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

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Year 1.....$73,542
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Total.....$126,618

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PROJECT OBJECTIVES

Objective 1) Determine correlations between the following important reproductive traits in individual catfish females induced to ovulate in 2 consecutive spawning seasons: a. incidence of ovulation, b. fecundity, and c. fertility.

Objective 2) Based on data collected in objective 1, develop management strategies to keep or cull groups of females based on initial reproductive performance to improve overall reproductive performance the following year.

ANTICIPATED BENEFITS

Although the catfish industry still accounts for the majority of US aquaculture, it is in crisis and has decreased in size from 300 million kg produced in 2003 to 150 million kg in 2013 due to the recession, high fuel costs, high feed costs and competition from imports. The catfish industry is at an important turning point in its history and innovative changes are occurring, which are key for the survival, subsequent recovery and growth of this industry. One key is the wide spread implementation of the hybrid between channel catfish, *Ictalurus punctatus,* females and blue catfish, *I. furcatus,* males (hybrid) which exhibits heterosis for several traits. To make hybrid catfish increasingly efficient at the hatchery level, hybrid fry production needs to become increasingly cost effective. It is not known if channel catfish females exhibiting good reproduction in one year continue to do so in subsequent years. If they do not have consistently good reproductive performance over time, a significant economic loss and inefficiency may occur. Our overall goal is to determine the repeatability of reproduction in channel catfish females to make hybrid catfish fry over two consecutive years.

The repeatability of ovulation, fecundity, fertility and ultimately hybrid catfish fry production/kg in channel catfish females will be determined over a two-year period. A strategy will then be

developed to allow farmers to decide which females should be carried over to the next year and which should be culled at the end of the spawning season to increase hybrid catfish fry production efficiency.

PROGRESS AND PRINCIPAL ACCOMPLISHMENTS

Objective 1) Determine correlations between the following important reproductive traits in individual catfish females induced to ovulate in 2 consecutive spawning seasons: a. incidence of ovulation,b. fecundity, and c. fertility.

USDA- In 2017, a total of 280 catfish were selected, forty fish per week for 7 weeks during the spawning season. The percentage of fish gravid was quite low as 635 fish were evaluated to find the 280 spawnable fish, 37.9% gravid. Percent ovulation of channel catfish ranged from 65 to 95% with an average of 80% ovulation. Percent neurulation ranged from 8 to 32% with an average of 16%. This lower percent neurulation may be attributed to our hatchery water, which could not be stripped of gasses.

Percentage of gravid channel catfish females was much better in 2018, perhaps because of better weather patterns, as 59.8% of the fish evaluated were gravid, and of these, ovulation rate, 78.1%, was similar to 2017. Of the 68 females injected with LHRHa in 2018 that spawned in 2017, 75.0% ovulated, which was not different, 79.6%, for 133 virgin (injected for the first time) females.

Sexual development affected survival post-spawning season. Females that ovulated, gravid and non-gravid females had 34.9, 41.5 and 59.5% survival, respectively, in 2017, which was similar to results at Auburn University (see below). Gravid and non-gravid females had 37.3 and 63.7% post-spawning survival, respectively, in 2018.

Auburn University- A total of 300 channel catfish females were injected over 6 spawning in 2017. The weather was unusually cold for the entire spawning season, and appeared to adversely affect the spawning preparation and spawning at Auburn University. Ovulation rates ranged from 38-69% with a mean of 59.6%. This had a major impact on fry output, but some runs produced as many as 2,000 fry/kg. In 2018, 76, 55 and 23 females that did not spawn in 2017, did spawn in 2017, were injected in 2016, but not 2017, respectively were injected with LHRHa to induce ovulation. There was no difference in ovulation rate for females that did not ovulate in 2017, 86.8% and those that did ovulate in 2017, 92.7%. Leaving females fallow for a year did not enhance ovulation rater, 78.3%.

Kansas random strain had higher ovulation percentage than Lake Marepas, 103KS, KxTH, Kmix select and Mix in 2017. However, genetic differences in ovulation rate were minor the following year.

Females that did not ovulate in 2017 had a higher (P=0.0001) survival rate (post-spawning 2017 until spawning season 2018) than females that ovulated in 2017 (30.7%). Strain affected survival and ranged from 0% for a commercial strain (limited sample) to 58% for 103KS.

For females that ovulated in both 2017 and 2018, repeatability of performance was essentially zero. The correlation between 2017 and 2018 for egg quality, relative fecundity, and female gravidness was near zero for each trait. Strain effects were minimal for these traits, however, there appeared to be a trend that the poorest ranking strains in 2017 became the best ranking strains in 2018, but this requires further analysis.

Objective 2) Based on data collected in objective 1, develop management strategies to keep or cull groups of females based on initial reproductive performance to improve overall reproductive performance the following year.

There was no relationship between year 1 performance and year 2 performance, so no strategy development is possible. Using best performing strains is the best strategy at this point. Heavy mortality occurred for females that were stripped. This could result in the brood pond having too low of density. Females should be inventoried in the fall and late winter to ensure that adequate numbers of females are present for final preparation for spawning.

IMPACTS

- Based on ovulation rate only, surviving females are good for hybrid embryo production for at least 2 years.
- Letting a female “rest” for 2 yrs had no benefit.
- Strain affected ovulation in bad spawning years and post-spawning survival.
- Ovulating one year does not affect the probability of ovulating a second year.
- Degree of female readiness, fecundity and egg quality were not repeatable over a 2-year period.
- Hand-stripping increases the probability of death prior to the next spawning season.
- Brood stock handling procedures at research institutions and ?farms? needs improvement if brood females are to be used multiple years.
- Management of brood stock densities is problematic because of potential high mortality that is not detected (fish often do not “float up” after death.

PUBLICATIONS, MANUSCRIPTS OR PAPERS PRESENTED

Presentations oral:

Dunham, R. 2018. Catfish Genetics Update (sub-part:R. A. Dunham, N. Chatakondi, B. Bosworth and P. Allen. Repeatability of Incidence and Time of Ovulation, Fecundity and Fertility in Channel Catfish Females Induced to Ovulate for Production of Hybrid Catfish Fry). Catfish Update Meeting. Demopolis, Alabama.

R. A. Dunham, N. Chatakondi, B. Bosworth, I. Butts, N. El Husseini, A. Salah, Z. Taylor, M. Coogan, J. Gurbatow and P. Allen. 2019. Repeatability of Incidence and Time of Ovulation, Fecundity and Fertility in Channel Catfish Females Induced to Ovulate for Production of Hybrid Catfish Fry. Aquaculture America 2019. New Orleans.

Abstracts:

R. Dunham, Z. Taylor, D. Robinson, M. Coogan, J. North, J. Gurbatow, N. El Husseini, A. Salah, R. Odin, D. Olesen, N. Chatakondi, B. Bosworth and P. Allen. 2019. Repeatability of Incidence and Time of Ovulation, Fecundity and Fertility in Channel Catfish Females Induced to Ovulate for Production of Hybrid Catfish Fry. Aquaculture America 2019. New Orleans. https://wasblobstorage.blob.core.windows.net/meeting-abstracts/AQ2019AbstractBook.pdf

RESULTS AT A GLANCE

There was no relationship between consecutive years for reproductive performance of channel catfish females. Females that ovulated and were handstripped, had double the mortality of females that did not ovulate. There were apparent genetic differences in hybrid fry production attributable to the channel catfish strain of female.