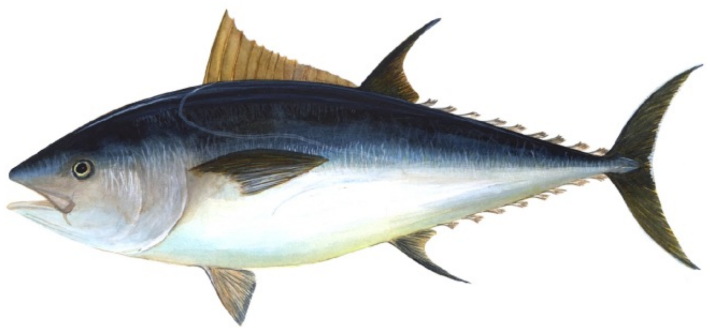
COSEWIC
Assessment and Status Report

on the

Atlantic Bluefin Tuna
Thunnus thynnus

in Canada



ENDANGERED
2011

COSEWIC
Committee on the Status
of Endangered Wildlife
in Canada

COSEPAC
Comité sur la situation
des espèces en péril
au Canada

COSEWIC status reports are working documents used in assigning the status of wildlife species suspected of being at risk. This report may be cited as follows:

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For additional copies contact:

COSEWIC Secretariat
c/o Canadian Wildlife Service
Environment Canada
Ottawa, ON
K1A 0H3

Tel.: 819-953-3215
Fax: 819-994-3684
E-mail: COSEWIC/COSEPAC@ec.gc.ca
http://www.cosewic.gc.ca

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Atlantic Bluefin Tuna — Atlantic Bluefin Tuna (from http://www.en.wikipedia.org/wiki/File:Bluefin-big.jpg).

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COSEWIC
Assessment Summary

Assessment Summary – May 2011

Common name
Atlantic Bluefin Tuna

Scientific name
Thunnus thynnus

Status
Endangered

Reason for designation
This iconic fish has been heavily exploited for over 40 years and the current abundance of spawning individuals is the lowest observed. Fishing is the main threat to the viability of the species, and despite management efforts for the past 30 years to rebuild the population there is little sign of population increase. The abundance of spawning fish has declined by 69% over the past 2.7 generations. While the cause of the decline, overfishing, is understood, it has not ceased and it is not clearly reversible. The spawning segment of the species was exposed to the Deepwater Horizon oil spill in a portion of its spawning area in the Gulf of Mexico. While the effects of the spill on the species are currently unknown, it may represent an additional threat.

Occurrence
Atlantic Ocean

Status history
Designated Endangered in May 2011.

COSEWIC
Executive Summary

Atlantic Bluefin Tuna
Thunnus thynnus

Wildlife species information

Atlantic Bluefin Tuna is a very large species (the all-tackle angling record is a 679 kg fish of 304 cm fork length taken off Aulds Cove, Nova Scotia in 1979), with a stout but efficiently streamlined, fusiform body that is a little compressed. There are two dorsal fins; the first is yellow or bluish while the second is reddish-brown. The head is conical with a pointed snout and a mouth that is terminal with the lower jaw slightly projecting. The dorsal surface is dark blue to black, shading to lighter blue on the sides and silvery grey below. The lower sides and belly are silvery white with colourless transverse lines alternated with rows of colourless dots (these dominate in older fish), which are visible only in fresh specimens. Atlantic Bluefin Tuna in Canadian waters are large, usually about 270 cm fork length and 400 kg or more.

Distribution

Atlantic Bluefin Tuna occurs on both sides of the Atlantic Ocean, from the Lofoten Islands, off northern Norway, south to the Canary Islands and into the Mediterranean and Black seas in the eastern Atlantic and from Newfoundland to the Caribbean Sea and coastal waters of Venezuela and Brazil in the western Atlantic. These fish are seasonal migrants to Canadian waters where they are fished from July through December over the Scotian Shelf, in the Gulf of St. Lawrence, in the Bay of Fundy, and off Newfoundland. The occurrence and abundance of Atlantic Bluefin Tuna in any one of these locations varies considerably from one year to the next.

Atlantic Bluefin Tuna consist of at least 2 discrete and evolutionarily significant populations, one that spawns in the Gulf of Mexico (western population) and one or more that spawn in the Mediterranean Sea (eastern population). The vast majority of the fish found in Canadian waters are thought to originate in the Gulf of Mexico based on tagging and otolith microchemistry studies from the directed fishery in the Gulf of St. Lawrence and off Nova Scotia. The origin of fish caught in non-directed fisheries has not been investigated.

Habitat

Specific habitat requirements have not been defined for Atlantic Bluefin Tuna. It has been known for a long time that this species could regulate its temperature and therefore tolerate a wide thermal range, allowing it to spawn in the warm waters of the Gulf of Mexico and to feed in cool waters off Atlantic Canada. Atlantic Bluefin Tuna occurs in Canadian waters during its summer feeding migration.

The April 2010 oil spill in the Gulf of Mexico has caused particular concerns. There was spatial and temporal overlap with the occurrence of Atlantic Bluefin Tuna eggs and larvae and it is reasonable to assume that there will be some negative impact.

Biology

The western population of Atlantic Bluefin Tuna is known to spawn in the Gulf of Mexico; larvae and mature individuals have also been found in the Bahamas / Straits of Florida in suitable water temperatures at the time of spawning. Early growth is rapid and, in general, males tend be longer but both sexes have similar weight at similar sizes. There is considerable uncertainty regarding the age at maturity in the western Atlantic. For this report it is assumed that age at 50% maturity is 9 years, although some data suggest it may be somewhat older (up to 12 years). Atlantic Bluefin Tuna are highly active predators eating both pelagic and bottom fishes in Canadian waters. Humans, Killer Whales, and Mako Sharks are among the few predators on adult Atlantic Bluefin Tunas, but natural mortality is expected to be higher for smaller fish vulnerable to other pelagic predators and seabirds.

Population sizes and trends

The estimated trend in mature population numbers shows an initial steep and steady decline from 1970 to the early 1990s, a small increase until the late 1990s, followed by a steady decline to the last data point in 2010. Recruitment since the late 1970s is estimated to have been considerably lower than for the first part of the 1970s. Fishing mortality of spawners increased irregularly to a peak in the early 2000s but is estimated to have decreased since.

Age 9 and older population numbers decreased from 264,842 individuals in 1970 to 66,865 in 1992 (75% decline), increased to 84,306 in 1998 (26%), and declined to 65,923 in 2010 (22%). The three generation decline is therefore inferred to be 69%.

Limiting factors and threats

Historical and present-day overfishing remains the single largest threat to the western population of Atlantic Bluefin Tuna. Recent research clearly shows that the western population migrates over much of the North Atlantic where fish are susceptible to fleets targeting both western and eastern populations. The majority of the catch (in numbers) is of immature fish and this poses a threat to recovery. The species has been exposed to the April 2010 Deepwater Horizon oil spill in its spawning area in the Gulf of Mexico and this may hamper recruitment. Fisheries on forage species off Atlantic Canada pose a possible threat.

Special significance of the species

Atlantic Bluefin Tuna is an apex predator whose role in the ecosystem is not precisely known, but is expected to be important, particularly with respect to small pelagic species. They are an iconic fish that are highly prized for their flesh, which is sold for sushi and sashimi.

Existing protection

The International Commission for the Conservation of Atlantic Tunas (ICCAT) is the primary organization responsible for the management of Atlantic Bluefin Tuna fisheries but has been criticized for not achieving its management objectives.
The Canadian fishery is managed by Fisheries and Oceans Canada under the *Fisheries Act*. A recent proposal by Monaco to list Atlantic Bluefin Tuna under Appendix I of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) was rejected at the March 2010 meeting of CITES. The World Conservation Union (IUCN) lists the western population of Atlantic Bluefin Tuna as *critically endangered*. Atlantic Bluefin Tuna are considered a candidate species for listing under the *Endangered Species Act* in the U.S.

TECHNICAL SUMMARY

Thunnus thynnus
Atlantic Bluefin Tuna — Thon rouge de l'Atlantique
Range of occurrence in Canada: Atlantic Ocean

Demographic Information

Generation time	15 yrs
Is there an [observed, inferred, or projected] continuing decline in number of mature individuals?	Inferred continuing decline in number of mature individuals.
Estimated percent of continuing decline in total number of mature individuals within [5 years or 2 generations]	Not calculated
[Observed, estimated, inferred, or suspected] percent [reduction or increase] in total number of mature individuals over the last [10 years, or 3 generations].	Estimated 69% reduction over 2.7 generations
[Projected or suspected] percent [reduction or increase] in total number of mature individuals over the next [10 years, or 3 generations].	Not calculated
[Observed, estimated, inferred, or suspected] percent [reduction or increase] in total number of mature individuals over any [10 years, or 3 generations] period, over a time period including both the past and the future.	Not calculated
Are the causes of the decline clearly reversible and understood and ceased?	Understood but not ceased and not clearly reversible.
Are there extreme fluctuations in number of mature individuals?	No

Extent and Occupancy Information

Estimated extent of occurrence	Not calculated, not considered relevant in Canadian waters
Index of area of occupancy (IAO) (Always report 2x2 grid value).	Not calculated, not considered relevant in Canadian waters
Is the total population severely fragmented?	No
Number of locations∗	Unknown
Is there an [observed, inferred, or projected] continuing decline in extent of occurrence?	None detected
Is there an [observed, inferred, or projected] continuing decline in index of area of occupancy?	Possibly. Rapid decrease in CPUE off Brazil at the beginning of longline fishing indicates a decrease in AO
Is there an [observed, inferred, or projected] continuing decline in number of populations?	NA
Is there an [observed, inferred, or projected] continuing decline in number of locations*?	NA
Is there an [observed, inferred, or projected] continuing decline in [area, extent and/or quality] of habitat?	No

∗ See Definitions and Abbreviations on COSEWIC website and IUCN 2010 for more information on this term.

Are there extreme fluctuations in number of populations?	No
Are there extreme fluctuations in number of locations∗?	No
Are there extreme fluctuations in extent of occurrence?	No
Are there extreme fluctuations in index of area of occupancy?	No

Number of Mature Individuals (in each population)

Population	**N Mature Individuals**
Western population of Atlantic Bluefin Tuna	~ 66,000
Total	~ 66,000

Quantitative Analysis

Probability of extinction in the wild is at least [20% within 20 years or 5 generations, or 10% within 100 years].	Not conducted

Threats (actual or imminent, to populations or habitats)

Overfishing, habitat loss from marine pollution.

Rescue Effect (immigration from outside Canada)

Status of outside population(s)? Western population considered one population with only one known spawning area. No evidence of eastern breeders spawning in the Gulf of Mexico.	
Is immigration known or possible?	No
Would immigrants be adapted to survive in Canada?	Yes
Is there sufficient habitat for immigrants in Canada?	Yes
Is rescue from outside populations likely?	No

Current Status

COSEWIC: Assessed as Endangered in May of 2011

Status and Reasons for Designation

Status: Endangered	**Alpha-numeric code:** A2b
Reasons for designation: This iconic fish has been heavily exploited for over 40 years and the current abundance of spawning individuals is the lowest observed. Fishing is the main threat to the viability of the species, and despite management efforts for the past 30 years to rebuild the population there is little sign of population increase. The abundance of spawning fish has declined by 69% over the past 2.7 generations. While the cause of the decline, overfishing, is understood, it has not ceased and it is not clearly reversible. The spawning segment of the species was exposed to the Deepwater Horizon oil spill in a portion of its spawning area in the Gulf of Mexico. While the effects of the spill on the species are currently unknown, it may represent an additional threat.	

