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

Pre-1950's	1950's	1960's	1970's	1980's	1990's	2000's	Present

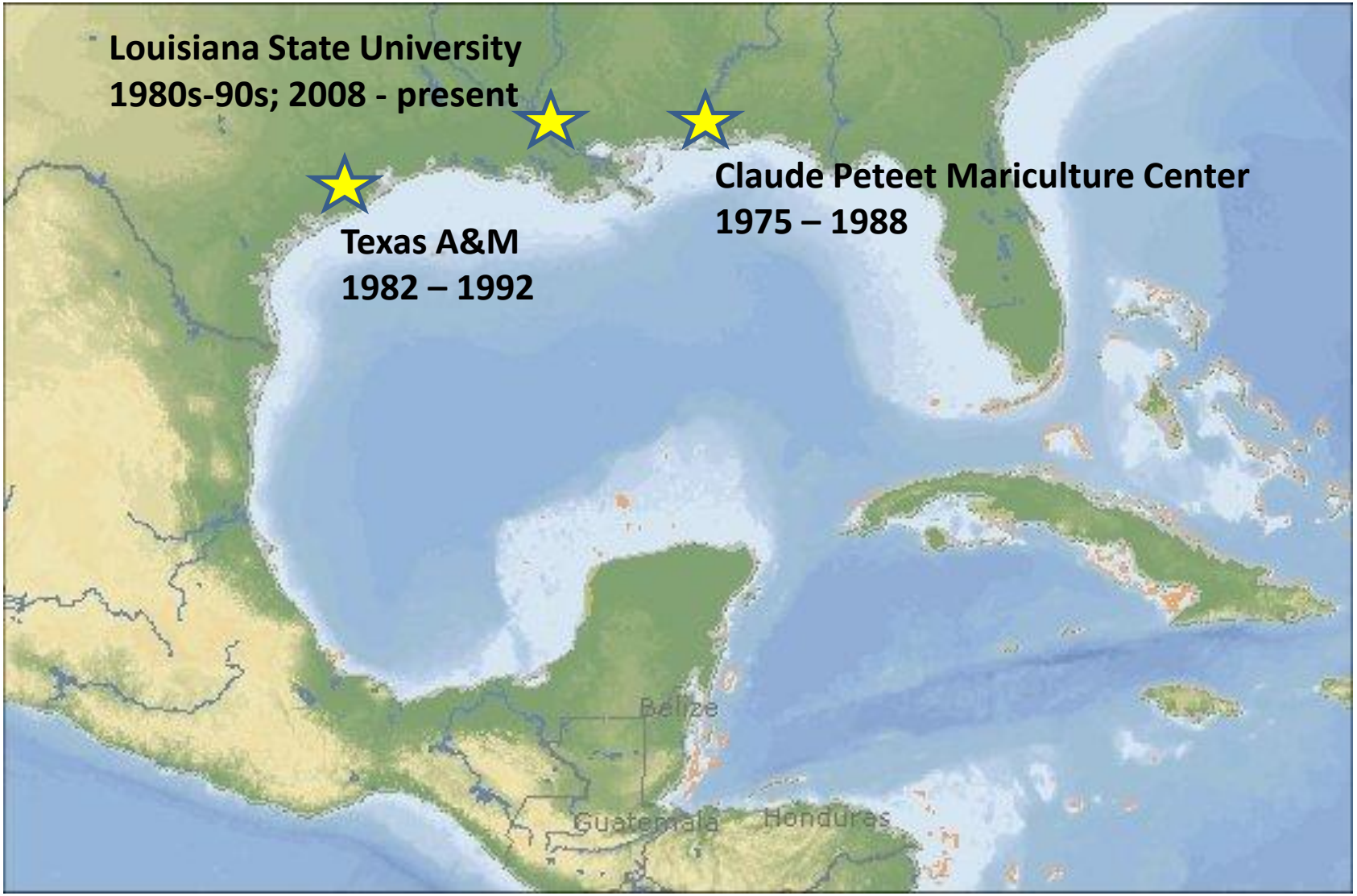
1960s: start of marine aquaculture in U.S.

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


Louisiana State University
1980s-90s; 2008 - present
Claude Peteet Mariculture Center
1975 – 1988
Texas A&M
1982 – 1992
Belize
Guatemala
Honduras

Introduction

- 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.

