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Harbor Porpoise Take Reduction Team

Virtual Webinar & Meeting
June 28, 2024 4-6 PM

The Team

Academic/Scientific Groups
Bill McLellan, University of North Carolina-Wilmington
Tara M. Cox, Savannah State University
Sue Barco (Alt: Alex Costidis)
Damon Gannon, University of Georgia Marine Institute

Conservation/Environmental Groups
Kristen Monsell, Center for Biological Diversity (Alt: Sarah Uhlemann)
Regina Asmutis-Silvia, Whale and Dolphin Conservation (Alt: Andrea Bogomolni
Jane Davenport, Defenders of Wildlife

Federal Resource Managers
Kristy Long, NOAA Fisheries, Headquarters
David Wiley, Stellwagen Bank NMS
Dennis Heinemann, Marine Mammal Commission
Colleen Coogan, Greater Atlantic Region

Fishery Management Organizations
Robin Frede, New England Fishery Management Council
Vacant, Mid-Atlantic Fishery Management Council (Alt: Kiley Dancy, pending)
Toni Kerns, Atlantic States Marine Fisheries Commission

Gear Research
Ron Smolowitz, Coonamessett Farm
Pingguo He, University of Massachusetts-Dartmouth

Gillnet Industry
Jamie Hayward, Elliot, ME (Alt: Dan Salerno)
Todd Sutton, Newport, RI
Jackie Odell, Gloucester, MA (Alt: Phil Lynch)
Douglas Feeney, Chatham, MA
Aubrey Church, Chatham, MA
Ernie Bowden, Jr., Chincoteague, VA
Bill Van Druten, Frisco, NC
Sonny Gwin, Berlin, MD
Leonard Voss, Smyrna, DE
Chris Rainone, Little Egg Harbor, NJ (Alt: Rick Marks)
Greg DiDomenico, Fairfax, VA

State Fishery Resource Managers
Somers Smott, VA Marine Resources Commission
Meghan Rickard, NY Dept. of Environmental Conservation (Alternate: Jesse Hornstein
Cheri Patterson, NH Fish and Game Dept. (Alt: Renee Zobel)
Erin Wilkinson, ME Dept. of Marine Resources (Alt: Meredith Mendelson)
Scott Olszewski, RI Division of Marine Fisheries (Alt: Tara Plee, pending)
Audrey Ostroski, DE Division of Fish and Wildlife (Alt: Rich Wong)
Erin Burke, MA Division of Marine Fisheries
Stacy VanMorter, NJ Division of Fish, Game, and Wildlife
Angel Willey, MD Dept. of Natural Resources
Barbie Byrd, NC Division of Marine Fisheries (Alt: Casey Knight)

Today's Agenda

- 4 PM Welcome, introductions, and updates
- 4:15 Abundance, trends and bycatch update, followed by Q&A
- 5:00 Presentation on proposed management action to reduce sturgeon bycatch
- 5:15 Twine size: explanation of background and potential impacts
- 5:35 Q&A and discussion on proposal
- 5:55 Next steps
- 6:00 Adjourn

Ground Rules for Team Members

Discussion protocols:

- Contribute - need to build shared understanding
- Make room for others - need to hear from all
- Ask questions (including of one another)
- Make effort to collaborate

To contribute to the discussion:

- Primary members
  - Please turn on video if you can
  - Raise hand function available to get in queue for discussion time
  - Chat to host only with tech issues; not for substantive input or discussion

- Alternates
  - Engage as public unless sitting in for primary

- Members of the public
  - Welcome observe. No public comment during this meeting

Population Update

By Debi Palka

Northeast Fisheries Science Center

Protected Species Division

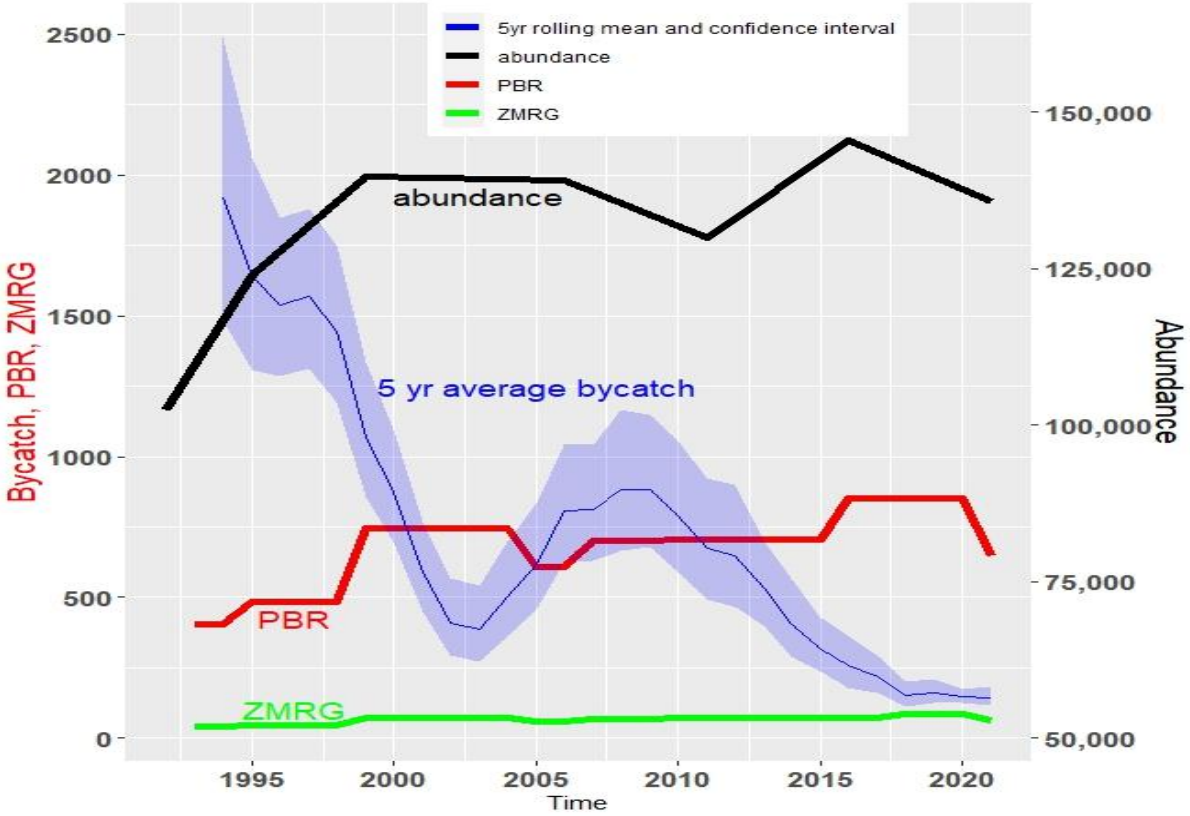
Conservation Ecology Branch

Woods Hole, MA

Outline

- Review what PBR and ZMRG are
- Mid-Atlantic distribution and abundance patterns
- Future surveys and research

Gulf of Maine/Bay of Fundy Harbor Porpoise Population



2022

PBR = 649
ZMRG = 65
2022 annual bycatch = 130
5-yr rolling bycatch = 142

Conclusion:

- Population is non-strategic (bycatch < PBR)
- And above ZMRG

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Gulf of Maine/Bay of Fundy Harbor Porpoise

$$PBR = N_{min} \bullet \tfrac{1}{2} R_{max} \bullet F_r$$

Year	N_{best}	CV(N_{best})	N_{min}	R_{max}	F_r	PBR	ZMRG
1991	37,500	0.29	--	--	--	--	--
1992	67,500	0.23	40,297*	0.040	0.5	403	40
1995	74,000	0.20	48,289**	0.040	0.5	483	48
1999	89,739	0.22	74,695	0.040	0.5	747	75
2006	89,054	0.47	60,970	0.040	0.5	610	61
2011	79,883	032	61,415	0.046[1]	0.5	706	71
2016[2]	95,543[3]	0.31	74,034	0.046	0.5	844	84
2021	85,765	0.53	56,420	0.046	0.5	649	65

PBR = Potential Biological Removal

N_{best} = Best estimate of population size

N_{min} = Minimum population size

$$N_{min} = \frac{N_{best}}{\exp\left(z \bullet \sqrt{\ln\left[1 + CV(N_{best})^2\right]}\right)}$$

R_{max} = Maximum net productivity rate

- Default = 0.04

F_r = Recovery factor

- Default = 0.5 for depleted and threatened stocks and stocks of unknown status
- Default = 0.1 for endangered stocks
- Reduce F_r and CV(bycatch) increases

ZMRG = zero mortality rate goal

- 10% of PBR

* Average of 1991 and 1992

** Average of 1991, 1992, and 1995

1 https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-stock-assessments

2 Moore and Read. 2008. A Bayesian uncertainty analysis of cetacean demography and bycatch mortality using age-at-death. Ecol. Appl. 18(8): 1914-1931

