

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



**Report: #2**

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

**Project Title: *PCBs as Novel Tracers for Determining Bluefin Tuna (Thunnus thynnus) Population Mixing in the North Atlantic***

**Principal Investigator(s):** Rebecca M. Dickhut (PI), Dept. of Physical Sciences, Virginia Institute of Marine Science, Ashok D. Deshpande (co-PI), U.S. Dept. of Commerce, NOAA, NMFS, NEFSC, Sandy Hook Laboratory

### **1. Purpose of the Project:**

The primary objective of this research is to measure PCB (specifically PCB153 and other nonmetabolizable congeners) and chlordane (cis-chlordane, trans-chlordane, trans-nonachlor) concentrations in bluefin tuna and selected prey fish from the Mediterranean, western N. Atlantic, and Gulf of Mexico food webs in order to establish the utility of using PCB and organochlorine (OC) pesticides as tracers of bluefin tuna origin and the extent of stock mixing in the N. Atlantic.

### **2. Progress during the last six months:**

Extraction and analysis of tissue samples (muscle = 25 and liver = 11) from bluefin tuna captured off the Virginia coast during July 2006, and 9 bluefish (*Pomatomus saltatrix*) muscle tissue composites from fish collected from the western N. Atlantic during Sept.-Oct., 2006, for PCBs and OC pesticides was completed. In addition, 17 muscle tissue samples from bluefin tuna captured in the Gulf of Mexico were acquired from the NOS/NCCOS/CCEHBR Marine Forensics Archive and analyzed for PCBs and OC pesticides. We have also acquired ~90 tissue samples from giant bluefin tuna captured in the Gulf of Maine courtesy of Dr. Molly Lutcavage (UNH), and 33 muscle extracts from bluefin tuna captured in the southern Tyrrhenian Sea courtesy of Dr. Simonetta Corsolini (Univ. of Siena, Italy). Additionally, Dana M. Bethea from the NOAA Fisheries Panama City Laboratory has agreed to collect 50 tissue samples from Spanish mackerel (*Scomberomorus maculatus*) for us, which will be used to validate the baseline signal for the Gulf of Mexico.

### **3. Preliminary Data:**

Preliminary results based on measurement of PCB153 and  $\gamma$ -chlordane in bluefin tuna and bluefish from the western N. Atlantic (WNA) indicate that:

- 90% of PCB153/ $\gamma$ -chlordane ratios for giant bluefin tuna from the Gulf of Mexico are similar to WNA bluefish, with one GoM bluefin tuna potentially indicating a unique foraging location distinct from the WNA and Mediterranean

- ~38% of PCB153/ $\gamma$ -chlordane ratios for large bluefin tuna from the coast of VA exceed the range for WNA bluefish with high PCB153 relative to  $\gamma$ -chlordane indicative of the signal expected from Mediterranean bluefin tuna

#### **4. Difficulties:**

The bluefin tuna samples analyzed thus far have revealed that Endosulfan I, a current use organochlorine pesticide, interferes with the analysis of  $\alpha$ -chlordane, and that  $\gamma$ -chlordane and  $\alpha$ -chlordane are often difficult to fully separate in these tissue samples. However, further sample analysis has revealed that *trans*-Nonachlor, another chlordane compound, is both abundant in bluefin tuna and readily isolated from other organochlorine pesticides. Therefore, we are proceeding with the development of a GC-MS method that includes *trans*-Nonachlor as a chlordane marker compound since this compound is likely to be a better chlordane marker than  $\gamma$ -chlordane or  $\alpha$ -chlordane.

#### **5. Plans for the next six months to year:**

1. Establish a single GC-MS method for analyzing selected PCB and chlordane marker compounds in a single run in order to minimize the time required for sample analysis and reduce uncertainty in PCB/chlordane ratios.
2. Analyze the 33 muscle tissue extracts from bluefin tuna captured in the southern Tyrrhenian Sea in order to establish the PCB/chlordane baseline for Mediterranean fish.
3. Reanalyze the Gulf of Mexico bluefin tuna samples, and analyze Gulf of Mexico Spanish mackerel tissue samples to validate the baseline PCB/chlordane signal for the Gulf of Mexico food web.
4. Analyze the ~90 tissue samples from giant bluefin tuna captured in the Gulf of Maine to evaluate bluefin tuna stock mixing in this region.
5. Reanalyze the bluefin tuna samples collected off the coast of Virginia in 2006 to confirm our preliminary evaluation bluefin tuna stock mixing in this region.

#### **6. Dissemination**

##### **Publications:**

**Workshops:** Presentation at the LPRC PI Meeting, April 10, 2007 in Durham, NH entitled *PCBs and Pesticides as Novel Tracers of Bluefin Tuna (Thunnus thynnus) Populations and Mixing in the North Atlantic*

**Conferences:** Poster presentation at the North American meeting of the Society of Environmental Toxicology and Chemistry, Nov. 5-10, 2006 in Montreal, Canada entitled *Persistent Organic Pollutants in Atlantic Bluefin Tuna*

**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.

**7. Collaborators and Personnel:**

Richard Brill (Ph.D.) – NOAA National Marine Fisheries Service

Michele A. Cochran (M.S.) – Virginia Institute of Marine Science

Alessandra Cincinelli (Ph.D.) – University of Florence (Italy)

Simonetta Corsolini (Ph.D.) – University of Siena (Italy)

**8. Images and Captions:** Please send two or three high resolution images (preferably in color) of people at work, graphic data, schematics, etc. as JPEG images. Include appropriate photo/analysis credit. Images will be used in the Center's reports to NOAA and on the Center's website to highlight your research.

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