

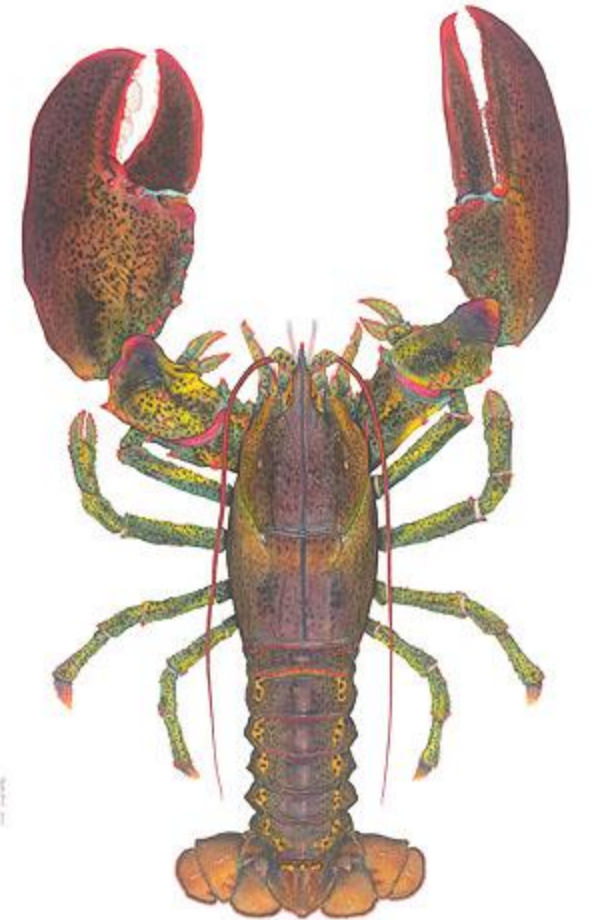
# Atlantic lobster ecology, management, economics, and conflict



David Moulton  
CONS 486  
February 17, 2023

# Course Topics Involved

- ▶ Invertebrate fisheries
- ▶ Climate change
- ▶ Anthropogenic evolutionary change
- ▶ Pain and welfare
- ▶ Alien/invasive species
- ▶ Transboundary management
- ▶ Marine protected areas
- ▶ Effects of fishing gear and handling practices
- ▶ Indigenous fishing rights and governance



# Vevox polling



Join at [vevox.app](https://vevox.app)

**ID: 156-702-446**

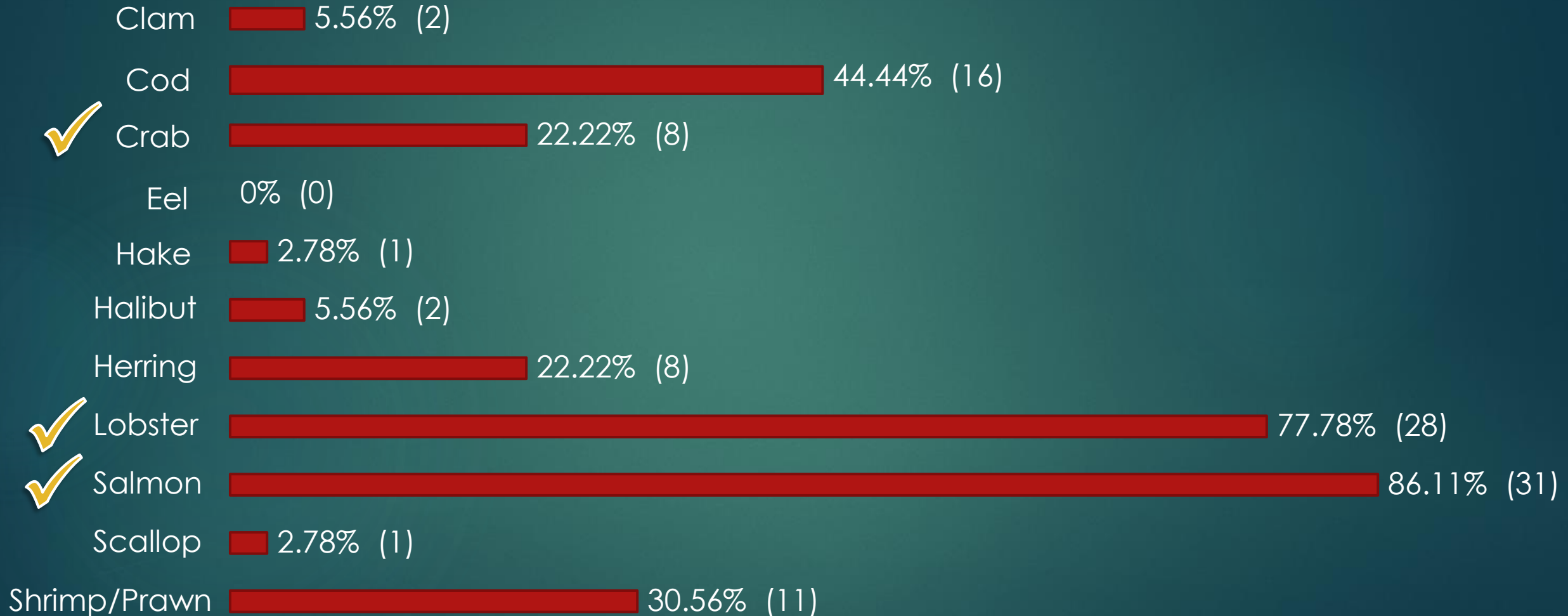


Vote for up to 3 choices

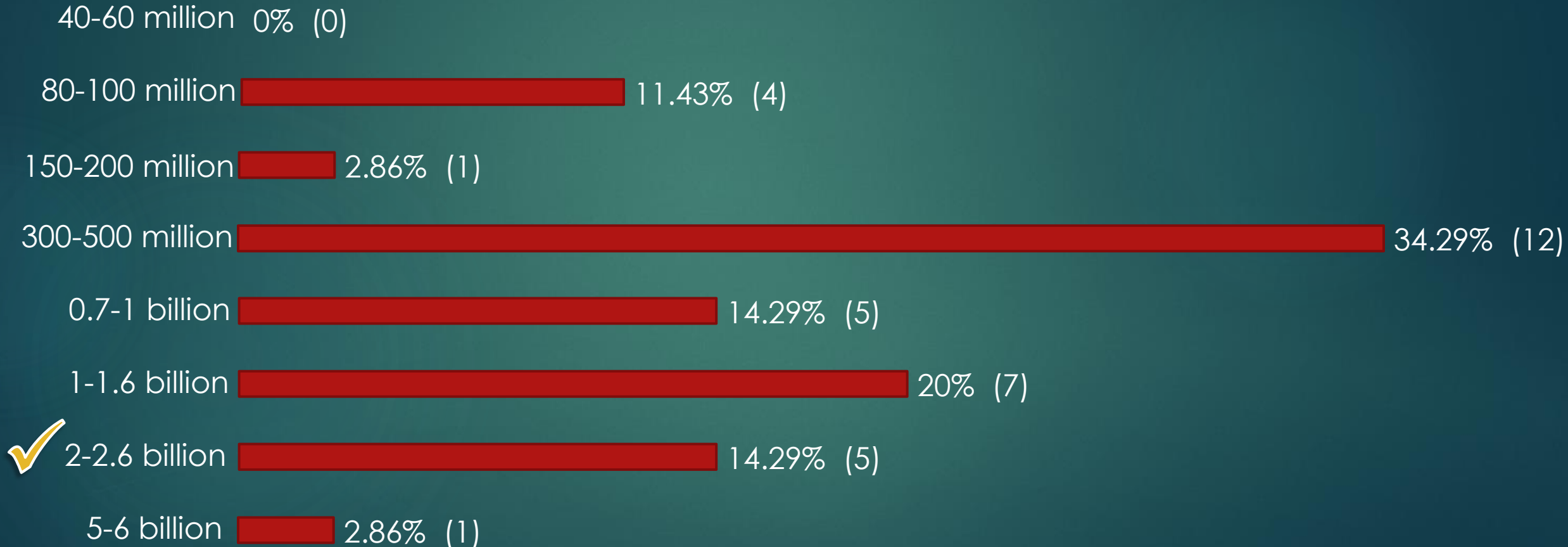
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POLL  
OPEN

# What are the 3 most economically valuable Canadian fisheries?



# What is the annual export value for lobster? (\$)



# Economic Value of Canadian Fisheries

- ▶ Lobster is Canada's most valuable seafood export (by far)
- ▶ 2019: Canada \$2.6 billion (Nova Scotia ~ 50%) export value

Figure 6. Canada's Fish and Seafood Exports by Species, 2019 (\$M)

