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Conservation and Ecological Implications of the Introgression between Black Bass Subspecies

by

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Undergraduate honors thesis under the direction of

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the Upper Division Honors Program.

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The Louisiana Department of Wildlife and Fisheries (LDWF) has stocked 52,420,703 Florida bass since 1988 in order to increase recreational fishing quality (M.D. Kaller, 2013). My research mentor, Dr. M.D. Kaller, and I want to quantify the impact these stocked fish have on native fish, specifically those described as northern-strain bass, *Micropterus salmoides salmoides* (Philipp et. al. 2002). Recently, Louisiana State University's School of Renewable Natural Resources fisheries lab determined that the so-called Florida-strain bass, *Micropterus salmoides floridanus*, which is potentially another species entirely (Kassler et al. 2003), and hybrid bass, *Micropterus salmoides salmoides X floridanus*, have an increasing proportion in Louisiana lakes, and that the native northern-strain bass have a decreasing proportion (Fries 2010). Florida-strain and hybrid bass are analyzed as one group, due to the likelihood that the hybrid bass are underrepresented in our data. This decrease in native population may be a concern, and understanding size-selective growth and mortality may be useful in Florida-strain and hybrid bass management efforts. Based on nearly 25 years of monitoring these fishes, we hypothesized that weight is a function of genetic identification (Fries 2010).

Since 1988, bass were collected each fall by gill nets and/or electrofishing by LSU and LDWF biologists, including myself. An additional subset was collected by anglers participating in a trophy fish genetic analysis. Length and weight were recorded, and liver samples were transported on ice to determine sex and genetic identity through gel electrophoresis following *Shaw and Pravad* (1970). Because on-site identification was difficult, many fish needed to be identified in the lab using morphological examination by myself and others. I assisted in the composition of a Java script that converts MS Excel files into comma-separated values (.csv) files and performs error analysis on the input data. This script cleaned the data such that it could be utilized in the program, SAS version 9.3. Data were analyzed by a generalized linear mixed

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model employing a logit link (whole equation transformation) and a binomial distribution, because the model only assessed northern-strain compared with combined Florida-strain and hybrid fish. The model examined the relationship between weight, which is an angler measure of success, with length and genetic origin to evaluate our hypothesis. Whereas multiple lakes were sampled with inherently different characteristics, the lake sampled was treated as a random variable in the analysis.

Our analysis showed that the relationship between weight and length is dependent upon genetic identity. Florida-strain bass and hybrids are 0.05% more likely to be heavier (grams) per mm of length (i.e., as fish get larger, the Florida-strain and hybrid fishes are increasingly more likely to be heavier at a given length than northern-strain fish). This primarily applies to bass over 320mm, as there is not significant variance in weight between juveniles. The length and weight data, as it varies with species, is expressed in Figure 1. Our next objective will be to visualize the different trajectories of length and weight. According to our analysis, prior to 320mm, Florida-strain and hybrid bass are lighter than their native cousins. They weigh about 83g on average compared with a 100g northern-strain fish. Therefore, in the larger size bass, it is likely that the genetic identity can be predicted from weight and the reverse.

The live fast, die young life history of the Florida-strain and hybrids may be the key to what makes them so competitive with the native northern bass (Philipp 2002). These findings are relevant to both management and conservation. Anglers desire heavier fishes, and LDWF managers are in part beholden to this interest. Simultaneously, concerns over the conservation of endemic bass genetic diversity, as well as potential concerns related to stocking a possibly non-native fish, suggest that angler interests may not be the only consideration. Because this analysis suggests that stocking produces heavier fish, care must be taken that stocking success does not

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lead to loss of endemic fish genetic diversity by outbreeding depression and competition with the larger Florida-strain and hybrid bass (larger fishes tend to win competitive interactions). The proportions of these species must be closely monitored, as the interaction between them may be of conservation concern in the future (Fries 2010).

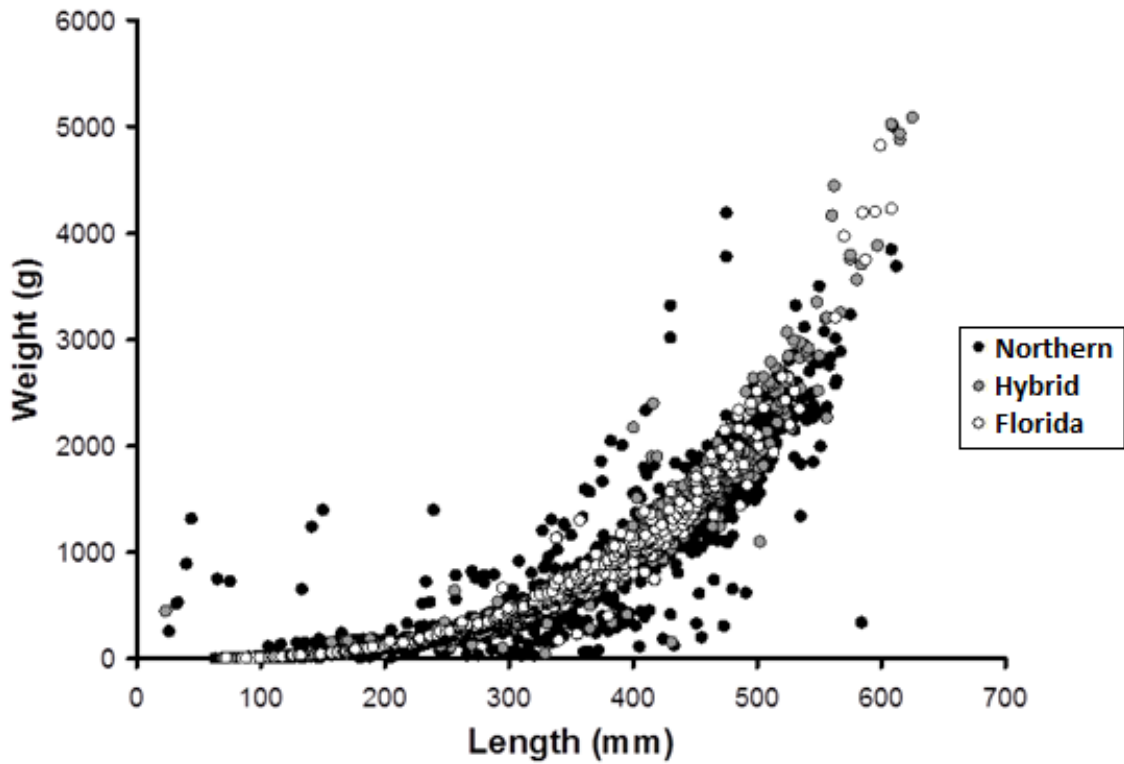


Figure 1

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