Applicability of Criteria

Criterion A (Decline in Total Number of Mature Individuals): Meets Endangered A2b as there has been a measured decline in the abundance of mature individuals of 69% over the past 40 years.
Criterion B (Small Distribution Range and Decline or Fluctuation): Not applicable as the extent of occurrence and the index of area of occupancy are greater than the thresholds.
Criterion C (Small and Declining Number of Mature Individuals): Not applicable as the number of mature individuals is greater than the threshold.
Criterion D (Very Small or Restricted Total Population): Not applicable.
Criterion E (Quantitative Analysis): Not done.

∗ See Definitions and Abbreviations on COSEWIC website and IUCN 2010 for more information on this term.

COSEWIC HISTORY

The Committee on the Status of Endangered Wildlife in Canada (COSEWIC) was created in 1977 as a result of a recommendation at the Federal-Provincial Wildlife Conference held in 1976. It arose from the need for a single, official, scientifically sound, national listing of wildlife species at risk. In 1978, COSEWIC designated its first species and produced its first list of Canadian species at risk. Species designated at meetings of the full committee are added to the list. On June 5, 2003, the *Species at Risk Act* (SARA) was proclaimed. SARA establishes COSEWIC as an advisory body ensuring that species will continue to be assessed under a rigorous and independent scientific process.

COSEWIC MANDATE

The Committee on the Status of Endangered Wildlife in Canada (COSEWIC) assesses the national status of wild species, subspecies, varieties, or other designatable units that are considered to be at risk in Canada. Designations are made on native species for the following taxonomic groups: mammals, birds, reptiles, amphibians, fishes, arthropods, molluscs, vascular plants, mosses, and lichens.

COSEWIC MEMBERSHIP

COSEWIC comprises members from each provincial and territorial government wildlife agency, four federal entities (Canadian Wildlife Service, Parks Canada Agency, Department of Fisheries and Oceans, and the Federal Biodiversity Information Partnership, chaired by the Canadian Museum of Nature), three non-government science members and the co-chairs of the species specialist subcommittees and the Aboriginal Traditional Knowledge subcommittee. The Committee meets to consider status reports on candidate species.

DEFINITIONS
(2011)

Wildlife Species	A species, subspecies, variety, or geographically or genetically distinct population of animal, plant or other organism, other than a bacterium or virus, that is wild by nature and is either native to Canada or has extended its range into Canada without human intervention and has been present in Canada for at least 50 years.
Extinct (X)	A wildlife species that no longer exists.
Extirpated (XT)	A wildlife species no longer existing in the wild in Canada, but occurring elsewhere.
Endangered (E)	A wildlife species facing imminent extirpation or extinction.
Threatened (T)	A wildlife species likely to become endangered if limiting factors are not reversed.
Special Concern (SC)*	A wildlife species that may become a threatened or an endangered species because of a combination of biological characteristics and identified threats.
Not at Risk (NAR)**	A wildlife species that has been evaluated and found to be not at risk of extinction given the current circumstances.
Data Deficient (DD)***	A category that applies when the available information is insufficient (a) to resolve a species' eligibility for assessment or (b) to permit an assessment of the species' risk of extinction.

* Formerly described as "Vulnerable" from 1990 to 1999, or "Rare" prior to 1990.

** Formerly described as "Not In Any Category", or "No Designation Required."

*** Formerly described as "Indeterminate" from 1994 to 1999 or "ISIBD" (insufficient scientific information on which to base a designation) prior to 1994. Definition of the (DD) category revised in 2006.

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Canada

The Canadian Wildlife Service, Environment Canada, provides full administrative and financial support to the COSEWIC Secretariat.

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TABLE OF CONTENTS

List of Figures

List of Tables

WILDLIFE SPECIES INFORMATION

Name and classification

The Atlantic Bluefin Tuna (Figure 1), *Thunnus thynnus* (Linnaeus, 1758), belongs to the Class Actinopterygii, Order Perciformes, and Family Scombridae, a relatively large family of pelagic marine fishes occurring in tropical, subtropical and temperate waters of the world's oceans (Scott and Scott 1988). Atlantic Bluefin Tuna is known as *thon rouge de l'Atlantique* in French and *Atun rojo* in Spanish. In the past, the species has also been known under various scientific names (see http://www.fao.org/fishery/species/3296/en). Scott and Scott (1988) recognize two subspecies, *Thunnus thynnus thynnus* in the north Atlantic and *Thunnus thynnus orientalis* in the North Pacific, but Maguire *et al.* (2006, page 9, based on Carpenter 2002) state that these are now recognized as two species: *Thunnus thynnus* for Atlantic Bluefin Tuna and *Thunnus orientalis* for Pacific Bluefin Tuna. A related, smaller species, the Southern Bluefin Tuna, *Thunnus maccoyii* (Castelnau, 1872) occurs in the southern ocean. Atlantic Bluefin Tuna is the largest member of the mackerel-like fishes (family Scombridae) (Scott and Scott 1988). It is a pelagic species that swims constantly to ventilate (Fromentin and Powers 2005).

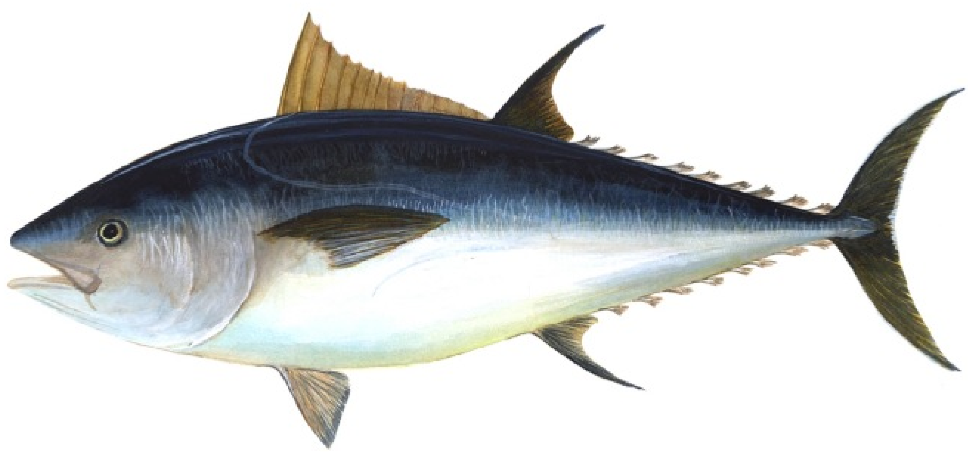

Figure 1. Atlantic Bluefin Tuna (from http://www.en.wikipedia.org/wiki/File:Bluefin-big.jpg).

Atlantic Bluefin Tuna is one of the 16 species or species groups officially recognized in Annex I of the United Nations Convention on the Law of the Sea (UNCLOS) as a highly migratory species (Maguire *et al.* 2006).

Morphological description

The following description is a combination of information found in Scott and Scott (1988), on the FAO Species Identification website (http://www.fao.org/fishery/species/3296/en), and on the Fishbase website (http://www.fishbase.org/Summary/SpeciesSummary.php?id=147).

Atlantic Bluefin Tuna is a very large fish (largest recorded 679 kg, 304 cm fork length), with a stout but efficiently streamlined, fusiform body that is a little compressed. There are two dorsal fins; the first is yellow or bluish while the second is reddish-brown, providing an explanation for the different common names in English and French-Spanish. The head is conical with a pointed snout and the mouth is terminal with the lower jaw slightly projecting. There is one series of small conical teeth in each jaw and the eye is relatively small. The body is deepest below the middle of the first dorsal fin tapering to a slender caudal peduncle with a strong median keel and smaller keels above and below it. There are 34 to 43 gillrakers on the first arch. The second dorsal fin is higher than the first one. The pectoral fins are very short, less than 80% of head length (16.8 to 21% of fork length), and they never reach the space between the dorsal fins. The first dorsal fin is depressible in a groove, but the second one is not.
The second dorsal fin is followed by nine finlets. The caudal fin is firm, widely forked and has a lunate shape. The anal fin has the same size and shape as the second dorsal and it too is followed by eight or nine finlets. The pelvic fins are small, thoracic, ventral, under the pectorals, and they fold in a depression, thus increasing streamlining.
The ventral surface of the liver is striated. Atlantic Bluefin Tuna possess a swimbladder, 18 pre-caudal vertebrae and 21 caudal vertebrae. The dorsal surface is dark blue to black, shading to lighter blue on the sides and silvery grey below. The lower sides and belly are silvery white with colourless transverse lines alternated with rows of colourless dots (these dominate in older fish) that are visible only in fresh specimens. The anal fin and the finlets are dusky yellow edged with black while the median caudal keel is black in adults. The body is covered with scales; those in the pectoral region form a sort of obscure corselet. The lateral line is complete. Individuals in Canadian waters are large, ranging between 150 and 300 cm and averaging about 200 cm fork length.

Genetic description

Carlsson *et al.* (2007) found that young of the year Atlantic Bluefin Tuna captured on the spawning grounds in the Gulf of Mexico showed significant genetic differences from those in the Mediterranean. Furthermore, genetic analyses on young of the year fish from the Mediterranean Sea suggest that individuals from the eastern Mediterranean (Ionian Sea) are different from those in the western Mediterranean (Carlsson *et al.* 2004).

Population spatial structure

Knowledge of Atlantic Bluefin Tuna population structure has evolved over the past several decades. From 1970 to 1980, the Standing Committee on Research and Statistics (SCRS) of the International Commission for the Conservation of Atlantic Tunas (ICCAT) provided advice for the management of fisheries on Atlantic Bluefin Tuna under the hypothesis that fish in the western Atlantic, in the eastern Atlantic and in the Mediterranean and Black seas were part of a single stock. In its 1981 Annual Report (ICCAT 1982), SCRS states that the evidence seemed to favour a two-stock hypothesis, one for the western Atlantic and one for the eastern Atlantic and Mediterranean plus Black seas. According to the most recent SCRS report (ICCAT 2008) the Atlantic Bluefin Tuna displays a homing behaviour and fidelity to the major spawning sites in the Mediterranean Sea or the Gulf of Mexico. Fisheries on Atlantic Bluefin Tuna are now managed assuming that the two stocks are separated by the 45°W meridian (the 2-stock hypothesis). However, interchange does occur between the two management areas.

Electronic tagging results suggest that feeding migrations vary considerably among individuals, years and areas. Information on natal origin derived from otolith microchemistry (Rooker *et al.* 2008) shows an increasing contribution of eastern-origin fish to North American fisheries south of Cape Cod in the mid-Atlantic Bight, up to 62% for fish in the 69-119 cm size class. However, Canadian fisheries catching larger size classes rely almost entirely on tuna of western origin (ICCAT 2008; Schloesser *et al.* 2010). Fish of western origin are also caught east of the 45°W meridian and this is of particular concern given the higher Total Allowable Catch (TAC) in that area (Rooker *et al.* 2007). None of the Atlantic Bluefin Tunas tagged with electronic tags (n=6) in the Gulf of St. Lawrence reported by Block *et al.* (2009) had moved into the eastern management area. More recent information (Wilson *et al.* 2010) indicated that 1 of 14 Atlantic Bluefin Tuna tagged in the Gulf of St. Lawrence entered the Mediterranean. Schloesser *et al.* (2010) indicate that more than 99% of the Atlantic Bluefin Tuna in their Gulf of St. Lawrence samples (n=224) originated from the Gulf of Mexico.

