Previous Work on the Culture of the Cocahoe Minnow *Fundulus grandis*

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1930s: freshwater baitfish production trials started
1940s: first baitfish farm started in Arkansas
1960s: start of marine aquaculture in U.S.
1970s: research on Gulf killifish culture in Alabama
1980s: research expanded to Texas and Louisiana
1990s: drop in research on Gulf killifish
2000s: resurgence on Gulf killifish research
Claude Peteet Mariculture Center
1975 – 1988

Texas A&M
1982 – 1992

Louisiana State University
1980s-90s; 2008 - present
Several species of saltwater and brackish water baitfish species have been considered for aquaculture.

The cocahoe minnow *Fundulus grandis* shows the greatest potential and has received the most study.

The cocahoe minnow is an excellent live bait for flounder, speckled trout and red drum.

Currently bait dealers rely on trapped wild stocks.
Positives and Negatives

Cultured vs Wild Caught Cocahoe Minnows
Wild Caught Minnows: Negatives

- Seasonal availability (erratic supply)
- Running traps is labor intensive and takes time
- Fish captured are variable in size
- Survival is poor due to injury during trapping and parasites and diseases that are common in wild fish.

*Streptococcus* infection
Wild Caught Minnows: Positives

• Low cost
  – Boat
  – Traps
  – Holding tank or Net pen
  – Salt water supply
Cultured Minnows: Positives

• Unlimited supply of high quality product for distribution.
• Uniform size (makes it easy to sell by weight)
• High survivability (in transport, in the bait shop, and on the hook)
• High health fish (diseases are eradicated or controlled in the hatchery and grow out)
Cultured Minnows: Negatives

• Production costs
  – Outdoor Pond Culture
    • Land and Pond Construction
    • Feed
  – Indoor Tank Culture
    • Tanks
    • Pumps
    • Filters
    • Electricity
    • Feed
Biology

• The cocaehoe minnow belongs to the family *Cyprinodontidae*, is an egg layer, and is known regionally as Gulf Killifish, Bull Minnow, Mud Minnow or Cocahoe Minnow.

• The body is torpedo shaped and at a length of 3 inches the male and female are easily distinguished from each other
  – Males: colorful with iridescent green, yellow, blue and red spots
  – Females: Uniform drab grey-grey-green color
Biology cont.

• Natural Range: St. John’s River, Florida to Veracruz, Mexico along bay shores and tidal marshes.
• Salinity Range: 0-40 ppt
• Temperature Range: 32°F (0°C) – 94°F (35°C)
• Maximum size: Approximately 7 inches
Spawning and Egg Production

• Occurs over and extended period from early March to mid-September with two peaks, spring (March-April) and fall (August-September). The spring spawning is much more intense.

• Egg production is generally low when compared to fresh water baitfish such as the golden shiner, goldfish and fathead minnows.
Egg Production cont.

• A 3 inch cocaohoe minnow will carry approximately 650 mature and developing ova in a single ovary.

• In aquarium studies 10-12 gram females deposit around 20 eggs/day/female (3 day cycles).

• Egg hatching occurs in 3 weeks at 68°F (20°C) and in two weeks at temperatures of 77°F (25°C).
• Early research on pond spawning and rearing done at the Claude Peteet Mariculture Center, Gulf Shores, Alabama by Tatum, Hawke, Minton and Trimble 1979-1985.
• Research on pond culture using fertilization methods Strawn, Waas, Pershbacher, Texas A&M University, 1981-1983.
• Culture in recirculating systems – Peterman et al. Mississippi State University, 2002.
• Tank and pool culture - LSU Aquaculture Research Station, LSU Ag Center, 2006 to present.
Pond Spawning

• Pond spawning trials in Alabama (CPMC) were able to achieve ~ 8 eggs/day/female over a 30 day period = 240 eggs/female on cured Spanish moss mats. Ponds 10-12 ppt salinity.

• Explanation for low numbers:
  • brood fish consume a portion of eggs
  • Competition for spawning sites
  • Eggs not being deposited on the mats
  • Eggs are adhesive when first deposited but as they mature they lose adhesiveness and can fall through or off the mat.
Pond Spawning cont.

- Stocking Rate 10,000 fish /acre (ponds 0.2-0.5 acre).
- 2:1 ratio females to males
- Stock before water temps reach 59°F (15°C )
- Broodstock fed a high quality ration (32% protein) at 5% body weight per day.
- Eggs are collected on mats constructed of cured spanish moss sandwiched between 2 in. x 4 in. mesh, vinyl coated wire or plastic. (rectangular 2 ft x 4 ft and 2 in. thick)
Pond Spawning cont.

• Mats are placed around the shallow edge of the pond (@100 per acre) about 6 inches deep.
• Mats should be in place when water temperatures reach 64°F (18°C) and are left in the pond for 7-12 days depending on rate of egg deposition.
• As mats are removed they are replaced with new mats.
Hatching Ponds

• As mats are removed from spawning ponds they are placed in 0.2 to 0.5 acre Phase 2 hatching ponds
• Hatching ponds are stocked with 500,000 to 1 million eggs/acre collected over a 10-12 day period to ensure all fry are similar in age.
• Hatching ponds are prepared in advance by filling to 1/3 capacity and fertilizing with organic and inorganic fertilizers 2 wks prior to stocking to promote plankton blooms.
• This provides a first food for newly hatched fish.
• Treatments to kill predaceous insects
Production Ponds

• Production ponds (Phase 3) are stocked at 100,000/acre for fast growth or 200,000/acre for reduced growth.
• Ponds are harvested when the average weight of minnows is in the range of 4 grams (113/lb)
• Production in crop 1 (June – July) Crop 2 (June - September) crop 3 (overwinter).
• For winter culture ponds should be covered with netting to prevent bird predation.
Aquarium or Tank Spawning
Tank Spawning

- 500-gallon pools
- 25 lbs salt per pool
- mats harvested 3d
- 2:1 sex ratio F:M
- 20, 40, 60 females
- synthetic substrate
- shade cloth (varying %)
Tank Spawning

Season avg:
- 20 females (3 tanks) • 36,003 eggs
- 40 females (3 tanks) • 48,770 eggs
- 60 females (3 tanks) • 52,386 eggs
- 360 females: • 384,229 eggs
References

• Cocahoe Minnow Production Manual

• Intensive (Non-pond) Culture of Gulf Killifish
  https://srac.tamu.edu/index.cfm/event/getFactSheet/whichfactsheet/267/

• Growing Bull Minnows for Bait
  https://srac.tamu.edu/index.cfm/event/getFactSheet/whic hfactsheet/149/