THE PEW ENVIRONMENT GROUP

BLUEFIN TUNA STOCK ASSESSMENTS

IMPROVING A KEY TOOL IN MANAGING ONE OF THE OCEAN'S MOST VALUABLE FISH SPECIES

THE ATLANTIC BLUEFIN TUNA IS ONE OF THE OCEAN'S MOST REMARKABLE FISH. WEIGHING UP TO 700 KG (1,500 LBS) AND ABLE TO DIVE TO DEEPER THAN 1,000 M (3,000 FT), THESE ANIMALS TRAVEL UP TO 64 KM PER HOUR (40 MPH) AS THEY CRISSCROSS THE ATLANTIC OCEAN IN A 7,000-KM (4,800-MI) MIGRATION.[1] AS ONE OF ONLY A FEW WARM-BLOODED FISH SPECIES, BLUEFIN TUNA ARE ABLE TO ELEVATE THEIR BODY TEMPERATURE AS THEY MOVE THROUGH A WIDE RANGE OF CONDITIONS.

These fish are one of the world's most valuable marine species.[2] Unreported and illegal fishing, spurred by a growing demand for sushi, pushed this once-plentiful species to the brink of collapse. Atlantic bluefin tuna now face a long road to recovery, as both eastern and western populations have been fished to near-historic lows.

The International Commission for the Conservation of Atlantic Tunas (ICCAT), the body responsible for the management of Atlantic bluefin, uses information from stock assessments, conducted every two to three years, to set conservation and management measures and yearly catch limits, or quotas. Precautionary catch limits, which allow the population to rebuild after years of overfishing, are critical for Atlantic bluefin tuna's recovery. The scientific assessments of these fish are conducted by the Standing Committee on Research and Statistics (SCRS), a panel of scientists from ICCAT member countries. These assessments provide information to decision makers on the current status and size of Atlantic bluefin populations as well as predictions on how future management measures will affect the species.

How does a stock assessment work?

A stock assessment simulates the bluefin population as individual fish are born, grow up, reproduce, and die. (See diagram, next page). To do this, scientists use computer models that incorporate mathematical formulas, statistical techniques, and data provided from a variety of sources. The results of these assessments are then considered by ICCAT as it sets catch limits, size restrictions, area closures, and other management and enforcement measures.

A STOCK ASSESSMENT SIMULATES THE BLUEFIN POPULATION AS INDIVIDUAL FISH ARE BORN, GROW UP, REPRODUCE, AND DIE.

However, stock assessments are only as good as the data that are used. Many sources of information go into stock assessments, but catch records make up a significant portion of the data used. Alantic bluefin catch records, however, are often inaccurate and lack crucial information, such as how old the fish were when caught. In addition, the amount of fish caught illegally is not accounted for, a factor that can skew the stock assessment, resulting in overly optimistic predictions. **Improving the quality and quantity of data provided by both fishermen and scientists for the bluefin assessments will allow ICCAT to make more-informed decisions to protect this important species and help it recover.**

BLUEFIN TUNA STOCK ASSESSMENTS

Stock assessment models use mathematical formulas, statistical techniques, educated assumptions about the biology of the species, and the provided data to simulate a fish population as individual fish are born, grow up, reproduce, and die.

1 DATA COLLECTION

The data that can be used in stock assessments fall into two categories: fishery independent data that are collected by scientists and fishery dependent data that are collected by commercial and recreational fishermen as they catch their fish. Currently, the majority of information that is used in the Atlantic bluefin stock assessments comes from fishery dependent catch and market records.

Fishery Independent Data

Aerial Surveys

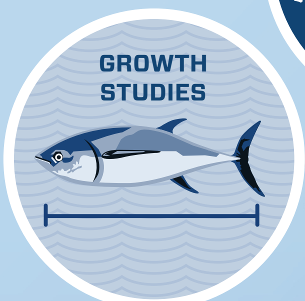
Using airplanes, scientists identify and count fish that are parts of schools near the ocean surface. Aerial surveys can collect data on the numbers of reproductive mature adults and younger juvenile fish.

Tagging—Fishery Independent

By releasing tunas with tags that are returned by fishermen when the fish is caught, or using tags that communicate and send data back to satellites, scientists can gather information on fish movement, spawning behaviors, seasonal distribution, and natural and fishing mortality.