3 75,079 (CV=0.38) in US waters in 2016

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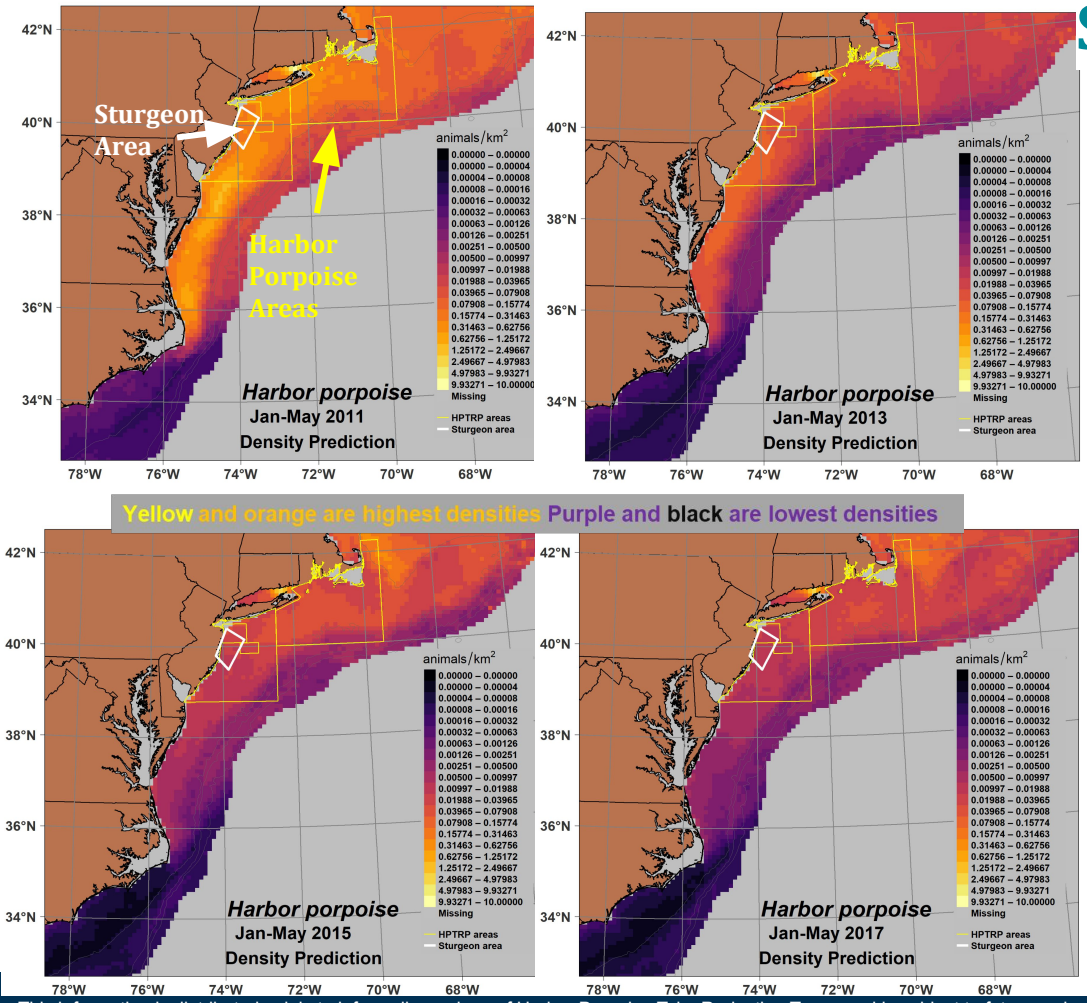
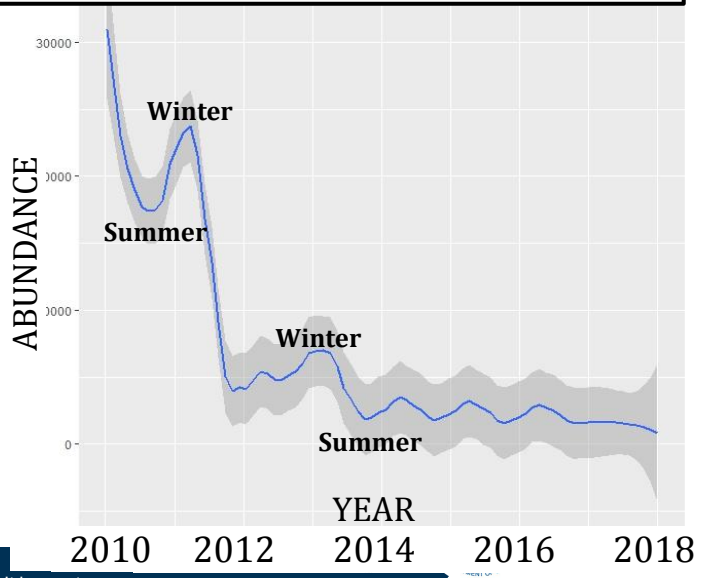
Shifting out of mid-Atlantic



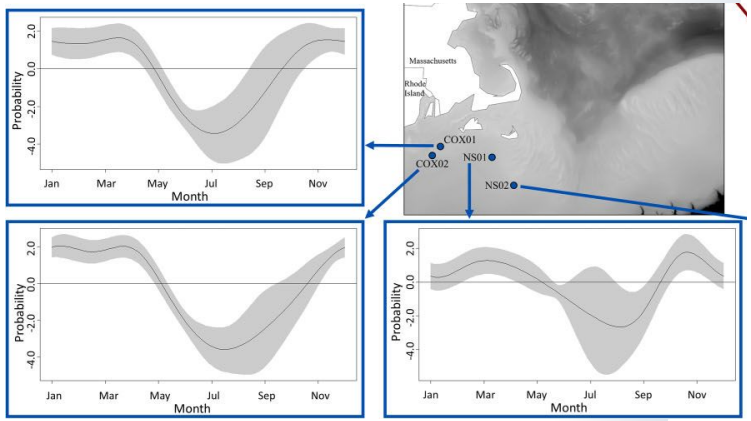
Conclusions:

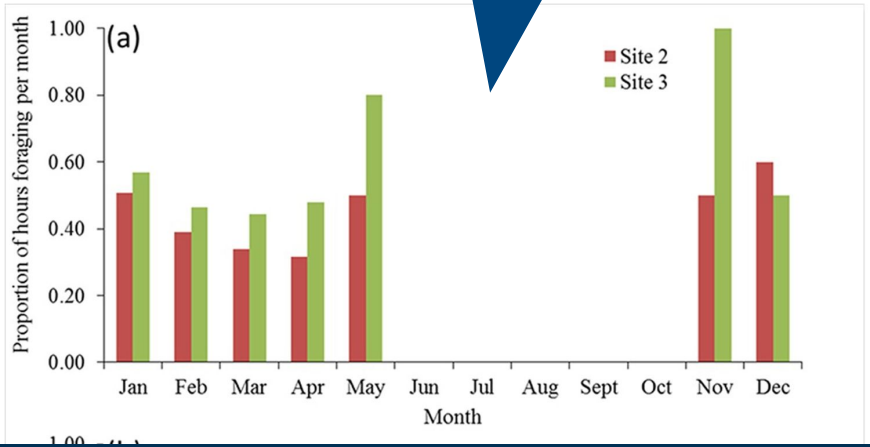
- More harbor porpoises are present during Nov-May (winter) and few in summer.
- Fewer harbor porpoises are in the mid-Atlantic during Jan - May now than before 2012.



Since 2018, the same temporal patterns are occurring

- During Nov 2020 - Oct 2022, just south of Cape Cod, Holdman et al. (2023) used passive acoustic monitoring
- During Nov 2014 - May 2016, offshore of Maryland Wingfield et al. (2017) used passive acoustic monitoring





Holdman AK, Tregenza N, Van Parijs SM, DeAngelis AI. 2023. Acoustic ecology of harbour porpoise (Phocoena phocoena) between two US offshore wind energy areas. ICES J. of Marine Science https://doi.org/10.1093/icesjms/fsad150h

Wingfield JE, O'Brien M, Lyubchich V, Roberts JJ, Halpin PN, Rice AN, Bailey H. 2017. Year-round spatioteporal distribution of harbour porpoises within and around the Maryland wind energy area. PLoS ONE 12(5): e0176653. https://doi.org/10.1371/journal.pone.0176653

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Future work to look at harbor porpoise distribution

1. We are updating spatiotemporal density habitat models of all cetaceans and sea turtles using US Atlantic data from 2010 - 2023
2. Canadians will be conducting summer 2024 aerial survey in Canadian waters from Bay of Fundy to Newfoundland
3. In fall 2024, we start a project to develop a tool to look at relationships between climatic/environmental factors and distributions of marine mammals, their prey, and bycatch
4. We plan to conduct an aerial abundance survey in Jan-Feb 2025 to cover waters south of Long Island, NY using cameras and human observers
5. We plan to conduct the next abundance survey in summer 2027 to cover all U.S. Atlantic waters

Summary of distribution and abundance

1. Population is classified as non-strategic and are above ZMRG (PBR > bycatch > ZMRG)
2. Harbor porpoises inhabit the mid-Atlantic during Nov - May, with a peak at about Feb - Mar
3. Since the 1990's in the winter some harbor porpoises have been shifting from the mid-Atlantic towards the northeast

2022 Bycatch

Kristin Precoda

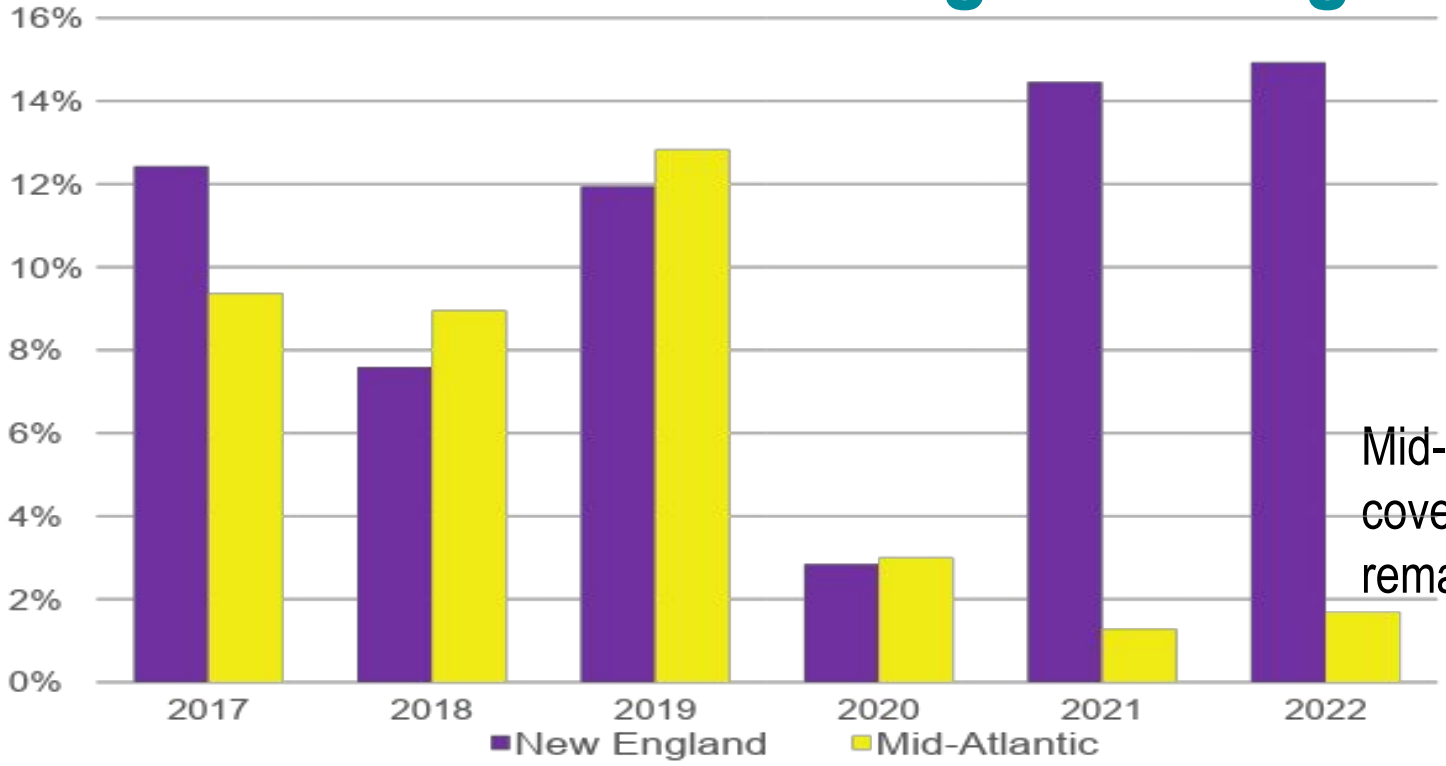
Northeast Fisheries Science Center
Protected Species Division

