

**LARGE PELAGICS RESEARCH CENTER  
ANNUAL PROGRESS REPORT– DEADLINE 05/30/2008**



**Report: #3**

**Reporting Period: 05/30/2007 – 05/30/2008**

**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:** (one paragraph)

The primary objective of this research is to measure PCB (specifically PCB153 and other nonmetabolizable congeners) and chlordane (*cis*-chlordane, *trans*-chlordane, *cis*-nonachlor, *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 12 months:**

Four marker compounds for distinguishing bluefin tuna migration patterns were identified which include PCB congeners 153 and 187, *cis*-nonachlor, *trans*-nonachlor. A gas chromatography/mass spectrometry method for measuring all of these marker compounds in a single analytical run was developed in order to reduce the impact of analytical error on marker ratio determinations. Tissue samples from bluefin tuna captured off the Virginia coast during July 2006 (n = 21), giant bluefin tuna captured in the Gulf of Mexico acquired from the NOS/NCCOS/CCEHBR Marine Forensics Archive (n = 16), and bluefin tuna captured in the southern Tyrrhenian Sea obtained courtesy of Dr. Simonetta Corsolini (Univ. of Siena, Italy; n = 44) were analyzed using this new method. In addition, 9 bluefish (*Pomatomus saltatrix*) muscle tissue composites from fish collected from the western N. Atlantic during Sept.-Oct., 2006, and 11 Spanish mackerel (*Scomberomorus maculatus*) tissue samples from the Gulf of Mexico obtained courtesy of Dana M. Bethea from the NOAA Fisheries Panama City Laboratory were also analyzed for PCBs and nonachlors using the newly developed method.

**3. Preliminary Data:**

Preliminary results based on measurement of PCB congeners 153 and 187, *cis*-nonachlor, *trans*-nonachlor in bluefin tuna, bluefish, and Spanish mackerel demonstrates:

- Small, but significant differences in nonachlor/PCB ratios for fish from the same region indicative of species specific metabolism of nonachlors such that fish species other than bluefin tuna cannot be used to establish baseline nonachlor/PCB ratios for bluefin from a specific region.

- Significantly higher ( $p < 0.001$ ) nonachlor/PCB ratios in bluefin tuna from the Gulf of Mexico compared to the Mediterranean Sea representing a unique chemical tag for fish feeding within the food webs of these two spawning grounds.
- Bluefin tuna captured off the coast of Virginia by the recreational fishery are indicative of a mixed population of fish ( $\geq 21\%$  from outside the region).

**4. Plans for the next six months to year:** (one paragraph)

1. Analyze the y-o-y bluefin tuna samples obtained from the western N. Atlantic.
2. Publish a paper describing the technique and bluefin tuna stock mixing estimates for the mid-Atlantic recreational bluefin tuna fishery.
3. 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. Dissemination**

**Publications:**

**Workshops:** Presentations at the LPRC PI Meetings, April 10, 2007 and May 2, 2008 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*

**Manuals, Protocols:**

**Outreach Activities:**

**Patent, Copyright, Invention Disclosure Activity:**

**6. Collaborators and Personnel:** (list collaborators and personnel working on this project, include terminal degree and institution not listed on the proposal).

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)