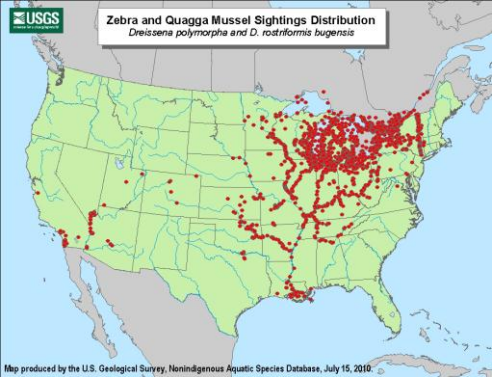
- up to 1,610,000 eggs per female/year
- up to 800,000/m<sup>2</sup>

Source of Introduction

- probably ballast disposal
- subsequent spread by watercraft, gear



www.pikemasters.com



Potential Damage

- outcompetes native fauna
- infests unionids
- reduces phytoplankton
- "biofouling"



www.fishbase.org

## New Zealand Mud Snail

*Potamopyrgus antipodarum*

- solid operculum resists digestion
- average 230 juveniles per female
- females brood offspring
- up to 6 generations a year
- populations in invaded regions are entirely female



www.zimodan.edu/sums/



Distribution of NZMS snail genotypes in introduced range. Modified from Fromme & Dybdahl 2006, J Evol Biol.



www.cfr.pdx.edu

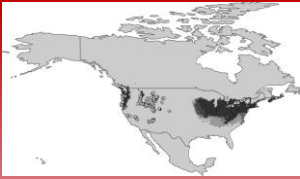
- densities as high as 500,000 m<sup>2</sup>

### Source of Introduction


- probably ballast
- subsequent spread by:
  - watercraft, fishing gear,
  - aquaculture products,
  - aquatic ornamental plants,
  - birds and fish

Potential Damage


- outcompetes other invertebrates
- inferior food for salmonids



Loo et al. 2007



www.seagrant.umn.edu

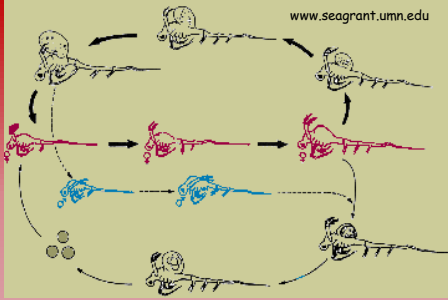


Suggested citation: Benson, A. J. 2011. New Zealand mudsnail sightings distribution. Retrieved 3/11/2011 from newzealandmudsnaildistribution.aspx.

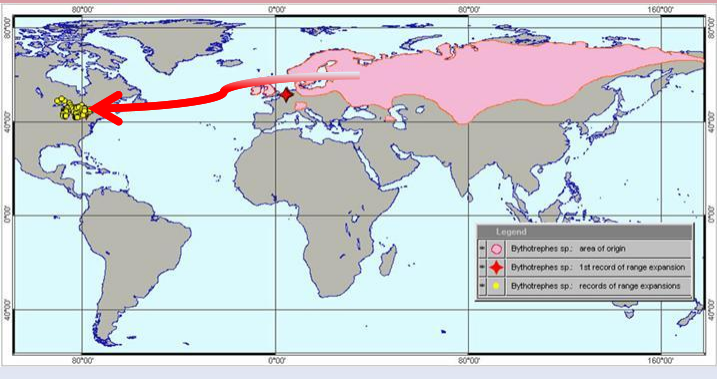
### Spiny Water Flea

*Bythotrephes longimanus*

- maturity at 11 days
- carnivorous
- variable size of neonates

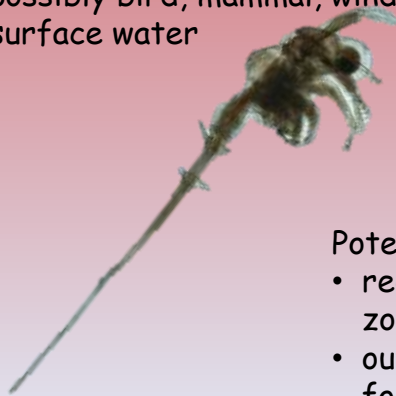


www.seagrant.umn.edu



www.vilaslandwater.org

- Source of Introduction
- probably ballast initially
  - contaminated equipment
  - assisted travel in digestive tract of fish
  - possibly bird, mammal, wind and surface water