Outline

- 2022 Bycatch
  - Observer Coverage
  - Observed Harbor Porpoise Takes
  - Approach to Estimating Bycatch
  - Estimated Annual Takes
- Longer-Term Trends in Landings and Bycatch
- Compliance with HPTRP Pinger & Gear Requirements
- Future Outlook

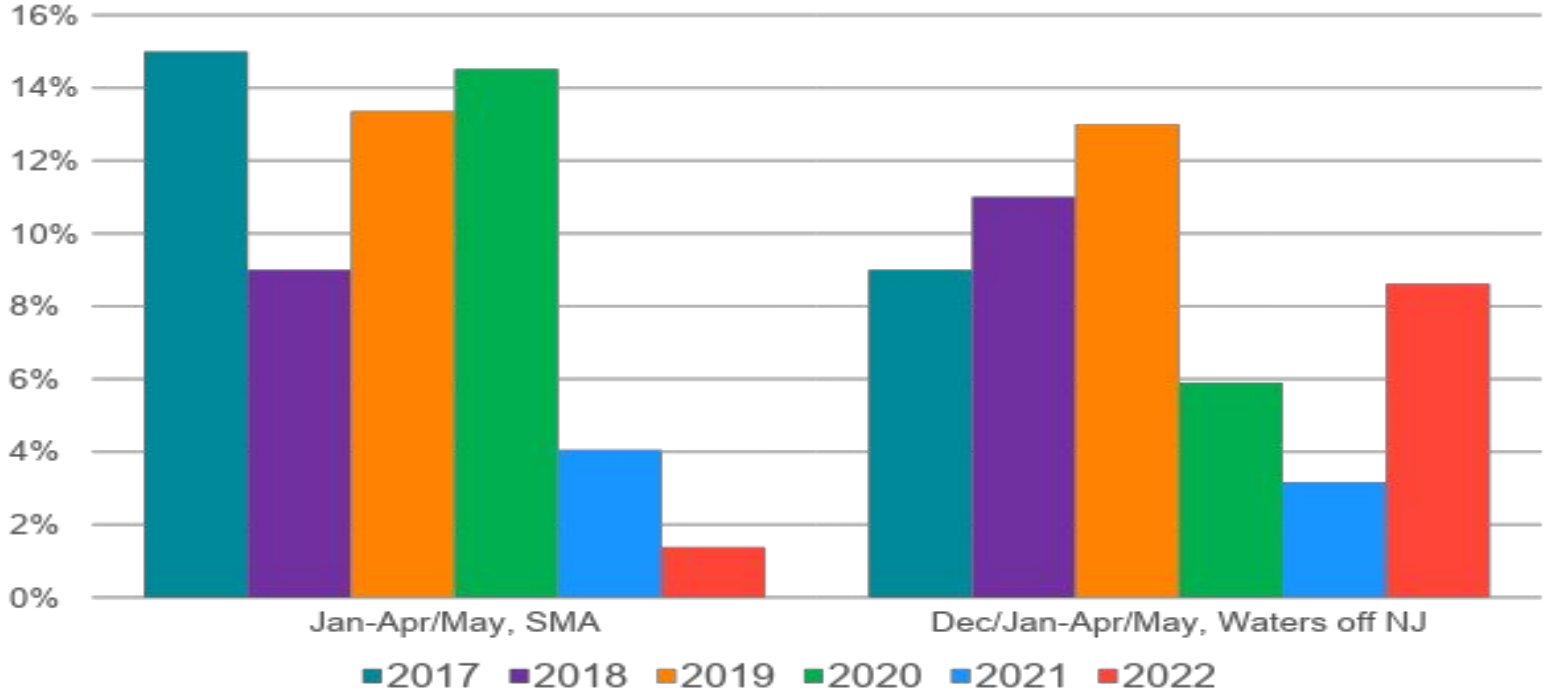
2022 Bycatch Summary

2017-2022 Observer Coverage Per Region



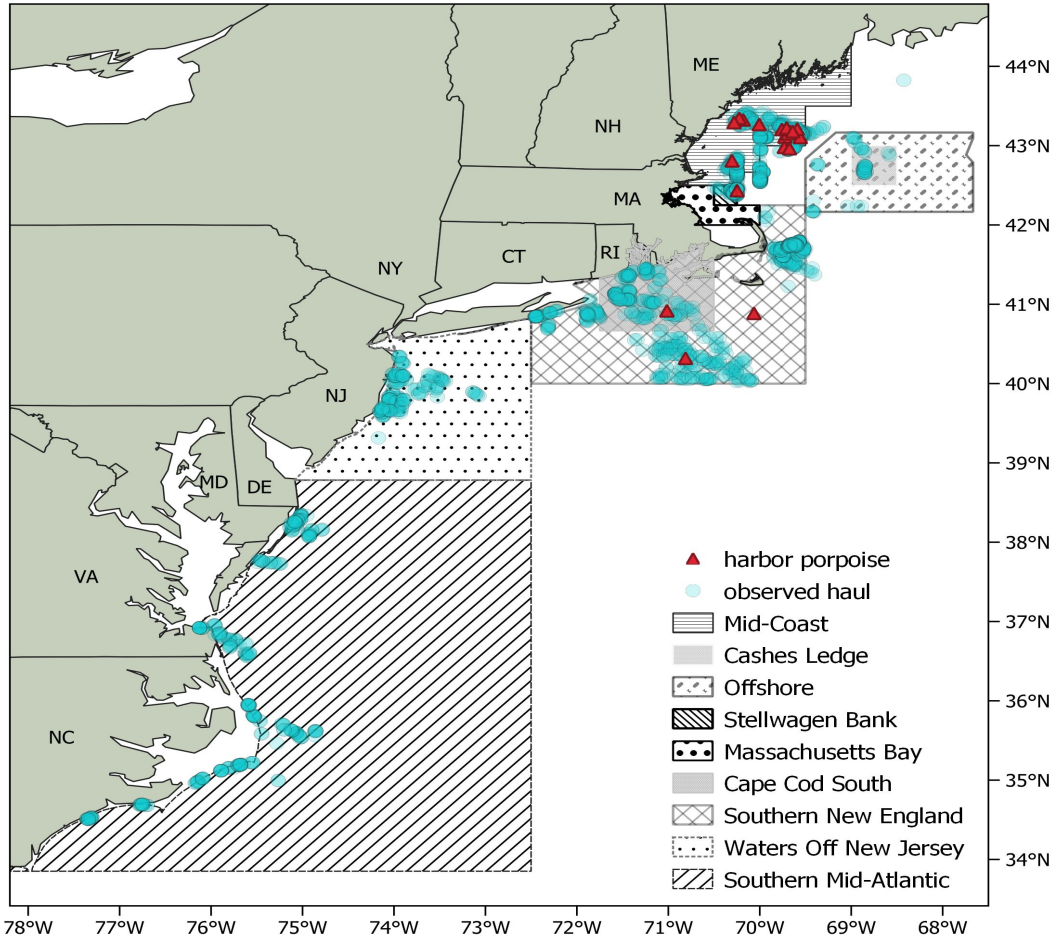
Mid-Atlantic coverage remains low

2017-2022 Observer Coverage of Key Bycatch Times/Areas in Mid-Atlantic



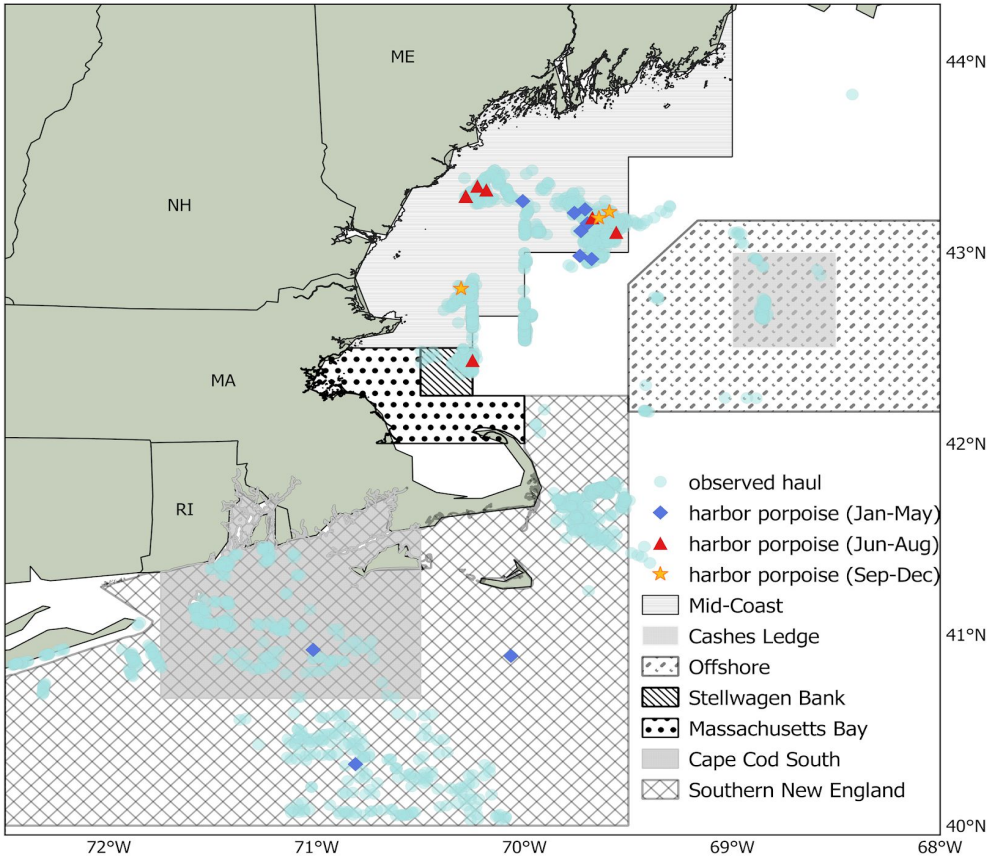
2022 Bycatch Locations

- 22 observed takes, all in New England
  - 19 in GOM
  - 3 in SNE
- 12 of the 22 takes were in HPTRP times/areas



