NOVA SCOTIA SPECIES SPOTLIGHT: **BLUEFIN TUNA** (***Thunnus thynnus***)

FISHERY

Bluefin Tuna (BFT) in Nova Scotia is part of the western Atlantic stock (BFT-W). These animals migrate into Canadian waters between summer and winter to feed, and then return south to the Gulf of Mexico to spawn. Bluefin is also believed to migrate east between the Mediterranean Sea and the Atlantic Ocean, and travel up to 10,000 km in a single year.

The total allowable catch (TAC) for BFT-W is 2350 t, where Canada receives 22.34% of the western Atlantic stock. In 2020, 163 t were captured in SW Nova (BF51), whereas 423 t were captured in the Gulf of St. Lawrence (BF50), and 61 t captured in elsewhere in Canada (BF52).

Bluefin is caught primarily by rod and reel on short fishing trips.

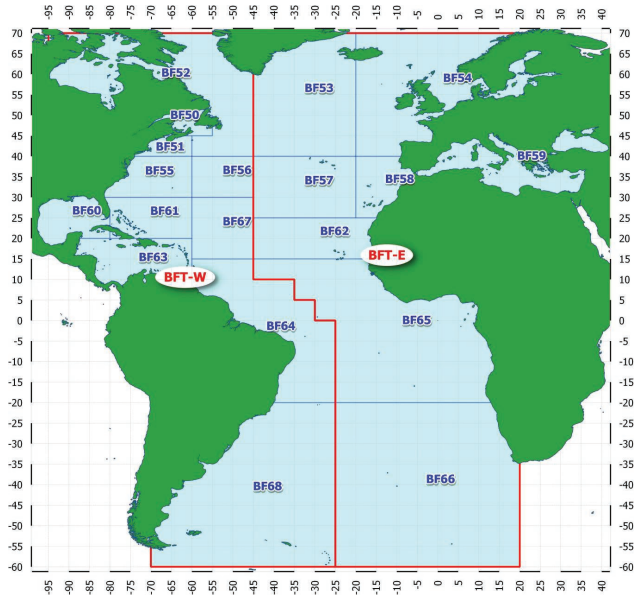

Figure. Bluefin tuna fishing areas in the Atlantic Ocean

BIOLOGY

Bluefin is a warm blooded fish with a resting internal temperature of 28 °C, but it can rise as high as 40 °C during periods of activity.

Bluefin occupy a broad pelagic habitat including tropical and temperate waters, surface waters and depths exceeding 1000 m, and in coastal to open-sea areas, which helps to maintain their body temperatures.

Bluefin swim constantly to regulate their body temperature, and therefore their ability to breath.

Juveniles feed on crustaceans and cephalopods, and adults feed on herring, anchovy, sand lance, sardine, spray, bluefin and mackerel to sustain their high metabolic demands.

Bluefin can live up to 40 years of age, and can measure up of 330 cm in length and weigh up to 725 kg.

LIFE CYCLE

Bluefin begin to reach sexual maturity at around age 5, and all females are believed to reach maturity by age 10. Spawning occurs in waters over 24 °C, primarily in the Mediterranean Sea and the Gulf of Mexico in the summer.

Young females can carry up to 5M eggs, whereas 15 to 20 year old females can carry up to 45M eggs. Bluefin release eggs directly into the water column to be fertilized.

Four months after fertilization, juvenile bluefin can measure 30 to 40 cm in length and weigh nearly 1 kg. After 1 year, juvenile bluefin measure nearly 60 cm in length and weigh nearly 4 kg. By 10 years, adult bluefin measure 200 cm in length and weigh 170 kg. By 20 years, bluefin measure 270 cm in length and weigh 400 kg.

MANAGEMENT AND CONSERVATION

The International Commission for the Conservation of Atlantic Tunas (ICCAT) is an inter-governmental fishery organization responsible for the conservation of tunas and tuna-like species in the Atlantic Ocean and its adjacent seas. Representatives from Fisheries and Oceans Canada, as well as industry associations, participate with other member countries in ICCAT meetings to ensure consistent management measures get adopted. Bluefin tuna is managed as Western and Eastern areas, separated by the 45° meridian.

Statistical metrics adopted by ICCAT indicate overfishing is not occurring in the western stock.

Each fish captured in Canada is tagged with a unique identifying number, and offloading must be supervised by an independent dockside monitoring company to verify the weight and tag of each landed fish.

