ABOUT THE SMALL BLUEFIN TUNA NETWORK

Compiled by Pamela Mace & Dave Secor, September 1999

What is the purpose of the network?

The purpose of the network is to alert scientists conducting research on very small bluefin tuna whenever concentrations of these tuna are located.

How small is small?

The tuna we seek are those of age zero (young-of-the-year) or age 1 -- all less than 15 pounds (6.8 kilograms) or 27 inches (70 centimeters) curved fork length. These are young school fish and therefore both commercial and recreational fishermen are prohibited from possessing or landing them. However, a special Scientific Research Permit has been developed that allows authorized individuals to collect the young school bluefin and send them to the NOAA Charleston laboratory for distribution to various research facilities (see below).

Who is in the network?

The "network" consists of whoever is willing and able to participate in locating small bluefin and notifying the researchers involved in the project (see below). The network also includes several federal, state, academic, and contract biologists, as well as a small number of recreational and commercial fishermen, who have authorization under the Scientific Research Permit to collect and possess young school bluefin tuna.

What should I do if I find/ hear of concentrations of young school bluefin?

The small number of biologists and fishermen listed on the Scientific Research Permit "TUNA-SRP-1999-002" are authorized to catch and retain young school bluefin tuna provided these are transferred to appropriate authorities as soon as possible after landing. For everyone else, it is illegal to possess bluefin of this size. To report either a sighting or a landing, please contact one or more of the following people:

Dr. Dave Secor, University of Maryland, (410) 326-7229
Dr. John Graves, Virginia Institute of Marine Sciences, (804) 642-7352
Dr. Pamela Mace, Northeast Fisheries Science Center, (508) 495-2357

Dr. Secor is involved in the microconstituents studies, Dr. Graves is involved in the genetics studies, and Dr. Mace is trying to facilitate collection of samples for these and other studies. If a sighting is reported, one of the above three contacts may try to arrange a collecting trip to attempt to sample the fish. If a landing is reported, one of the contacts will arrange for pick-up of the samples. Alternatively, if it is convenient, the landed fish can be placed

on dry ice and shipped directly to the following central collection facility:

NOS/NOAA
James Island,
Charleston, SC 29412
ATTN: Dr. Cheryl Woodley; phone (803) 762-8555; fax (803) 762-8700

All bluefin tuna collected under this Scientific Research Permit are ultimately sent to this central collection facility in Charleston, recorded in a database, and then otolith or tissue samples are sent to research laboratories that request them.

All bluefin tuna collected under this Scientific Research Permit must be reported by the collector within 24 hours of landing by faxing a Scientific Research Permit Landing Report to Sarah McLaughlin, fax number (978) 281-9340. If samples are to be held less than 24 hours, they should just be placed on ice, not frozen. If they need to be held longer than 24 hours, they should only be lightly frozen. Deep freezing seems to destroy the otoliths.

What kind of research is being conducted and why are such small bluefin required?

As most bluefin tuna fishermen know, one of the most perplexing questions about bluefin is their stock structure: where do they spawn and what are their migration patterns? The current belief is that there are two spawning grounds – the Gulf of Mexico and the Mediterranean. Thus, bluefin in the eastern and western Atlantic are treated as two separate "stocks" for management purposes, even though there is known to be some degree of mixing between the two sides of the Atlantic. But are there two stocks with a small degree of mixing and migration, two stocks with substantial mixing and migration, one stock with two alternative spawning grounds, or multiple stocks throughout the Atlantic? Several research programs are attempting to address these problems. These include conventional tagging experiments, archival tagging experiments, otolith microconstituents analysis, and genetics. Microconstituents and genetics are the programs that require small (young school) fish. The reason that the smallest possible fish are required is that we want the odds that the fish could have crossed the Atlantic since being born to be as small as possible. In other words, we want to be reasonably certain that the fish we sample from the western Atlantic were born in the western Atlantic, and the fish we sample from the Mediterranean were born in that area.

Most people have heard of genetics analyses, but many have not heard the term "microconstituents analysis" and may not know what an otolith is. Therefore, a description of otolith microconstituent analysis follows.

Otoliths are the fish equivalent of earbones, located inside the skull behind the brain. All fish contain 3 pairs of otoliths, which are formed of layers of calcium carbonate. The layers are deposited seasonally. Thus, otoliths are like biological CD-ROMs chronicling a fish's age and

environmental history. They can reveal a fish's time and place of birth, the waters it has travelled, even which days it grew well. For over a hundred years, fisheries scientists have used these layers to assign ages to fishes. (For more information about modern techniques for ageing fish, there is an excellent manual located at the web site: http://www.wh.whoi.edu/fbi/age-man.html). As otoliths grow, they take up metals from the fishes' environment. For instance, marine waters contain lots of strontium; freshwater contains eight-fold less strontium. Examination of strontium in Chesapeake Bay striped bass has shown annual spawning migrations from marine water to freshwater.

The premise of using otolith microconstituents, or trace elements, such as strontium to back-track the environmental histories is that certain elements are incorporated into otoliths in direct proportion to their availability in surrounding water or food. Thus, larvae or young-of-the-year juvenile bluefin tuna exposed to either Gulf of Mexico or Mediterranean waters might be expected to incorporate different mixtures of elements into their otoliths. In Canada, researchers have used a cocktail of microconstituents to successfully distinguish stocks of Atlantic cod in Scotian shelf waters. Previous genetic-based studies had provided ambiguous results on Atlantic cod stock structure.

Large improvements in technology to measure otolith microconstituents have advanced its application in fisheries science. Currently, the instrument of choice is Inductively Coupled Plasma Mass Spectrometry (ICPMS) because it can analyze many elements simultaneously, and it has high sensitivity and precision. A cooperative research program involving University of Maryland and National Marine Fisheries Service scientists has been initiated using ICPMS techniques to address stock structure issues on Atlantic bluefin tuna.

While the microconstituents research program uses the otoliths, genetics studies require tissue samples. Several academic and government laboratories are conducting various genetics tests to determine whether or nor there are consistent differences in the genetic structure of bluefin spawned in the Gulf of Mexico compared to those spawned in the Mediterranean. In addition, we are archiving bluefin tuna vertebrae for subsequent age and growth studies. The biggest problem in conducting both the microconstituents and genetics research is a lack of samples of very young bluefin from the western Atlantic. It has also been harder than anticipated to collect appropriate samples from the Mediterranean, even though large numbers of very small bluefin are taken in several areas.