



# NOVA SCOTIA SPECIES SPOTLIGHT: ATLANTIC HERRING (*Clupea harengus*)

## FISHERY

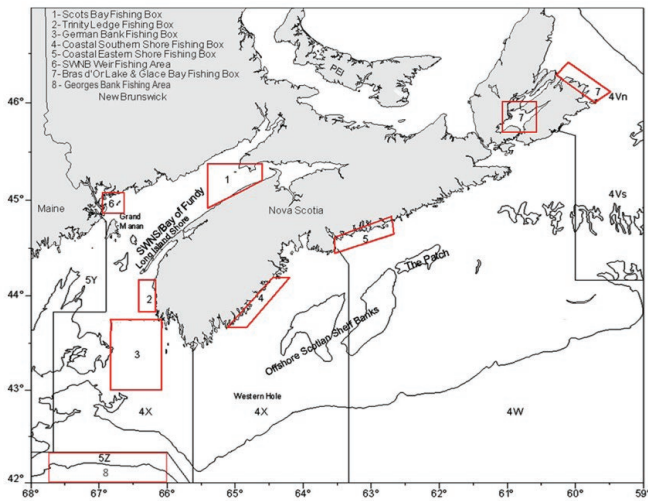
The herring fishery in Nova Scotia includes commercial, food, social and ceremonial (FSC), bait, and recreational components. It takes place within Northwest Atlantic Fisheries Organization (NAFO) areas 4VWX5, or Herring Fishing Areas 18 – 22.

Herring is targeted by fixed gear such as weir, trap net, and bar seine, as well as vessel-based gear such as gillnet, and purse seine. The purse seine fleet accounted for 81 to 99% of landings over the past 40 years.

Herring is an important species for the fishing industry in the Maritimes Region, accounting for 20% by weight of all commercial species in 2016 and is used as a bait fish in other fisheries such as lobster, crab, and tuna.

The total allowable catch (TAC) in 2022 was 24,350 t for 4WX, 5,699 t and 8595 t for the eastern shore and little hope gillnet fisheries, and 8000 t for the offshore component.

In 2021, 38,430 t of herring were landed in NS, representing 55% of the total landings in Atlantic Canada.



**Figure.** Herring fishing areas. Red boxes denote known spawning locations.

## BIOLOGY

Atlantic herring is a schooling fish, often found grouped together in large numbers. Herring grow to a maximum of 44 centimeters in length and a maximum weight of 750 grams.

Herring is a vital part of the ecosystem balance. They are known as a “forage fish” because they are preyed upon by fish, sharks, seabirds, and marine mammals. Their eggs are preyed upon by a variety of bottom dwelling fish, including cod and haddock.

Herring is a migratory species, demonstrating both seasonal migrations, coming inshore from the open ocean for spawning and overwintering, and temporal migrations, spending daytime in deeper waters and coming up to the surface at night to feed.

Herring feed on zooplankton, krill, and other fish larvae.

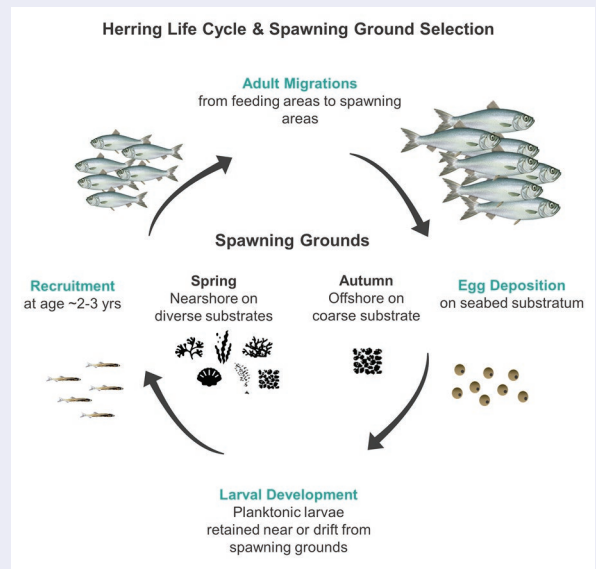
## LIFE CYCLE

Herring reaches sexual maturity from 3 to 4 years old and can live up to 15 years.

Spawning around coastal Nova Scotia takes place in late summer, and in late Fall on Georges Bank. Females can produce from 30,000 to 200,000 eggs annually, and males release milt directly into the sea where egg fertilization takes place.

When fertilized, eggs measure 1 to 1.4 mm in diameter and sink to the seabed where its sticky surface adheres to rock, gravel, plant material, or settles on sandy ocean bottom. Eggs hatch after 7 to 10 days.

Hatched larvae are 3 to 4 mm long and transparent except for the eyes which have some pigmentation.



**Figure.** Herring life cycle



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## MANAGEMENT AND CONSERVATION

The Maritimes region herring fishery is managed by Fisheries and Oceans Canada. The TAC is set annually based on the outcomes of research surveys and is evaluated against stock reference points established using the precautionary approach to fisheries management.

To address a decline in herring biomass, a rebuilding plan was developed by DFO in 2013 and building the stock out of the critical zone is the primary focus of the management of the fishery.

Management tactics include setting a total allowable catch (TAC), defining size restrictions, seasonal and geographic closures of fishing areas, and fleet sector quota allocations, among others.