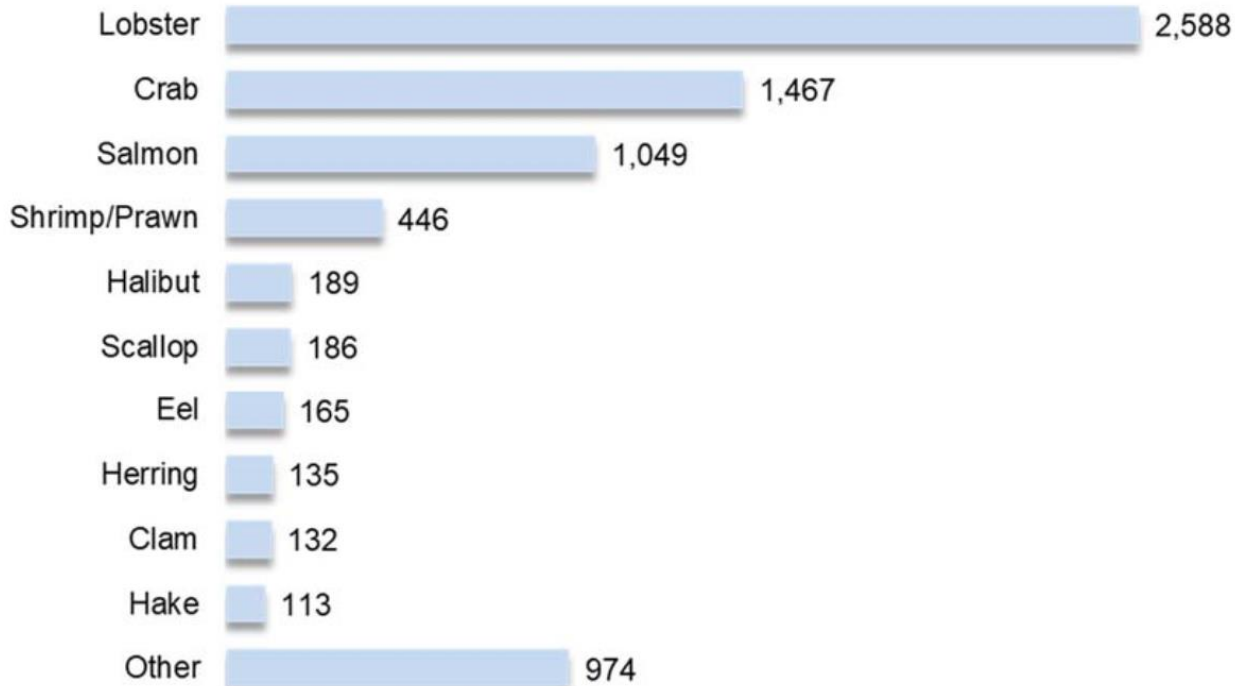
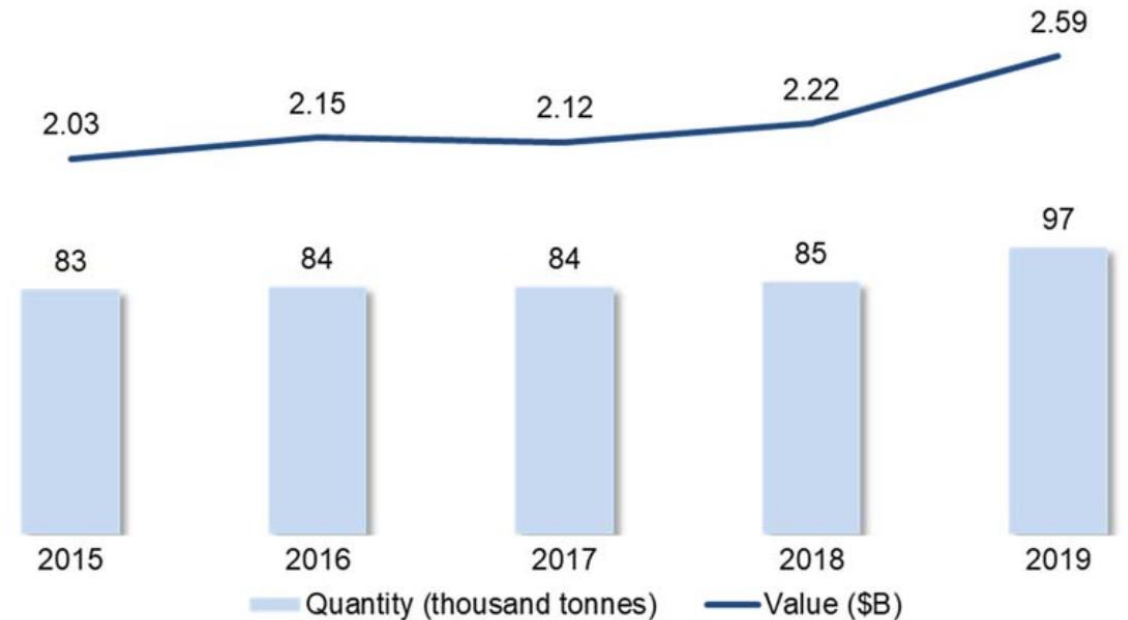


Figure 7. Canada's Lobster Exports, 2015-2019



# About Me

- ▶ PhD Candidate: Pacific Salmon Ecology and Conservation Lab
- ▶ Researching stressors affecting sockeye salmon spawning migrations (fishing nets, rising water temperatures, infections)
- ▶ Prior experience: coastal sport fish, coral reef fish, and pelagic fish including sharks, tuna, and billfish
- ▶ Instructor training: Certificate in Advanced Teaching and Learning
- ▶ Forestry Best TA Award (2022)



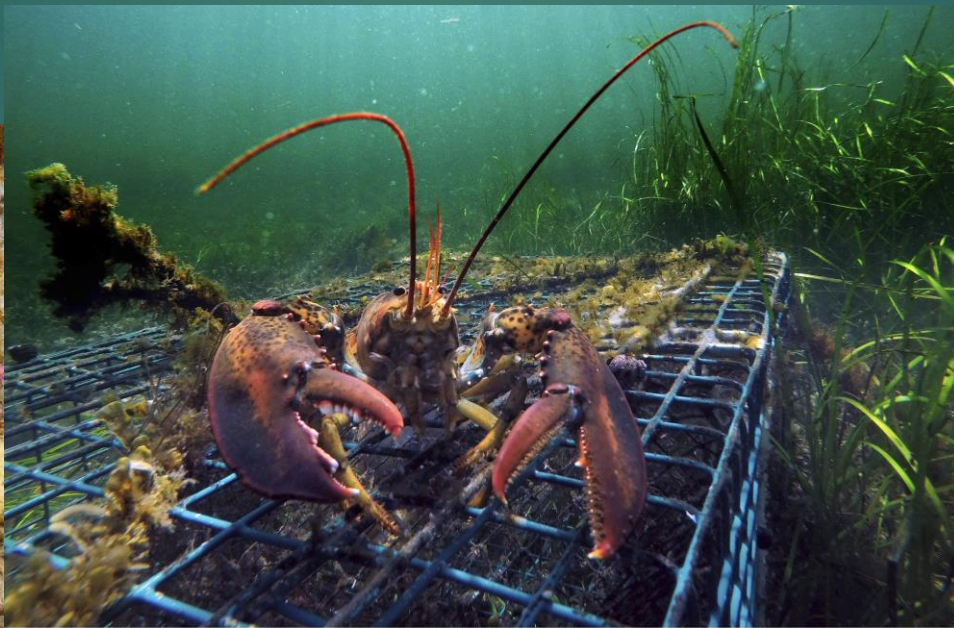
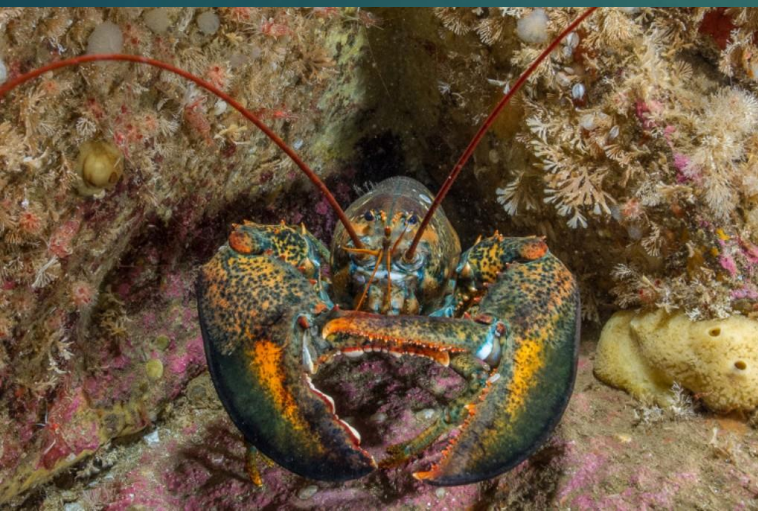
# Outline

- ▶ 1) Anatomy, Ecology, Life History
- ▶ 2) Fisheries and value
- ▶ 3) Management
- ▶ 4) Welfare
- ▶ 5) Climate change impacts
- ▶ 6) Transboundary conflict: Canada and USA
- ▶ 7) Industry conflict: Indigenous and non-Indigenous



# American Lobster (*Homarus americanus*)

- ▶ Arthropod
- ▶ Exoskeleton, jointed appendages
- ▶ Crusher claw, pincer claw
- ▶ Indeterminate growth with molting
- ▶ Estimated life span: 50-100 years



# Anatomy Fun Facts

- ▶ Right/left “handed”
- ▶ 20 pairs of gills
- ▶ Reversible gill current
- ▶ 3 stomachs, one with gastric mill
- ▶ Regenerate limbs



Exposed branchial chamber with gill branchiae. G = gill.