Conventional tagging experiments (Mather *et al.* 1995; Sara 1963) had shown that Atlantic Bluefin Tuna tagged in the western Atlantic were recovered in the eastern Atlantic. Electronic tags show similar movements (Block *et al.* 2005; Rooker *et al.* 2007), but, along with micro-constituents analyses, suggest that some of these may in fact be of Mediterranean origin. It is clear, however, that western origin Atlantic Bluefin Tuna are caught east of the 45^o meridian (Block *et al.* 2005).

Overall, the evidence suggests that Atlantic Bluefin Tuna in Canadian waters, based primarily on samples of large individuals captured in directed fisheries or on fishing grounds in the Gulf of St. Lawrence and off Nova Scotia, originate in the Gulf of Mexico. The origin of Atlantic Bluefin Tuna caught in non-directed fisheries (e.g., the Canadian pelagic longline fishery for swordfish) has not been investigated.

Designatable units (DU)

COSEWIC identifies DUs as discrete and evolutionarily significant units. Discreteness is considered of primary importance, and may refer to genetic isolation, habitat discontinuity, or ecological isolation. Significant means that the DU is important to the evolutionary legacy of the species as a whole, and if lost would likely not be replaced over ecological time scales. Significance may refer to deep phylogenetic divergence, adaptive life history variations, or ecological uniqueness.

The stock structure of Atlantic Bluefin Tuna is composed of at least 2 discrete spawning populations, one in the Gulf of Mexico (western population) and one or more in the Mediterranean Sea (eastern population). These populations differ significantly in their age of maturity, with 50% mature at age 8 in the Gulf of Mexico and at age 4 in the Mediterranean (see biology section). Thus, over its entire range, the species exists in 2 DUs. The vast majority (~99% from directed fishery caught samples from the Gulf of St. Lawrence and off Nova Scotia) of Atlantic Bluefin Tuna found in Canadian waters originate in the Gulf of Mexico (western population). Because the species does not spawn in Canada, its status in Canada is considered equivalent to the overall status of the entire western population, as determined from data and stock assessment models considered by ICCAT. Thus, there is one Canadian DU.

DISTRIBUTION

Global range

The following description is adapted from a combination of information found in Scott and Scott (1988), on the FAO Species Identification website (http://www.fao.org/fishery/species/3296/en), on the Fishbase website (http://www.fishbase.org/Summary/SpeciesSummary.php?id=147) and in the recent SCRS reports (ICCAT 2008, 2010).

Atlantic Bluefin Tuna are distributed on both sides of the Atlantic Ocean, from the Lofoten Islands, off northern Norway, south to the Canary Islands and into the Mediterranean and Black seas in the eastern Atlantic and from Newfoundland to the Caribbean Sea and coastal waters of Venezuela and Brazil (Figure 2). It is a mostly pelagic species with a wide geographical distribution and it is one of the only large pelagic fish living permanently in temperate Atlantic waters. Results from electronic tags (Block *et al.* 2009, Rooker *et al.* 2008) show that Atlantic Bluefin Tuna can swim in a wide range of temperatures (from 3^{o}C to 30^{o}C) while maintaining stable internal body temperature. Those tagging results also revealed that Atlantic Bluefin Tuna frequently dive to depths of 500 m to 1,000 m and are not confined to the surface and subsurface waters as was previously believed. Smaller Atlantic Bluefin Tuna school by size, sometimes together with Albacore (*Thunnus alalunga*), Yellowfin (*Thunnus albacores*), Bigeye (*Thunnus obesus*), Skipjack (*Katsuwonus pelamis*), and Frigate Tuna (*Auxis thazard thazard*).

Scott and Scott (1988), FAO (http://www.fao.org/fishery/species/3296/en) and Fishbase mention that there is a subpopulation off southern Africa, with Fishbase showing relatively large abundance off Namibia on its native range map (http://www.fishbase.org/Summary/SpeciesSummary.php?id=147), but recent SCRS reports do not mention the occurrence of Atlantic Bluefin Tuna south of the equator in the eastern Atlantic. Note that Fishbase has doubts about the southern distribution: "*Predicted distribution possibly false in lower eastern central and southeast Atlantic below Mauritania*" (http://www.aquamaps.org/receive.php obtained by clicking on the map on Fishbase's main page for Atlantic Bluefin Tuna http://www.fishbase.org/Summary/SpeciesSummary.php?id=147).

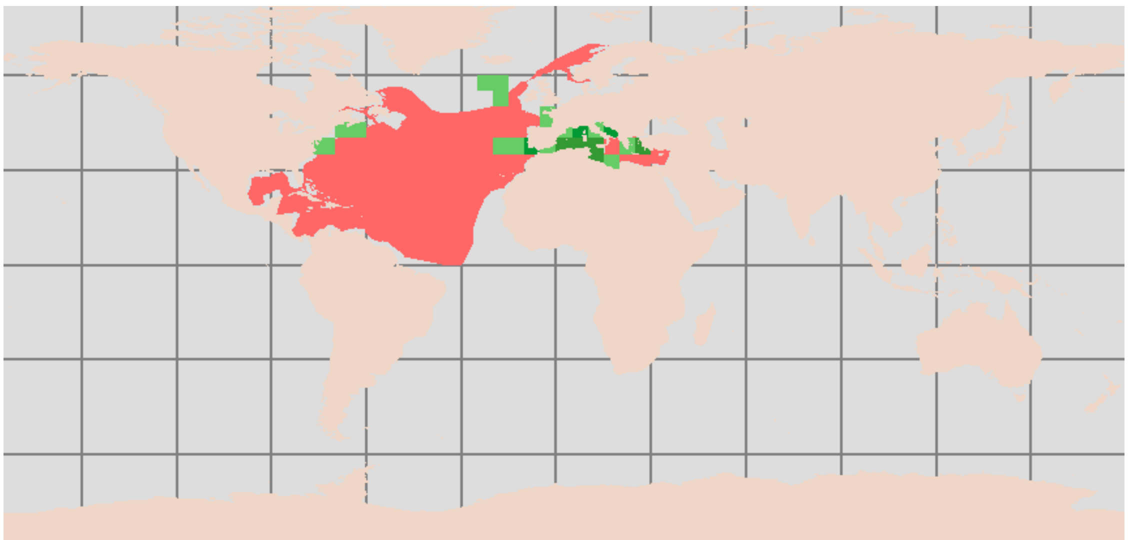

Figure 2. Distribution of Atlantic Bluefin Tuna. The red areas are the known distribution and the green areas are the main fishing grounds since the 1970s. Modified from Maguire *et al.* (2006).

Figure 3 below from Fonteneau (2009) illustrates the changes in distribution of catches of bluefin tuna in the Japanese longline fisheries (generally not targeting Atlantic Bluefin Tuna). Years are chosen to illustrate specific points: the catches off Brazil during 1959-1963 and the absence of catches in later years although the fleet continued to be active in the area; the largest Japanese longline catches during 1964-1966; the low catches during 1967-1974 possibly because of low abundance and low market value; increased targeting on bluefin starting in 1975 with the development of deep freezing; large catches in the Gulf of Mexico during 1975-1980; movement of the fleet eastward during 1981-1993 after the implementation of low quotas for the western Atlantic; and increased catches in northern waters during 1994-2006.

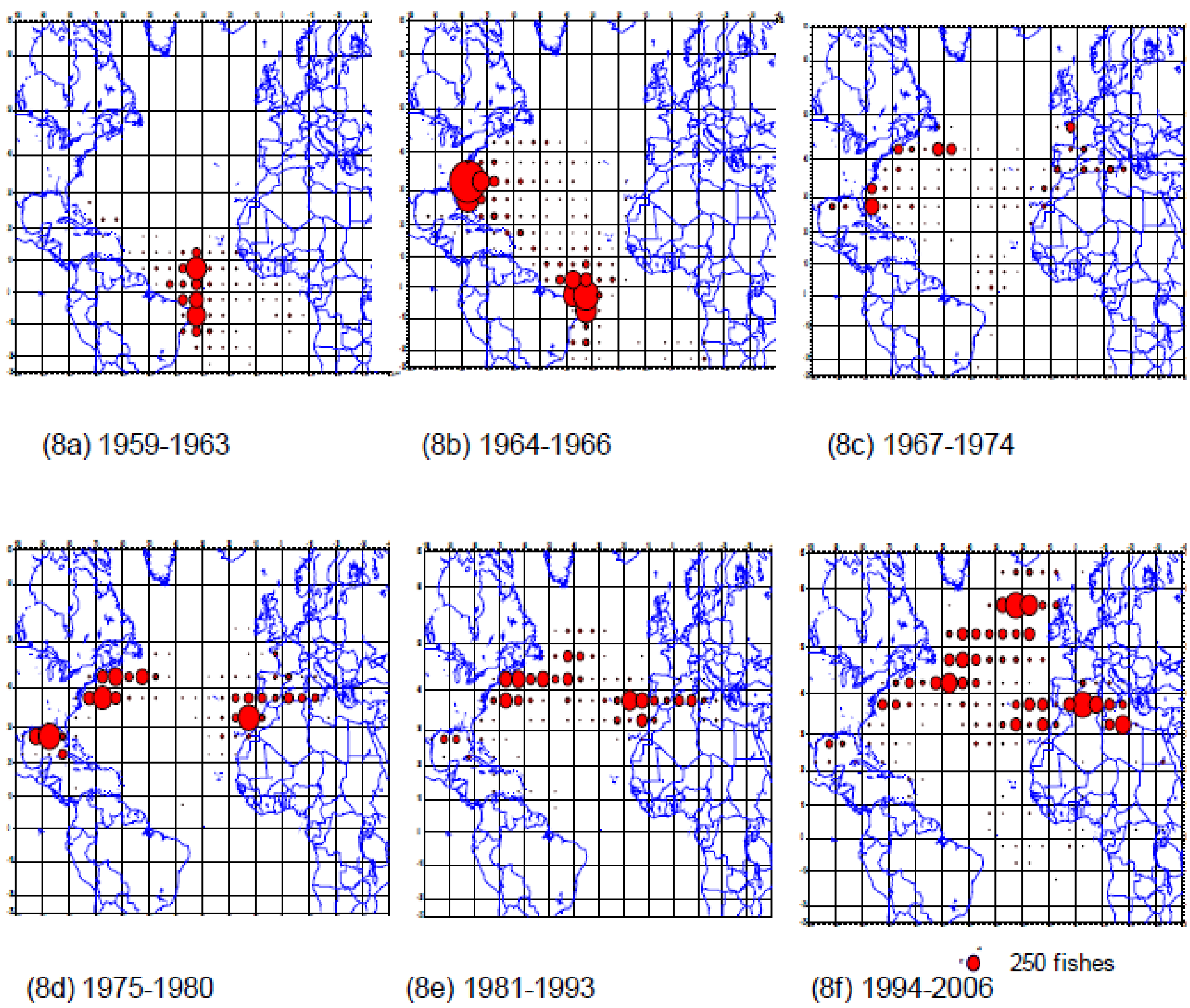

Figure 3. Maps showing average Atlantic Bluefin Tuna catches by Japanese longliners during 6 selected periods. From Fonteneau (2009).

