MAINE FISHERMEN'S FORUM, 2020

Reconsideration of Atlantic cod stock structure in US waters

THE ATLANTIC STOCK STRUCTURE WORKING GROUP (ACSSWG)

Host: Maggie Raymond

Moderator: Richard McBride, NOAA Fisheries

Panelists:

Ted Ames, Bowdoin College and MCCF Founding Board;

Russell Brown, NOAA Fisheries;

Steve Cadrin, Univ. of Mass. Dartmouth School for Marine Science and Technology;

Lisa Kerr, Gulf of Maine Research Institute;

Thomas Nies, New England Fishery Management Council

Outline

Presentation. Background
Why does stock structure matter?
The case of US Atlantic cod, current management units

Presentation. The ACSSWG
Process & findings of biological stock structure for US Atlantic cod

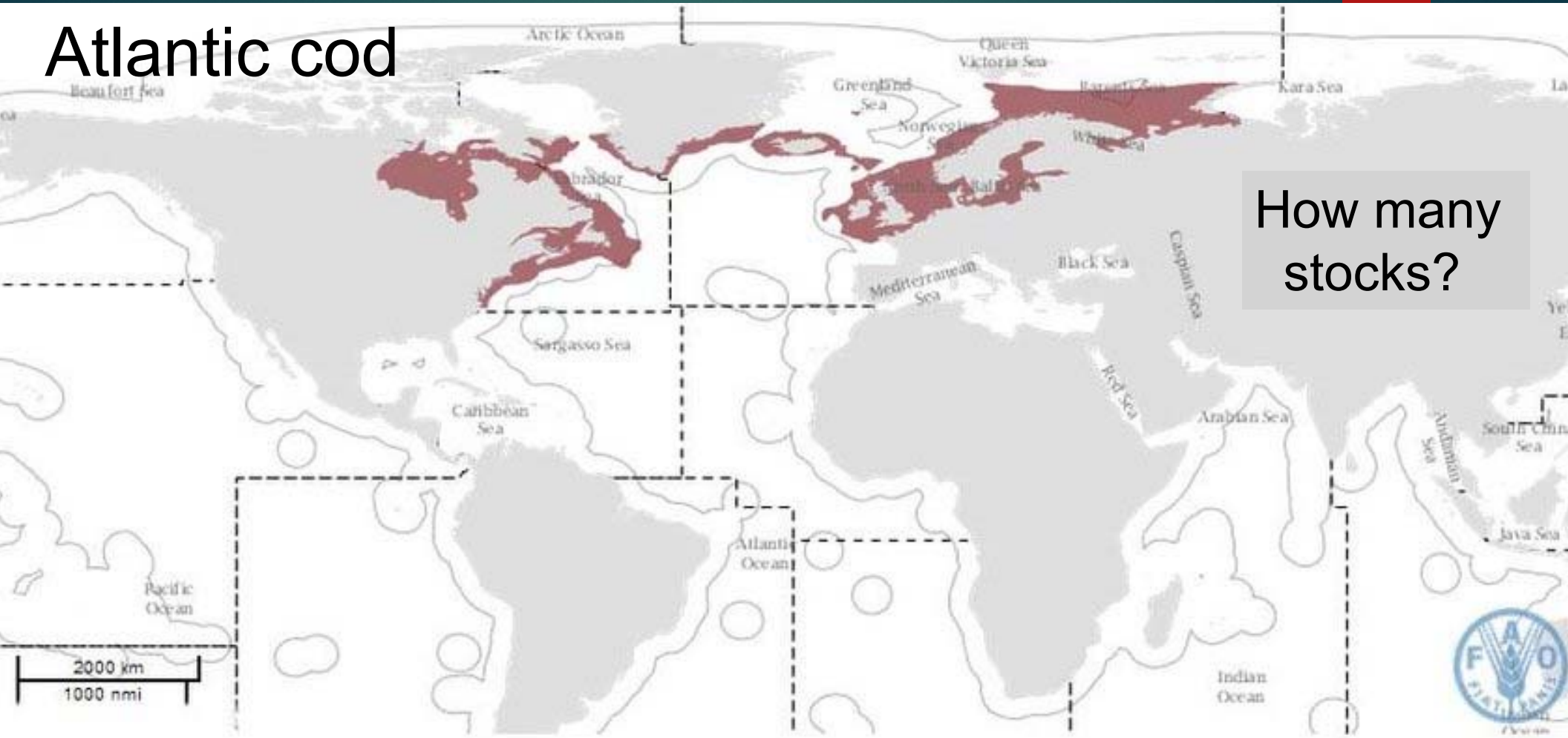
Open discussion. Implications regarding:
Assessment, Fishing, Management, Monitoring, Research

No, not this kind of fish stock

Instead, a biological stock (= population)

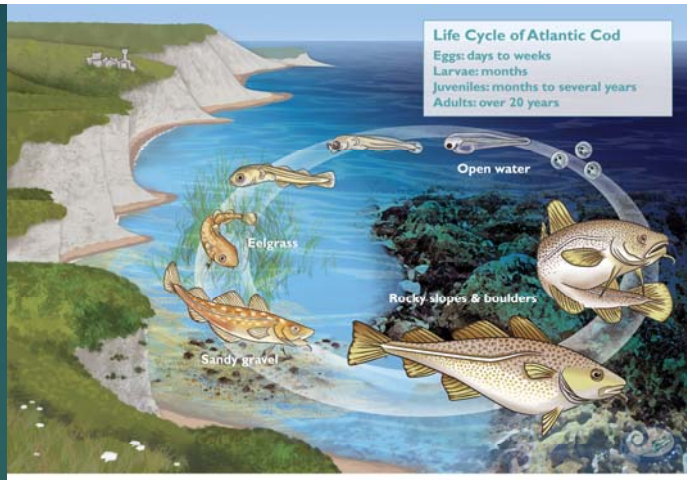
Global distribution of the species

Atlantic cod



How many stocks?

What is a biological stock?



The Atlantic cod uses many habitats throughout its life. Open water, eelgrass beds, sandy and gravel areas, kelp, boulder fields and steep rocky ledges are important for growth and survival during different life stages of this fish.
Art by Molly Thomson