# Colour Preference?



# Rare lobster, rare shoes



Nike Lobster Dunk Yellow/Red c. 2008

# You'd have to shell out \$\$\$



✓ Authenticity Guarantee

## Nike Dunk Low Premium SB Sneaker in Yellow Lobster Size 13 - 313170 137566

★★★★★ Be the first to [write a review](#).

Condition: New with box

Price: **US \$100,010.00**

Buy It Now

Add to cart

♥ Add to Watchlist

15 watchers

**Shipping:** Secure delivery with signature confirmation | [See details](#)

International shipment of items may be subject to customs processing and additional charges. ?

Located in: Las Vegas, Nevada, United States

**Delivery:** Varies

Please allow additional time if international delivery is subject to customs processing.

**Returns:** Final sale. Seller does not accept returns. | [See details](#)

Payments:



\$ Have one to sell?

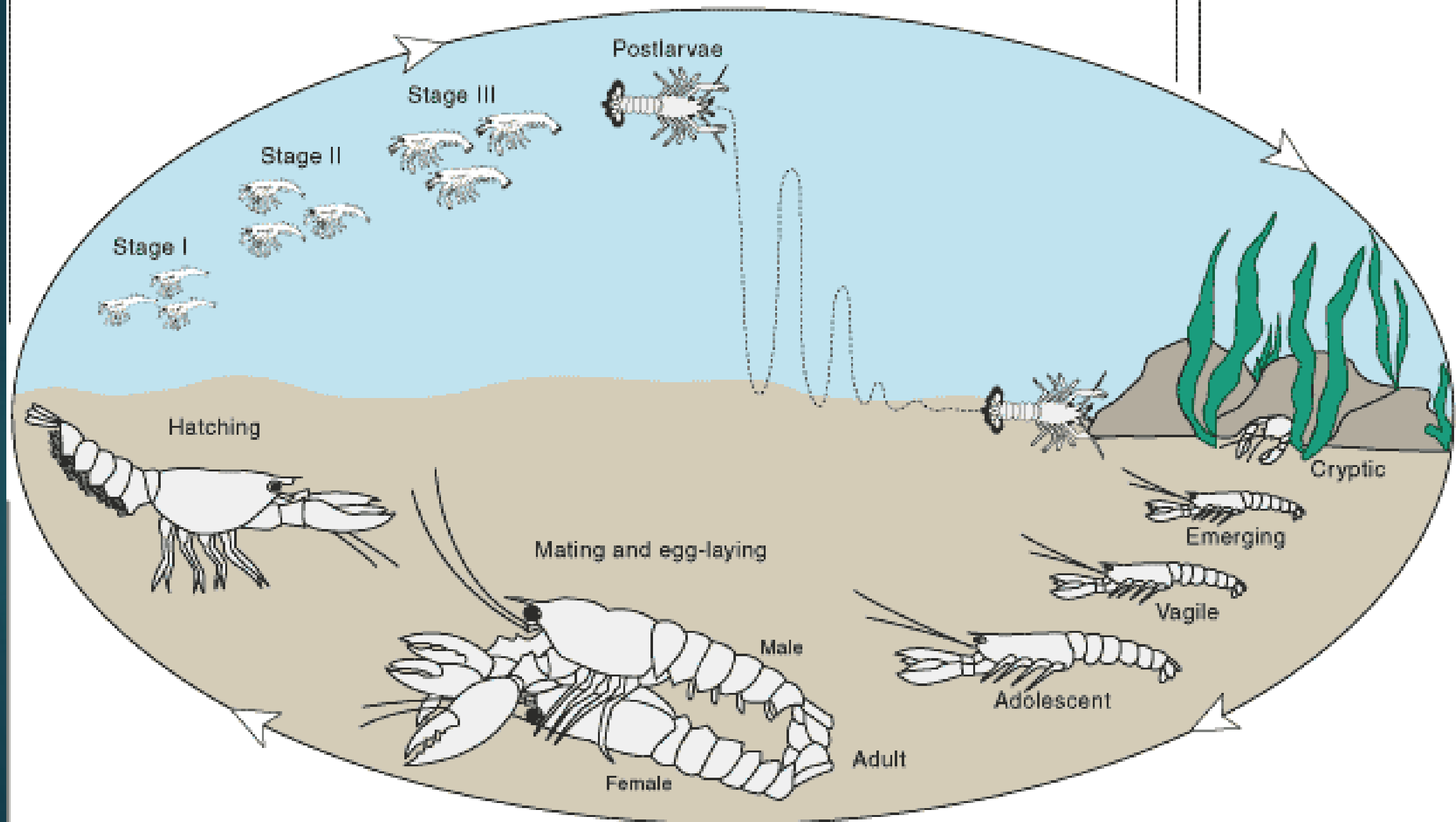
Sell now

# Lobster Ecology

- ▶ Most abundant in coastal waters, also abundant offshore
- ▶ Bottom-dwelling
- ▶ Depth generally  $< 50\text{m}$ , but up to  $500\text{m}$
- ▶ Tracking studies: inshore typically  $0\text{-}15\text{ km}$  dispersal; max recorded offshore  $360\text{ km}$
- ▶ Nocturnal
- ▶ Generalist feeders: predators and scavengers



3 to 12 weeks

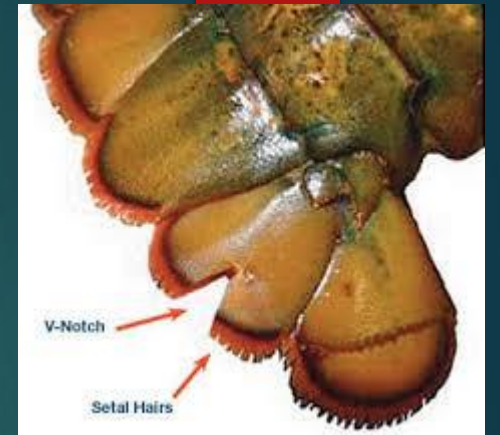


About 1½ to 2 years

About 6 to 8 years

# Reproduction


- ▶ Mate between July and September
- ▶ 2 year reproductive cycle (generally)
- ▶ Female releases pheromones, males wait for molt
- ▶ Sperm stored up to 15 months!
- ▶ Eggs carried under abdomens
- ▶ 5,000-100,000 eggs depending on size
- ▶ Hatch in late spring or early summer







# Blue Planet clip

- ▶ <https://www.youtube.com/watch?v=yuE7XeqNLI0>










YouTube <sup>CA</sup> Search  


BBC

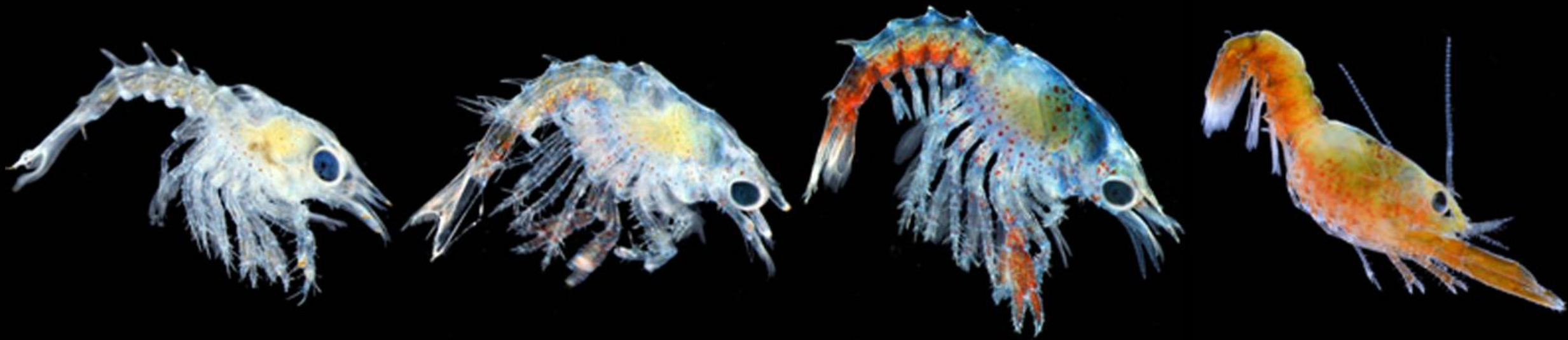
Lobsters Battle for a Breeding Pit | Blue Planet | BBC Earth

735,319 views · Feb 15, 2017

 8.4K  DISLIKE  SHARE  DOWNLOAD  SAVE ...

