



## REQUEST FOR PRE-PROPOSALS

*Please Copy and Distribute to All Interested Parties*

The USDA-NIFA Southern Regional Aquaculture Center solicits response from qualified multi-state teams interested in participating in the regional project:

### **REPEATABILITY OF INCIDENCE OF OVULATION, FECUNDITY AND FERTILITY IN CHANNEL CATFISH FEMALES INDUCED TO OVULATE FOR PRODUCTION OF HYBRID CATFISH FRY**

SRAC's Board of Directors has authorized up to \$160,000 for a 2-year project to improve ovulation, fecundity and fertility in channel catfish females induced to ovulate for production of hybrid catfish fry. This project will be developed using the "competitive proposal method" where a team of multi-state scientists having demonstrated records of expertise in the subject complete a single pre-proposal that addresses all project objectives. One proposal will be selected for funding based on review by a committee of scientists not involved in any of the proposals that are submitted.

#### **Background**

Commercial production of channel catfish female x blue catfish male F1 hybrids has increased dramatically in the last 10 years in the Southeastern U.S. and now comprises over 50% of annual U.S. farm-raised catfish production. Production of hybrid catfish fry requires hormone induced ovulation of female channel catfish, manual expression of eggs, and fertilization with blue catfish sperm. Female channel catfish are selected for spawning in the spring of the year based on external physical characteristics (extended abdomen, reddish urogenital opening, and grey coloration under the lower jaw). Commercial hybrid fry producers typically spawn 50 to 150 females per day from early May through June with ovulation rates ranging from 50% to 90% and fertilities of 0 to 95%. Females are placed back in ponds after spawning and used again in subsequent years, but given the large number of females used and inability to track individual female reproductive performance there is no information available to determine if a female's reproductive performance in the first year is predictive of subsequent reproductive performance.

Determining correlations among important reproductive traits (ovulation, fecundity, fertility) for individual female channel catfish induced to ovulate in consecutive years is not possible on commercial farms given the inability to track performance on individual females. Research facilities have the ability to track reproductive performance of individually tagged female channel catfish across years, and therefore can provide information on repeatability of female reproductive traits. Spawning success has been shown to be repeatable in tilapia (Trong et al., *Aquaculture* 416-417:57-64, 2013), time of spawning is repeatable in Lake Sturgeon (Forsythe et al., *Canadian Journal of Fisheries and Aquatic Sciences* 68:1-13, 2011), and fecundity shows a genetic component and therefore repeatability in the guppy (Reznick, *Evolution* 43:1285-1297, 1989).

If there is a relationship between the incidence of females that ovulate, fecundity, and egg fertility across years, then strategies could be developed to sort fish based on their initial performance for these traits into fish that were kept to spawn again the next year or culled due to predicted poor future reproductive performance. The strategies developed would have to allow real-time sorting of fish into groups to either keep for future spawning or cull for disposal as food fish. If these strategies can be developed, improvements could be made in the efficiency of hybrid fry production.

## Objectives

The goal of this project is to determine correlations among important reproductive traits in female channel catfish subjected to hormone-induced ovulation in consecutive spawning seasons and use this information to develop on-farm strategies to increase production of hybrid catfish fry. Specific objectives include:

- 1) Determine correlations between the following important reproductive traits in individual channel catfish females induced to ovulate in 2 consecutive spawning seasons:
  - a. incidence of ovulation,
  - b. fecundity, and
  - c. fertility.
- 2) Based on data collected in objective 1, develop management strategies to keep/cull groups of females based on initial reproductive performance to overall reproductive performance the following year.

## Experimental Approach

Participating facilities will each provide 200 to 300 PIT tagged female channel catfish for hormone induced spawning and production of hybrid catfish fry in year 1 and again in year 2. Due to the inherent variability of spawning and ovulation data, a consistent hormone type and dose must be used during both years of the study at all participating facilities. Fry produced from the trial can be used for various trials after production, but consistent methods for fertilization and hatching across years and all females used in the trials are required to allow clear determination of correlations among female reproductive traits, free from confounding factors. Data will be recorded on each female for incidence and time of ovulation, fecundity, and fertility in both years. Correlations among traits, across years for each female will be estimated to determine if reproductive performance in the first year is predictive of reproductive performance in the second year. Past data has shown the majority of differences in hybrid embryo fertility are related to differences in egg quality among female parents; however potential effects of differences in blue male sperm quality and quantity will be minimized by using pooled sperm from 4 to 5 males to fertilize eggs and using 5 times the recommended sperm density for maximum fertilization. Using these 2 strategies will greatly reduce any effects of sperm quantity and quality on results. If there is a relationship between reproductive performances across years, strategies will be developed to instruct farmers on how to sort female broodfish to improve reproductive performance in subsequent years, thereby improving the efficiency of hybrid catfish fry production.

## How to Respond

Pre-proposals must address all objectives. Preference will be given to pre-proposals that show a high degree of collaboration and coordination among participants. To meet the criterion for a regional project, the pre-proposal must include collaboration from scientists in two or more states or territories in the Southern Region (Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, Oklahoma, Puerto Rico, South Carolina, Tennessee, Texas, U.S. Virgin Islands, and Virginia).

The pre-proposal must include a one page vita for each participant and a proposed budget for each participating institution or organization. Pre-proposals, vitae, and budgets that are not in the proper format will not be considered. The *Guidelines for Writing a SRAC Pre-proposal (Comprehensive)* contains an example of a pre-proposal. Contact Kristen Thompson at 662-686-3269 for any assistance.

Send an electronic copy of the pre-proposal in Word format to Jimmy Avery, SRAC Director as an email attachment (jimmy.avery@msstate.edu) **by August 7, 2016**. Proposals received after that date will not be considered.