Atlantic Bluefin Tuna fisheries have shown unique variability, at both local and global scales due to changes in biomass and environmental fluctuations affecting both spawning and feeding (Fonteneau 2009, Figure 3 above). Prey abundance and distribution is also believed to influence Atlantic Bluefin Tuna distribution and abundance (Fonteneau 2009, Fromentin and Powers 2005, Rooker *et al.* 2007).

Canadian range

Atlantic Bluefin Tuna are seasonal migrants to summer feeding grounds in Canadian waters. Scott and Scott (1988) report one sighting of Atlantic Bluefin Tuna from Hamilton Inlet, Labrador. Generally, it is the larger ("giant") Atlantic Bluefin Tuna that occur in Canadian waters, but smaller ones ("jumpers" between 23 and 68 cm) have been reported in southern Canadian waters in late August or September (Scott and Scott 1988). The review of the 2003 Canadian fishery (ICCAT 2004, p. 35) provides a description of contemporary fisheries in Canadian waters which can be used as a surrogate to understand the Canadian range. Fisheries for Atlantic Bluefin Tuna occur over the Scotian Shelf, southern Gulf of St. Lawrence, Bay of Fundy and Grand Banks off Newfoundland. Figure 4 shows the location of these fisheries and Figure 5 shows the location of catches by main gear types for 1990-1999 (panel A) and for 2000-2009 (panel B).

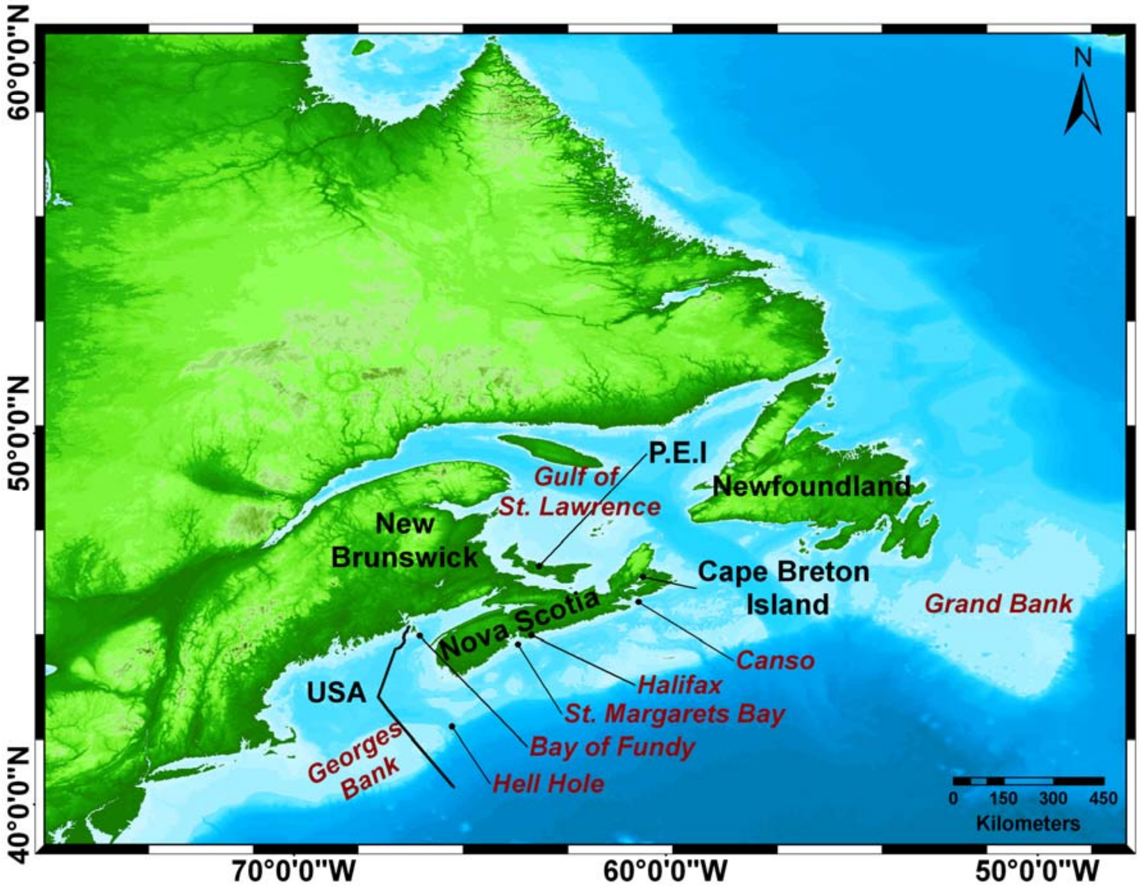

Figure 4. Map showing the major fishing locations of Atlantic Bluefin Tuna in the Gulf of St. Lawrence, Maritime (Hell Hole, Bay of Fundy, St. Margarets Bay, Halifax and Canso) and Newfoundland (Grand Bank) regions (prepared by DFO).

The occurrence and abundance of Atlantic Bluefin Tuna in any one of these locations varies considerably from one year to the next. Actual abundance and availability is believed to be related to overall abundance but also to the age and size structure, water temperature and currents, as well as prey availability, related to oceanographic conditions, and migration (Fromentin and Powers 2005).

There is some evidence of changes in the distribution of the species in Canadian waters based on fisheries data. In Canada, fisheries have come and gone with the inshore Wedgeport, Nova Scotia sport fishery from 1935 to 1966 being a prime example (Clay and Hurlbut, unpublished report, see also the Wedgeport Tuna Museum website http://tuna.mindseed.ca/) of a fishery that is gone and that of the "Hell Hole" off Georges Bank being one that has come.

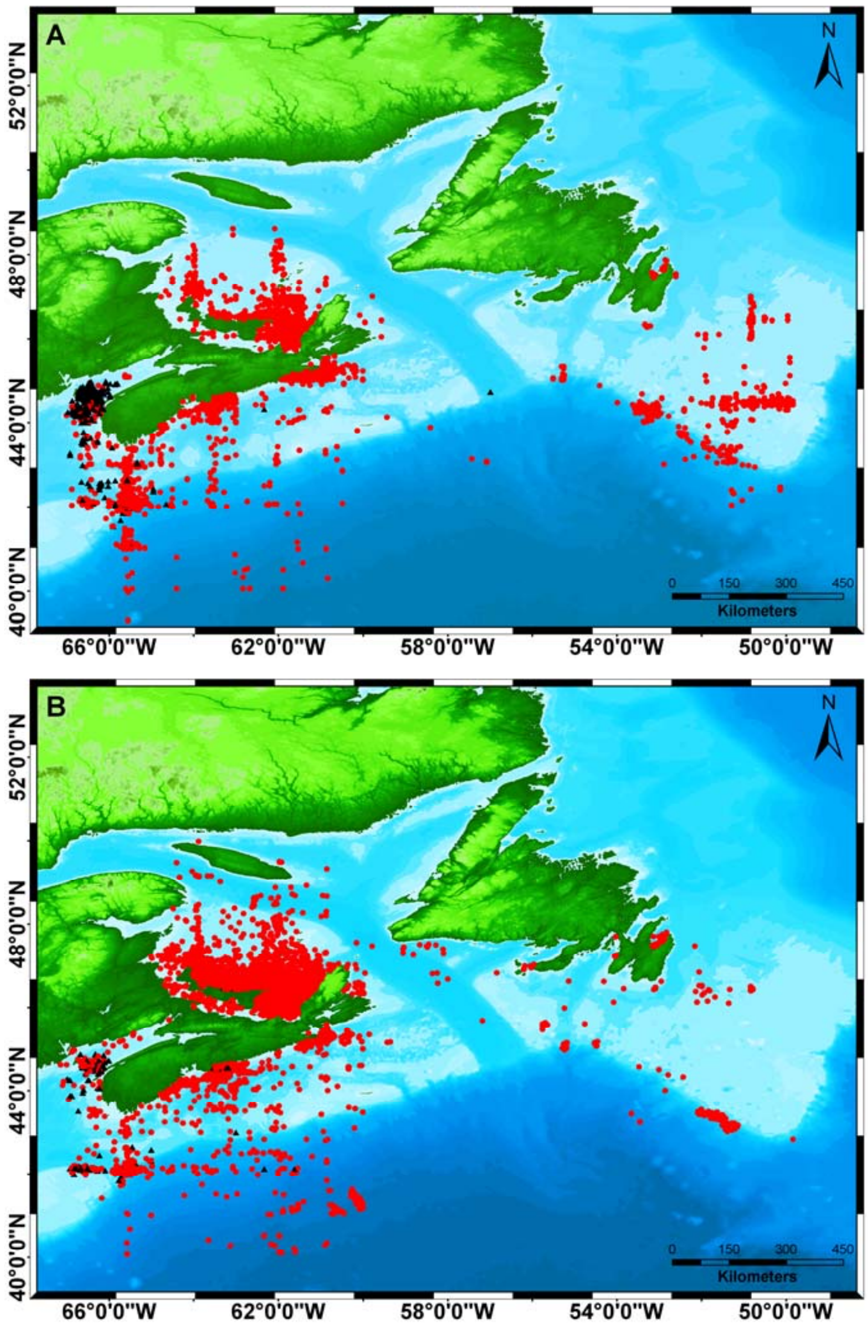

Figure 5. Location of Canadian Atlantic Bluefin Tuna catches by gear (red circle = hook line and black triangle = Harpoon) in the Gulf of St. Lawrence, Maritime and Newfoundland regions from logbook records from 1990 to 1999 (A) and 2000 to 2009 (B).

HABITAT

Habitat requirements

As indicated above, Atlantic Bluefin Tuna are seasonal migrants to Canadian waters in search of food. They arrive in summer and move southward in late fall. They may form schools, generally of less than 50 individuals (Scott and Scott 1988). Their spatial distribution is both coastal and oceanic (Figure 2). Two spawning locations are known: the western Atlantic population spawns in the Gulf of Mexico and the eastern Atlantic / Mediterranean population spawns in the Mediterranean (ICCAT 2008).

Specific habitat requirements have not been defined for this species. It has been known for a long time that they can regulate their temperature and therefore tolerate a wide range of temperature (Scott and Scott 1988). More recent work reported in the SCRS (ICCAT 2008) and in Fonteneau (2009) extends the range of temperature where Atlantic Bluefin Tuna can be found as well as the depth they occupy. Work is ongoing on the factors that influence their distribution (Fromentin and Powers 2005, Humston *et al.* 2000, Lutcavage *et al.* 2000). The distribution is expected to be closely related to that of its prey.

There are no known spawning or rearing habitats for larval and juvenile stages of Atlantic Bluefin Tuna in Canadian waters. As indicated above, the fish move into Canadian waters long after the larval stage most likely associated with prey abundance and distribution. Atlantic Bluefin Tuna has a diversified diet (Fonteneau and Fromentin 2009) but its migration into Canadian waters could depend on specific prey species but this has not been demonstrated.

Habitat trends

Fonteneau (2009) states: “Bluefin tuna in the Atlantic has been the tuna species showing the greatest flexibility, and permanently changing its areas of concentration and its apparent migration routes. Bluefin tuna is also and by far, among all other tuna species, the species having shown the best thermoregulation and being taken in the widest range of SST (sea surface temperature): from sub Arctic to equatorial waters”. This suggests that usual concepts of habitat trends may not be relevant to Atlantic Bluefin Tuna as long as spawning and larval and juvenile rearing habitats are protected. While trends in foraging habitat for the species in Canadian waters are not known, there is little to suggest that this habitat has deteriorated in recent years. Forage species such as Herring (*Clupea harengus*) and Mackerel (*Scomber scombrus*) have fluctuated, and Capelin (*Mallotus villosus*) abundance on the Grand Bank is considerably lower than that observed in the late 1980s and early 1990s (DFO 2008).