 BBC Earth  10.9M subscribers



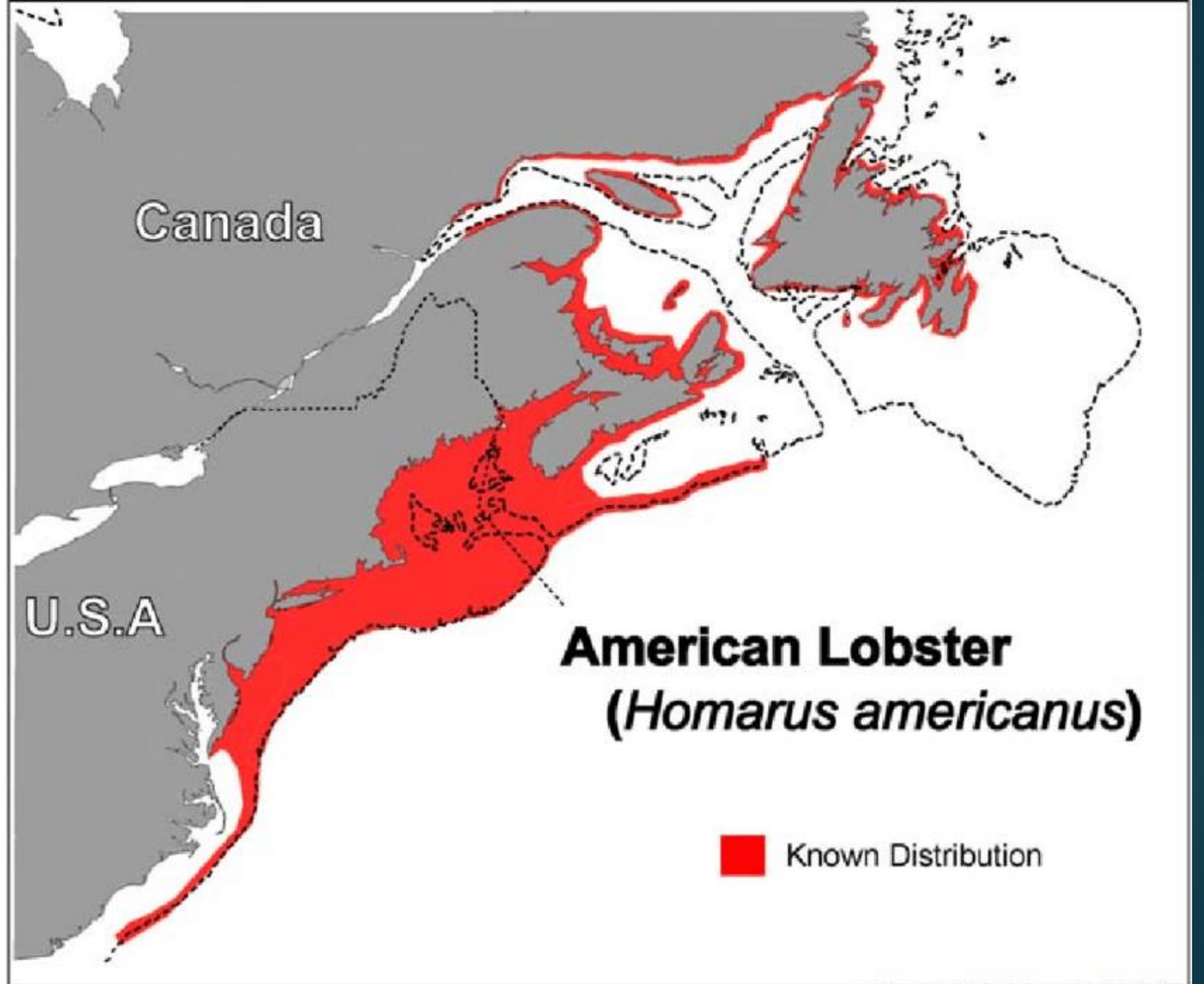


Jessica Waller

# Range

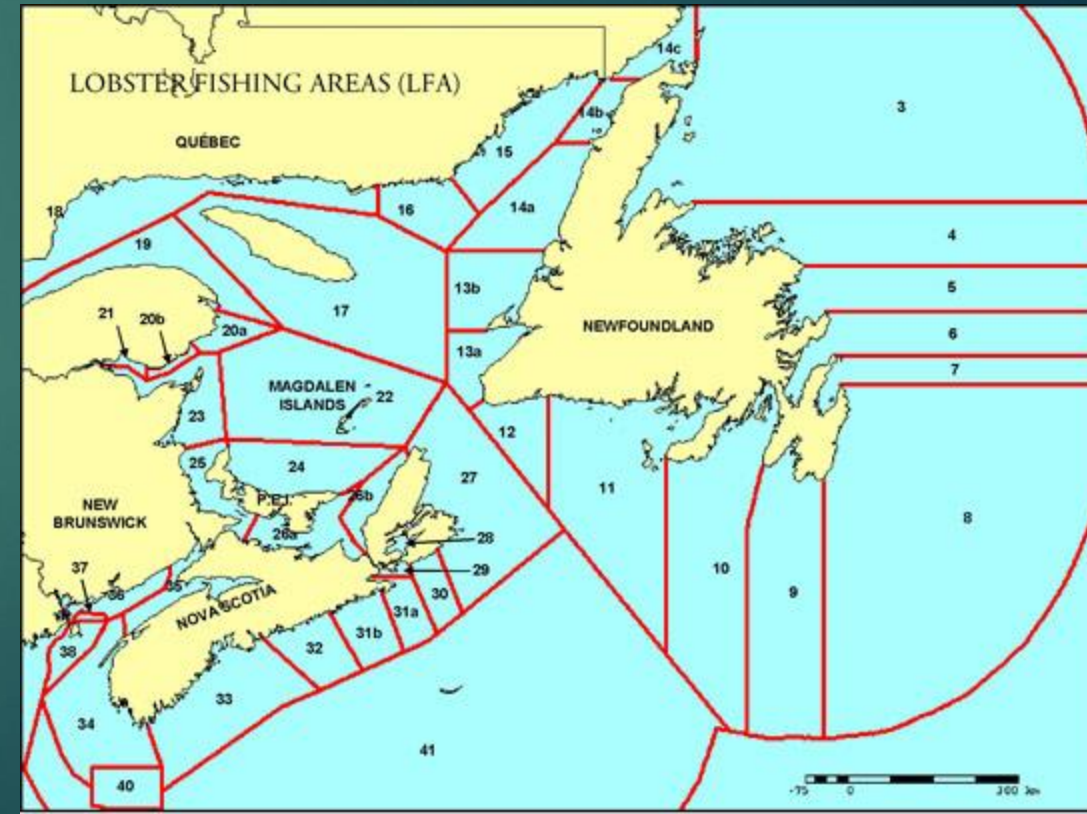
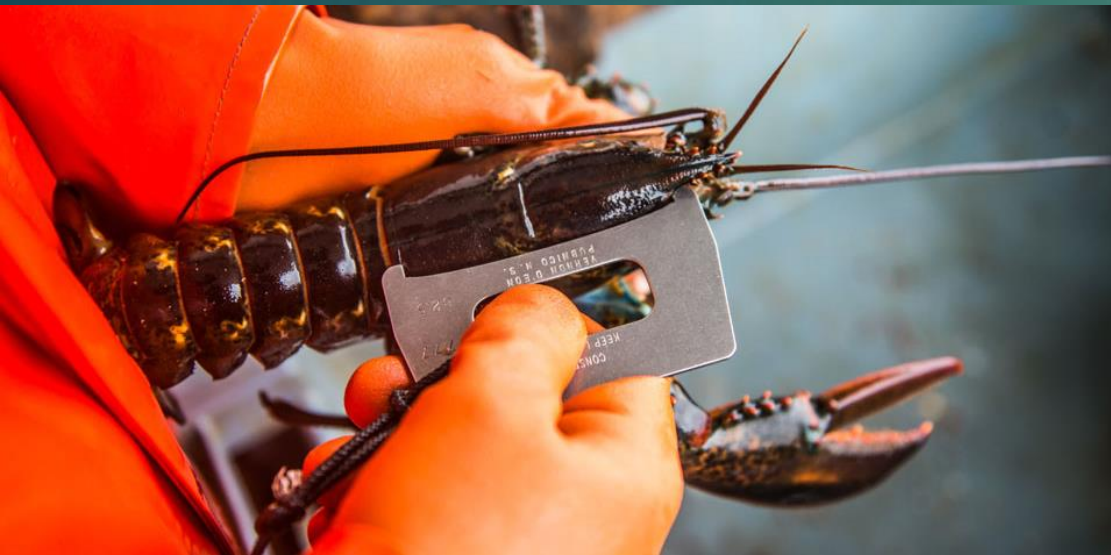
► Southern extent:  
North Carolina

