Margaritiferid Culture

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Family Margaritiferidae
Distribution of Margaritiferidae

http://mussel-project.uwsp.edu/publ/p/grano_salis/margaritiferidae.html
Working with *M. falcata*: where to start...

European research, primarily with *Margaritifera margaritifera*

1989 Buddensiek ‘sheet cages’

1990- Hruska, static boxes

Labor intensive
Utilize in situ conditions

2012 and 2013 cohorts of *M. falcata*

- To produce juveniles
  1) for toxicology work
  2) for culture method development

- South Fork, Eel River, California
  water temp 9-13°C early May

- Inoculation on Rainbow trout
  (*Oncorhynchus mykiss*)

- Fish kept at 11° to 15°C
Margaritifera falcata conglutinates, Jeanette Howard
Conglutinates of eggs containing mature larvae, released at 13°C
M. falcata and M. margaritifera larvae grow from ~65 µm to ~300 µm during encapsulation.
The larva looks like a glochidium, but it is not...
Growth of encapsulated *Margaritifera falcata*
Margaritiferidae

Primary larva (1) grows by inflation of dorso-lateral lobes to become secondary larva (2).

Secondary larva metamorphoses to juvenile (3), which grows by accretion at shell margin.
Larvae recovered from host gills at 4-5 days post-inoculation
Cuticle of secondary larva is initially uncalcified.

- 2 weeks
- 3 weeks
The cuticle calcifies, but remains very fragile...
Secondary larval shell with weak attachment to accreted juvenile shell
Culture techniques
‘Mucket Buckets’

Sediment-free mucket buckets:
  too dynamic

500 juveniles / cup

150µm nitex screen

Terminated after 3 weeks
Hruška sediment culture

- 1-L plastic boxes
- 20mL sieved fresh sediment (<150 µm)
- 500mL food water ~18-20°C
- 4 drops Nanno + 120 µl SFD per 10 L H2O
- 8 drops Nanno + 240 µl SFD per 10 L H2O

Eybe, T., Thielen, F., Bohn, T., & Sures, B. (2013). The first millimetre-rearing juvenile freshwater pearl mussels (Margaritifera margaritifera L.) in plastic boxes. Aquatic Conservation: Marine and Freshwater Ecosystems, 23(6), 964-975.
Weekly media change

- Sediment loosened with pipette
- All media sieved through 150µm screen
- Juveniles counted/measured
- New food water, new sediment
- Juveniles replaced
Growth in sediment

*M. falcata* size (mm)
mean +/- 95% CI, maximum - minimum

![Graph showing growth in sediment with *M. falcata* size over weeks.](image-url)
Growth comparison

*M. falcata and M. margaritifera* growth comparison

Culture 0-9 months, Eel River, 4, 5 and 8 years (from Howard and Cuffey, 2006)
Growth comparison

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Selheim, 2011 in Gum et al. 2011

Preston et al. 2005

Spisar 2007, in Gum et al. 2011

Selheim, 2011 in Gum et al. 2011

Lange, 2005 in Gum et al. 2011

Preston, et al. 2005
Results

- 2012
  - 4000 juveniles produced
  - For toxicology
  - Stage 1 culture successful

- 2013
  - 30,000 juveniles produced
  - For toxicology
  - Many lost in culture
    - ~1000/25,000 remained at 3.5mo
• *Margaritifera marrianae* (Alabama pearlshell)

• Static sediment boxes
  • 600mL pond water
  • 10-25 g of fine sediment
  • 53,000 cells/mL Shellfish Diet 1800 and 906,000 cells/mL Nanno

• Switched to twice weekly water and sediment changes, and survivorship improved, though growth slow

• Slow growth and total mortality in mucket buckets

Rearing Margaritifera margaritifera in Luxembourg
Eybe, Thielen et al.  > 1mm juveniles
Eybe, Thielen et al.  

6-8 mm growth in 1 year
Rearing procedure

Step: Growing juvenile mussels

1. Juvenile *M. m.* (+/- 400μm)
   - 500 ml Detritus box / until 1mm is reached

2. 20,000 ml Sand Aquaria / until 5-10 mm are reached

3. Gravel box in artificial stream in rearing facility / until 20 mm are reached

4. Gravel box in rearing channel outside / until 30-40 mm are reached

5. Release with tag in river of origin
Hruška sediment culture - summary

• Moderately successful for early stages (stage 1) (~3 months/1-2mm)

• Possible low DO at sediment interface?

• Inadequate food levels?

• Labor intensive for large numbers

• Temperature considerations and

• Laboratory space
Next stage culture methods


The MUSSEL project. [http://mussel-project.uwsp.edu/](http://mussel-project.uwsp.edu/)
Questions?