Habitat protection/ownership

Not applicable.

BIOLOGY

The information provided in this section originates from Scott and Scott (1988), reports of the ICCAT Standing Committee on Research and Statistics, Fonteneau and Fromentin (2009), and the summary prepared by Neilson (2009) for this review.

Life cycle and reproduction

Atlantic Bluefin Tuna are oviparous and iteroparous; they have asynchronous oocyte development and are multiple batch spawners. Spawning for the western population is known to occur in the Gulf of Mexico; larvae and mature individuals have also been found in the Bahamas / Straits of Florida in suitable water temperatures at the time of spawning. Spawning occurs in May in the Gulf of Mexico. Incubation takes a few days and larvae may hatch at 2-3 mm as early as 2 days after spawning; the yolk sac is absorbed at 4 mm.

Early growth is rapid and in general, males tend be longer but both genders have similar weight at similar sizes. Atlantic Bluefin Tuna is often segregated into three size categories: (1) "school size," (<61 kg or <120 cm curved fork length (CFL)), (2) "medium" (61–140 kg, 120–205 cm CFL) and (3) "giant" (>140 kg, >205 cm CFL) (Rooker *et al.* 2007). The large Atlantic Bluefin Tuna ('giants') observed in Canadian waters gain weight rapidly at about 8.5-10 percent of their body weight per month (Butler 1971). ICCAT (2008) provides a good summary of growth: "*Juvenile growth is rapid for a teleost fish (about 30 cm/year), but slower than other tuna and billfish species. Fish born in June attain a length of about 30-40 cm long and a weight of about 1 kg by October. After one year, fish reach about 4 kg and 60 cm long. Growth in length tends to be lower for adults than juveniles, but growth in weight increases. At 10 years old, a bluefin tuna is about 200 cm and 150 kg and reaches about 300 cm and 400 kg at 20 years.*" Atlantic Bluefin Tunas may reach a maximum age of 38 years (Clay and Hurlbut 1986).

Age at maturity is uncertain. ICCAT uses an age at 100% maturity for western Atlantic Bluefin Tuna of nine years, and 50% maturity of four years in the Mediterranean (ICCAT 2010). Studies have confirmed that the age at 50% maturity is considerably younger in the Mediterranean than in the western Atlantic (Susca *et al.* 2001). Samples from the Gulf of Mexico (Diaz and Turner 2007) suggest later age at 50% maturity (age 11-12), while samples collected off the northeast coast of the U.S. (Baglin 1982) suggest earlier age at 50% maturity. It is possible that the NE U.S. samples contained Atlantic Bluefin Tuna of Mediterranean origin (Rooker *et al.* 2007). Females weighing between 270 to 300 kg may produce as many as 10 million eggs per spawning season.

Generation time is calculated as the average age of spawners in an unexploited population. This is approximated by adding the age at 50% maturity to the inverse of the natural mortality rate. For the western population, the generation time is calculated to be 15 years based on an age of 50% maturity of nine years and a natural mortality rate of 0.15. If the Diaz and Turner (2007) estimate of the age of 50% maturity is used, the generation time is about 18 years.

Herbivory/predation

Scott and Scott (1988) note that Atlantic Bluefin Tuna are voracious and active predators eating both pelagic and bottom fishes in Canadian waters including Capelin (*Mallotus villosus*), Saury (*Scomberesox saurus)*, Herring (*Clupea harengus*), Mackerel (*Scomber scombrus)*, lanternfishes (*Benthosema* sp.), barracudinas (*Paralepis* sp.), Silver Hake (*Merluccius bilinearis)*, White Hake (*Urophycis tenuis*), Squid (*Loligo*) and euphausiids. Humans, Killer Whales (*Orcinus orca*), and Mako Sharks (*Isurus oxyrinchus* are among the few predators on adult Atlantic Bluefin Tunas, but natural mortality is expected to be higher for smaller fish vulnerable to other pelagic predators and seabirds.

In general, however, ICCAT (2008) describes the feeding habits of Atlantic Bluefin Tuna as follows: "*Juvenile and adult bluefin tuna are opportunistic feeders (as are most predators) and their diet can include jellyfish and salps, as well as demersal and sessile species such as, octopus, crabs and sponges. However, in general, juveniles feed on crustaceans, fish and cephalopods, while adults primarily feed on fish such as herring, anchovy, sand lance, sardine, sprat, bluefish and mackerel.*" This is based primarily on data from the eastern Atlantic. Important prey species in the western Atlantic include Herring, Mackerel and Capelin.

Physiology

A counter current heat-exchange system allows Atlantic Bluefin Tuna to maintain muscle temperatures above the temperature of the surrounding waters, which enables this warmwater species to feed in cold northern waters and take advantage of the abundance of food found there (Scott and Scott 1988)

Dispersal/migration

Atlantic Bluefin Tuna is one of the 16 species or species groups officially recognized as a 'highly migratory species' in Annex I of the United Nations Convention on the Law of the Sea (UNCLOS).

Understanding of the dispersal and migratory patterns of the western population of Atlantic Bluefin Tuna has improved in recent years through the use of otolith analysis and electronic tagging. Based on analysis of isotopic signatures in otoliths, a small proportion (4.2%, n=132) of giants and medium Atlantic Bluefin Tuna sampled in the Mediterranean have been found to be of Gulf of Mexico origin (Rooker *et al.* 2008). This study provides good evidence that at least some portion of the western population is capable of trans-Atlantic dispersal (also see ‘Population spatial structure’ above).

Electronic tagging has shown similar results. Figure 6 (from Block *et al.* 2005) shows geopositions for 330 Atlantic Bluefin Tuna tagged in the Gulf of Mexico and on the eastern coast of the U.S. The positions were recorded on archival tags and pop-up satellite tags, and the figure shows multiple positions (over 30,000 in total) for each fish. Atlantic Bluefin Tuna were identified as western, eastern or unknown breeders based on their presence in known ICCAT spawning locations at the appropriate age and season (see the figure legend for further explanation). Clearly, western breeders have a long and varied migratory pattern ranging throughout the North Atlantic and well into the eastern Atlantic (Figure 6a). However, no western breeders had positions in the Mediterranean Sea and no eastern breeder had positions in the Gulf of Mexico.

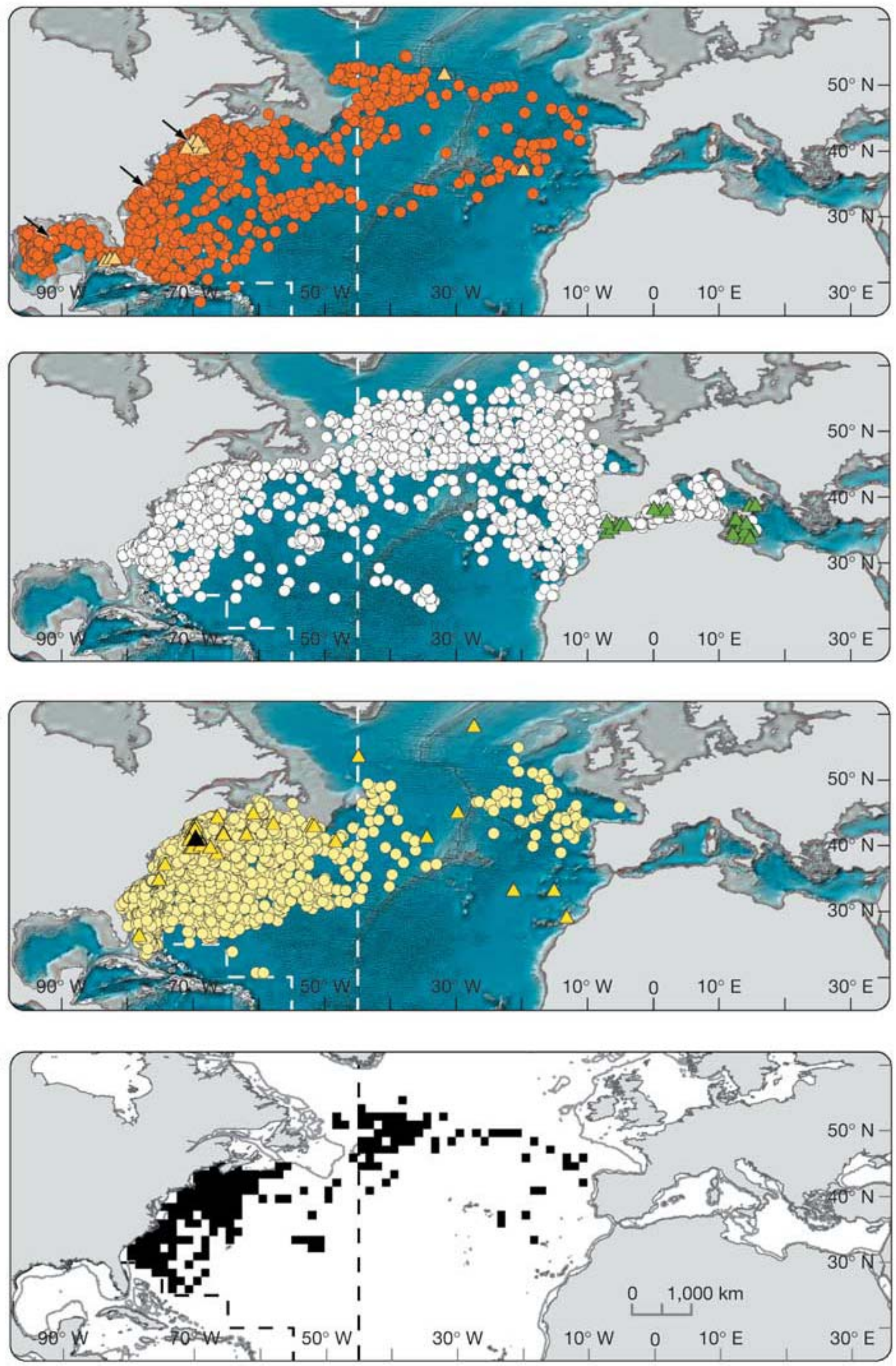

Figure 6. Tagging and location recordings of electronically tagged Atlantic Bluefin Tuna. The three tagging locations are shown by arrows in panel *a*, triangles represent recapture locations (the black triangle in panel *c* represents 35 recaptures). Panel *a* shows the locations where western breeders have been located, panel *b* shows the same for eastern breeders and panel *c* shows the location of fish that did not visit a known ICCAT breeding ground. Panel *d* shows where western and eastern breeders overlapped. (From Block *et al.* 2005.)

Adaptability

As indicated above, Fonteneau (2009) states: "*Bluefin tuna in the Atlantic has been the tuna species showing the greatest flexibility, and permanently changing its areas of concentration and its apparent migration routes. Bluefin tuna is also and by far, among all other tuna species, the species having shown the best thermoregulation and being taken in the widest range of SST: from sub Arctic to equatorial waters*". This suggests that Atlantic Bluefin Tuna has scope for adapting to changes in its environment.

POPULATION SIZES AND TRENDS

Population abundance and temporal trends in abundance used to infer status against the COSEWIC criteria are based primarily on the 2010 ICCAT assessment (http://www.iccat.int/Documents/Meetings/Docs/2010_SCRS_ENG.pdf).