Northern extent:  
Newfoundland  
Labrador



# DFO Lobster Management

- ▶ 45 lobster fisheries (43 inshore, 1 offshore, 1 closed)
- ▶ Much variation in regulations by area
- ▶ Inshore: Input control (e.g. limited licenses issued ~ 10,000)
- ▶ Offshore: Output control (total allowable catch)
- ▶ Summer molts protected
- ▶ Egg-bearing females released

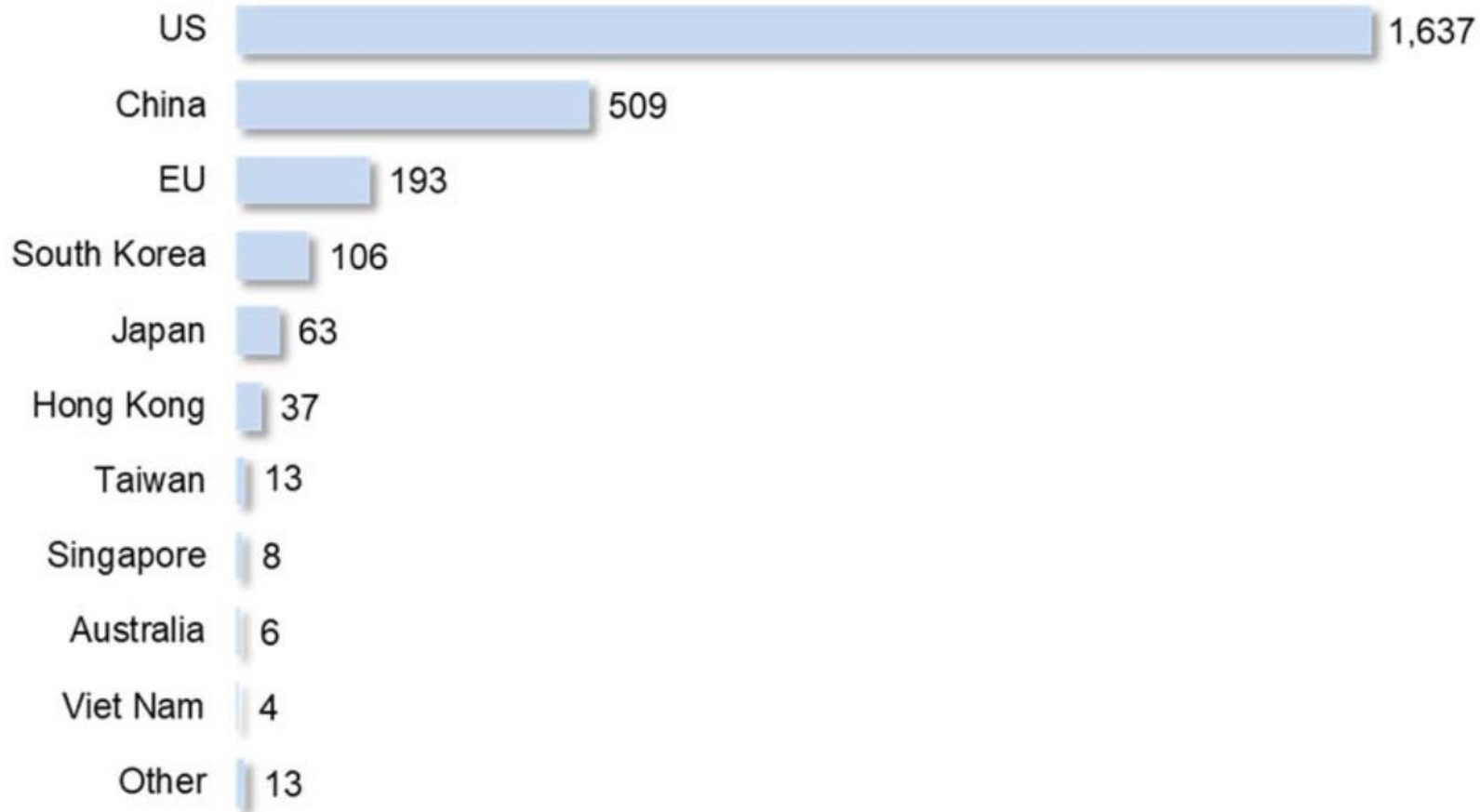


# Who imports the most Canadian lobster?



# Who imports the most Canadian lobster?

Figure 8. Canada's Lobster Exports by Destination, 2019 (\$M)



- ▶ USA: 32% live
- ▶ China: 90% live
- ▶ 41% Annual growth rate of exports to China

# Export Dynamics

- ▶ Lobsters held in “seasoning tanks”
- ▶ 2-4 C semi-hibernation up to 6 months
- ▶ Shell thickness, molting expectancy
- ▶ Trucking, aerial shipments
- ▶ Live display
- ▶ Welfare issues



LOBSTER DINNER  
only \$2.00!!!



ch 'Em, We Cook 'Em!

W ORIENT & CHO CES  
2.00E claw machine for ONLY \$2.00 per play  
is a lobster dinner! Are u up for the challenge??

# The LOBSTER Zone



You Catch 'Em, We Cook 'Em!



**\$2.00 PER TRY**  
Insert \$1.00, \$2.00 & \$5.00 in Any Combination  
Machine Does Not  
With Time Limit Control Claw Will Autochick to Default  
Position After Locking. Push Stop Once Running  
Claw Will Drop Automatically When Time Runs Out.  
WARNING: Do Not Make Contact With Lateral Mouth of Claw.

ORIG  
CLAW

00



# Cooking Lobster

- ▶ David Foster Wallace: “Is it all right to boil a sentient creature alive just for our gustatory pleasure?” – *Consider the Lobster* 2006
- ▶ Swiss ban on boiling alive
- ▶ Is cold better?
- ▶ Decentralized nervous system
- ▶ “Crustastun”: ~\$4000
- ▶ Processing plants



# IF YOU CATCH AN AMERICAN LOBSTER... RETAIN & REPORT

## AMERICAN LOBSTER

## DISTINGUISHING FEATURES

## EUROPEAN LOBSTER



**Location:**  
Underside claw  
**Distinctions:**  
Orange-red



**Location:**  
Head  
**Distinctions:**  
Spines tipped red  
Ventral tooth present



**Location:**  
Underside claw  
**Distinctions:**  
Cream



**Location:**  
Head  
**Distinctions:**  
Spines tipped white  
No ventral tooth



**Location:**  
Back & neck  
**Distinctions:**  
Larger, orange, reddish,  
dark green or black  
speckles



**Location:**  
Back & neck  
**Distinctions:**  
Smaller, blue to  
dark blue

Occasionally American lobsters find their way into our waters. This poses a risk of disease, outcompeting and interbreeding.

Please keep all potential American lobsters or hybrids and report them asap.

Report to your local Marine Scotland Compliance Fishery Office or the UK Fisheries Monitoring Centre on 0131 271 9700 (operational 24/7) or email [UKFMC@gov.scot](mailto:UKFMC@gov.scot)

marine scotland



Scottish Government  
Riaghaidas na h-Alba  
gov.scot



## 'Lucky' the lobster accepted at UBC

An Atlantic lobster fished out of the water off Bowen Island last weekend has gone from invasive species to death row inmate and finally, celebrated research subject.

Brent Richter  
Aug 31, 2014 12:00 AM



*Lucky the lobster after being pulled from the waters off Bowen Island | supplied, North Shore News*

An Atlantic lobster fished out of the water off Bowen Island last weekend has gone from invasive species to death row inmate and finally, celebrated research subject.

West Vancouver resident Blair Calkins found the lobster, loaded with eggs, in one of his prawn traps while taking his son fishing on Aug. 23.