## SEAFOOD LABELLING

	Terminology	Description
<b>Common Name</b>	<b>English:</b> Herring, Atlantic Herring, Sardine, Canadian Sardine <b>French:</b> Hareng, Sardine, Sardine Canadienne	Accepted common name(s) for <i>Clupea harengus</i>
<b>Production Method</b>	Wild	Harvested from the ocean
<b>Certifications</b>	Marine Stewardship Council (MSC)	Certifies that fish products come from wild fisheries that meet environmental standards for sustainable fishing
<b>Product Forms</b>	Round	Whole, unprocessed herring
	Dressed	Headed, gutted, tail removed, intact belly
	Fillets	Strips of flesh cut parallel to the central bone of the fish
	Butterfly	Gutted and deboned herring
	Kipper	Smoked gutted whole herring
	Bloater	Smoked Round herring
	Cured	Herring preserved in a mixture of acid and salt, also known as pickling or marinating
<b>Product Forms</b>	Canned	Herring preserved to sterility for room temperature storage
	Very Lightly Salted	1 - 4% water phase salt
	Lightly Salted	4 - 10% water phase salt
	Medium Salted	10 - 20% water phase salt
	Heavily Salted	> 20 % water phase salt
<b>Catch Methods</b>	Purse Seine	A vertical net curtain used to surround a school of fish, where the bottom of the net is then drawn together to enclose the fish
	Gillnet	A vertical net curtain that hangs in the water
	Weir	Stationary fish traps surround by nets, constructed from stakes driven into the ocean bottom



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## PROCESSING/HANDLING

Codex Alimentarius has developed standard for salted Atlantic herring and salted sprat (CXS 244-2004)

### Process Yields

Eviscerated (Head-on) = **78 - 87%**

Skin-on Fillets = **60 - 76%**

Kippers = **65 - 70%**

Bloaters = **68 - 80%**

Roe = **3 - 18%**

### Primary Products

Smoked (Kippered), Roe, Frozen whole/fillets, Cured, Salted, Canned

### Post-Harvest Primary Processing Flow

**Whole/Fillets:** Receiving » Chilling » Nobbing (Head and/or tail removal) » Filleting » Freezing » Packaging » Storage » Transportation

**Smoked:** Receiving » Filleting (Optional) » Salting » Smoking » Drying » Packaging » Storage » Transportation

### Post-Harvest Processes Impacting Quality

Temperature control (Proper icing, freezing time, thawing time)

- Gentle handling (Bruising, skin indentations, scale loss)
- Product inspection (Identification of parasites, rough handling, decomposition)
- Delays in processing (Acceleration of spoilage)

## CHEMICAL COMPOSITION

	Proportion (g / 100 g)		
	Raw	Cooked	Kipper
<b>Moisture</b>	72.0	64.2	59.7
<b>Protein</b>	18.0	23.0	24.6
<b>Fat</b>	9.0	11.6	12.4
<b>Carbohydrate</b>	0.0	0.0	0.0
<b>Ash</b>	1.5	1.9	1.9

\*USDA Nutritional Database ID: 175116 (Raw), 175117 (Cooked), 173668 (Kipper)

Herring is considered a fatty fish.

The composition of herring also varies throughout the year and between reproductive cycles. After spawning and during overwintering, herring can measure fat contents as low as 1%, but can increase to greater than 20% during the summer when actively feeding.

As fat content decreases in herring, its water content increases nearly proportionally, and as fat content increases, the water content decreases. Changes in water content are accompanied by proportional changes in protein content.

## STORAGE

The herring is a highly perishable fish due in part to its high fat content. When handling at sea, use of ice or refrigerated sea water are effective stowage methods but will only keep fish in good condition for up to 3 days. If using ice, a 1:3 (ice:fish) ratio should be used in the summer months, and stowage in boxes should not exceed 20 cm or else risk damaging the flesh and appearance of the skin.

Herring stowed gutted will show signs of advanced spoilage after 5 days. Herring should never be stowed without ice. Variation in stowage times will be affected by the fat content and feeding condition, that is summer herring measuring high fat contents and that are actively feeding will spoil far faster than winter herring.

Herring can be frozen whole, gutted or not, and as fillets. Ideally, herring should be processed no more than 24 hr after capture, or sooner in the summer when fat contents are high. Frozen herring should be maintained at a storage temperature of below -30 °C to maximize its storage life. Quality attributes of herring will be maintained for only 2 months at -18 °C, compared to 6 months at -30 °C.



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## KEY FOOD SAFETY AND QUALITY CONCERNS

Herring is susceptible to scombroid food poisoning. They naturally possess high levels of the amino acid histidine in their flesh, that gets converted to histamine by bacteria with extended high temperature storage. Histamine is heat stable, meaning cooking or any other subsequent processing will not eliminate it.

Herring is also a source of parasites that can be readily identified in the flesh. The herring worm, also known as *Anisakis simplex*, if ingested may cause anisakiasis leading to gastrointestinal discomfort. These parasites can be killed by cooking, by freezing to not more than -20 °C in all parts of the fish for no less than 24 hrs, and by other methods including a combination of salt, acid, and extended storage.

The high fat content of herring makes them vulnerable to rancidity by the oxidation fats. In the summer months, this can occur quickly, and is accelerated with increased exposure to sunlight and high temperatures. Further, fat oxidation continues even in the frozen state, and is a primary driver of quality loss during frozen storage.

When feeding in the summer, herring digestive enzymes are produced in large quantities. Post-harvest, this can lead to belly burst, where the viscera quickly dissolve and being to soften and tear through the herring belly.

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