Search effort

Atlantic Bluefin Tuna are not amenable to conventional trawl, acoustic or sighting surveys because of their extended area of distribution and because they undertake extensive migrations. The best means of obtaining stock size and exploitation rate estimates would be through relatively large-scale conventional tagging programs (Fonteneau and Fromentin 2009), but none has been conducted so far for the species.

The ICCAT assessment uses abundance indices from a wide variety of sources with broad spatial and temporal coverage (Figure 7). There are two indices based on the Canadian fishery (Gulf of St. Lawrence and southwest Nova Scotia), seven indices for different size categories in the recreational rod and reel fishery in the U.S., three area-based Japanese longline indices, the larval index in the Gulf of Mexico used as an index of spawning stock biomass, one U.S pelagic longline index in the Gulf of Mexico for January to June (this series has also been split into early years and later years due to changes in management), and one Japanese longline series in the Gulf of Mexico.

Abundance

The trends over time of the indices of stock size described above are provided in Figure 7. The Canadian Gulf of St. Lawrence (GSWL), the U.S. rod and reel (RR) 115-144 and the Japanese longline (JLL) Area 17+18 indicate an increasing trend over the most recent years available. The Canadian Southwest Nova Scotia (SWNS) and the U.S. pelagic longline (PLL) Gulf of Mexico (GOM) 1-8 show relative stability while the U.S. RR 66-114 suggest a decrease. The spawning stock biomass index derived from the Gulf of Mexico larval survey (Larval GOM) indicates persistent very low values since 1980.

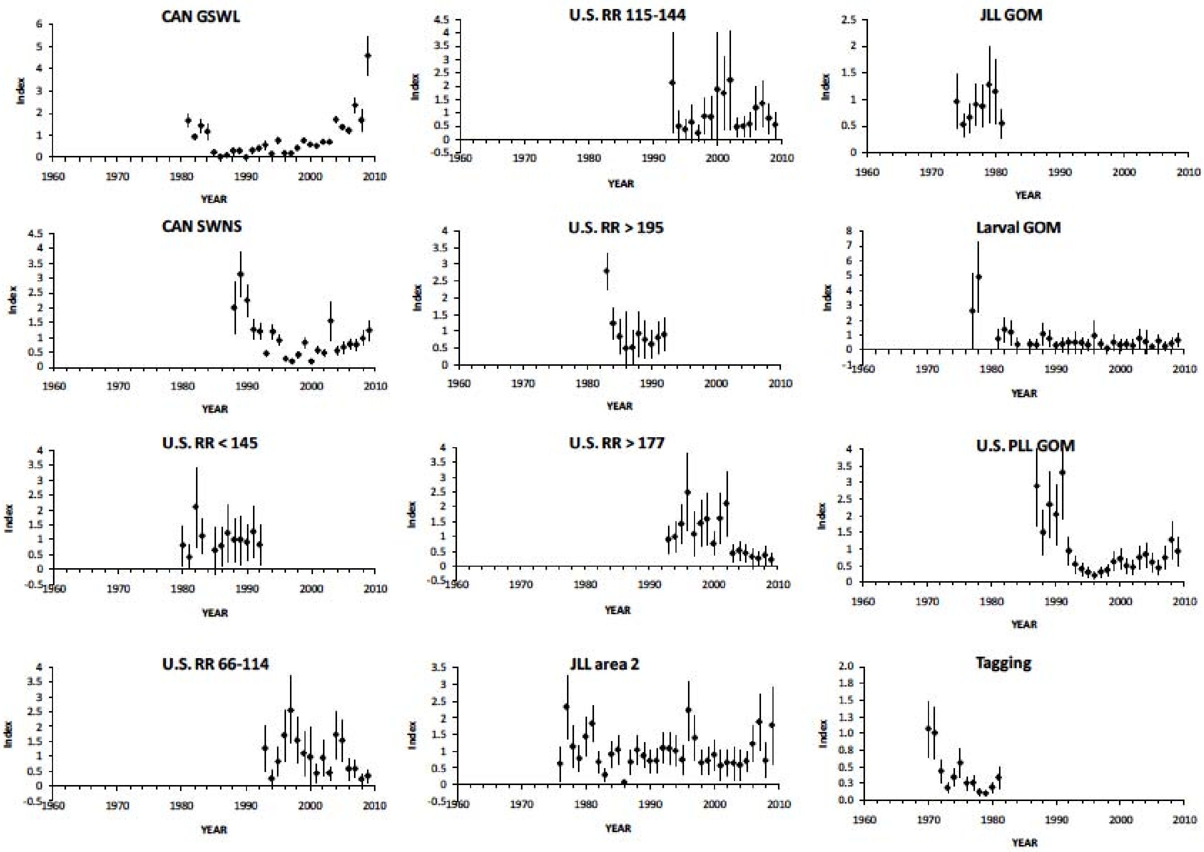

Figure 7. Indices of stock size used in the 2010 ICCAT assessment of western Atlantic Bluefin Tuna (with 95% confidence intervals).

The stock assessment for western Atlantic Bluefin Tuna used a Virtual Population Analysis (VPA) model based on catch-at-age data for 1970 to 2009, ages 1 to 16+, and the abundance indices shown in Figure 7. The catch-at-age estimates were based on the length compositions converted to age based on modes in the length frequencies for ages 1 to 3 and using a new growth model from Restrepo *et al.* (2009) for older ages.

Figure 8 summarizes trends in spawning stock biomass (SSB), spawning stock numbers (age 9+), the maximum fishing mortality at age (Apical fishing mortality), and the number of age 1 recruits for Atlantic Bluefin Tuna in the western Atlantic from the 2010 assessment. The SSB declined steadily from 50,000 t in 1970 to around 18,000 t in 1992; SSB has been relatively stable since then. A few strong year classes were produced in the first half of the 1970s, but since then, year classes have been considerably smaller with the exception of the 2003 year class, which was estimated to be the fifth largest in the time series.

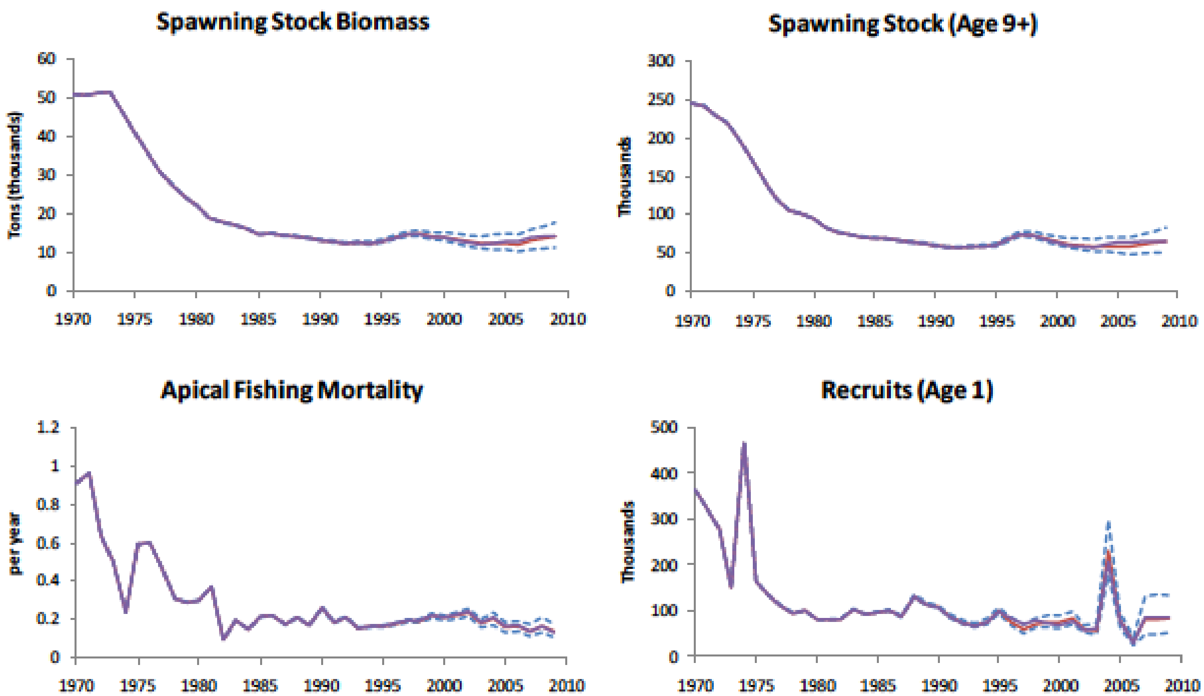

Figure 8. Median estimates of spawning biomass (age 9+), spawning stock numbers (age 9+), the maximum fishing mortality at age (Apical fishing mortality), and the number of age 1 recruits for western Atlantic Bluefin Tuna (Fig. 53 from the 2010 ICCAT stock assessment).

Table 1 provides the mature numbers (age 9 and older) from the 2010 ICCAT assessment. Age 9 and older population numbers decreased from 264,842 individuals in 1970 to 66,865 in 1992, increased to 84,306 in 1998, and declined to 65,923 in 2010. This was the lowest estimate in the time series and it is 25% of the 1970 value.

Table 1. Atlantic Bluefin Tuna in the western Atlantic – Mature (age 9 and older) population numbers from the 2010 ICCAT assessment. (This table was provided by J. Neilson, the Canadian scientist responsible for Atlantic Bluefin Tuna in Fisheries and Oceans Canada – DFO.)

Year	Numbers 9+	Year	Numbers 9+
1970	264842	1991	67235
1971	263701	1992	66865
1972	248443	1993	67123
1973	237779	1994	67691
1974	218134	1995	69099
1975	187652	1996	76253
1976	162084	1997	84260
1977	136934	1998	84306
1978	120947	1999	79483
1979	116719	2000	74267

Year	Numbers 9+	Year	Numbers 9+
1980	111429	2001	70296
1981	99095	2002	70141
1982	85471	2003	66399
1983	84315	2004	68540
1984	79568	2005	71764
1985	78445	2006	72714
1986	77465	2007	71724
1987	74672	2008	73276
1988	73280	2009	72697
1989	71897	2010	65923
1990	68958		

The natural log of mature numbers versus time is plotted in Figure 9. The percent change in mature numbers is estimated as $D = 100 (\exp(\alpha (2007-1970))-1)$ where α is the slope of the fitted regression in Figure 9, i.e., 0.0293. The percent change is therefore -69% over 40 years or about 2.7 generations.

The 2010 stock assessment indicates that the spawning stock biomass and numbers will increase in the near future (beginning in 2012) when the 2003 year-class recruits to the mature population.

There is considerable uncertainty regarding stock status relative to the ICCAT management target of achieving maximum sustainable yield (MSY). The uncertainty stems from a lack of understanding of the relationship between spawning stock size and recruitment. Two scenarios were presented, one based on a Beverton-Holt stock recruit relationship (referred to as the high recruitment scenario), and a second that was based on a two-line relationship (referred to as the low recruitment relationship). The stock assessment team could not determine which was more appropriate and presented results from both as equally probable. Under the high recruitment scenario, the current fishing mortality rate was estimated to be 1.77 times that associated with MSY and the current spawning biomass was 0.15 times the spawning biomass at MSY. For the low recruitment scenario these same ratios were 0.73 and 1.11 respectively. In other words, the assessment could not distinguish between a severely depleted and overfished population (high recruitment scenario) and a population more or less capable of producing MSY (low recruitment scenario).