British Columbia

## 'Huge' Atlantic lobster washed up in Vancouver likely set free by animal lovers



Alien lobster with claws almost as big as a man's shoe may have been cruising the Pacific for some time

[Lisa Johnson](#) - CBC News - Posted: Jan 06, 2016 4:33 PM PT | Last Updated: January 7, 2016

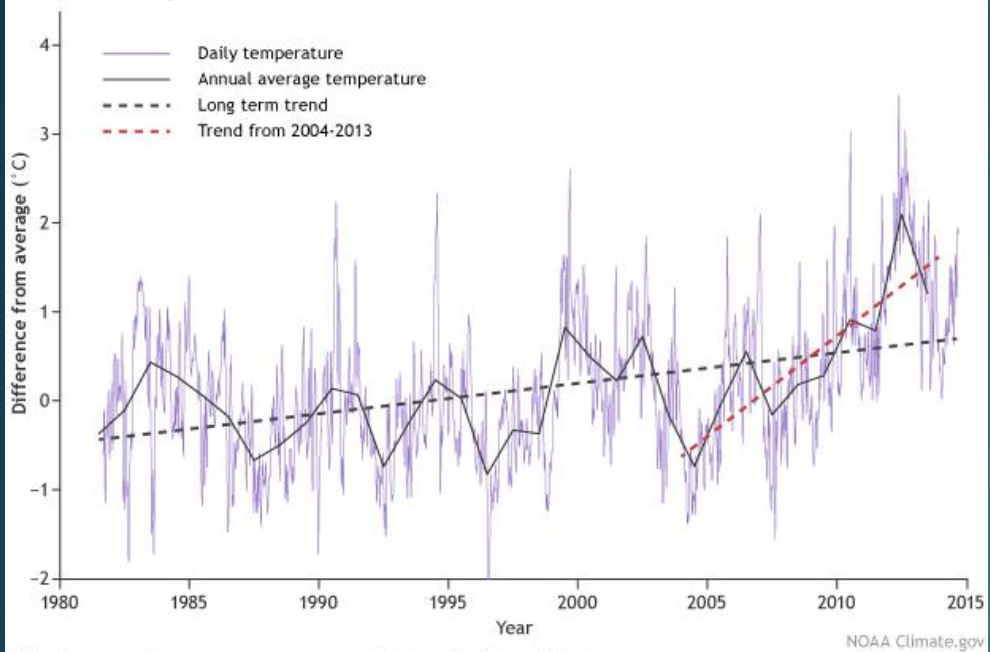


The large lobster carcass was found washed up in New Brighton Park in Vancouver by Damon Gudaitis, whose size 11 shoe is pictured alongside the claws. (Damon Gudaitis)

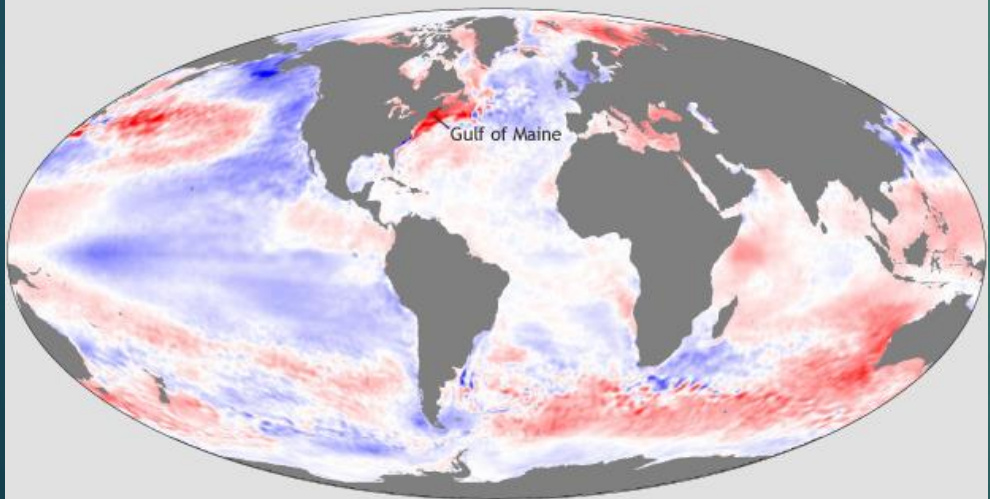
# Climate Change and Lobster

- ▶ Temperature increasing available habitat in Canada: “brighter side of climate change” (Goode et al. 2019)
- ▶ Abundance has increased in Gulf of Maine and Bay of Fundy
- ▶ Increases expected in Newfoundland and Labrador
- ▶ 20 °C stress threshold: respiratory issues and shell disease
- ▶ Acidity effect on shells?
- ▶ Prey distributions: zooplankton (e.g. copepod)

Sea surface temperature trends in the Gulf of Maine



Global sea surface temperature trends from 2004 to 2013

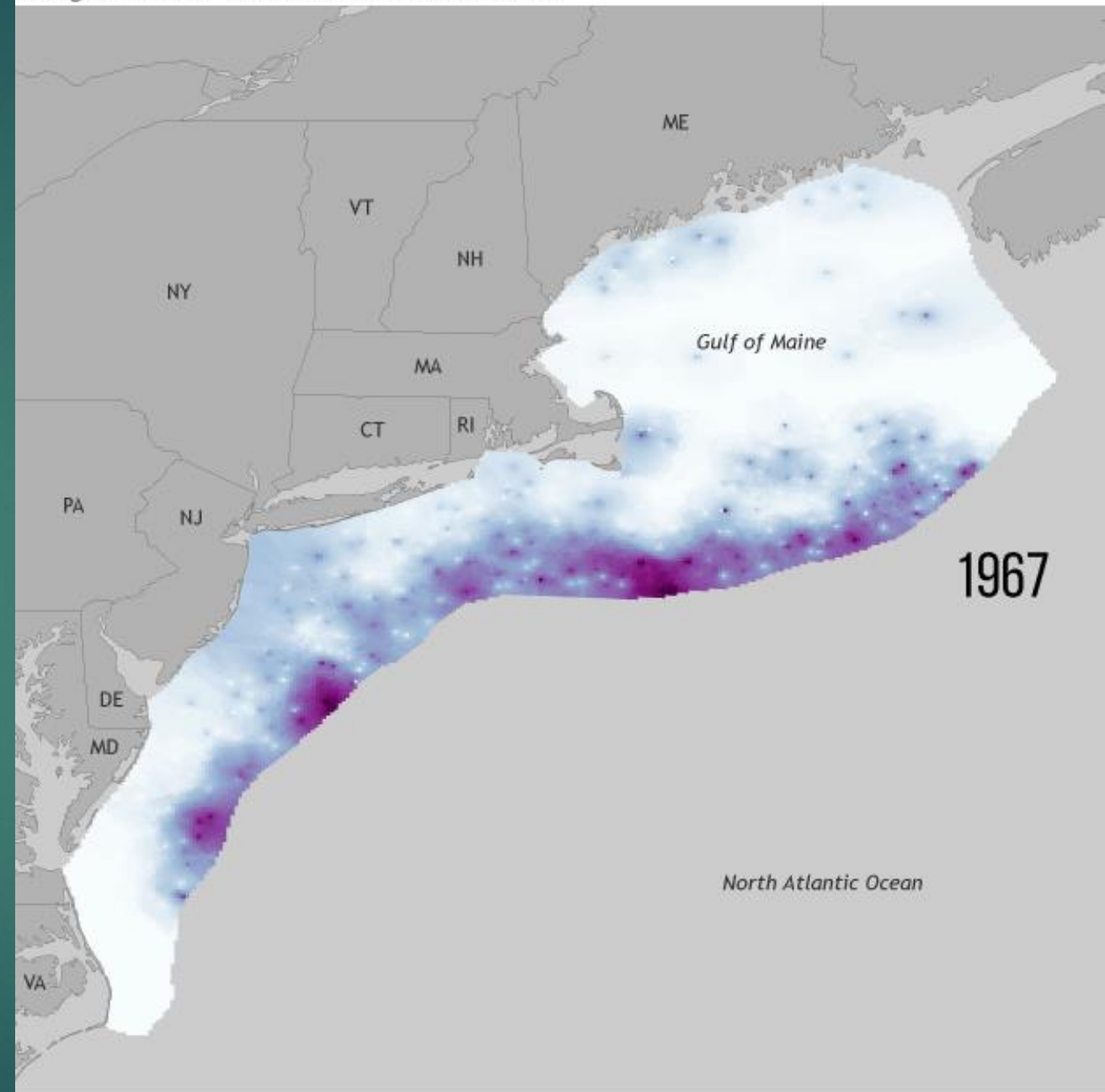


Change in temperature since 2004 (°F per year)