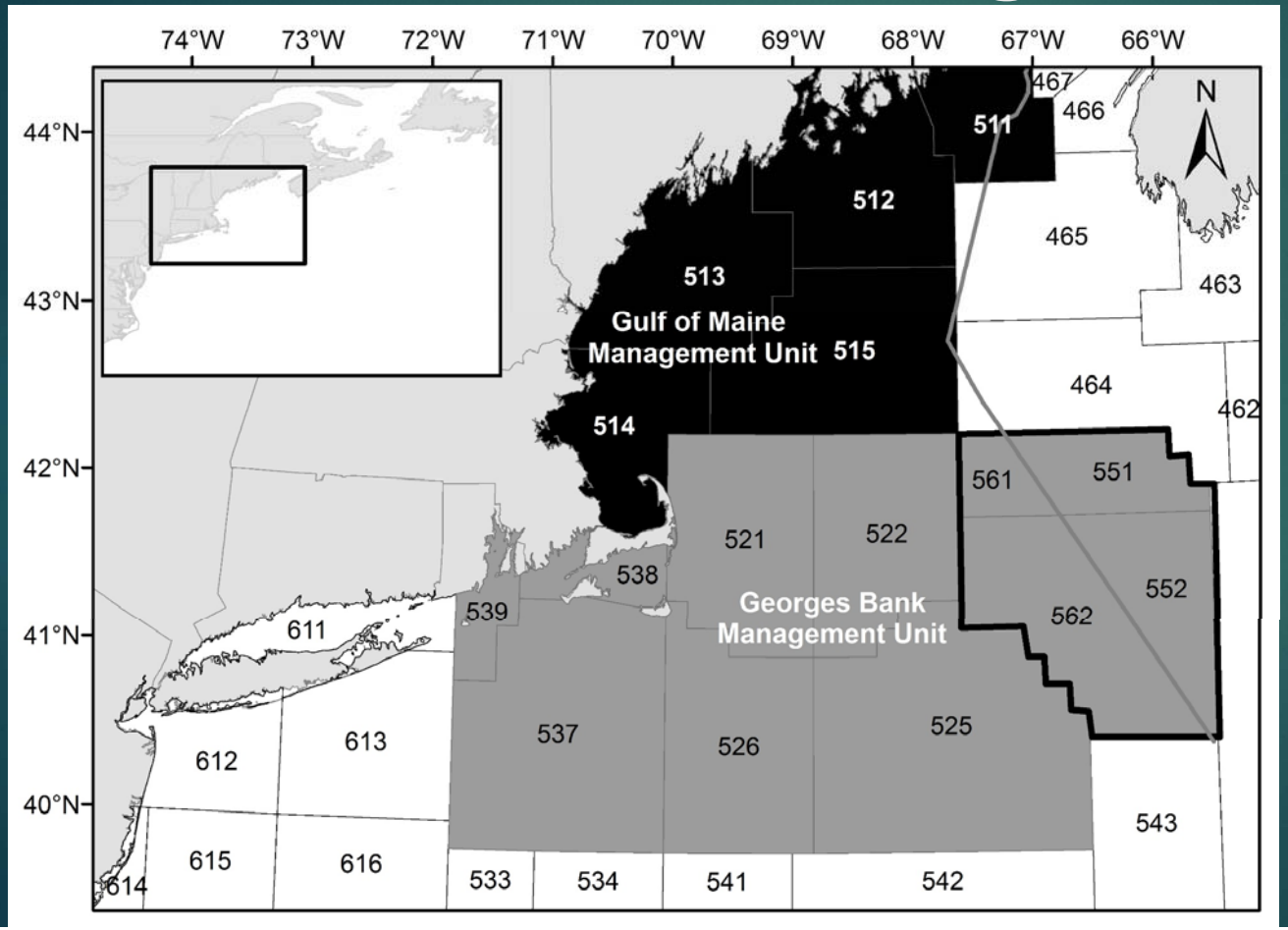
Consider a group of individuals where…

Source of new recruits comes from within
- **reproductive isolation**

Demographics – growth, mortality, maturity, fecundity – are similar by age, size, or sex
- **dynamic pool**

Abundance estimates are representative of the stock
- **well mixed**

Where are the boundaries of the current US cod management units?



Since ~ 1970s (North-South)

How do these <u>geographic</u> management units relate to biological stock structure of Atlantic cod?

Didn't we have a stock structure workshop in 2012?

"The Steering Committee recommends that an inclusive but focused Working Group meeting be held involving a small group of Canadian and US scientists to consider the results of the Workshop." - Annala, 2012

Timeline from WG formation (Feb 2018)

Conference Calls

- 7 in 2019
- 3 in 2018

Outreach meetings (UNH)

- Jun 6, 2019
- Jun 19, 2018

WG workshops (UNH, GMRI)

- Nov 14-15, 2018
- Jun 20-21, 2018

Maine Fishermen's Forum, March 7, 2020

https://www.nefsc.noaa.gov/press_release/pr2018/other/cod-stock-structure/

Who are the working group members?

Ames

*Andrushchenko

Cadrin

Cournane

Dean

DeCelles

Kerr

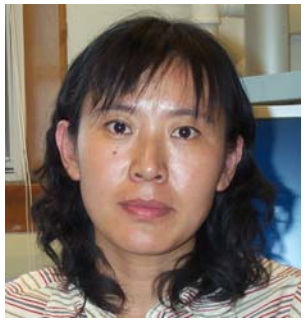
Kovach

McBride (co-chair)

Overgaard Therkildsen

Puncher

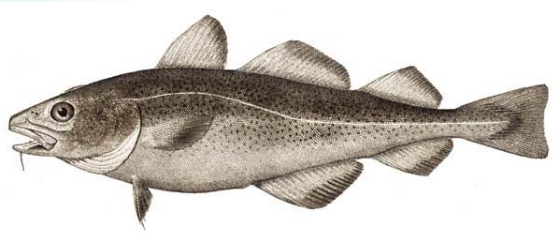
*Smedbol (co-chair)



*Wang

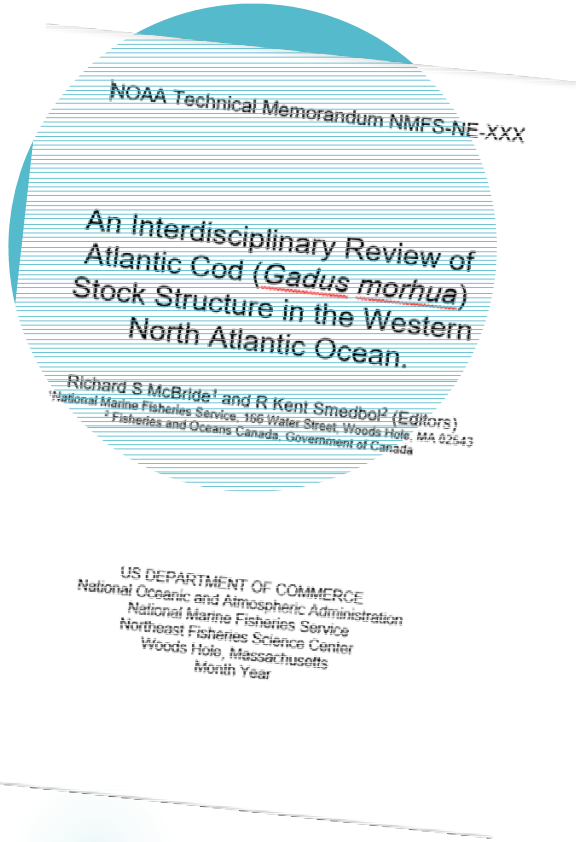
Zemeckis

WG's approach



<u>Everything was on the table:</u>
Literature review
Reanalysis of old data
Analysis of new data