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SEAFOOD LABELLING

	Terminology	Description
Common Name	**English**: Bluefin Tuna, Atlantic Bluefin Tuna, Tuna, Northern Bluefin **French**: Thon Rouge, Thon Rouge de L'atlantique, Thon	Accepted common name(s) for *Thunnus thynnus*
Production Method	Wild	Harvested from the ocean
	Farmed	Raised in marine net-pens
	Ranched	Wild-captured, raised in marine net-pens
Certifications	Marine Stewardship Council (MSC)	Certifies that fish products come from wild fisheries that meet environmental standards for sustainable fishing
Product Forms	Round	Unprocessed
	Dressed	Eviscerated and head, tail and fins removed
	Gutted	Eviscerated and gills removed
	Loin	Dorsal (back) or ventral (belly) segment of a tuna fillet
Grading	#1	Bright red, great clarity
	#2+	Slight loss of colour or clarity
	#2	Slight loss of colour and clarity
	#3	Dull red, opaque clarity
Process Description	Superfrozen	Frozen and maintained at temperatures < -60 °C
	Ikejime	Brains spiked, metal rod inserted into spinal column, fish bled then flushed with sea water
	Sushi-Grade	Previously frozen and stored below -35 °C for over 15 hrs, or below -20 °C for over 7 days
Sushi Cuts	Noten	Top of the head
	Hoho-niku	Cheek
	Kama-toro	Back cheek
	Sekami	Upper back-loin segment
	Senaka	Middle back-loin segment
	Seshimo	Lower back-loin segment
	Harakami otoro	Upper belly-loin segment
	Haranaka chutoro	Middle belly-loin segment
	Harashimo	Lower belly-loin segment

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PROCESSING/HANDLING

ICCAT Conversion Factors

Round weight = Gilled and Gutted * **1.11**

Round weight = Dressed * **1.25**

Round weight = Fillets * **1.46**

Round weight = Dorsal fillet * **2.90**

Round weight = Ventral fillet * **2.84**

FAO Handbook on Fishery Statistics

Round weight = Skin-on fillets * **1.54**

Round weight = Skin-off fillets * **1.92**

Primary Products

Dressed

Secondary Products

Loins

Post-Harvest Primary Processing

Harvest » Slaughter » Bleeding, Evisceration » Vessel Stowage » Off Loading » Head and Tail removal » Grading » Packaging » Storage » Transportation

By-Products

Heads, Skin, Viscera, Bones, Fins (up to 30% of round fish weight)

Grading Criteria

Fish Indicators - Appearance, size, and shape
Flesh Indicators - Colour, texture, and fat content

Post-Harvest Processes Impacting Quality

- Slaughter Technique (Ikejime)
- Delay in Slaughter
- Product Exposure
- Bleeding Practice
- Product Chilling (delay in chilling, temperature abuse)
- Gentle Handling (gaff punctures and ragged cuts)
- Cleanliness of Gut

CHEMICAL COMPOSITION

Proportion (g / 100 g)		
	Raw	**Cooked**
Moisture	68.10	59.1
Protein	23.30	29.9
Fat	4.90	6.28
Carbohydrate	0.00	0.00
Ash	1.18	1.51

*USDA Nutritional Database ID, 15117 (Raw) and 15118 (Cooked)

Bluefin tuna is considered an intermediate fat content fish. However, fat is not equally deposited throughout the fish, and certain cuts are considered lean, while other fatty. Specifically, toro represents the fatty segments of bluefin, whereas akami cuts represents the lean segments.

STORAGE

Chilling should commence as quickly as possible once on board the vessel. A mixture of brine and ice can produce a low temperature slurry capable of accelerating the chilling process over ice alone.

Freezing can extend the shelf life of the product, but tuna remains susceptible to fat oxidation and textural changes over the long term if not adequately protected by packaging.

Frozen storage at -18 °C is effective for maintaining a shelf life for up 6 months, whereas -30 °C is effective for maintaining a shelf life of up to 12 months, for a good quality product. Superfreezing to below -60 °C can greatly extend the shelf life by slowing the onset of textural changes that occur in fish frozen at -18 °C.

KEY FOOD SAFETY AND QUALITY CONCERNS

Tunas possess high concentrations of the amino acid histidine within their tissues, and temperature abuses allow microbes found naturally in the marine environment to grow and convert it to histamine. Histamine is a biogenic amine that if consumed leads to an allergic-type reaction called scombroid poisoning.

Tuna can bioaccumulate environmental contaminants and a primary hazard is heavy metals. Organic mercury (methylmercury) can accumulate within tuna flesh and limit of 1 ppm is permitted for tunas by Health Canada.

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Tuna flesh quality is assessed primarily by its colour and clarity. The following post-harvest practices influence flesh quality:

Ikejime method – this slaughter technique prevents post-mortem activity in the nervous system that prevents further energy consumption in the muscle. Post-mortem muscle activity consumes additional ATP, and can drive increases of both temperature and lactic acid that overall affect clarity and flavour of the muscle. This method is the most humane method of killing fish, and is prized for sushi because of the quality of flesh that it produces.

Increasing internal temperature during harvest – tunas generate heat when their activity increases, and fighting on the line during capture can
drive their internal temperatures up to 10 °C greater than the surface water temperature. Both colour and clarity become affected if harvested
in this condition.

Lactic acid build-up in the muscle during harvest – as tunas fight on the line during capture, they use up available energy within the muscle and begin to produce lactic acid. Lactic acid accumulation reduces muscle pH, and degrades the protein structure of the muscle tissues. Both colour and clarity become affected if harvested in this condition.

Speed of bleeding - delays in bleeding will make it more difficult to remove blood particles from the flesh. Slow or incomplete bleeding will affect the clarity.

Speed of chilling – chilling is necessary to drive down the internal product temperature. Tuna held longer at elevated temperatures post-harvest will lose colour and clarity more rapidly than if chilled sooner.

Bleeding – during the bleeding process, warm blood can interact with cool edible meat leading to damage to the flesh and stimulation of the development of rancidity in fat.

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