2022 Bycatch Locations by Season

- Observed takes:
  - 11 in Jan-May
  - 8 in Jun-Aug
  - 3 in Sep-Dec



(Normally) How to Estimate Total Bycatch

- Estimated total bycatch = bycatch rate * dealer landings
- Bycatch rate = takes / mtons landed
  - On observed trips within a spatial area & season
- In New England: within each spatial area and season:
  - Calculate 4 rates:
  - Weight by fractions of observed hauls with/without pingers and fraction of groundfish/other landings
  - Sum to get rate per area & season

Hauls with	Groundfish	Other
Pingers	Rate1	Rate2
No pingers	Rate3	Rate4

Estimating Bycatch for 2022

- New England
  - Follow the usual pre-pandemic estimation approach

- Mid-Atlantic
  - Coverage was low and no bycatch was observed (of any small cetaceans or pinnipeds)
  - As with 2020-2021, we decided not to use the 2022 observer data
  - Instead: Calculate bycatch rates with pooled 2017-2019 observer data, then apply to 2022 landings

2022 Estimated Takes – New England

Season	Portgroup (P) / Management Area (MA)	Observed Bycatch	Bycatch Rate	Estimated Bycatch	CV	95% CI
W	Cape Cod South (MA)	1	0.019	12.18	0.82	1-54
W	Mid-Coast (MA)	8	0.396	34.30	0.49	13-108
W	Southern New England (MA)	2	0.007	8.09	0.47	2-23
W	Subtotal	11	-	54.56	0.38	25-130
S	North of Boston (P)	2	0.023	4.33	0.26	2-10
S	Southern Maine (P)	6	0.068	51.66	0.33	22-110
S	Subtotal	8	-	55.99	0.29	26-114
F	Mid-Coast (MA)	3	0.026	7.37	0.24	4-16
F	Subtotal	3	-	7.37	0.24	4-16
	Total	**22**	-	**117.92**	**0.22**	**70-199**

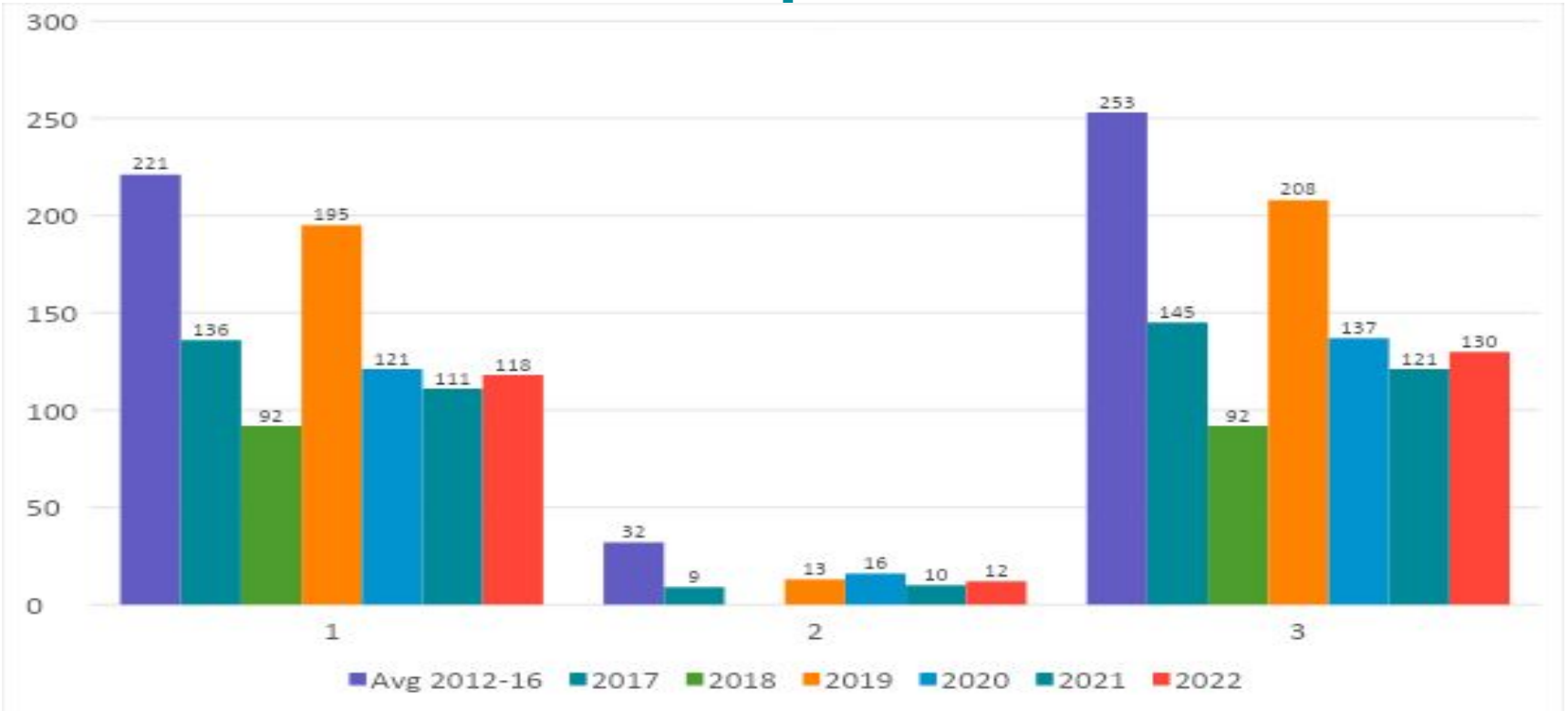
Seasons: W=Jan-May, S=Jun-Aug, F=Sep-Dec

2022 Estimated Takes – Mid-Atlantic

Season	Management Area and Fishing Characteristics	Observed Bycatch 2017-2019	Bycatch Rate	Estimated Bycatch in 2022	CV	95% CI
W	Southern Mid-Atlantic, mesh < 7”, soak <= 72h	2	0.002	11.42	0.70	0-38
S	Waters off New Jersey, mesh >= 7”, soak <= 72h	1	0.005	0.63	1.00	0-4
	Total	3	0.002	**12.05**	0.66	1-39