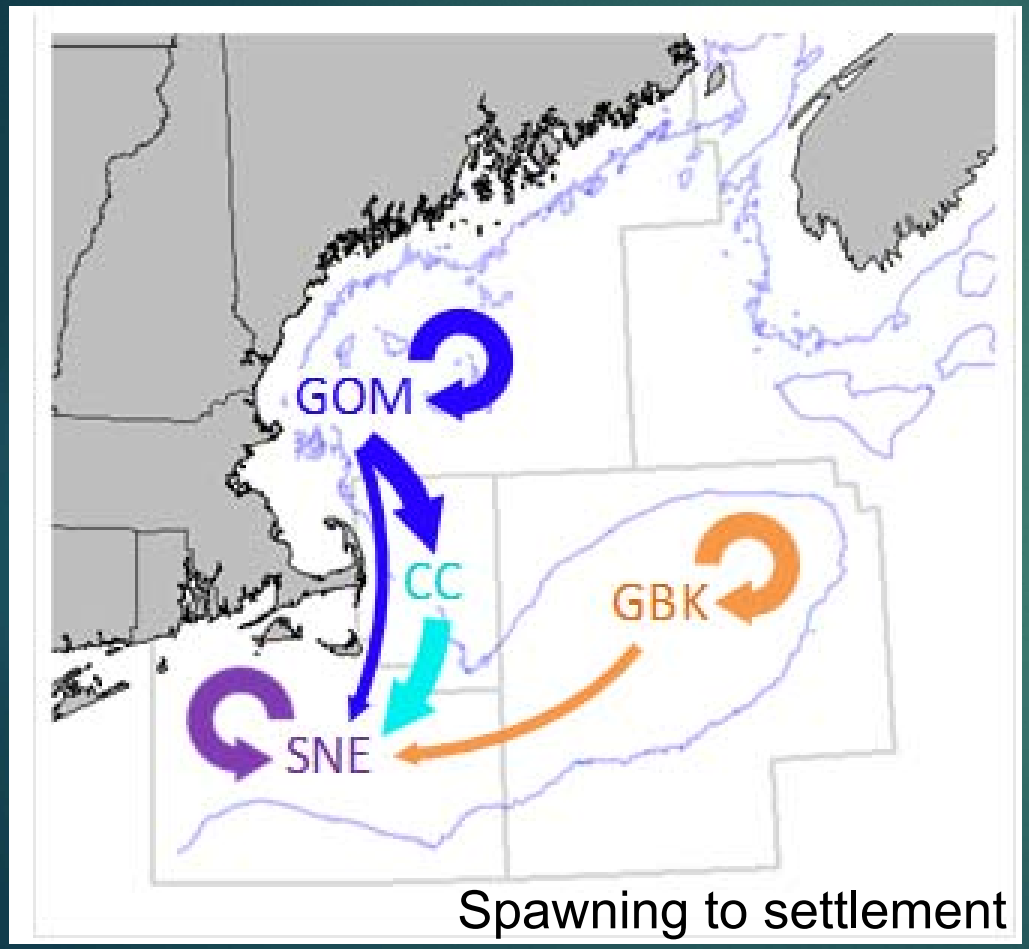
<u>Multiple reviews and public accessibility</u>
Conference calls, face-to-face WG workshops
Constituent reviews (such as today's meeting)
Scientific peer review (NEFMC, spring, 2020)
Publish as a NOAA Tech. Memo. (fall, 2020)
Follow-up workshop on implications (tbd)



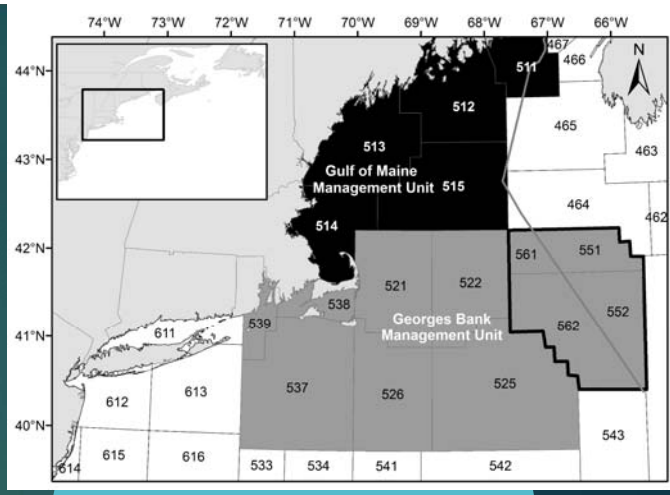
6 interdisciplinary categories

1. Early life history (spawning–settlement)
2. Genetic markers (including unpublished genomics data)
3. Life history (48 years of the NEFSC bottom trawl survey)
4. Natural markers (otoliths, parasites, color morphs, etc.)
5. Applied markers (200,000 tagged cod; 12,000 recaptures [1923-2013])
6. Fishermen’s ecological knowledge (structured interviews)