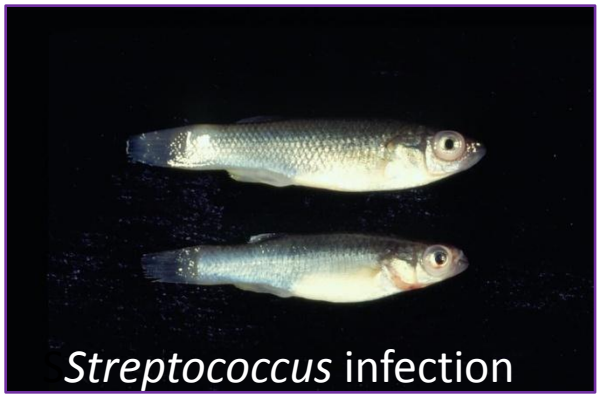
Positives and Negatives

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.



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 cocahoe 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-green color

Female

Male

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 cocahoe 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).

History

- Early tank rearing experiments. Gulf Coast Research Lab, Ocean Springs, MS. 1975-1977.
- 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.
- Air incubation studies – Pershbacher et al. Texas A&M 1995.
- 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 of the 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.

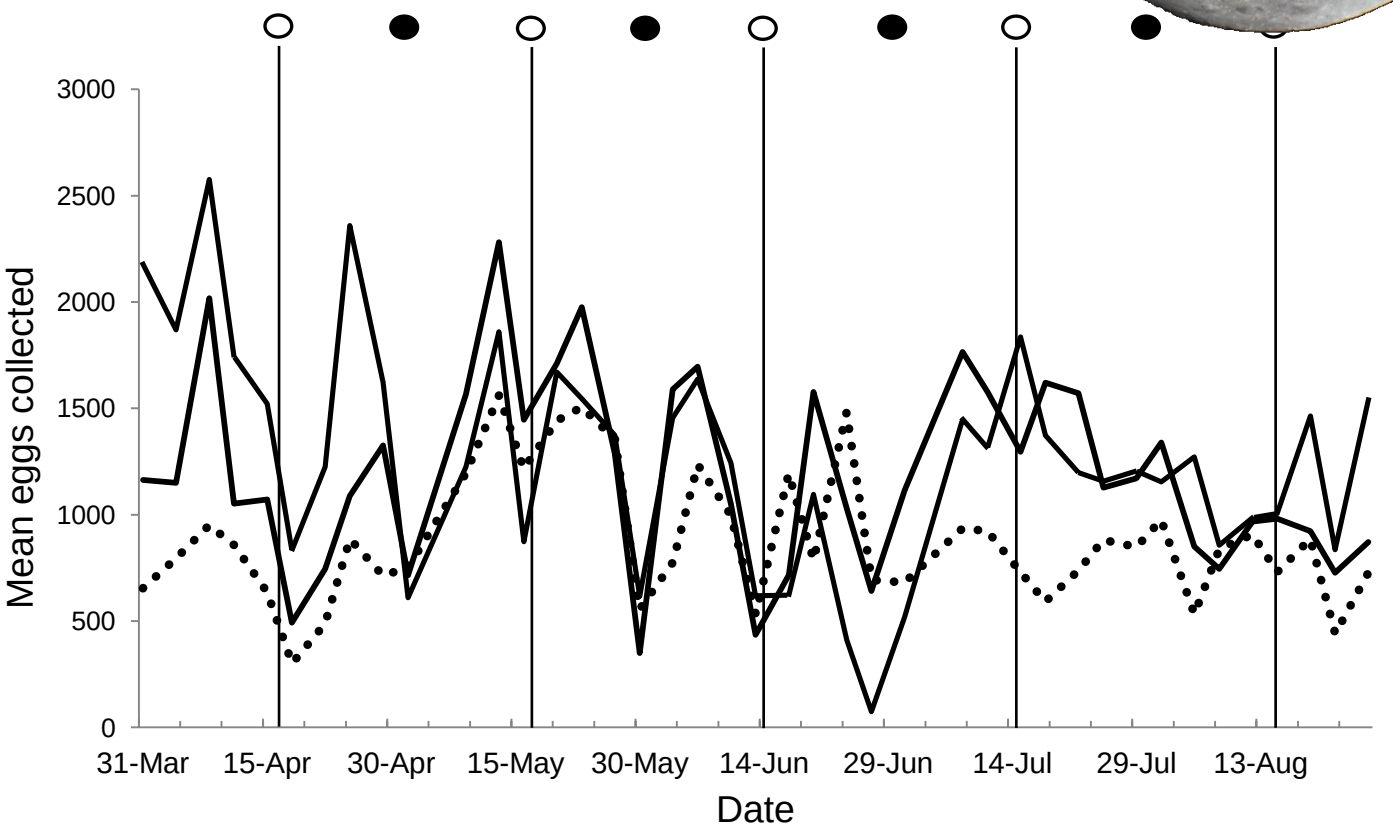
Aquarium or Tank Spawning

Tank Spav

- 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 http://www.lsuagcenter.com/en/crops_livestock/aquaculture/baitfish/

- 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/whichfactsheet/149/