SNAIL MANAGEMENT IN CULTURE PONDS

ROLE IN LIMITING GRUB ISSUES
BIOLOGICAL PROFILE

• Internal parasites (endoparasites)
• Varying size, shape, and habitat
• Complex life cycles
  • involving several hosts
  • both sexual and asexual reproduction within these hosts
• Actively or passively invade
EFFECTS

- Most grubs not a serious threat to fish health
- Presence undesirable
  - Anglers
  - Producers
  - Consumers
LOCATED IN MIDWEST

- Commonly seen in ponds
  - Black grub (*Uvulifer ambloplitis*)
  - White grub (*Posthodiplostomum minimum*)
  - Yellow grub (*Clinostomum complanatum*)
GENERIC LIFE CYCLE

- Bird (definitive)
- Snail (first intermediate)
- Fish (second intermediate)
BLACK GRUB

- **Black spot disease**
  - Pinhead-sized spots
    - 2 mm, 2/32 in
    - skin, tail, fins, musculature
  - Effected species
    - Sunfish (*Lepomis* spp.)
    - Black bass (*Micropterus* spp.)
    - Crappie (*Pomoxis* spp.),
    - Yellow perch (*Perca flavescens*)

Live in fish for 4 years
EFFECTS

Undesirable appearance

Photo credit: Parasite and Disease Section, Dept. of Fisheries and Allied Aquacultures, Auburn University

Photo credit: Michigan Department of Natural Resources
WHITE GRUB

• Often overlooked by both anglers and producers
  • Size (1 mm or 1/32 inch)
  • Location (kidneys, liver, heart)

• Pond strains
  • *P. minimum centrarchi* (sunfish)
  • *P. m. minimum* (minnows)
EFFECTS

Photo credit: Andrew J. Mitchell, USDA/ARS, Stuttgart, AK
YELLOW GRUB

• Common parasite in North America
  • Size (3 to 8 mm or 1/8 to ¼ inch)
• Visible after skinning or filleting
• Affect
  • Intermuscular (in the muscle)
  • Subcutaneously (under the skin)
  • Capable of infecting all freshwater fish
EFFECTS

• Both anglers and consumers do not accept fish because of unsightly appearance

Photo credit: Bill West, Blue Iris Fish farm
PREVENTION

• Limit initial grub infections
  • Infected fish cannot be treated
  • Grubs live in fish for years
  • Control at this point would serve to prevent further build-up
• Break the cycle (snail or birds)
SNAIL PREVENTION

Physical

• Remove vegetation
• Use of approved herbicides to control both algae and vascular plants
• Awareness of possible low oxygen related to decaying vegetation and warm water temperatures
BIRD PREVENTION

• Migratory Bird Treaty Act

• Environmentally sound solutions
BIRD PREVENTION

- Netting, wire grids, fencing
  - high cost, maintenance, harvest interference
- Noise-making devices
  - propane cannons, cracker shells
- Visual devices
  - “eye-spot” balloons, remote-control boats and planes, scarecrows
- Large active dogs highly recommended
BIRD PREVENTION

U.S. Fish and Wildlife Service (US-FWS)

- Issue depredation permits after assessing damage
- Remove limited amount of fish-eating birds from specific facilities
- Permits are tightly controlled (Migratory Bird Treaty Act)

USDA/APHIS/Wildlife Service
BREAKING UP THE LIFE CYCLE

PHYSICAL
PHYSICAL MEANS

- Aquatic plant and algae control
  - Removes detritus material for snails to live
- Drying pond bottoms
  - Use of lime
  - Delays culture season
  - Only limits the onset not the actual occurrence of snails
- Use of flow (Blue Iris Farm)
  - Use of pond-side tanks with flow to limit infestation
BREAKING UP LIFE CYCLE

CHEMICAL
CHEMICAL

• Bayluscide™
  • Not approved for food dish
• Copper sulfate with citric acid
  • Combination of copper sulfate and citric acid along pond shore line
    • Eliminated >97% of planorbid snails
  • Uniform copper sulfate application
    • 2.5-5.0 ppm of copper sulfate effective (CC ponds)
    • Higher level may have affected fish health
      • Some species will be killed
    • Study site had >200 ppm alkalinity and hardness
• Possible water quality problems
  • Effect on zooplankton populations
  • Low dissolved oxygen
  • Toxicity of copper to specific fish species
  • Needed awareness of the total alkalinity level
CHEMICAL

- Hydrated lime
  - Similar results as copper sulfate
  - Snails can burrow away from treatment
  - High pH effects
  - Expensive
    - Can be ~$300/acre
CHEMICAL

• NCRAC project
  • Investigated chemical, biological and their combination period
    • Chemical (SIU-C)
      • Hydrated lime
      • Due to pond mixing, settled lime mixed with water column resulting in high pH levels
      • Ponds treated with hydrated lime at 70 lb/10 ft of shoreline in a 3.3-ft m swath
        • 99% estimated reductions in snail densities following application, but snail populations rebounded to previous levels within 2 months
    • Chemical, biological and combination effective
BIOLOGICAL BREAKING UP LIFE CYCLE
BIOLOGICAL

- Supplemental stocking of snail predators
  - Redear sunfish (shellcracker)
    - Good snail consumption but limited by mouth gape
    - >4 inch avoid snails > ½ inch
    - Effective in controlling Physa but not rams-horn snails until fully mature
    - Limited by cold climates

[Image of a fish and a map showing the distribution of Lepomis microlophus]
BIOLOGICAL

- Hybrid redear sunfish (reedar x green sunfish)
  - Larger mouth gape
  - NCRAC Project (Southern Illinois University-Carbondale)
    - 4.7 – 5.5 TL consumed Physa and Planorbellla up to 12.0 mm (0.5 in) total length; redear sunfish in this size range only consumed snails <0.4 inch total length.
    - Maximum consumption rates equivalent to those of similar size redear sunfish.
  - Stocked 4 redear sunfish and 4 hybrid redear per acre
  - Reduced snail populations over the culture period
BIOLOGICAL

- NCRAC Project (UW-Stevens Point)
  - Use of crawfish resulted in 18-43% fewer grub infestations in yellow perch over 2 years
  - More time needed for complete snail elimination
  - Only 2-12% of snails actually infested yellow grub parasite
OTHER POSSIBLE PREDATORS

- Black carp
  - Exotic, illegal
- Blue catfish
- Freshwater drum
- Freshwater prawns
  - NCRAC (Southern Illinois University-Carbondale)
    - Freshwater prawns showed a strong preference for consuming Physa over Planorbella
SNAIL SPECIES AND SIZE PREFERENCES
FRESHWATER PRAWN

![Graph showing the percent eaten of Physa and Helisoma snails by freshwater prawn as a function of snail length.]

Source: Greg Whitlege, Southern Illinois University-Carbondale
INFORMATION

• **NCRAC site**
  - Grub ID
    - [http://www.ncrac.org/node/633](http://www.ncrac.org/node/633)
  - Literature review
  - Technical Bulleting #115
  - Aquatic plant management
    - [http://www.ncrac.org/node/631](http://www.ncrac.org/node/631)
  - Termination report
  - Wisconsin study
CONCLUSIONS

• Prevention when possible
• Use care in use of chemical controls
• Consider use of biological controls for long-term controls
Joe Morris
Telephone: 515-294-4622
email: jemorris@iastate.edu
Web site: http://www.public.iastate.edu/~jemorris/