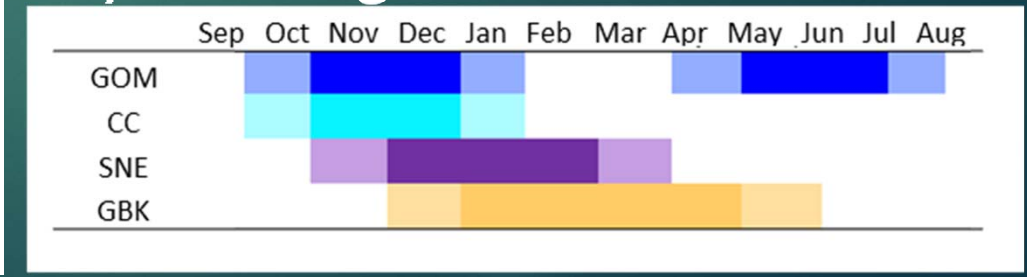
Early life history



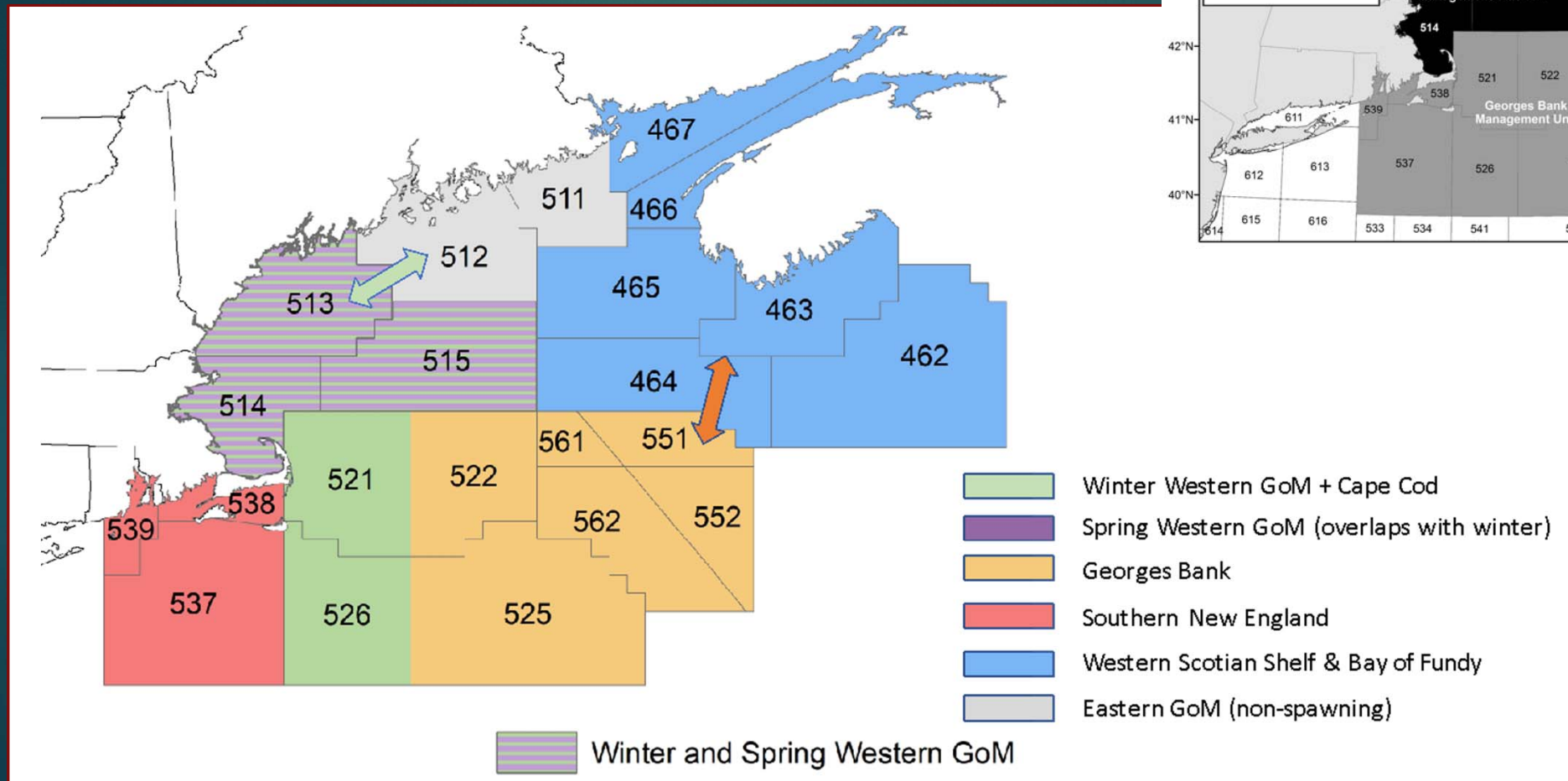
Spawning to settlement

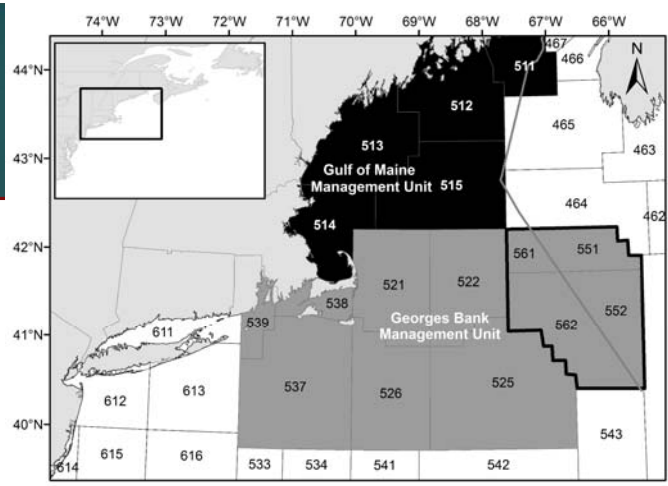


Spawning Seasons

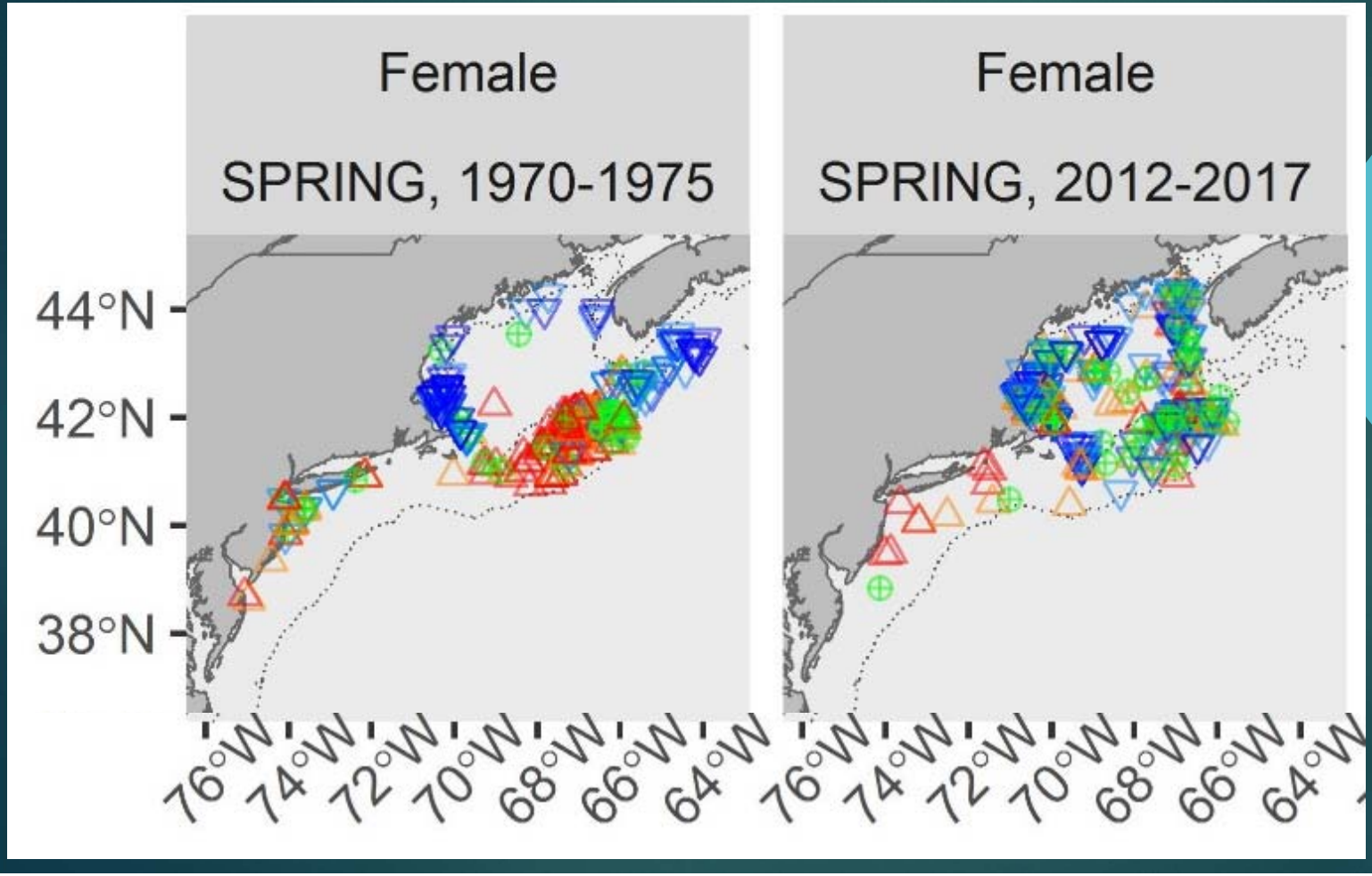


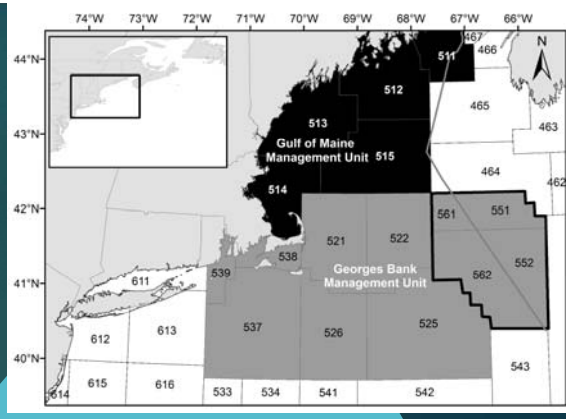
Genetic structure





Life history (size @ age-2)