Growth Studies

Combining the results of tagging studies with biological sampling and looking at the sizes of wild fish can help scientists chart growth rates and the ratio between length and weight for different ages of tuna.



Biological Sampling

Analysis of the chemical composition of the inner ear bone, or otolith, of individual tunas can tell scientists where a tuna was born. Scientists can also count the rings of the otolith or other bony parts, which, much like the rings of a tree trunk, indicate the age of the animal.

Fishery Dependent Data

Catch Records

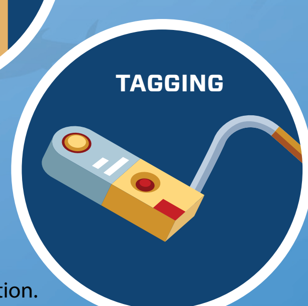
Logbooks, observer data, and catch records from fishermen around the Atlantic provide scientists a wealth of information on the size, spatial distribution, and abundance of the bluefin tuna population. They also provide data on the effort fishermen are expending to catch each fish. **However, recorded information from fishermen is often inaccurate and incomplete and can negatively impact the accuracy of the stock assessment.**

Market Records

Trade documents and records of the fish bought and sold at fish markets often include the weight of individuals and can be used to calculate the size distribution of a population.

Tagging—Fishery Dependent

Scientists have worked with recreational fishermen to tag tunas and collect data on the movement habits and migration patterns of the population.



2 THE MODEL

ICCAT scientists use a virtual population analysis (VPA) model that breaks the Atlantic bluefin tuna population into age classes, assigns each class its own growth and mortality rates, and works backwards using both fishery independent and dependent data to calculate past population levels. The model is often run multiple times, incorporating a range of assumptions and scenarios.

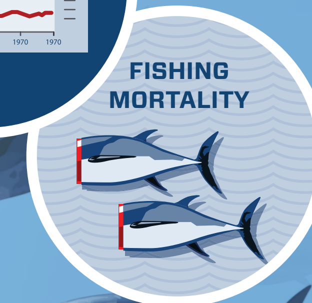
3 MODEL RESULTS

Stock assessment models provide scientists and managers with estimates of stock size, mortality over time, and projections of future conditions. These are then compared with concrete numbers, called biological reference points, to judge the health of the population.

Biological Reference Points

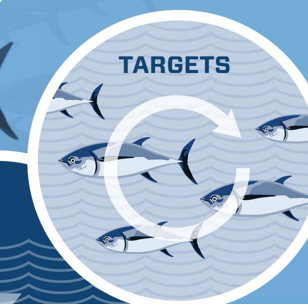
Stock Size

Stock size can be measured in two main ways: Abundance is the number of fish in the population; biomass is the total weight of all the fish in the population. Most models report stock size in terms of biomass.



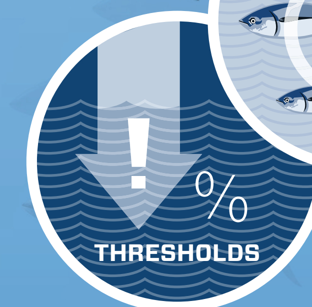
Fishing Mortality

Fishing mortality is the rate that fish are removed from the population by harvesting. A population is undergoing overfishing when more fish are being caught than can naturally be replaced.



Targets

Targets are numbers that managers aim to achieve and maintain. One of the most important is maximum sustainable yield (MSY), which is the maximum number of fish that can be sustainably caught and removed from the population, year after year.

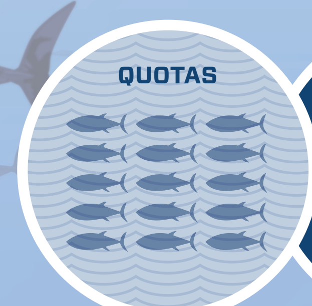


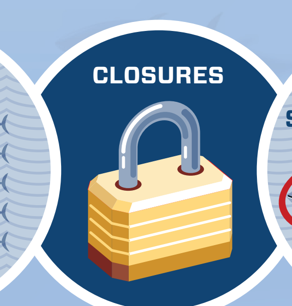
Thresholds

Thresholds are values that indicate a population is in trouble and that managers aim to avoid. For example, the threshold for an overfished stock occurs at the point when the population falls below the level that can support MSY.