Seasons: W=Jan-Apr, S=May-Aug

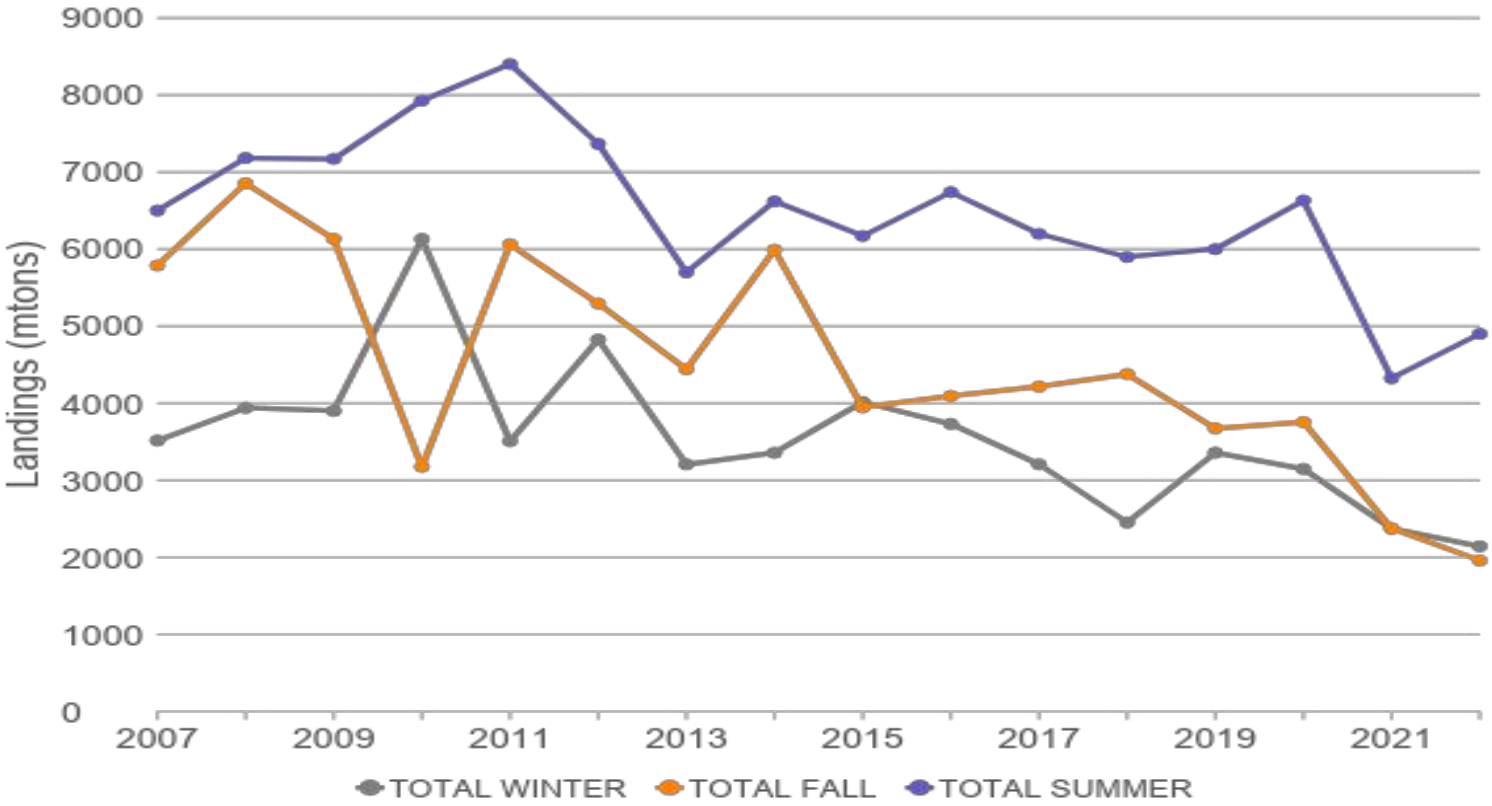
Estimated Total Takes per Year



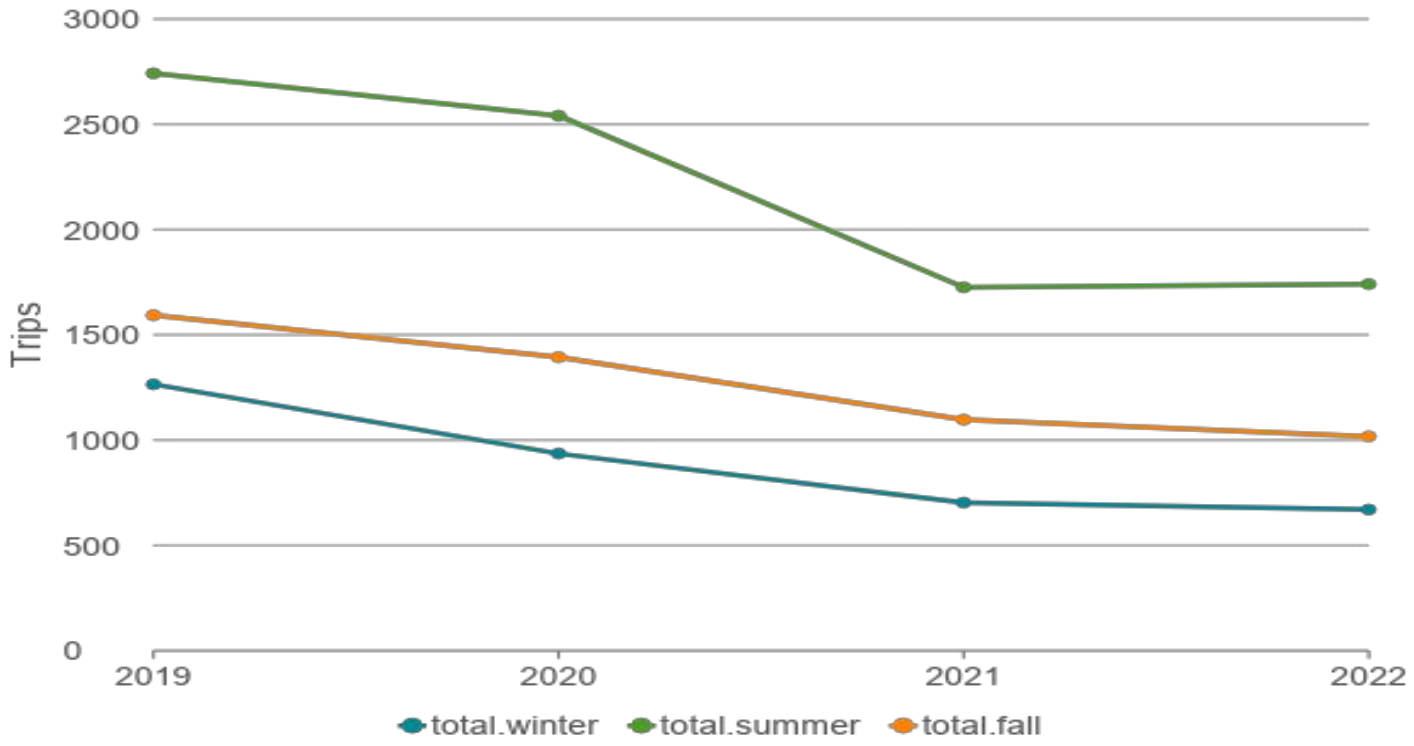
PBR:	706	851	851	851	851	649	649

Longer-Term Trends in Effort and Bycatch

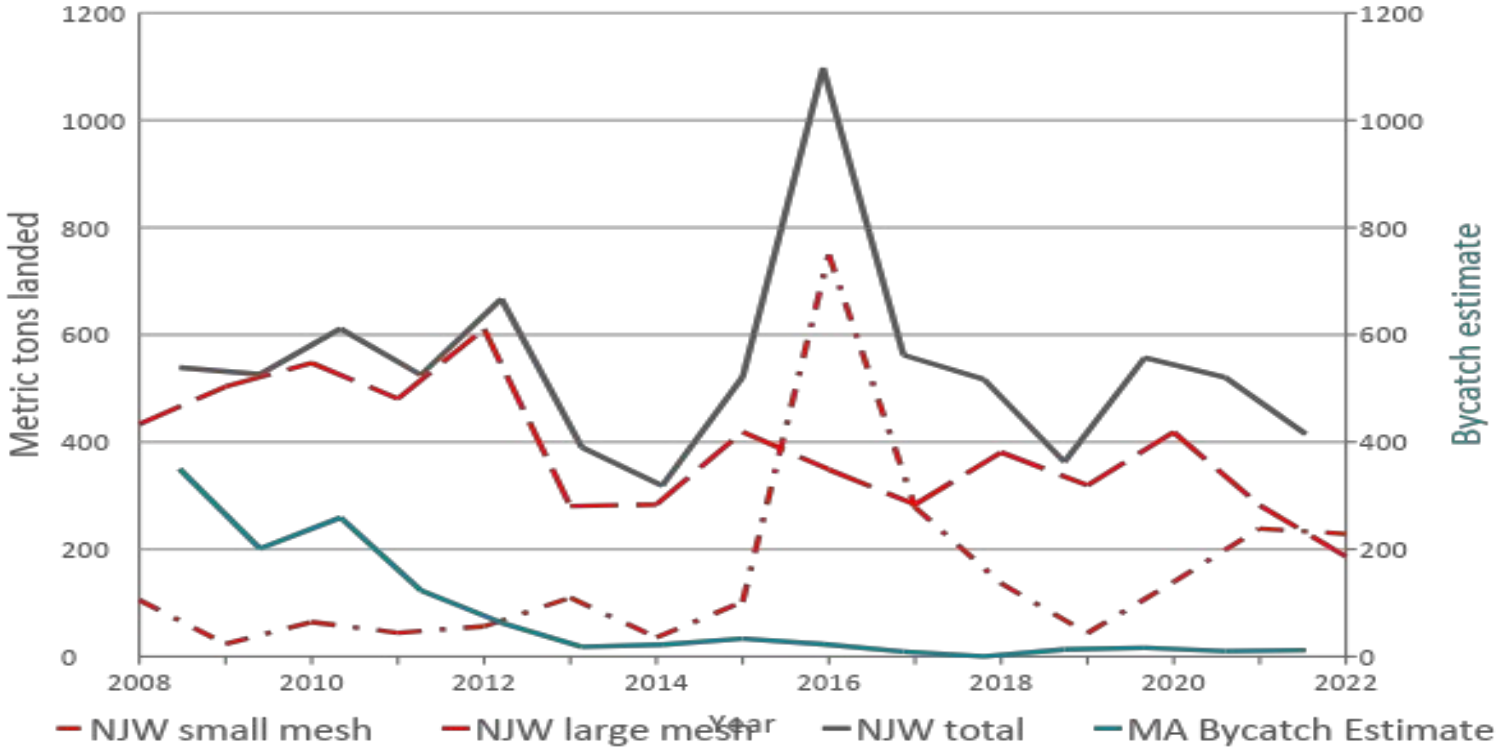
New England Gillnet Landings Over Time



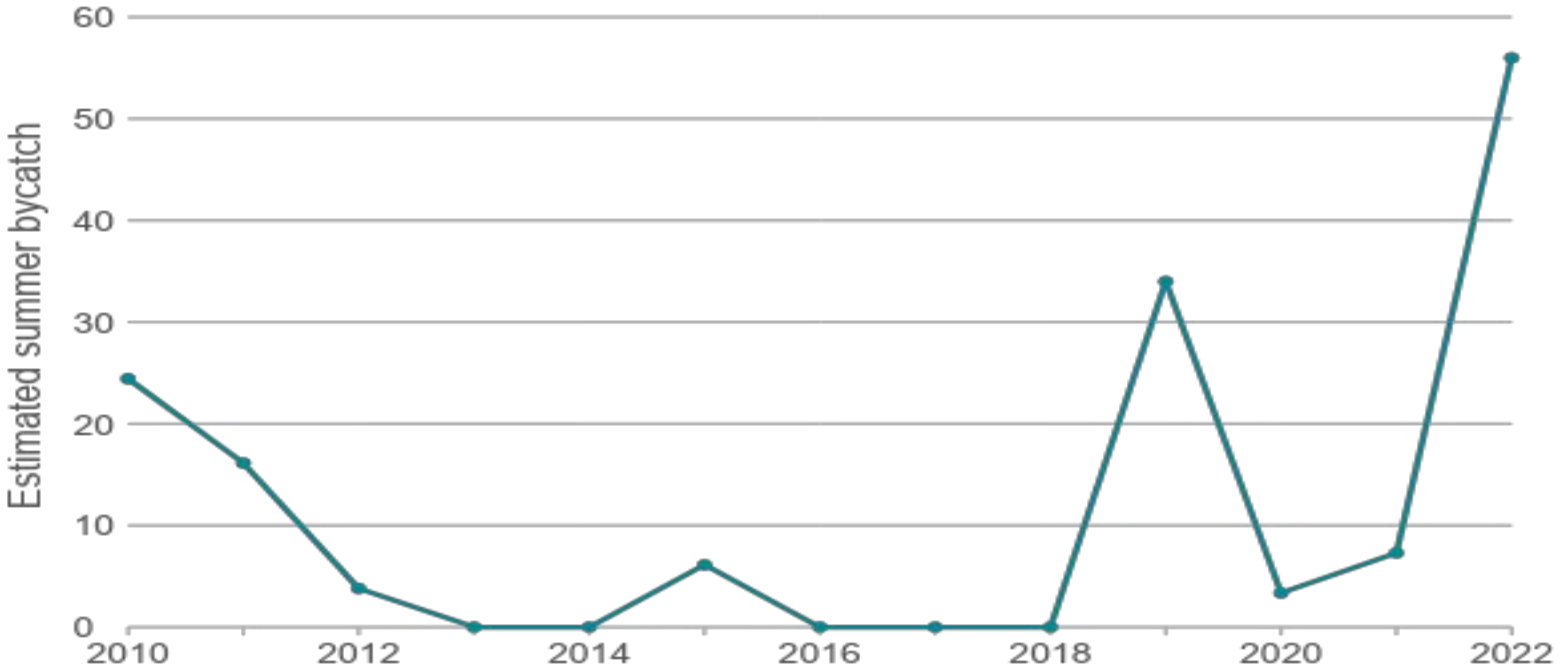
New England Gillnet Trips Over Time



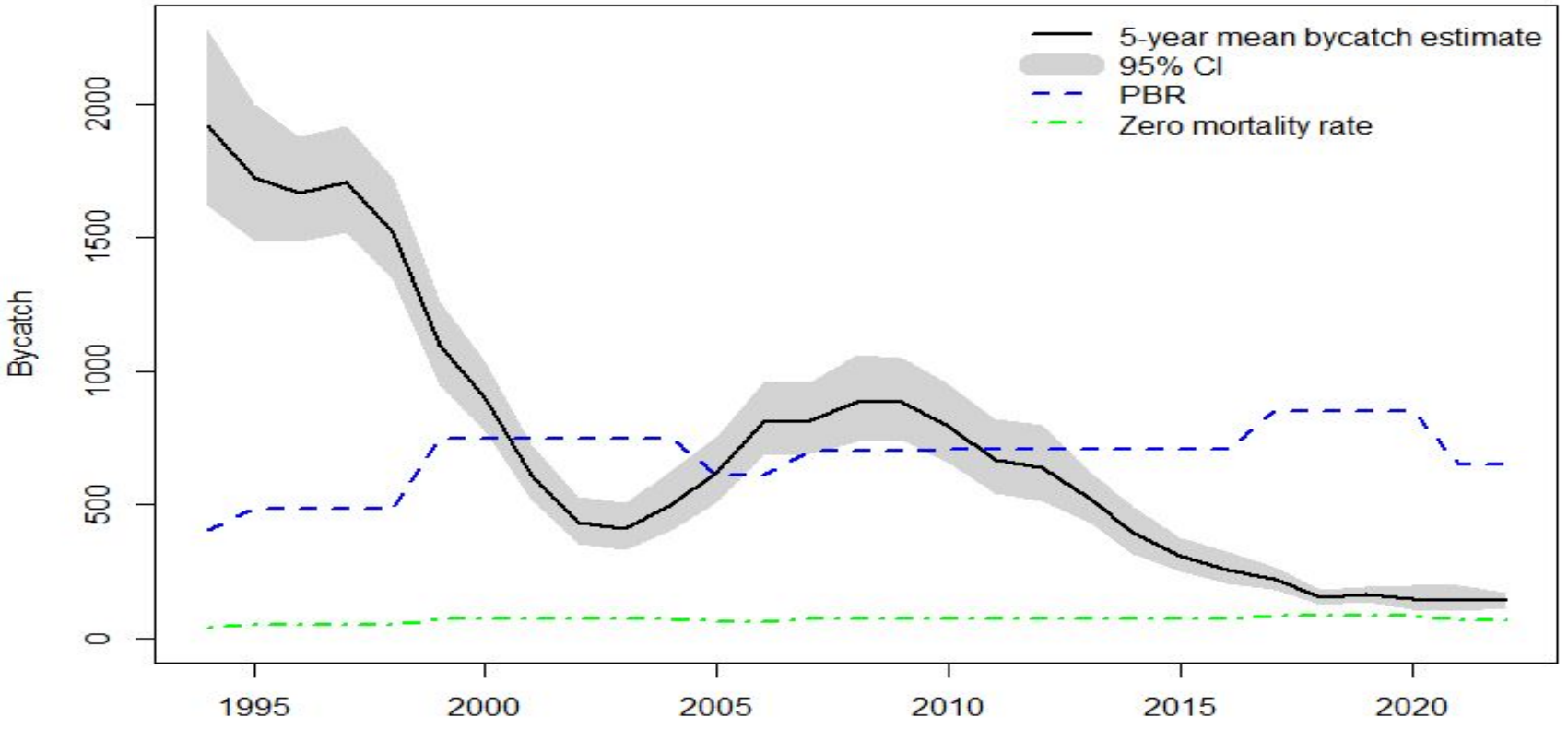
Landings in New Jersey Waters, Jan-Apr.



Estimated Summer Bycatch in New England



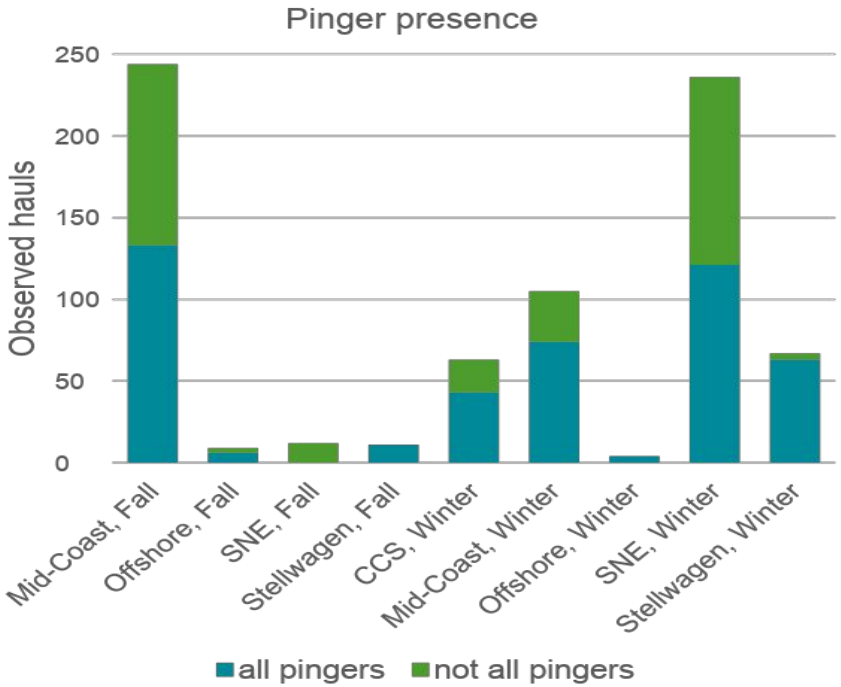
Total 5-year Mean Estimated Bycatch since 1994

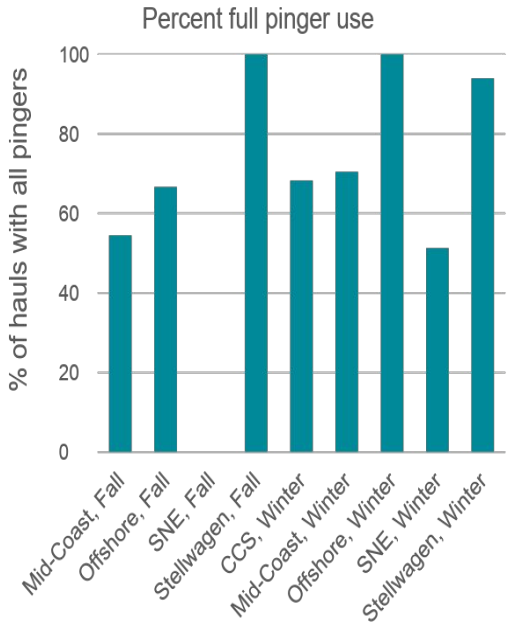


Observed Compliance with HPTRP Pinger & Gear Requirements

New England TRP Pinger Use, 2022

- Only pinger presence, not functionality
  - Overall, 60.5% have all required pingers





Mid-Atlantic TRP Gear Mods & Closures, 2022

Management Area	Total Observed Hauls	Non-compliant Hauls	Compliant Hauls (%)	Noncompliant with Gear Modification	Hauls in Closed Area
Southern Mid-Atlantic Large Mesh	0				
Southern Mid-Atlantic Small Mesh	100	17	83%	17	0
Mudhole North Large Mesh	0				
Mudhole North Small Mesh	0				
Mudhole South Large Mesh	7	7	0%	0	7
Mudhole South Small Mesh	0				
Waters off New Jersey Large Mesh	20	5	75%	5	0
Waters off New Jersey Small Mesh	7	3	57%	3	0
Totals	134	32	76%	25	7

- Total Small Mesh Compliance = 81% (most obs. hauls were in SMA)
- Total Large Mesh Compliance = 56% (most obs. hauls were in WNJ)

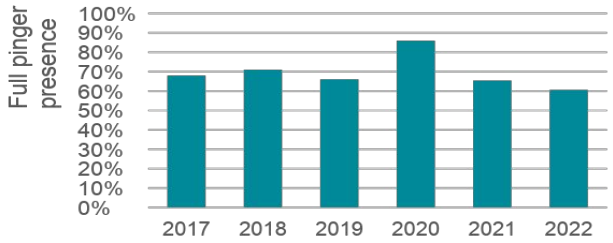
Mid-Atlantic TRP Gear Specifics, 2022

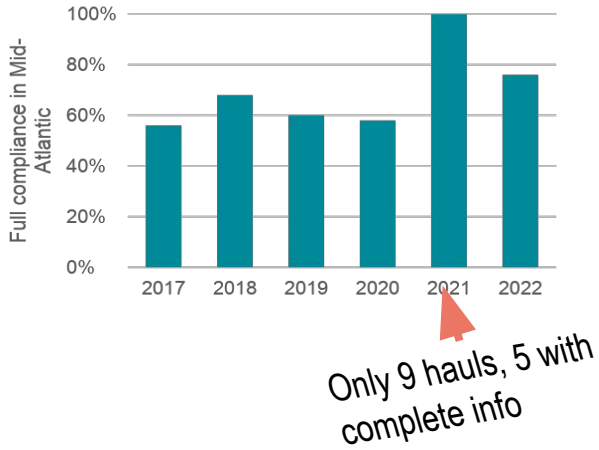
Management Area	Total Observed Hauls	Multiple Gear Issues per Haul	Number of Nets	Twine Size	Tie-Down Lengths	Tie-Down Use	Net Length	Unknown HPTRP Gear [a]
Southern Mid-Atlantic Large Mesh	0	-	-	-	-	-	-	-
Southern Mid-Atlantic Small Mesh	100	0	7	3	0	0	7	4
Mudhole North Large Mesh	0	-	-	-	-	-	-	-
