Biological Control of the invasive New Zealand Mud Snail: Is it possible?

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The New Zealand Mud Snail
*Potamopyrgus antipodarum*

- Why is it a problem?
- Is bio control an option?
The New Zealand Mud Snail

- Invasive species (where and when)
  - USA, Europe and Australia
  - First discovered in US at Idaho’s Snake River in 1987

- Densities often reach > 40,000 individuals per m²

- High temperature and salinity tolerance
Why is *P. antipodarum* a problem?

- One female snail is all it takes to establish a colony (20-120 embryos per female)

- Self-reproducing (just one can start a new colony)
- Can reach densities of >500,000 per square yard
- Crowds out aquatic insects and other species that provide food for trout
- Easy to spread by accident
New Zealand Mud Snail’s promising natural enemy: *Microphallus sp.*

- Life cycle of parasite involves only one intermediate host
- High host specificity
- No pathogenicity on the vertebrate host

http://www.indiana.edu/~curtweb/Research/About%20Microphallus.html
Eggs released and consumed by snail

Asexual Reproduction of larval stages and encysting in snail

Ingestion of snail by final host

Adult Microphallus in duck intestine

Eggs released and consumed by snail

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Life Cycle of *Microphallus sp.*

- Adult life stage in duck does not harm duck
- Adult *Microphallus* is hermaphrodite reproducing sexually.
- Eggs are released through duck’s feces.
Asexual Reproduction of larval stages and encysting in snail

[Larval cyst (Microphallus)]

Adult worm (Microphallus)

http://www.indiana.edu/~curtweb/Research/About%20Microphallus.html
This summer

- Examine the relationship between shell length and body mass on preserved snail samples previously collected from throughout New Zealand

- Calculate biomass of native sites
Average Weight vs. Length

Average weight in mg vs. Length in mm
Continued Research

- Raise local invasive NZMS
- Infect them with parasitic trematode
- Calculate the biomass of NZMS populations and the effect of *Microphallus sp.* on the reproductive output and population biomass
- Effect of trematode on other Hydrobiidae in affected areas.

http://www.sunsite.ualberta.ca/Projects/Aquatic_Invertebrates/thumbnails/tPlate14.1.jpg
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- Julio Lorda
- Ryan Hechinger
- UC Leads
- CNSI- Thank you Ofi and Eric!
What is bio control?

“The intentional introduction of an exotic, usually co-evolved, biological control agent for permanent establishment and long-term pest control” (Eilenberg et al 2001).
Microphallus sp. Life Cycle

Ingestion (of snail) by final host

Asexual Reproduction of Larval Cysts (in snail host)

Sexual reproduction

Eggs (released from host)

Ingestion by snail

Adult worm (in final host)
Bio control of Potamopyrgus antipodarum?

1. Measuring snails to calculate logistic regression between size and infection status. Data will also be used for future morphological studies.

2. Calculating length and weight relationships to quantify the effect of parasitism at the population level.

3. Quantifying the snail allocation to shell and soft body tissues through step 2.
What is bio control?

Dissect snails and identify:
- Length to Weight relationships.
- Allotment to shell development.
You could have this picture when you explain that this snails are parthenogenic and say that females clone themselves and produced this cute little crawl away young.

Julio Lorda, 7/9/2009
What is bio control?