Largest

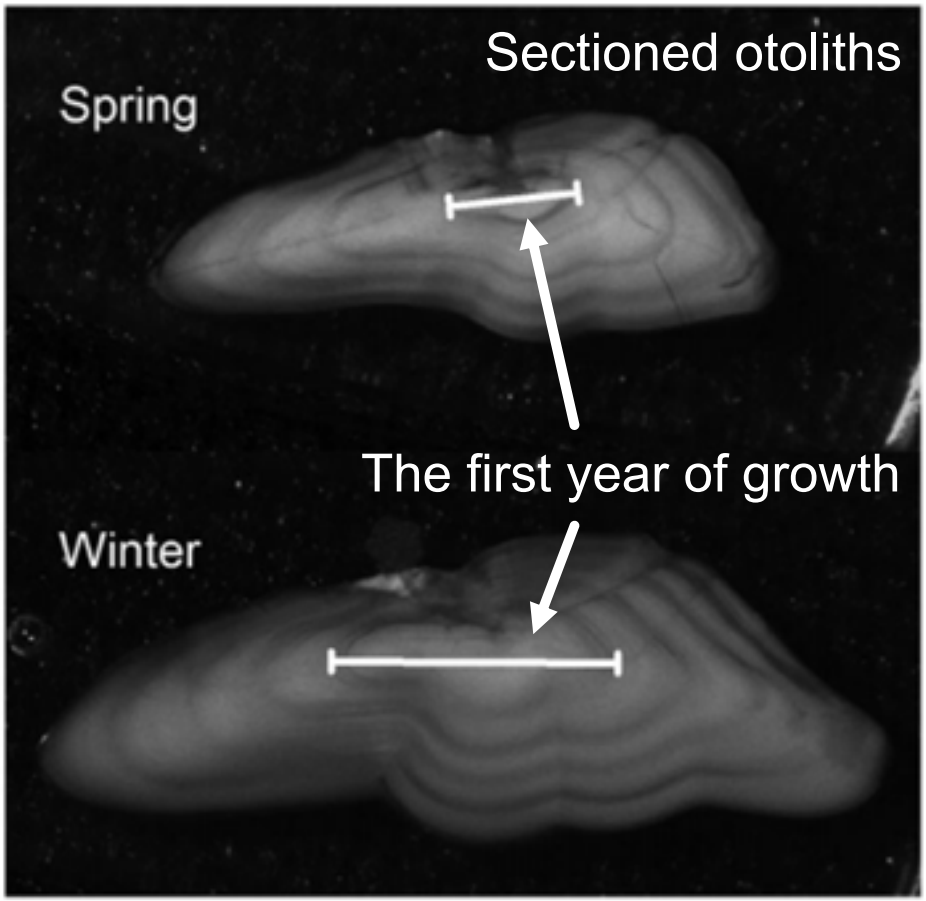
Larger

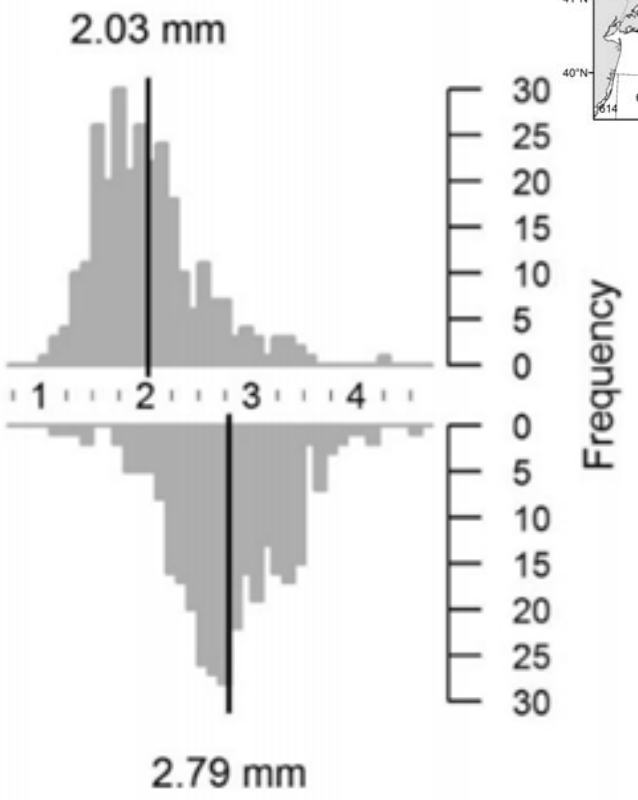
Average

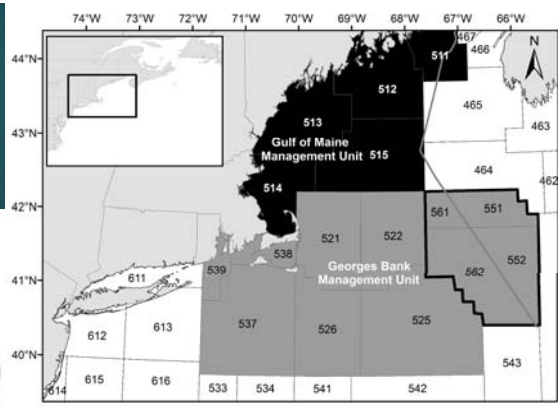
Smaller

Smallest

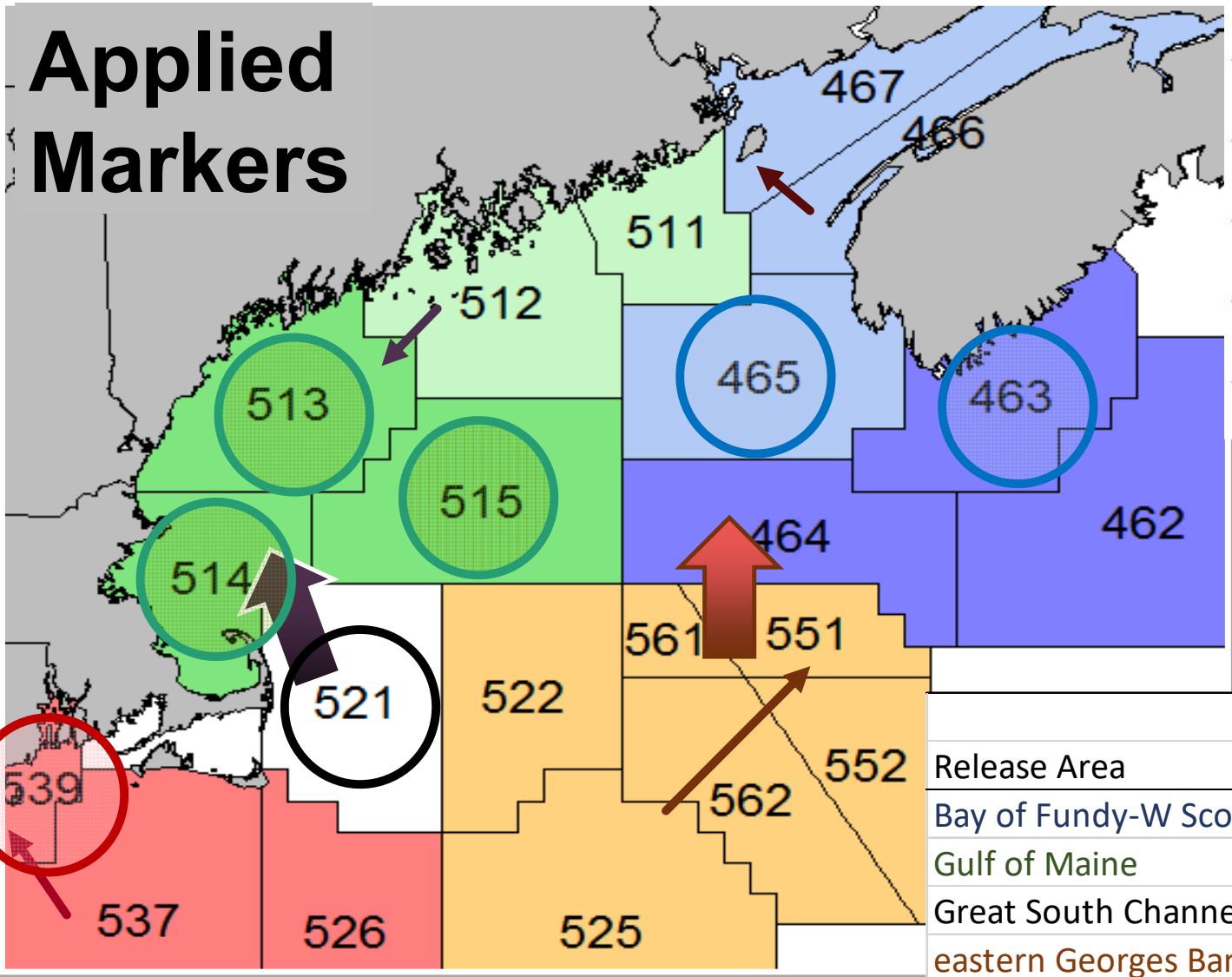
Natural Markers

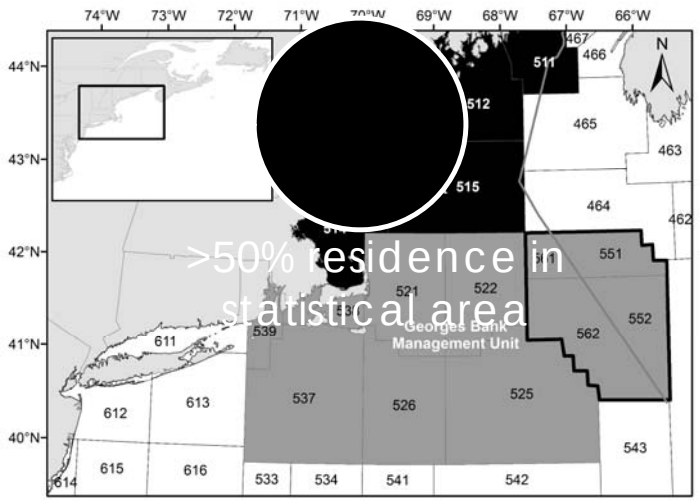






Applied Markers





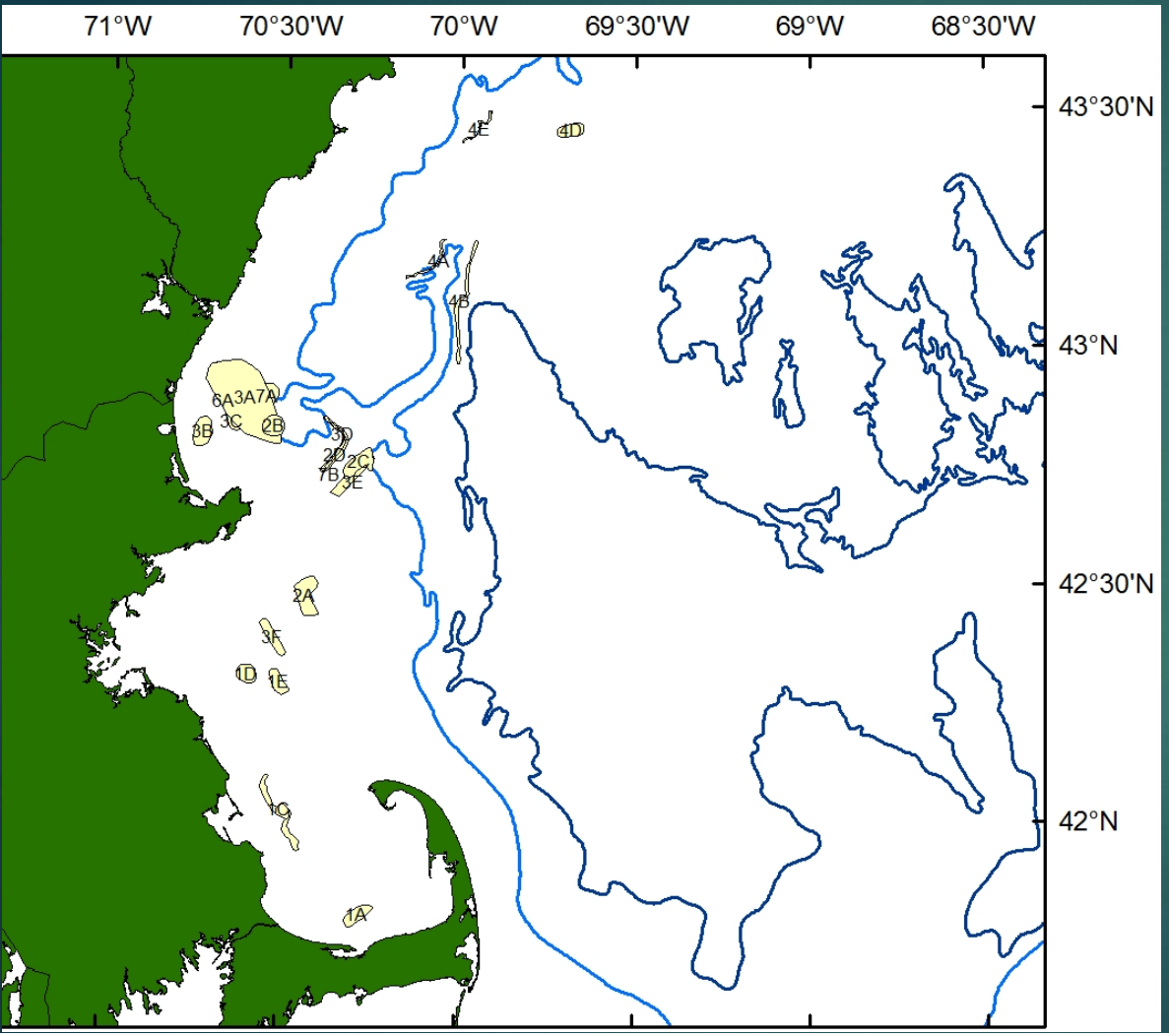
>50% residence in statistical area