Mudhole North Small Mesh	0	-	-	-	-	-	-	-
Mudhole South Large Mesh	7	0	0	0	0	0	0	0
Mudhole South Small Mesh	0	-	-	-	-	-	-	-
Waters off New Jersey Large Mesh	20	0	5	0	0	0	0	8
Waters off New Jersey Small Mesh	7	0	0	3	0	0	0	0
Totals	134	0	12	6	0	0	7	12

[a] Hauls in the unknown HPTRP gear column had at least one gear component that was not recorded and therefore could not be checked against the HPTRP

HPTRP Adherence Summary, 2017-2022

- Pinger use in NE may be falling slightly
- Higher compliance, same kinds of noncompliance in Mid-Atlantic
- Some fishing occurred in Mudhole South in closed season





Future Outlook

Bycatch Estimation: May Need a Different Method

- Issue: no bycatch of any small cetacean/pinniped observed in 2023 in the Mid-Atlantic
- Consequence: usual method would lead to bycatch estimate of 0
- Some options:
  - Continue to use 2017-2019 observer data
  - Develop model of bycatch
- Will update HPTRT next year on plans

Electronic Monitoring

- Risk of undercounting bycatch on EM trips
- Not many EM trips having EM video reviewed
  - Roughly 50% of EM trips are to be reviewed by EM provider
  - Counts may change as reviews progress

Year	Trips reviewed by EM provider	Trips reviewed under NMFS secondary review	Harbor porpoises seen in NMFS secondary review
2022	14	6	1
2023	28	11	0

- EM reduced the number of gillnet trips that would otherwise have been observed by ASM by about 9% in 2023

Summary

Bycatch Summary

- 5-year bycatch estimate is about 21% of PBR
- Winter and summer had nearly equal bycatch in 2022
- No bycatch of any species observed in Mid-Atlantic
- New England gillnet landings have generally decreased since 2008
- Possible slight fall in pinger use
  - Southern New England pinger use remains low: 49% in 2022
- Adherence to gear modifications in the Mid-Atlantic higher in 2022

Questions?