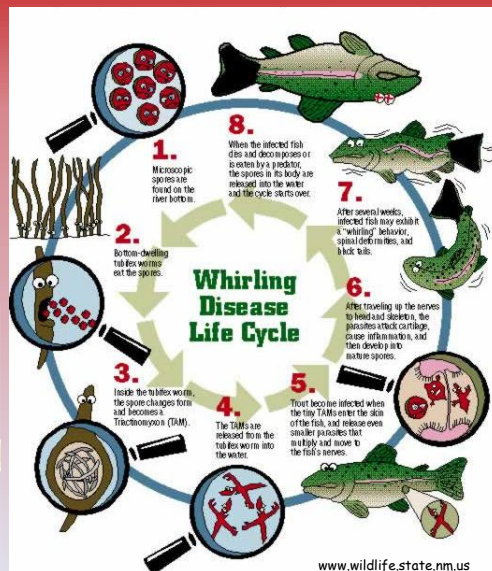
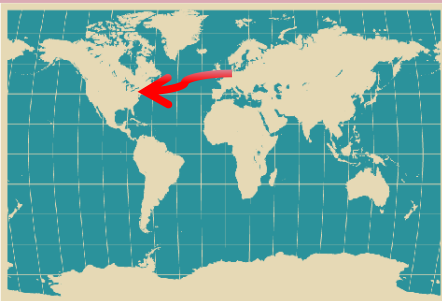
www.mass.gov

Potential Damage

- reduces abundance of native zooplankton species
- outcompetes native fauna for food including small fish


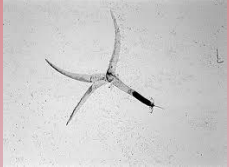


*Myxobolus cerebralis*

- causes whirling disease
- myxospores survive temperatures of -20°C to 60°C
- myxospores are suspected of retaining infectivity for decades



**Source of Introduction**

- infected hatchery fish
- subsequent spread by people and wildlife, boating and fishing equipment







**Potential Damage**

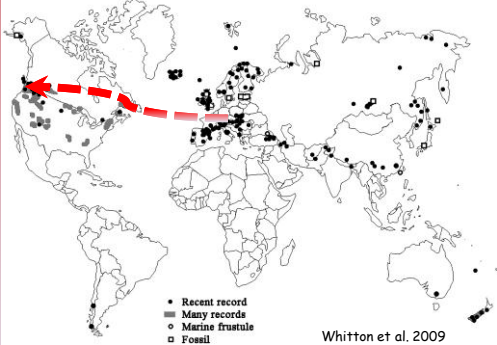

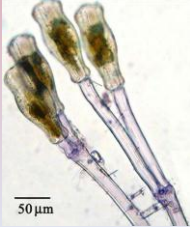
- reduced population of rainbow trout and other salmonids

**Didymo (rock snot)**  
*Didymosphenia geminata*

- thick interwoven structure persists after cells die
- in Alaskan fossil record

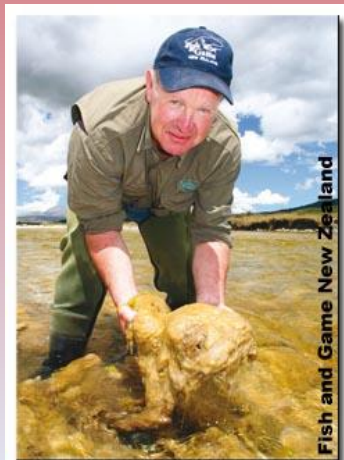


*"The best invasives are ugly and prolific."*  
Al von Finster 2011

### Source of Introduction

- contaminated equipment
- domestic and wild animals



### Potential Damage

- reduced aesthetic value of rivers
- outcompetes other algae

*...the current approach to alien species prevention and control in the US is still a patchwork of inadequate policies that are poorly coordinated; focused on species rather than vectors; slow; largely reactive rather than proactive... (Strayer 2009 Twenty years of zebra mussels: lessons from the mollusk that made headlines)*