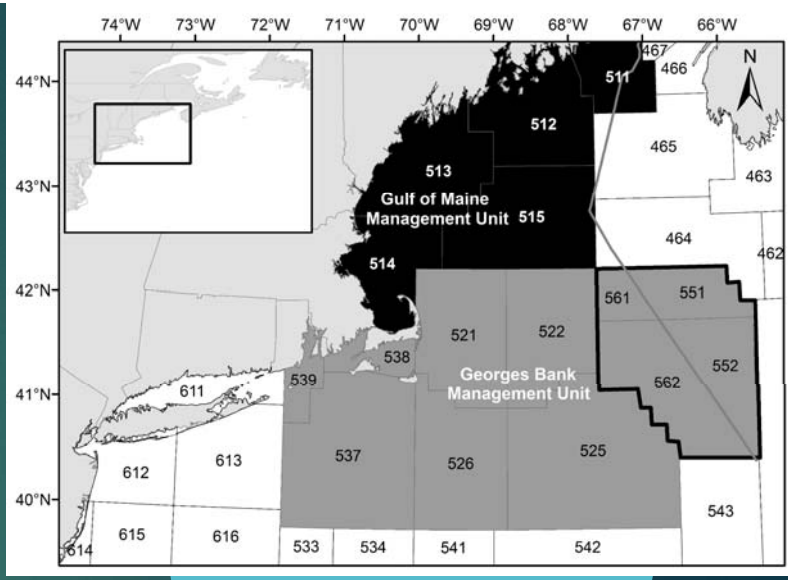
areas

>10% movement among regions

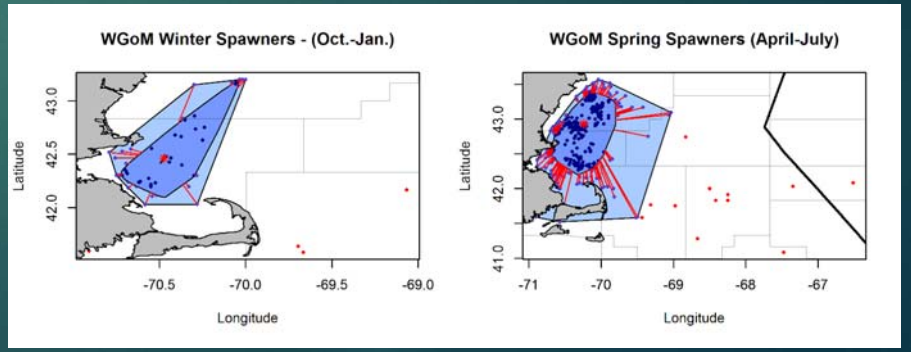
	Recapture Area				
Release Area	BOF	GOM	GSC	EGB	SNMA
Bay of Fundy-W Scotian Shelf	0.93	0.03	0.00	0.04	0.00
Gulf of Maine	0.02	0.92	0.03	0.02	0.01
Great South Channel	0.00	0.17	0.69	0.08	0.04
eastern Georges Bank	0.19	0.02	0.03	0.76	0.00
S. New England-Mid Atlantic	0.00	0.01	0.08	0.01	0.92