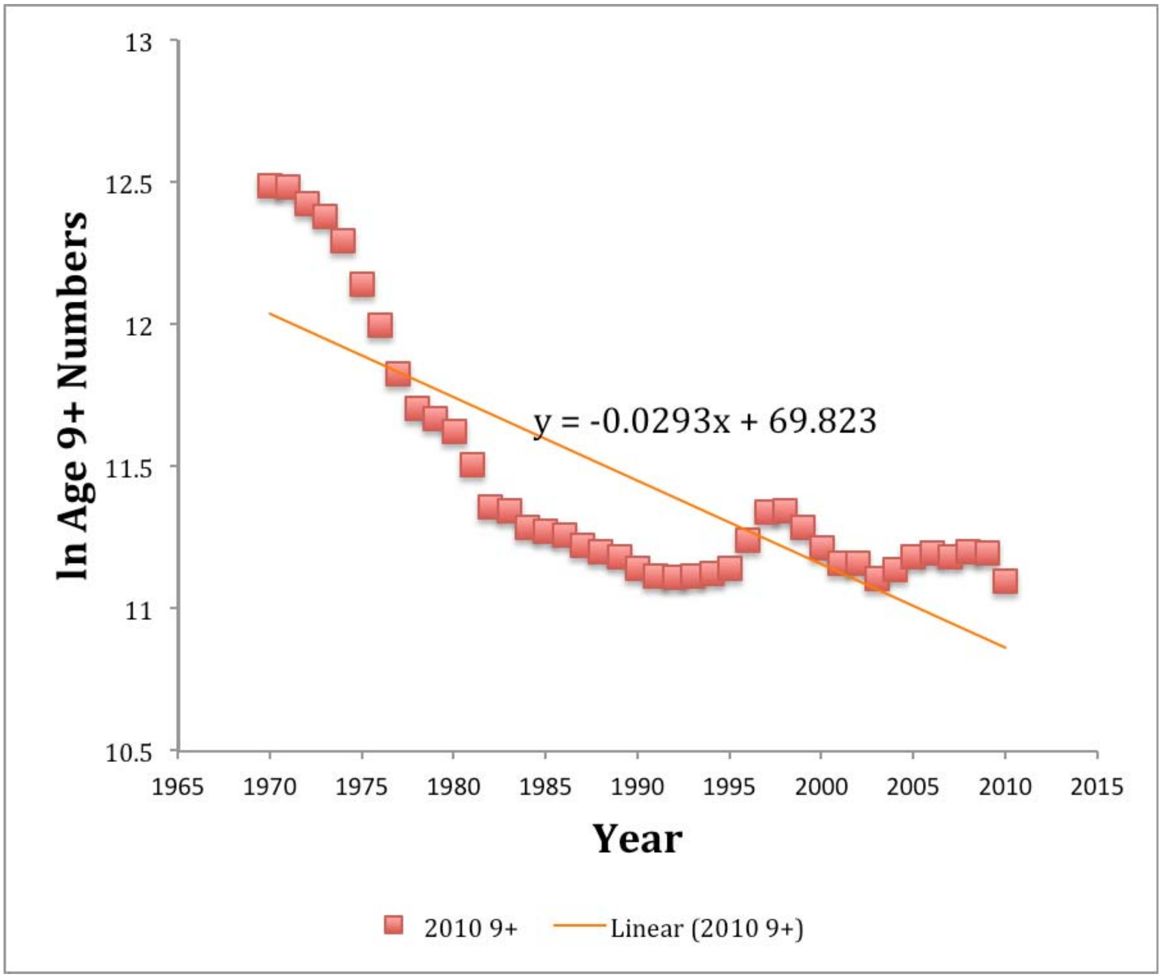

Figure 9. Trend showing the number (natural log scale) of mature (age 9 and older) Atlantic Bluefin Tuna in the western Atlantic. Source: 2008 ICCAT assessment.

The 2010 stock assessment is more optimistic than other recent assessments. The current estimates of mature population numbers are consistently higher across the entire time series than was estimated in the 2008 ICCAT assessment (http://www.iccat.int/Documents/Meetings/Docs/2008_SCRS_ENG.pdf). The differences are larger from 1985 to the present where the average ratio between the 2010 and 2008 estimates is 2.3. The estimated decline in mature numbers from the 2008 assessment was 78% compared to the current estimate of 69%. The 2003 year-class was estimated to be below average in abundance in 2008 while the current estimate is more than 2.6 times the average.

These differences are likely due to changes in the assessment method (i.e., change in growth model and change in age range) and not to new data on abundance. A “continuity” run conducted in the 2010 assessment using the same methods as in 2008 and data updated to 2010 produced very similar results to the 2008 assessment (Figure 54 in the 2010 assessment). There was virtually no difference in the estimated size of the 2003 year-class between the 2008 assessment and the continuity run. The same was true for the estimated time series of spawning stock biomass.

Other assessments also suggest that recent abundance may be less optimistic than presented by ICCAT. Gavaris *et al.* (2008) noted that past projections of western Atlantic Bluefin Tuna have been optimistic and that past projected stock increases at the agreed TACs did not materialize. McAllister and Carruthers (2008) indicate that the stock may further decline at fishing levels well below that adopted by ICCAT. These comparisons and the fact that VPA population estimates are more uncertain for the most recent years indicates that the results from population projections must be interpreted with caution.

Canadian fisheries operate in several geographic areas off the Atlantic coast from July to November, when Bluefin Tuna have migrated into Canadian waters. Canadian vessels capture western Bluefin Tuna in both directed and non-directed fisheries with most of the catch coming from inshore vessels centred in southwest Nova Scotia and Prince Edward Island. The non-directed fishery for Atlantic Bluefin Tuna is from the pelagic longline fishery for swordfish and other tunas. Catches for 2005-2009 were 600, 733, 491, 575 and 530 t, respectively. The 2006 catch was the highest recorded since 1977. The 2009 landings were taken by rod and reel, tended line, longline, harpoon and trap gear. Canadian catches are well monitored and catch quotas are respected.

Indices of abundance for the Canadian fisheries have been updated in preparation for the September 2010 assessment (Figure 10, J. Neilson 2010 pers. comm). These suggest a modest but sustained increase in southwest Nova Scotia, and in the southern Gulf of St. Lawrence, the 2007, 2008 and 2009 values are the highest in the time series beginning in 1981. The observed increases in CPUE in Figure 10 are likely to reflect local availability rather than being an indicator of overall abundance because the increase is steeper than potential population growth rates (i.e., the population could not have increased 6-fold in 6 years, Figure 10 lower panel).

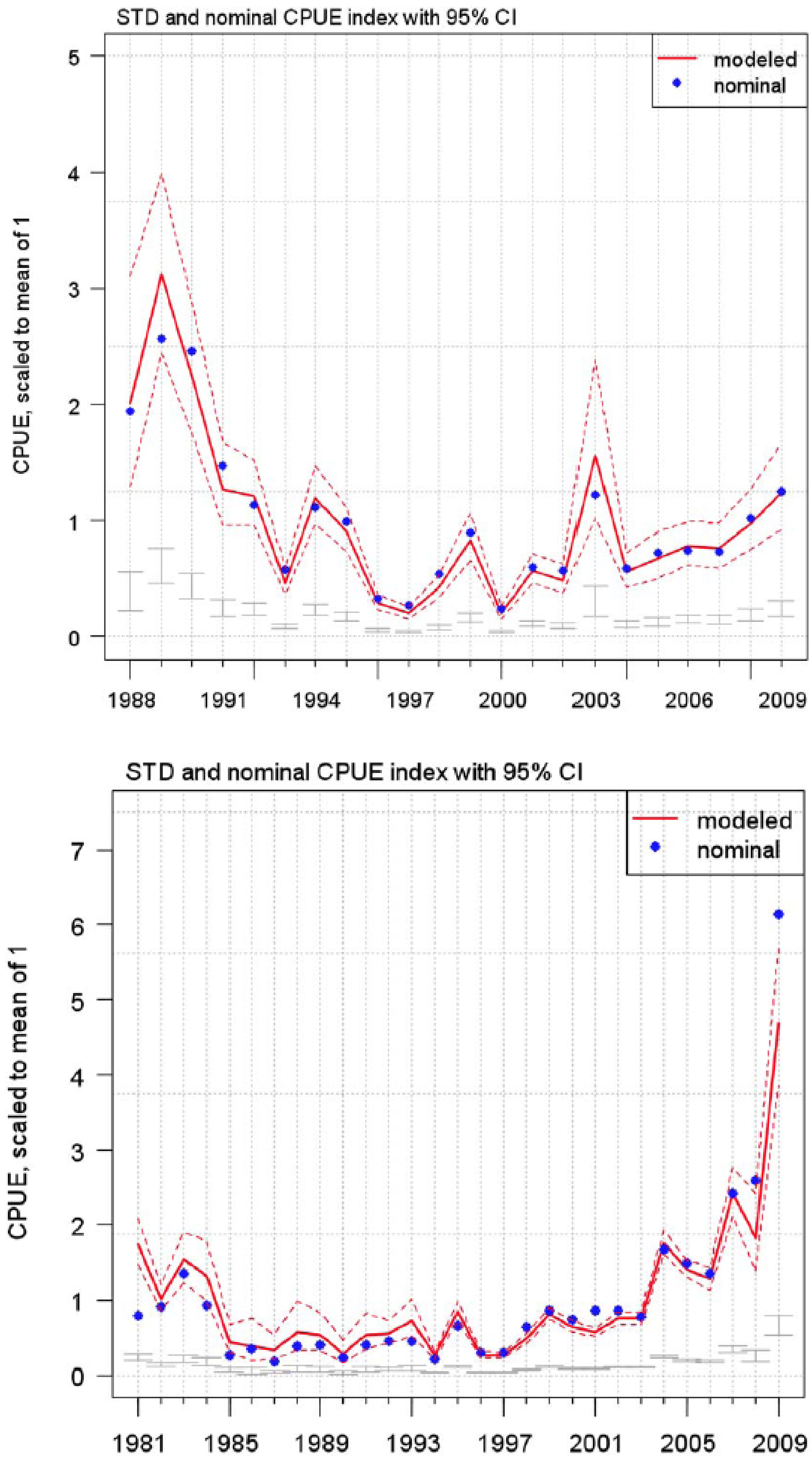

Figure 10. Atlantic Bluefin Tuna in the western Atlantic – updated CPUE for Canadian fisheries. Upper panel southwest Nova Scotia; lower panel, southern Gulf of St. Lawrence. J. Neilson 2010 pers. comm.

Rescue effect

The western population of Atlantic Bluefin Tuna found in Canadian waters is considered to be reproductively independent of the eastern breeding populations and therefore there is no rescue effect potential from adjacent populations.

LIMITING FACTORS AND THREATS

Adult Atlantic Bluefin Tuna have few natural predators, but Killer Whales (*Orcinus orca*), and Mako Sharks (*Isurus oxyrinchus*) have been observed to occasionally prey upon them (Scott and Scott 1988). Mortality from predators is not expected to be a major limiting factor or threat.

Historical and present-day overfishing remains the single largest threat to the western population of Atlantic Bluefin Tuna. Industrial fishing on Atlantic Bluefin Tuna began in the 1950s (eastern population) and 1960s (western population) (Figure 11). Over the past 40 years, fishing has prevented the western population from increasing. The fisheries are assessed and managed by ICCAT. A recent review of ICCAT's performance concluded that the Commission's objectives for maintaining the stocks at levels that can produce maximum sustainable yield have not been met. The review was particularly critical of the management of fisheries for the eastern stock (Hurry *et al.* 2009). Recent research clearly shows that the western population of Atlantic Bluefin Tuna migrates over much of the North Atlantic where they are susceptible to fleets targeting both western and eastern populations. Although quotas are set for both eastern and western populations, it is not possible to distinguish the two populations in the landings. Furthermore, underreporting of Bluefin Tuna catches throughout the North Atlantic is an ongoing problem.

