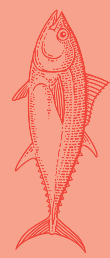


NOVA SCOTIA SPECIES SPOTLIGHT: **BIGEYE TUNA** (*Thunnus obesus*)

FISHERY

Bigeye tuna is a single Atlantic-wide fish stock. Fishing methods in Nova Scotia include longline and harpoon.

Bigeye is a target species within the swordfish longline fishery, which takes place from April to December.

In 2020, the total allowable catch (TAC) of bigeye in the Atlantic stock was 62,500 t, of which 3.3% (2,100 tonnes) was allocated to Canada. Canadian landings totalled 104 t, compared to over 9000 t by each of the fleets from Japan and China.

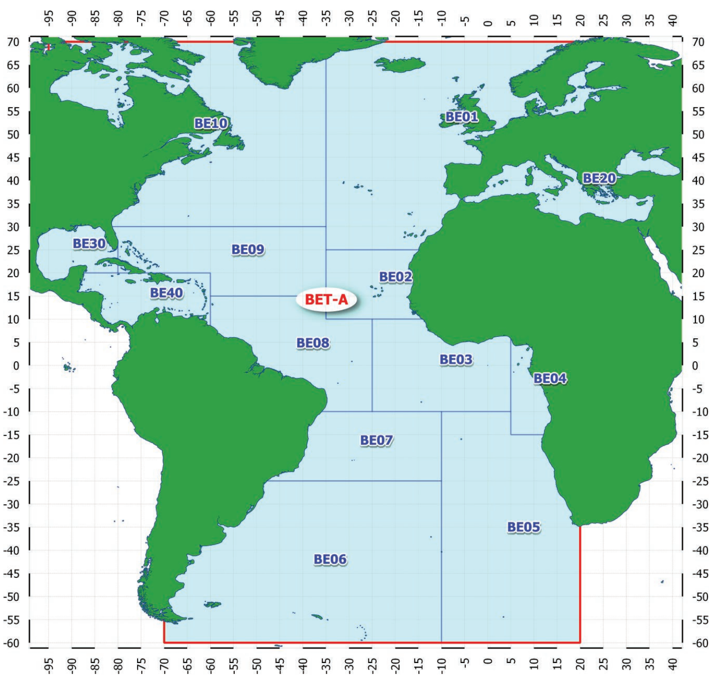


Figure. Biegeye tuna fishing areas in the Atlantic Ocean

BIOLOGY

Bigeye is considered a tropical and subtropical species preferring water temperatures from 17 to 22 °C. Canadian waters represents the northern limit of their range. Juvenile fish spend more time in temperate waters as they grow.

The average weight of bigeye caught by the Canadian Northwest Atlantic longliner fleet is 55 kg, but globally the maximum recorded weight is 210 kg.

Bigeye is found in shallower waters at night, and deeper waters during the daytime. They can withstand temperatures down to 5 °C and depths of 500 m due to their greater tolerance of low blood oxygen conditions than other tunas.

Bigeye is near the top of the food chain, and feeds on fish, cephalopods, molluscs, and crustaceans.

Young bigeye form schools with other tunas, and often aggregates with floating objects than older bigeye.

LIFE CYCLE

Spawning takes place two or more times per year, in water temperatures over 28 °C.

Females release between 3 and 6 million eggs with each spawn. Eggs measure from 0.8 – 1.2 mm. Larvae develop 86 hours after spawning.

After 3 years, bigeye measure ~ 110 cm in length, and 50% of females have reached maturity. By 5 years, they measure ~145 cm in length, and ~ 163 cm in length by 7 years of age.

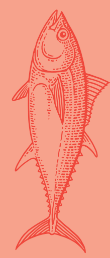
The oldest recorded age is 11 years.

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 (DFO) and industry associations participate with other member countries at ICCAT meetings to ensure consistent management measures get adopted. Bigeye throughout the Atlantic Ocean is managed as a single stock.

Statistical models adopted by ICCAT in 2019 indicated the stock is overfished, but overfishing is not currently occurring.

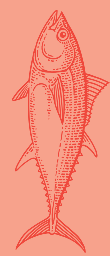
Management measures include gear restrictions, seasonal closures, minimum size limits, vessel observer coverage, and catch weights and size information reported by an independent dockside monitoring company.



NOVA SCOTIA SPECIES SPOTLIGHT: **BIGEYE TUNA** (***Thunnus obesus***)

SEAFOOD LABELLING

	Terminology	Description
Common Name	**English**: Bigeye Tuna, Tuna **French**: Thon Obèse, Thon	Accepted common name(s) for *Thunnus obesus*
Production Method	Wild	Harvested from the ocean
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



NOVA SCOTIA SPECIES SPOTLIGHT: BIGEYE TUNA (*Thunnus obesus*)

PROCESSING/HANDLING

ICCAT Conversion Factor

Round weight = Gutted weight * **1.16**

Round weight = Dressed weight * **1.25**, or

Round weight = Dressed weight * **1.133 + 2.980**

Primary Products
Dressed

Secondary Products
Loins

Post-Harvest Primary Processing
Harvest » Slaughter » Bleeding, Evisceration » Stowage » Off Loading » Head and Tail removal » Grading » Packaging » Storage » Transportation

By-Products
Heads, Skin, Viscera, Bones, Fins (up to 40% 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)	
	Light Meat	**Dark Meat**
Moisture	73.2	72.5
Protein	24.2	21.3
Fat	1.5	2.4
Carbohydrate	0.0	0.0
Ash	1.2	1.3

*Sidwell, 1981

Bigeye 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 bigeye, whereas akami cuts represents the lean segments.

STORAGE

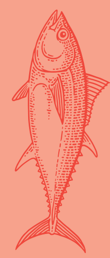
Chilling should commence as quickly as possible once on board the vessel. A mixture of brine and ice can produce a low temperature slurry capable of accelerating the chilling process over ice alone.

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 stored 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.



NOVA SCOTIA SPECIES SPOTLIGHT: **BIGEYE TUNA** (***Thunnus obesus***)

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.

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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