Ecological knowledge

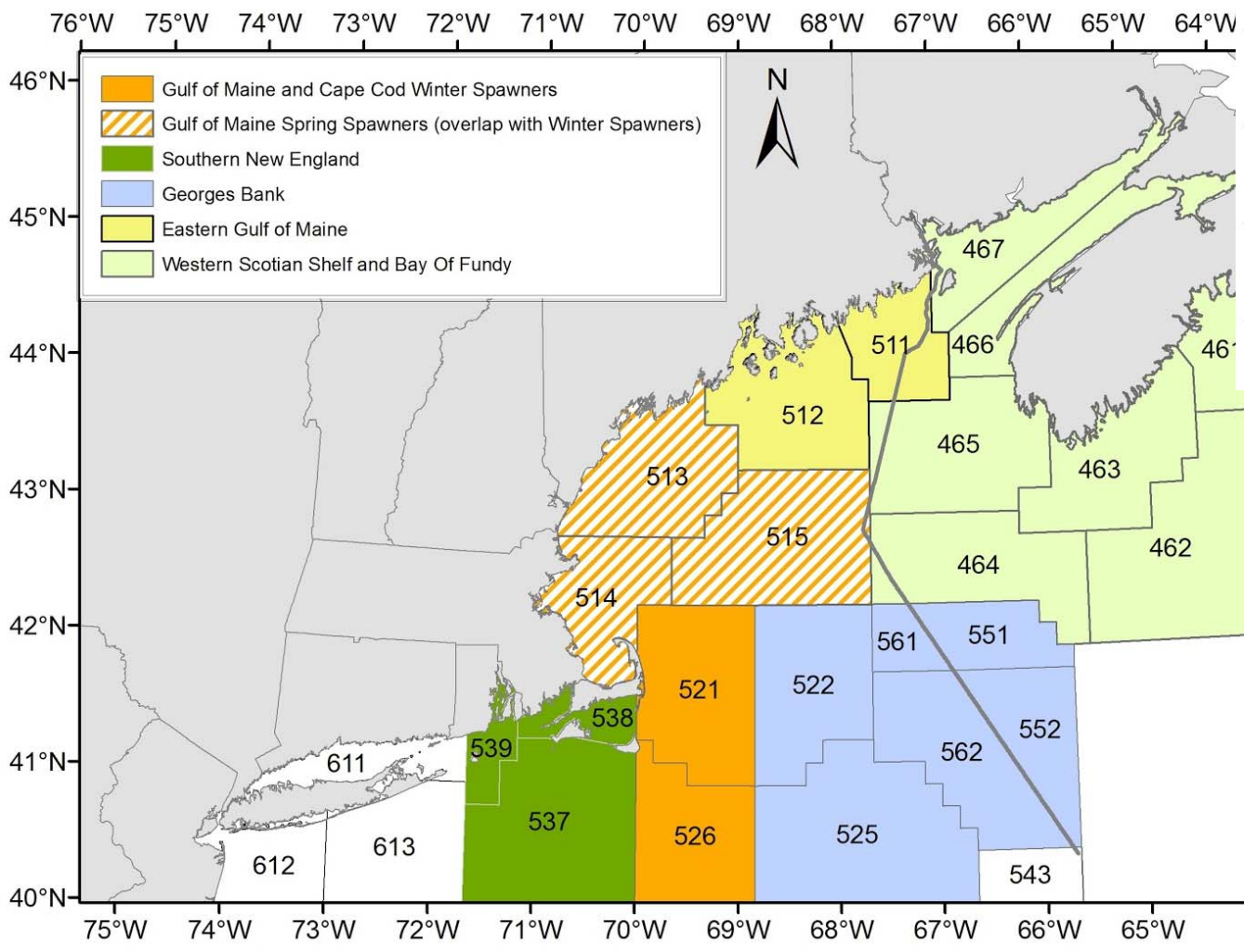


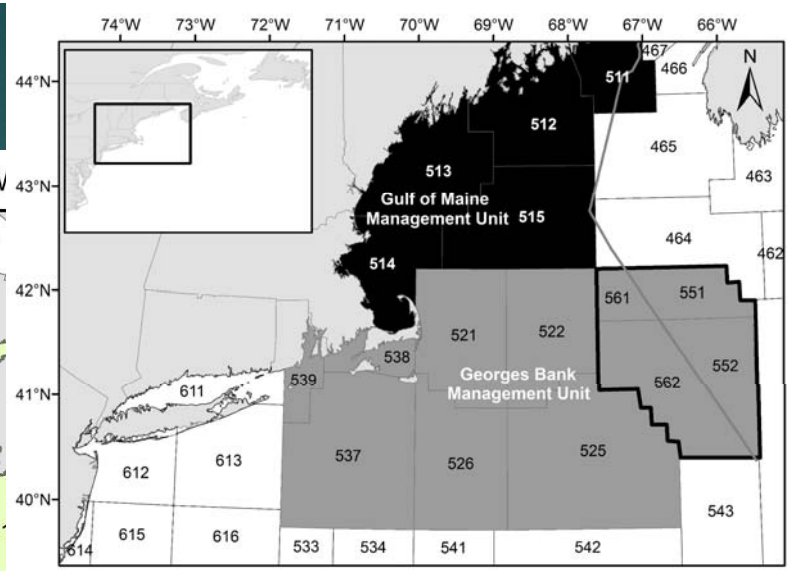


Recaptures of tagged fish show fidelity to spawning grounds



5 US cod stocks proposed





What is the ACSSWG?

Atlantic cod stock structure working group

- **Used an interdisciplinary approach**
- **to characterize the biological stock structure of cod**
- **for consideration in monitoring, assessment and management**

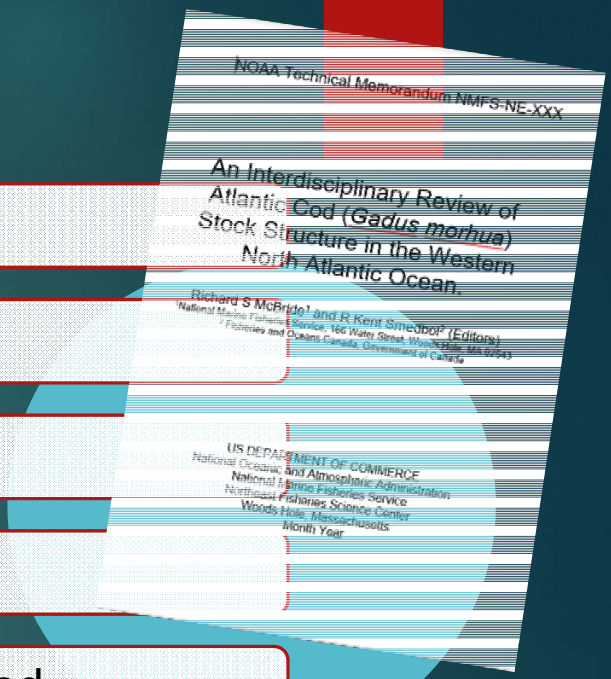
New England
Fishery Management Council

NOAA
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
U.S. DEPARTMENT OF COMMERCE

What's next?

You Are Here →

- 2018 • ACSSWG formed
- 2019 • ACSSWG report written
- 2020 • ACSSWG report peer-review
- 2020 • Review implications of potentially new stock status
- 2020 • Cod assessment research steering committee formed
- 2021 • Assessment-related research, alternative models, etc., started
- 2022 • Stock assessment working group formed
- 2023 • Cod benchmark (research-track) assessment



Atlantic Cod Stock Structure Working Group

Atlantic cod have been a mainstay of coastal economies around the Northern Atlantic for hundred of years. While cod in the North Atlantic are similar to one another in many ways, the population is actually made up of discrete stock components distinguished by differences in characteristics like size, growth rate, and even genetics. While it is well known that there are multiple cod stocks, fully identifying those stocks on a biological and ecological scale has proven elusive.

In the Northwest Atlantic, both the United States and Canada have long histories of harvesting and trading these fish, and each country is responsible for managing cod fisheries within their waters. While some cod stocks stay within a country's waters, some also straddle the international boundaries as well as those set up for management purposes. Understanding how the stocks that constitute the cod population are the same and how they are different is a key part of improving how we manage and use these fish and what can be done to restore their numbers.

Researchers in the U.S. and Canada regularly monitor and study cod. These scientists may be working for government, or universities, or non-proft organizations. To compose a complete and detailed picture of the cod stocks means mounting a truly international and interdisciplinary effort to bring together all of the data, studies, and knowledge about stock components.

