

LARGE PELAGICS RESEARCH CENTER
SEMI-ANNUAL PROGRESS REPORT – DEADLINE 07/30/2007



Report: #2

Reporting Period: 11/01/2006 – 05/30/2007

Project Title: Genetic discrimination of bluefin tuna spawned in the Mediterranean Sea and the Gulf of Mexico

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1. Purpose of the Project:

This project is focused on assessing the stock composition of school size bluefin tuna along the U.S. Atlantic coast. Previous work in our laboratory demonstrated significant differences in the distribution of mitochondrial DNA control region sequence haplotypes and genotypic frequencies at eight microsatellite loci between young-of-the-year (YOY) bluefin tuna collected near spawning grounds in the Mediterranean Sea and Gulf of Mexico. In this project we are surveying these molecular markers in yearling bluefin tuna (or two or three year old fish, depending on availability) taken in the recreational fishery along the U.S. Atlantic coast to estimate the contribution of the two spawning grounds to the U.S. school bluefin fishery. We are also increasing our “baseline” collections, with additional yearclasses of YOY bluefin tuna from the Gulf of Mexico and Mediterranean Sea. Furthermore, we are developing new microsatellite loci to improve the overall power of our genetic analysis.

2. Progress during the last six months:

Collections: As detailed in our first six-month report, yearling (one year old) bluefin were not abundant off the U.S. Atlantic coast during 2006 and we were unable to obtain large sample sizes necessary for population analyses. For 2007 we decided to collect all school size bluefin tuna (one, two and three year old fish), with the hope that we will get a good sample size (>100 individuals) for at least one year class. Furthermore, we expanded our sampling network by sending out collecting kits to several cooperating charter captains, recreational boat owners, as well as to the Maryland DNR (they record the tag numbers and lengths of all bluefin), and to several biologists along the coast that will be measuring bluefin tuna as part of a project to better understand the relationship between curved and straight fork lengths versus weight.

Consistent with the lack of one year old fish in 2006, there is a lack of two year old fish off the U.S. Atlantic coast in 2007. Furthermore, there has been a paucity of one year old fish. Either the younger school size bluefin are feeding in areas offshore, or there has been very poor recruitment from the 2005 and 2006 year classes. Most of the bluefin taken in the recreational fishery this year are three year old fish. We are trying very hard to make sure that we get a large sample of these individuals. We have some samples in hand, and have received reports from several captains that they have samples for us.

Microsatellite loci development: We had originally planned to subcontract the development of a new microsatellite enriched library to an outside firm due to limited personnel availability in our laboratory. However, in our last progress report we stated that we were in a position to do the work in our lab. Recently, several hundred Atlantic bluefin tuna DNA sequences containing expressed sequence tags (ESTs) were deposited in GenBank and made publicly available. Many of these EST sequences contain repetitive motifs (microsatellites) and we are using them as a source to create new microsatellite loci for population analyses. We have developed primers to amplify 25 of these loci, and are currently in the process of optimizing amplification conditions and screening a subset of our samples to determine if inheritance is consistent with the expectations of Hardy-Weinberg equilibrium. Those markers that exhibit genotypic distributions within collections consistent with Hardy-Weinberg expectations will be used to augment the eight microsatellite loci we are currently using in our analyses.

Population Genetic Analyses: At the time of our last progress report we were nearly finished with the analysis of new (2006) samples, including the juvenile bluefin from the Mediterranean Sea. As we have not obtained further collections, population screening has not progressed. Instead, we have focused our laboratory efforts on developing new microsatellite loci (described above) and the further analysis of “albacore-like” bluefin mitochondrial DNA. One of the notable differences between YOY bluefin tuna spawned in the eastern Atlantic and western Atlantic is a difference in the distribution of “albacore-like” mtDNA: it occurs in ~5% of eastern spawned bluefin, but has not been encountered in western YOY bluefin. “Albacore-like” mtDNA is also very common in Pacific bluefin tuna and may occur in southern bluefin tuna as well. We have noted the occurrence of some “Pacific bluefin tuna-like” control region sequences in Atlantic bluefin tuna, as well as some sequences that appear related to yellowfin tuna. For those individuals, we are screening additional nuclear markers to determine if these samples represent mis-identifications or truly reflect the variation inherent in Atlantic bluefin mtDNA. For the other sequences, we are undertaking a variety of phylogenetic analyses to determine the relationships of the various control region sequences in an effort to understand the evolutionary history of hybridization(s)/introgression(s) and subsequent gene flow.

3. Preliminary Data:

4. Difficulties:

Difficulty collecting school bluefin samples. The lack of availability of school bluefin has hampered our population studies. This year we have increased our efforts to secure cooperation of anglers, captains, and scientists to help obtain samples of school bluefin. Investigation of the archived bluefin samples at the NOS lab in Charleston indicated that there were not enough of any yearclass for a meaningful population analysis. Instead, in addition to the school bluefin collected this year, we will analyze archived samples older bluefin taken in the U.S. commercial fishery that are available from Dr. Lutcavage. Although this collection will comprise multiple year classes, it will be sufficiently large for a meaningful assignment of individuals to spawning areas.

Note: Information provided will be included in the Center’s reports to NMFS-NOAA and made public through the center’s website. Clearly indicate any confidential information that you do not wish to make public at this time.

5. Plans for the next six months to year: For the next six months we will focus on collecting as many samples as possible of school bluefin from the U.S recreational fishery. In addition, we will make several trips from mid-August – mid-September to collect YOY bluefin. We will also subsample Dr. Lutcavage's collection of older bluefin. Microsatellite locus development will continue and we will begin to screen all 2007 samples for variation at the mtDNA control region and all available microsatellite loci.

6. Collaborators and Personnel:

7. Students:

8. Images and Captions:

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