Atlantic Sturgeon: Management Action to Reduce Bycatch in Monkfish and Spiny Dogfish Gillnet Fisheries

Joint Action of the NEFMC and MAFMC

June 28, 2024

HPTRT Meeting

New England Fishery Management Council

MID-ATLANTIC FISHERY MANAGEMENT COUNCIL

Why this Action?

2021 Biological Opinion (BiOp) and its Action Plan required some action to reduce catch in large mesh gillnet.

New Biological Opinion

expected Jan. 2025

- **Why?** Recent bycatch exceeded sturgeon take allowance; mortality also increased
- **What will it include?** New stock assessment & Joint Council action
- **What may happen?** May trigger need for more bycatch reduction
  - Greater reduction now - less chance of jeopardy finding and less chance of more stringent measures in future
  - Could be Council- or NMFS-led

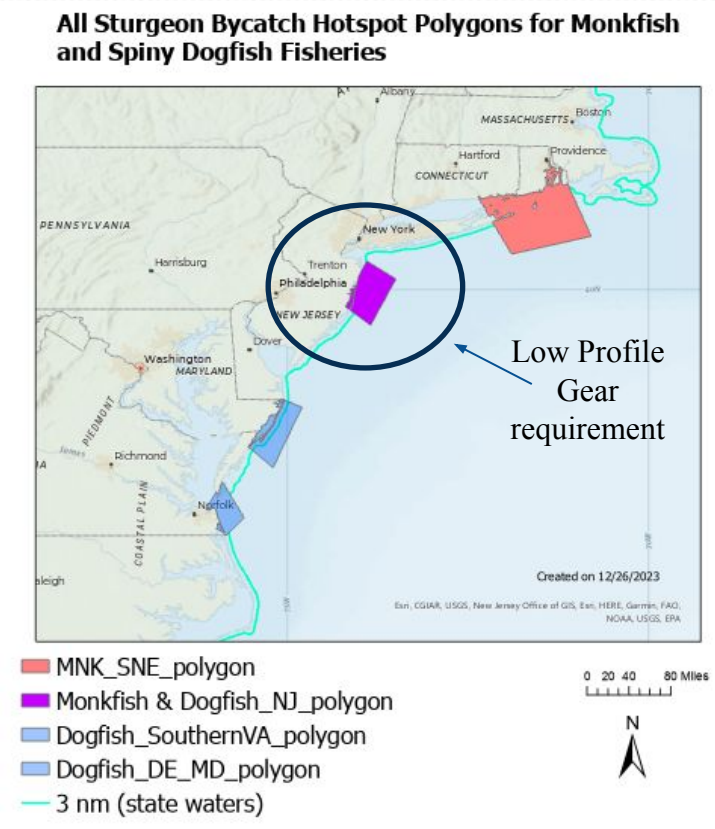
Alternative 5: Gear-Only Sturgeon Package
Councils' preferred alternative

Federal vessels targeting monkfish in federal & state waters

Which polygon?	Type of measure?	When?
New Jersey	Low-profile gillnet gear	Year-round

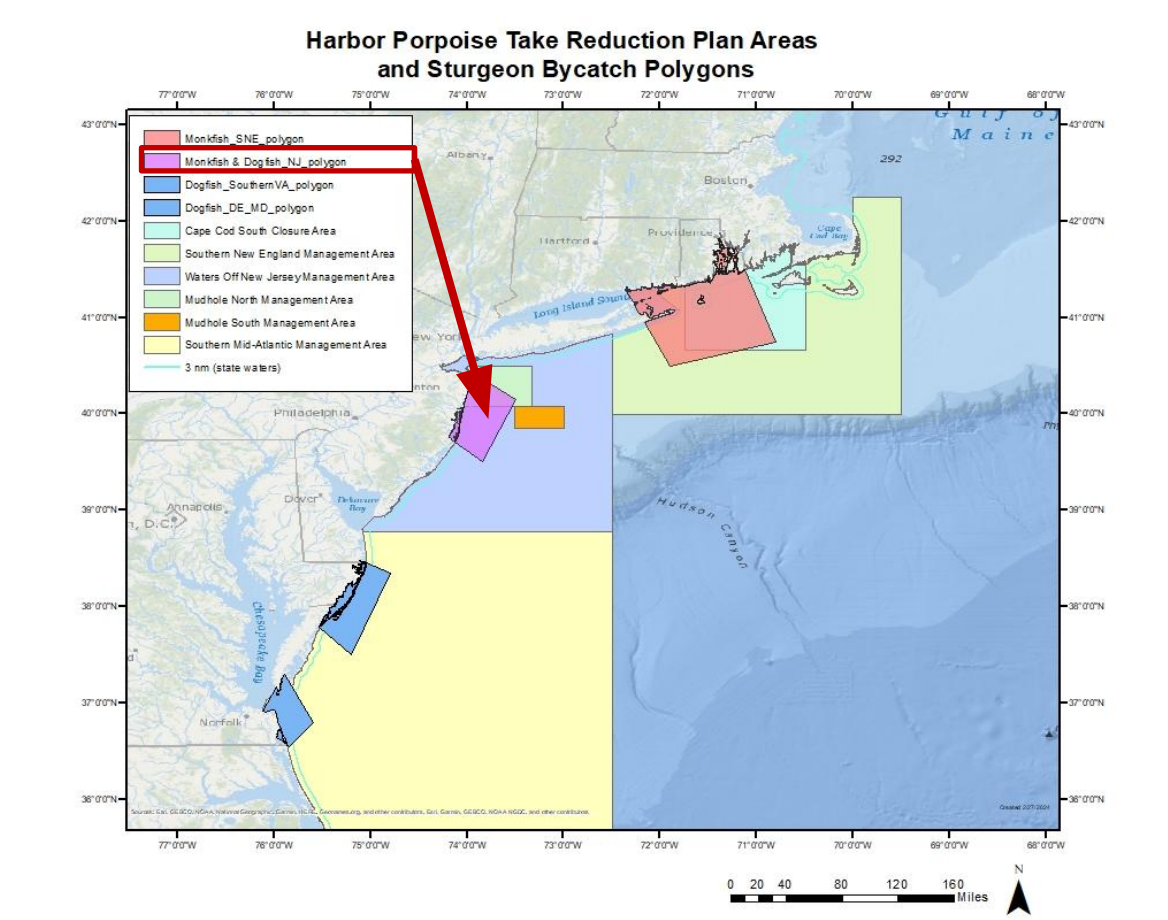
Federal vessels targeting spiny dogfish in federal & state waters

Which polygon?	Type of measure?	When?
New Jersey	Overnight soak prohibition	May 1 – May 31 & Nov. 1 – Nov. 30
DE / MD / VA	Overnight soak prohibition	Nov. 1 – March 31



Other Protected Species Impacts

Harbor Porpoise Take Reduction Plan Areas



Low-profile gillnet definition

Low-profile gillnet gear mentioned below is defined based on research by Fox et al. (2012 and 2019) and He and Jones (2013) in New Jersey:

- Mesh size ranging from 12 to 13 inches,
- Net height ranging from 6 to 8 meshes tall,
- Net length of 300 feet,
- Tie-down length of less than or equal to 30 inches,
- Tie-down spacing of 12 feet,
- Primary hanging ratio of 0.50,
- Twine size 0.81mm, and
- Net is tied at every float to keep float line down.

NOTE: Harbor Porpoise regulations require 0.90 mm minimum twine mesh for large-mesh gillnets in the Mid-Atlantic management areas Jan. – April.

Exemption needed for 0.81 mm twine size for low-profile gillnet gear via work with the Harbor Porpoise Take Reduction Team (see Council letter)

Rationale for Low-Profile Gillnet Gear Monkfish Fishery

- Several studies testing various iterations of this gear: Fox et al. 2011, Fox et al. 2012, Fox et al, 2013, Fox, et al. 2019:
  - Sturgeon bycatch reduced by ~76% when using low-profile gear in NJ
  - No significant difference in monkfish catch rates off NJ
  - Significantly fewer monkfish caught off NY
  - No significant difference in winter skate catch off NJ or NY
- Proposed delayed requirement until Jan. 1, 2026 to allow Harbor Porpoise Take Reduction Team to consider impacts of changes to minimum twine size requirements and to allow gear to be produced

Fox, et al. 2019	**Mesh Size (in.)**	**Net Height (# Mesh)**	**Tie Down Length (ft)**	**Tie Down Spacing (ft)**	**Hanging Ratio**	**Net Length (ft)**	**Twine Diameter (mm)**	**Sturgeon Catch (#)**
Control	12	12	4	24	0.5	300	0.90	25
Experimental	13	8	2	12	0.5	300	0.81	6

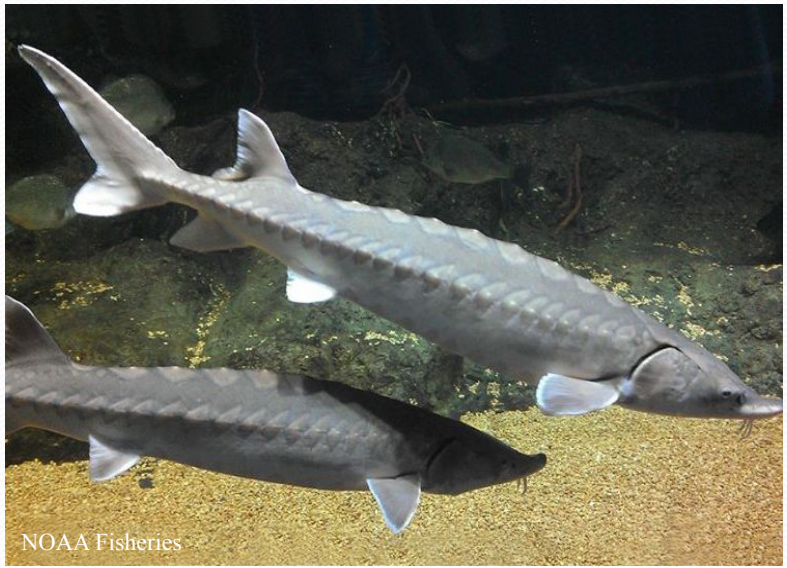
Next steps

- May – Council staff submitted framework for preliminary submission
- Summer – Council staff receive comments, finalize framework
- TBD – proposed rule
- TBD – final rule
  - *Note: Per the 2021 Biological Opinion Action must be taken to reduce Atlantic Sturgeon bycatch by the end of 2024*
  - Currently, the low-profile gear requirement for monkfish (.81mm) is at conflict with the twine size requirement for harbor porpoise (.90mm)

Questions?