Climate.gov, adapted from Pershing, et al. Data: OISST

Changes in lobster distribution from 1967 to 2014



Climate.gov

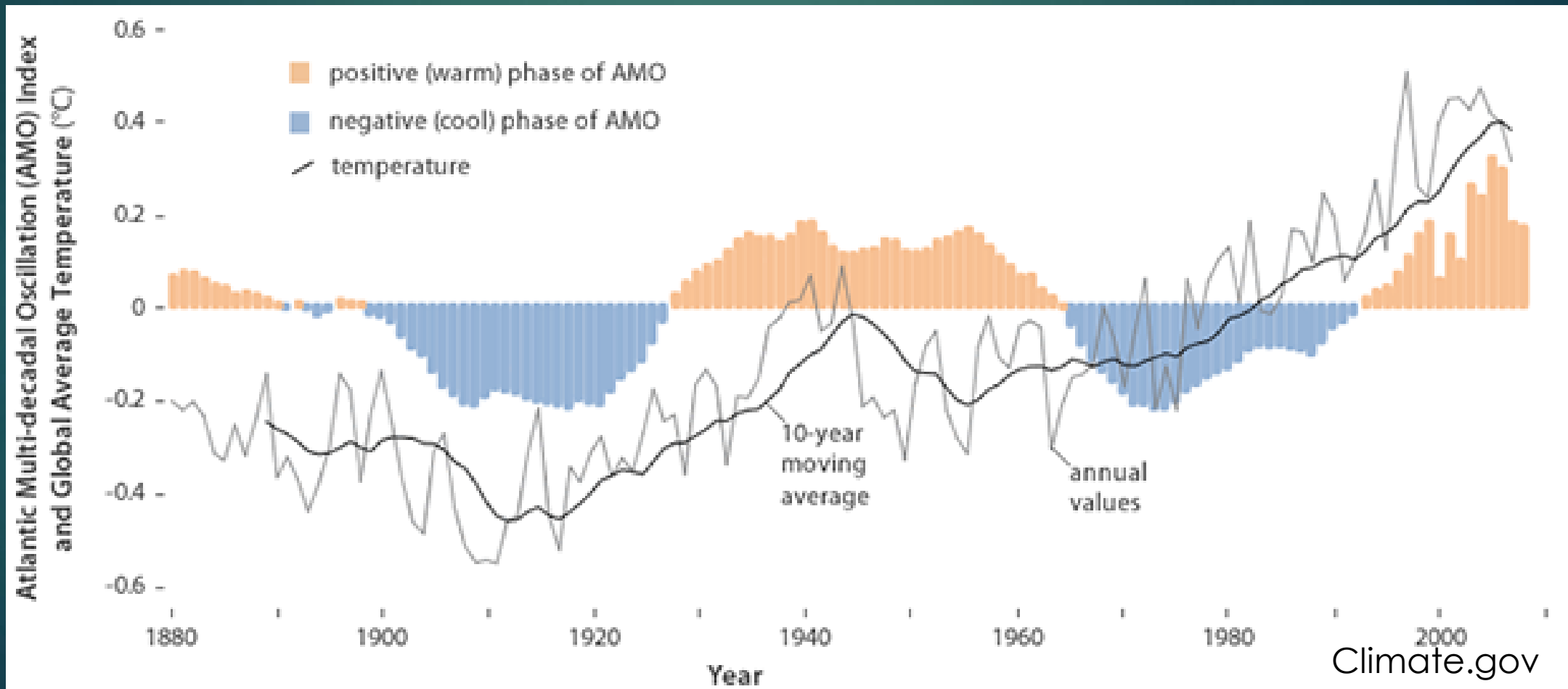
Amounts of lobster caught



Climate.gov, adapted from OceanAdapt

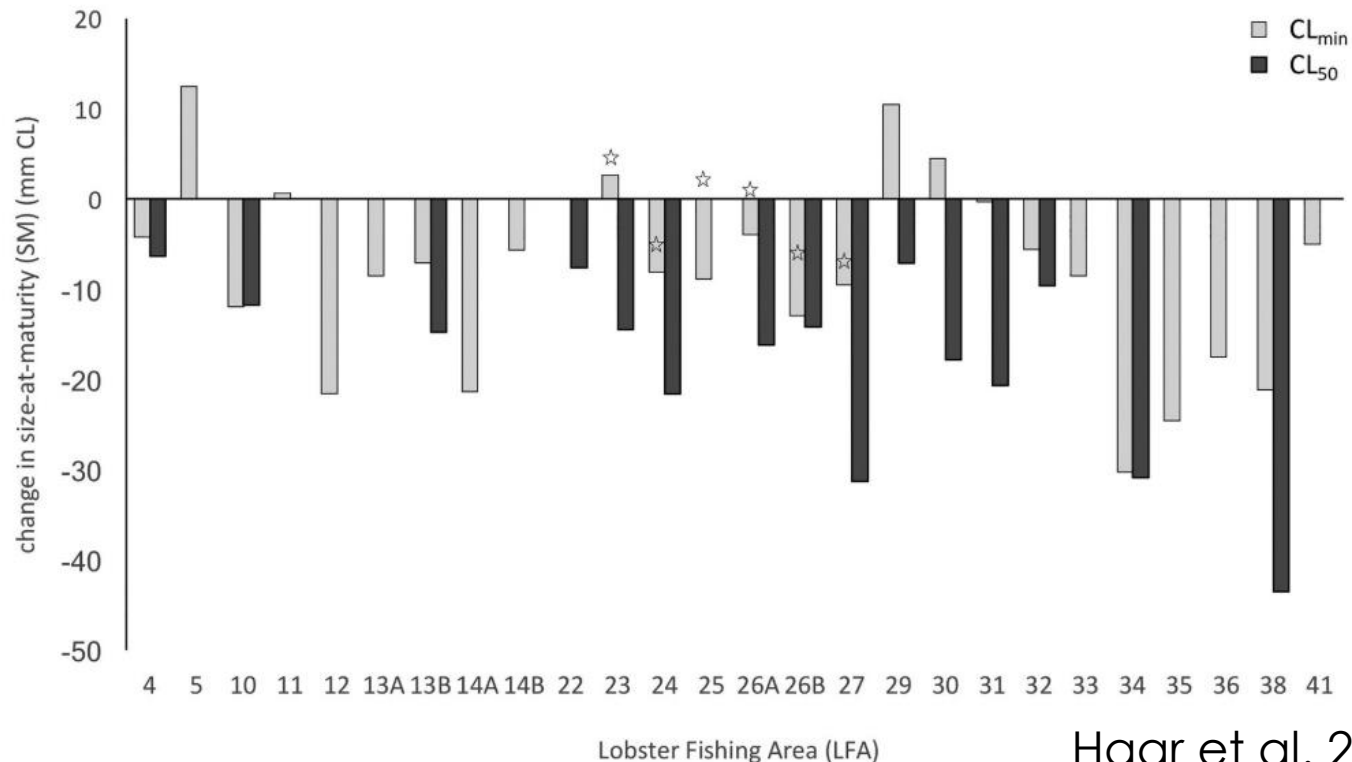
# Atlantic Multi-decadal Oscillation (AMO)

- ▶ Currently in a positive (warm) phase
- ▶ Phases appear to last roughly 30 years



# Female size at maturity has decreased

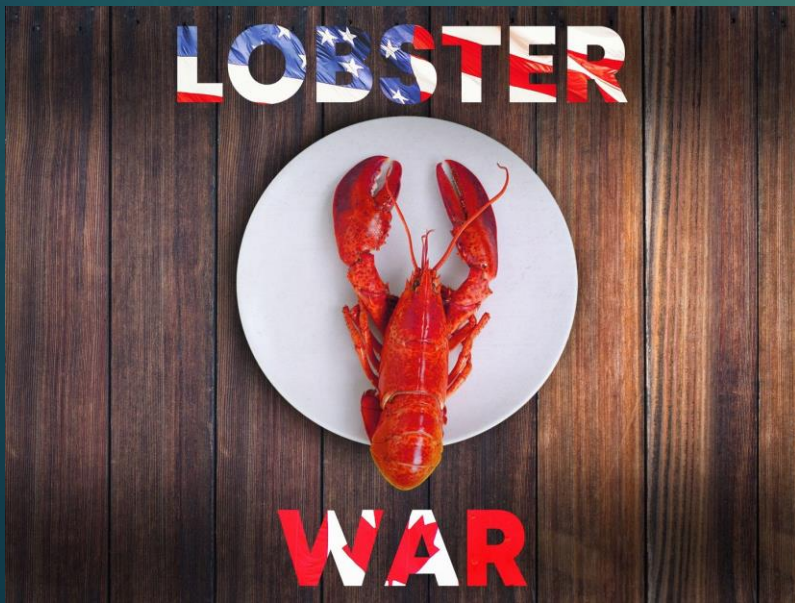
- ▶ Declines up to 30% over the last 10-80 years
- ▶ Size selective fishing > rising temperature and abundance (Haar et al. 2018)
- ▶ Likely an evolutionary response over 10-15 generations



Haar et al. 2018

# Lobster wars part one: Canada and USA

- ▶ “Grey zone”
- ▶ Disputed area
- ▶ Different regs: Season, Trap #s, Maximum size limit, Hauling at night





# Machias Seal Island dispute

- ▶ Only Canada-USA boundary dispute involving land
- ▶ 1621: defined as part of Nova Scotia by British
- ▶ 1713: returned to British by French
- ▶ 1783: islands within 20 leagues (111 km) belong to USA
  - \*except ones that are within Nova Scotia
- ▶ New Brunswick lighthouse established 1830s



# Class Discussion

- ▶ Pros and cons of making grey zone a MPA?
- ▶ What would be economic ramifications?
- ▶ How would a local fisher be likely to react?