MANAGEMENT OPTIONS

While stock assessments provide information on the status of the population and specify the likely outcomes of a variety of management options, it is ultimately up to the fishery managers to choose which management plan to implement. These decisions are often influenced by other factors besides the scientific information provided by the stock assessment.





Quotas Managers often set a Total Allowable Catch (TAC), which limits the total weight of fish that can be harvested in a specified time period.

Area and Time Closures Both area and time closures are an effective way to reduce harvest or protect important habitat or spawning grounds.

Size Restrictions By restricting the minimum or maximum size of fish that can be kept by fishermen, managers can protect juvenile fish or mature reproductive adults.

IN 2010, ICCAT RECOGNIZED " THE NECESSITY TO DEVELOP AND STRENGTHEN THE IMPLEMENTATION OF THE BLUEFIN TUNA CATCH DOCUMENTATION BY THE IMPLEMENTATION OF AN ELECTRONIC DOCUMENT SYSTEM. "

BETTER DATA YIELD BETTER ASSESSMENTS

Currently, ICCAT mandates that all its member countries implement a Bluefin Catch Documentation (BCD) system that tracks each haul of tuna as it moves through the supply chain.[3] The BCD collects the number and weight of bluefin, the date and location of catch, and the individuals or companies involved in the trade. It also records whether the appropriate authorities have verified that ICCAT regulations were followed. This information is vital to combat illegal, unreported, and unregulated (IUU) fishing and to provide data that are incorporated into scientific stock assessments, which managers use to set catch limits and conservation measures.

Unfortunately this paper-based system has been plagued by problems, including non-reporting, delayed reporting, and outright fraud. A report from 2010 found that more than 75 percent of the BCD records from purse seine vessels in 2008 and 2009 lacked crucial information that would allow the catch to be tracked through the marketplace.[4]

An electronic BCD (eBCD) system would reduce the fraudulent reporting, increase the speed and accuracy of data collection and reporting, and reduce the record-keeping burden on legitimate fishermen and industry members.[5] Better data that accurately reflect the amount of fish caught each year would allow scientists to model the population more accurately, improve stock assessments, lower the uncertainty of predictions and recommendations, and help to develop more-effective management measures.

At the 2010 annual ICCAT meeting, countries agreed to implement a fully functional electronic catch documentation scheme in time for the 2012 fishing season.[6] For this deadline to be met, countries must take decisive action at the 2011 ICCAT meeting, November 11 – 19, by agreeing to an implementation schedule, timeline, and budget. The ICCAT Secretariat must work with member countries to ensure that they meet their obligations.

The electronic system that ICCAT adopts should include, at a minimum:

A central, secure database where the information generated by the eBCD is stored and can be easily accessed by authorized users.

A bar-coding system that enables operators to generate a physical label linked to the eBCD system, allowing individual fish to be tagged and easily tracked through the supply chain.

A requirement that all information in the eBCD be checked and validated by the appropriate authority before the fish can move through the supply chain.

Contact Lee Crockett, lcrockett@pewtrusts.org
or 1-202-552-2065, for more information

Global Tuna Conservation www.PewEnvironment.org/Tuna

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[1] Rooker, J., *et al.* 2007. Life History and Stock Structure of Atlantic Bluefin Tuna (*Thunnus thynnus*). Reviews in Fisheries Science, 15:265-310.
[2] McCurry, J. 2011. BLUEFIN TUNA FETCHES RECORD £254,000 AT TOKYO AUCTION. The Guardian, Jan. 6.
[3] International Commission for the Conservation of Atlantic Tunas. 2009. Recommendation by ICCAT Amending Recommendation 08-12 on an ICCAT Bluefin Tuna Catch Documentation Program [Rec. 09-11].
[4] International Consortium of Investigative Journalists. 2010. Looting the Seas: How Overfishing, Fraud, and Negligence Plundered the Majestic Bluefin Tuna.
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[6] International Commission for the Conservation of Atlantic Tunas. 2010. Recommendation by ICCAT on an Electronic Bluefin Tuna Catch Documentation Program (eBCD) [Rec. 10-11].