In February 2018, a working group was convened to take on this challenge. Organizers plan a two-year effort: one year to synthesize information about stock structure and one year to look into the management implications of their findings. The NOAA Northeast Fisheries Science Center is hosting the working group and updates on their activities will be posted here.

Photo credit: Staticflickr.com

More on Atlantic cod

- Consumer guide
- 2017 U.S. assessment update
- 2018 Transboundary Resource Assessment Committee Meeting

Contacts

- **Co-Chairs**
  Rich McBride
  NOAA Northeast Fisheries Science Center
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  Richard.McBride@noaa.gov
  Woods Hole, Massachusetts

  Kent Smedbol
  Department of Fisheries and Oceans, Canada

2019 Meetings

- **May 31**
  Working Group Conference Call
- **May 13**
  Working Group Conference Call
- **April 23**
  Working Group Conference Call
- **March 4**
  Working Group Conference Call

Updates

Symposia

- **June 6, 2019**
  Cod Population Structure: Building a Shared Vision of Atlantic Cod Population Structure and New England Fisheries
  University of New Hampshire
  Meeting information and registration

Acknowledgements

The working group

Ames, Ted	Bowdoin College & MCCF Founding Board
Andrushchenko, Irene	Canadian Department of Fisheries & Oceans
Cadrin, Steve	University of Massachusetts Dartmouth, SMAST
Cournane, Jamie	New England Fishery Management Council
Dean, Micah	Massachusetts Division of Marine Fisheries
DeCelles, Greg	Massachusetts Division of Marine Fisheries
Kerr, Lisa	Gulf of Maine Research Institute
Kovach, Adrienne	University of New Hampshire
McBride, Rich (co-chair)	Northeast Fisheries Science Center
Overgaard Therkildsen, Nina	Cornell University
Puncher, Greg	University of New Brunswick
Smedbol, Kent (co-chair)	Canadian Department of Fisheries & Oceans
Wang, Yanjun	Canadian Department of Fisheries & Oceans
Zemeckis, Doug	Rutgers University

New England Fishery Management Council
New Hampshire Sea Grant
Maine Fishermen's Forum

https://www.nefsc.noaa.gov/press_release/pr2018/other/c

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