# Lobster wars 2: Indigenous and non-Indigenous

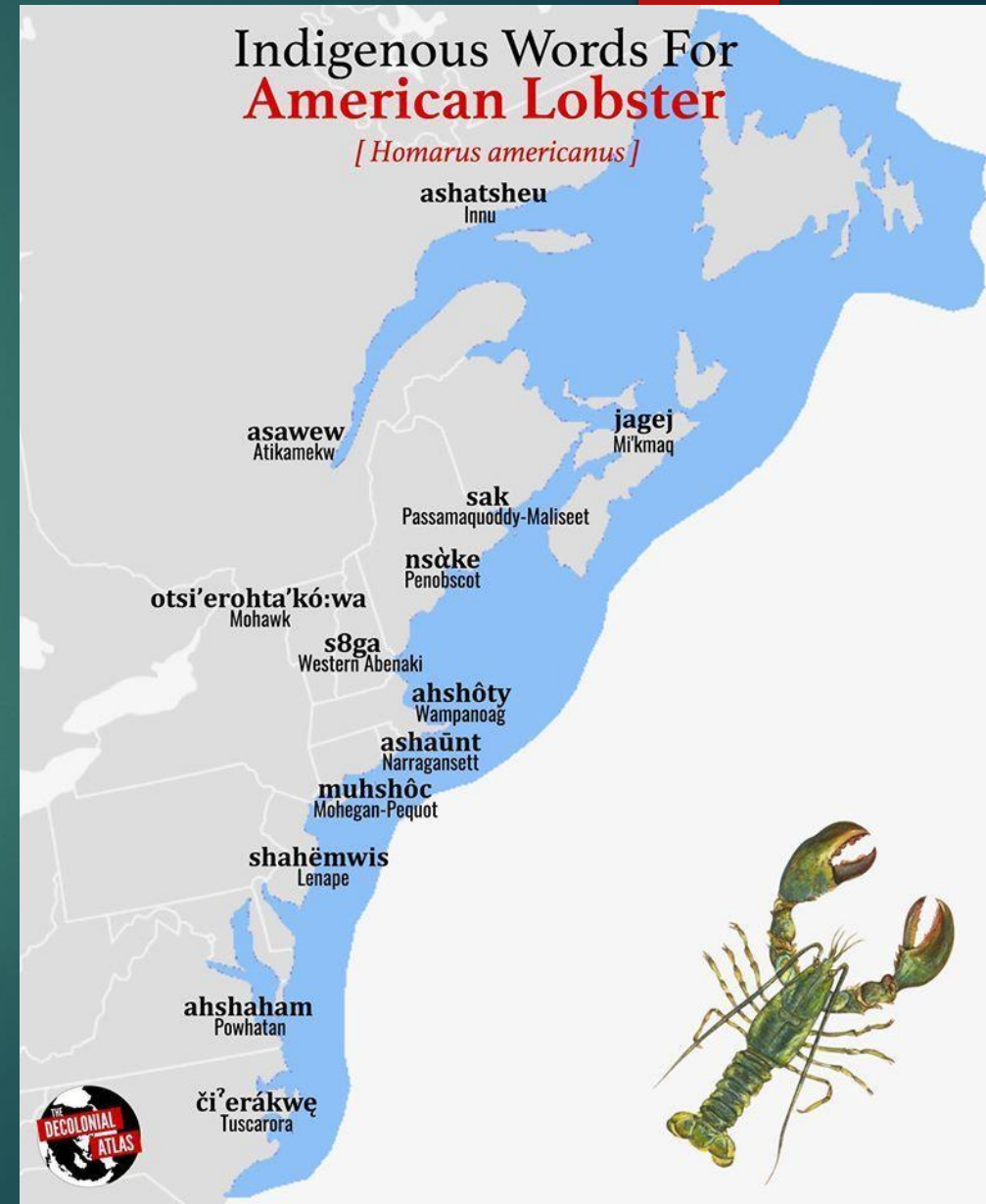


# Indigenous lobster harvest

- ▶ Traditionally highly mobile hunting and gathering
- ▶ Seafood collected primarily in warmer months

## Modern fisheries

- ▶ Food, Social, Ceremonial (FSC) fishery
- ▶ Commercial fishery: ~1300 licenses held
- ▶ “Moderate livelihood fishery”



# R. v Marshall case

- ▶ Donald Marshall Jr. (Mi'kmaw)
- ▶ Previously wrongfully imprisoned for murder
- ▶ 1993 arrested for harvesting eels
- ▶ 1700s Peace and Friendship Treaties (Treaty of 1752)
- ▶ 1999 Supreme Court affirms treaty right to catch and sell
- ▶ “The accused’s treaty rights are limited to securing ‘necessaries’ (which should be construed in the modern context as equivalent to a moderate livelihood), and do not extend to the open-ended accumulation of wealth.”
- ▶ Marshall 2: treaty rights to fish can be limited (by DFO) “on conservation or other grounds”



# Indigenous / non-Indigenous conflict

- ▶ 1999-2000: Burnt Church, New Brunswick
- ▶ 2020: Area 34 in southern Nova Scotia
- ▶ Traps removed or cut, physical threats/violence, property damage, lobsters stolen/destroyed
- ▶ 2021 lawsuit in Nova Scotia Supreme Court filed by Mi'kmaq alleges intimidation and harassment



# Lobster pound destruction

- ▶ October 2020
- ▶ 25 non-Indigenous people arrested
- ▶ Restorative justice
- ▶ Pound stores for both Indigenous and non-Indigenous commercial fishers



# Establishment of moderate livelihood fishery

- ▶ Traps (~ 1-2% of total commercial fishery)
- ▶ July - November
- ▶ Aligns with traditional Mi'kmaq fishing season
- ▶ Management plan with trap limits, monitoring guidelines, community sharing responsibility, designated buyers
- ▶ Non-Indigenous concern: Summer is molting and nursery time
- ▶ Lobster are more likely to be caught and more likely to be harmed by capture





# Class Discussion

What constitutes “moderate livelihood”?

Should the government give more specific guidance, or is ambiguous better?

What can be done to diffuse the conflict and move forward?



# Collaborative Study on Indigenous Fishery

- ▶ Sipekne'katik First Nation and Dalhousie University
- ▶ 3 year collaborative study
- ▶ Study the status of lobster throughout year and effects of harvesting outside commercial season
- ▶ DFO permitted the research and provided methodologies (e.g. datasheets), but declined to participate



Jade Robinson, picture by Megan Bailey



# Lobster Science Partnership Roundtable

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The Lobster Science Partnership Roundtable brings together Fisheries and Oceans Canada scientists, Indigenous partners, academic and research institutions, industry organizations and provincial government representatives from the Maritimes and Quebec to discuss important lobster science research questions and priorities, identify new areas of work, how to effectively work together, and engage others in the process.

## Areas of focus

The Roundtable will initially focus on the following themes:

- Ecosystem and Climate Change
  - Research areas could include: lobster productivity, distribution, temperature effects on lobster mobility, range and catchability, shell disease
- Lobster Biology and Ecology
  - Research areas could include: size at maturity, timing of reproduction, moult, reproductive success, and survivorship
- Population Structure and Connectivity
  - Research areas could include: movement into and out of Lobster Fishing Areas and the related effects on lobster populations over time
- Studies to Inform Sustainable Harvest
  - Research areas could include: estimates of fishing mortality, effects of harvest methods (handling, gear, or bait, scientific research to inform socio-economic studies, use of Indigenous traditional knowledge)

If you would like to contribute ideas or comments on lobster science, please contact [DFO.LobsterScience-Scienceduhomard.MPO@dfo-mpo.gc.ca](mailto:DFO.LobsterScience-Scienceduhomard.MPO@dfo-mpo.gc.ca).

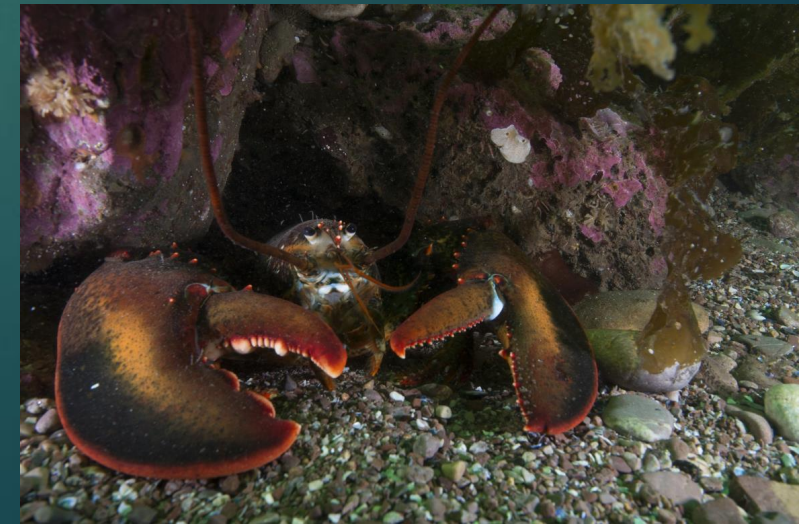
# Is the Crown at war with us?



A National Film Board of Canada Production

# Takeaways

- ▶ Lobster is an extremely valuable fishery
- ▶ Welfare issues in supply chain and cooking
- ▶ Climate change has increased northern abundance, but further study and careful monitoring needed (e.g. recruitment)
- ▶ Long-running transboundary and Indigenous/non-Indigenous conflicts
- ▶ Continued conflict is likely and mediation discussions are needed



Thanks for listening!

**LET'S MAKE LIKE A LOBSTER**



**AND GET THE SHELL OUT OF HERE**

made on imgur