The lack of recovery of western Atlantic Bluefin Tuna can be attributed almost entirely to overfishing under the assumption that high levels of recruitment observed in the 1970s before the decline could again be achieved if the population was given the opportunity to rebuild by lowering fishing mortality. Although the fishery in the western Atlantic is relatively well regulated within ICCAT TAC, Atlantic Bluefin Tuna from the western population are also taken by the larger and more poorly regulated fishery in the eastern Atlantic.

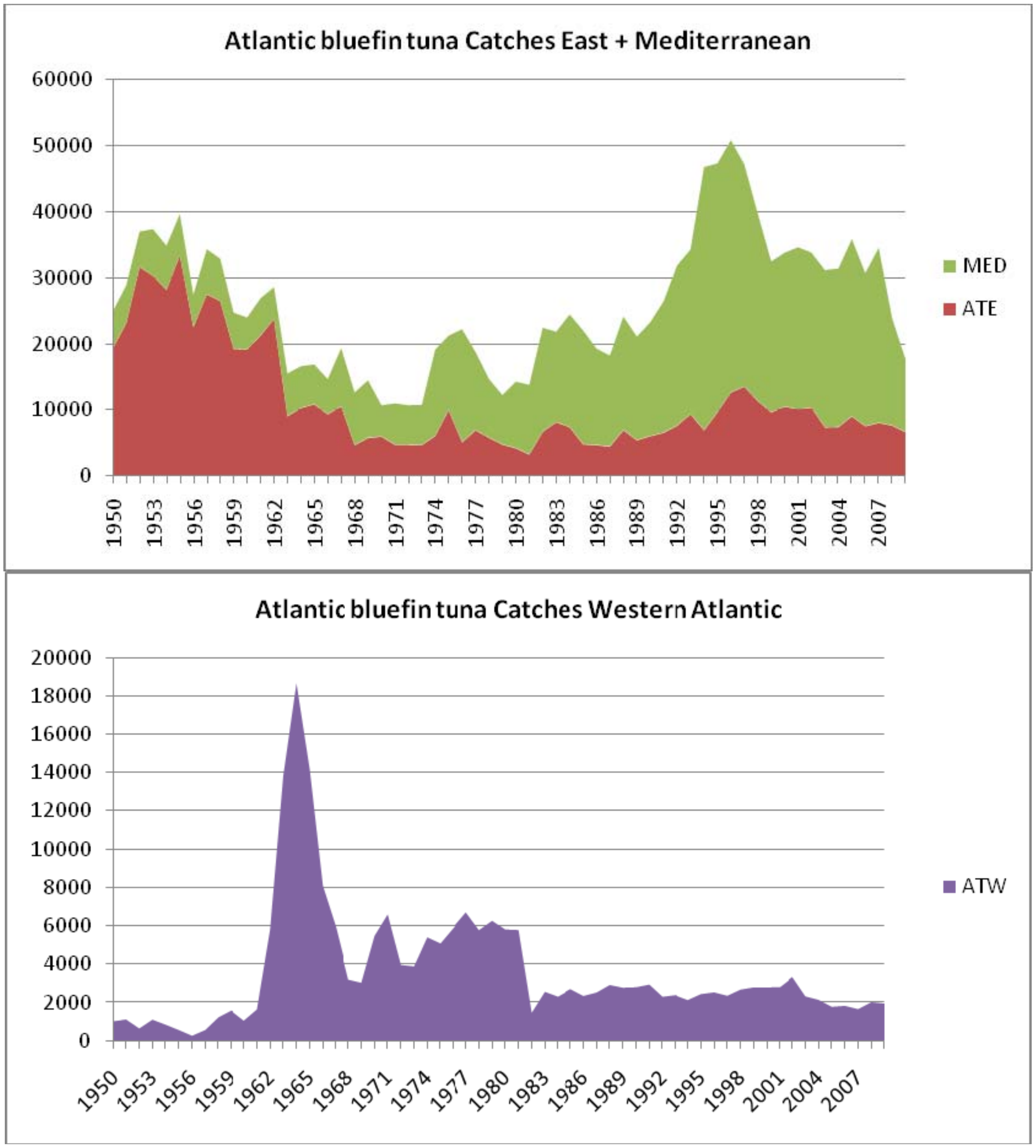

Figure 11. Catches (t) of Atlantic Bluefin Tuna in the eastern Atlantic and Mediterranean (upper panel) and in the western Atlantic (lower panel) (data from the 2010 ICCAT stock assessment).

Most of the fish caught from the western population are immature (based on the assumed age of 50% maturity in the 2008 assessment). The fishery took almost exclusively immature fish in the early 1970s. The percent immature in the catch declined through the 1970s to the early 1980s. The percent immature varied between 65% to 90% during the 1980s and early 1990s. There was a temporary decline in the percent immature to a minimum of 48% in 1999. The percent immature then increased to over 85% in 2007 (Figure 12). Continued high levels of removals of immature fish at a time when the population is severely depressed pose a significant threat to the populations and will further reduce the chances of recovery.

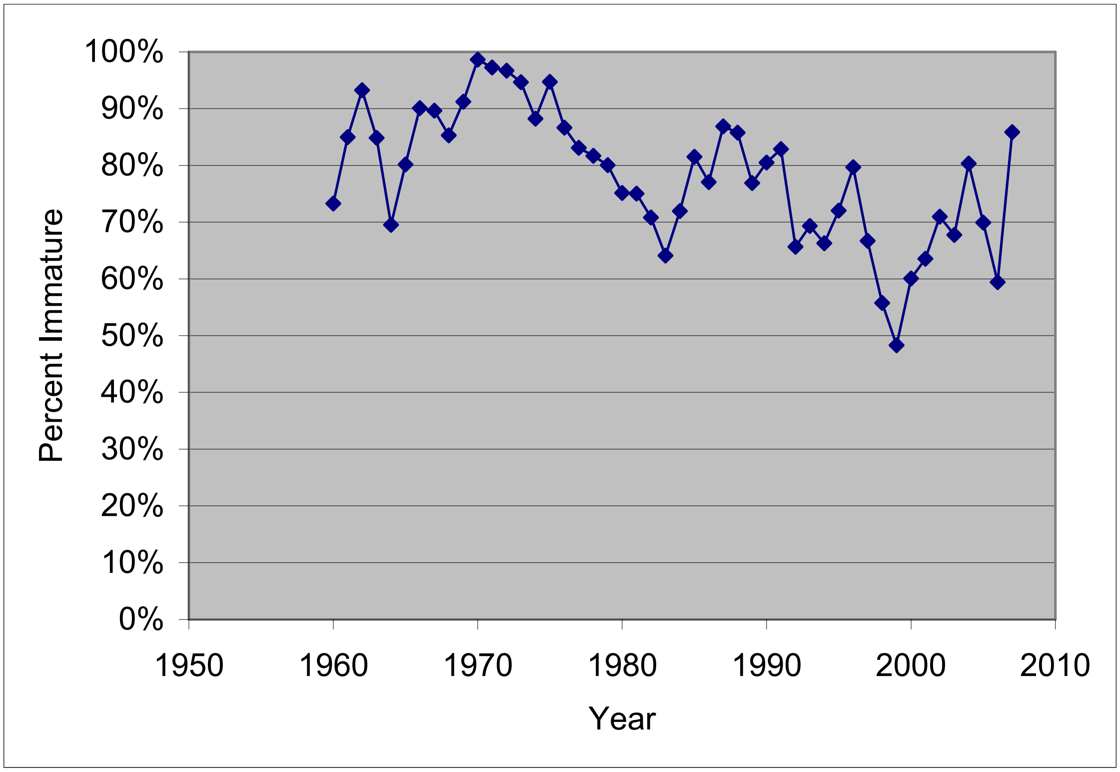

Figure 12. Atlantic Bluefin Tuna in the western Atlantic. Proportion of the catch less than age 8. (From the 2008 ICCAT stock assessment.)

The April 2010 Deepwater Horizon oil spill in the Gulf of Mexico is of particular concern as it overlaps with the only known spawning area for the western population of Atlantic Bluefin Tuna. It is possible that exposure to crude oil and various dispersants used to combat the spill may elevate risks to Bluefin Tuna recruitment.

Seasonal migration of fish from the western population into Canadian waters is primarily for feeding purposes. Fisheries on forage species and the decline in Capelin on the Grand Bank pose potential threats.

SPECIAL SIGNIFICANCE OF THE SPECIES

Atlantic Bluefin Tuna are arguably the most iconic pelagic fish in the oceans. They are highly prized for their flesh that is sold for sushi and sashimi. Their high value makes their management particularly challenging. In January 2010, a 232 kg Atlantic Bluefin Tuna sold for US$175,000 at an auction in Japan.

Atlantic Bluefin Tuna is an apex predator whose role in the ecosystem is not precisely known, but is expected to be important, particularly with respect to small pelagic species (herring, mackerel, sand lance).

EXISTING PROTECTION OR OTHER STATUS DESIGNATIONS

Atlantic Bluefin Tuna fisheries have been assessed and managed by ICCAT since 1969 and catch regulations have been used for the western stock since the mid-1980s. ICCAT adopted a 20-year rebuilding plan for the western stock in 1999. In accordance with the plan, ICCAT reduced the total allowable catches for Western Atlantic Bluefin Tuna from 2,100 t in 2008 to 1,900 t in 2009, 1,800 t in 2010, and 1,750 t in 2011. There has been no improvement in stock status since the rebuilding plan was started.
The Canadian fishery is managed by Fisheries and Oceans Canada under the *Fisheries Act*.

The IUCN ranks the western population of Atlantic Bluefin Tuna as *critically endangered* (Safina 1996). A proposal by Monaco, supported by the European Union and the U.S. but opposed by other countries including Japan and Canada, to list Atlantic Bluefin Tuna under Appendix I of CITES was rejected at the March 2010 meeting of CITES. Atlantic Bluefin Tuna are considered a candidate species for listing under the Endangered Species Act in the U.S. (http://www.nmfs.noaa.gov/pr/species/fish/bluefintuna.htm).

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BIOGRAPHICAL SUMMARY OF REPORT WRITER

Jean-Jacques Maguire worked for Fisheries and Oceans Canada from 1977 to 1996. He has led stock assessment teams in DFO and participated in stock assessment review processes on both coasts of North America in both Canada and in the U.S., in the International Council for the Exploration of the Sea (ICES) and in the International Commission for the Conservation of Atlantic Tunas (ICCAT), whose bluefin tuna working group he chaired. He chaired both the pelagic and the groundfish subcommittees of the former Canadian Atlantic Fisheries Scientific Advisory Committees before chairing its Steering Committee. He was a member of the ICES Advisory Committee on Fisheries Management (ACFM) during 1989-1999. As a consultant in fisheries science and fisheries management since 1996 he chaired the ACFM of ICES. He works regularly for the Food and Agriculture Organization of the UN, for national and international organizations as well as for fishermen organizations and environmental non-governmental organizations. He was a member of the three-person review team that evaluated the performance of ICCAT in 2008 and attended the 2008 bluefin tuna assessment meeting.