See NEFMC and MAFMC websites for background presentations:

https://d23h0vhsm26o6d.cloudfront.net/1.-April-2024-NEFMC-sturgeon-presentation.pdf



Distillation

Recap: Councils' Proposal vs. HPTRP Management Measures

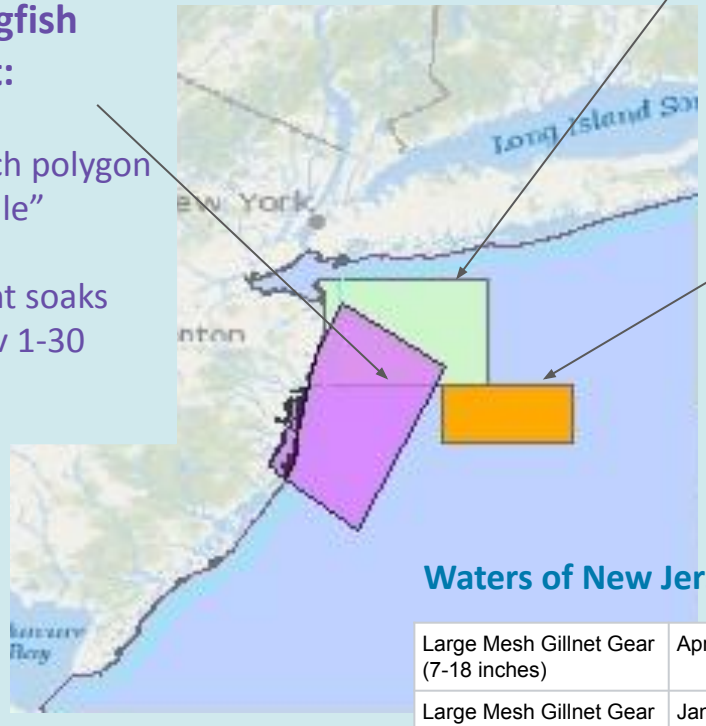
	Proposed Low-Profile Net to Reduce Sturgeon Bycatch	Harbor Porpoise Take Reduction Plan Regulations
Mesh size	12 to 13 inches	Larger than 7 inches
Net height (# of meshes)	6 to 8 meshes tall	not regulated
Max net length	300 feet	300 feet
Max tie-down height	≤ 30 inches	≤ 48 inches
Tie-down spacing	12 feet	≤ 24 feet
Hanging ratio	0.50	not regulated
Twine size	0.81mm (24ga) (year-round)	0.9mm (30ga) (periods in Jan-Apr)
Net tie-downs	every float	every float

Recap: Councils' Proposal and HPTRP Management Areas Overlap

Monkfish and Spiny Dogfish Framework Adjustment:

New Jersey sturgeon bycatch polygon

- Monkfish - "low profile" gillnets year-round
- Dogfish - no overnight soaks from May 1-31 & Nov 1-30



Mudhole North

Large Mesh (7-18 inches)	Feb 15-Mar 15, Apr 1-20	Closed (No Large Mesh Gillnets)
Large Mesh (7-18 inches)	Jan. 1-Feb 14, Mar 16-31, Apr 21-30	Gear Modification Requirements
Small Mesh (>5 inches - <7 inches)	Feb 15-Mar 15	Closed (No Small Mesh Gillnets)
Small Mesh (>5 inches - <7 inches)	Jan 1-Feb 14, Mar 16-Apr 30	Gear Modification Requirements

Mudhole South (no overlap)

Large Mesh (7-18 inches)	Feb 1-Mar 15, April 1-20	Closed (No Large Mesh Gillnets)
Large Mesh (7-18 inches)	Jan 1-31, Mar 16-31, April 21-30	Gear Modification Requirements
Small Mesh (>5 inches - <7 inches)	Feb 1-Mar 15	Closed (No Small Mesh Gillnets)
Small Mesh (>5 inches - <7 inches)	Jan 1-31, Mar 16-Apr 30	Gear Modification Requirements

Waters of New Jersey

Large Mesh Gillnet Gear (7-18 inches)	Apr 1-20	Closed (No Large Mesh Gillnets)
Large Mesh Gillnet Gear (7-18 inches)	Jan. 1-Mar. 31, Apr 21-30	Gear Modification Requirements
Small Mesh Gillnet Gear (>5 inches - <7 inches)	Jan. 1-Apr 30	Gear Modification Requirements

NOAA FISHERIES

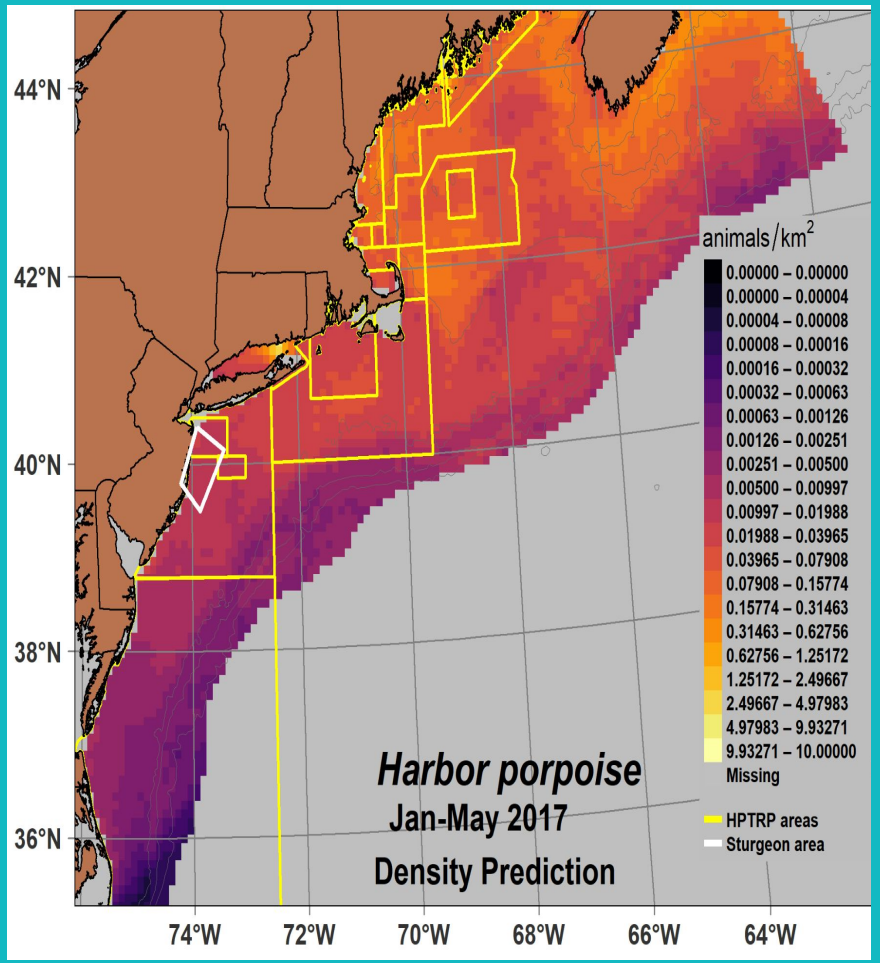
Why was 0.9 mm twine size chosen for take reduction plan?

By

Debi Palka

NEFSC

28 June 2024



Current HPTRP Gillnet Requirements

Large Mesh (7-18 inches)

	Management Area	Floatline	Twine Size	Tie-downs	Net Size	Nets per vessel	Nets per String
Jan 1 - Mar 31, Apr 21 - 30	Waters off NJ	4800 ft max	Min .90mm	Required No more than 24 ft apart in floatline No more than 48 inches from floatline to lead line	300 ft max	80 max	16 panels max
Jan 1 - Mar 31, Apr 21 - 30	Mudhole North	3900 ft max					13 panels max
Jan 1 - Mar 31, Apr 21 - 30	Mudhole South						
Feb 1 - 14, Mar 16 - Apr 30	S Mid Atlantic						

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In 1997 conducted analysis of mid-Atlantic monkfish hauls observed during 1995-1996

1. Methods:

- Used Generalized Additive Models to document relationship between gear and fishing characteristics and the presence or absence of by-caught harbor porpoises as documented in the observer program data
- Looked for characteristics that were associated with low bycatch that could potentially be used in the plan

2. Results - characteristics related with low bycatch:

- Twine size ≥0.9 mm (large)
- Float line length <3000 ft (short)
- Soak duration < 20 hrs (short)
- Twine size and float line length were the most important

3. 1997 confirmed patterns

Mid-Atlantic monkfish hauls observed with a harbor porpoise take

Twine size (mm)	Number of hauls with a take in 1997	Number of observed hauls in 1997	Takes per haul
0.57	3	7	0.43
0.62	6	50	0.12
0.66	4	127	0.03
0.70	1	11	0.09
0.81	1	17	0.06
0.90	1	119	0.008

All 1997 takes were from hauls with:
- Soak duration ≥ 48 hrs
- Float line length mean = 3523 ft

5 takes from 18 nets with 6 vertical meshes (0.28 takes/haul)
11 takes from 300 nets with 12 vertical meshes (0.04 takes/haul)

4. Conclusion:

Twine size of 0.9 mm was used by many fishers and was associated with lower bycatch than hauls with smaller twine sizes so Team used this value in the Take Reduction Plan

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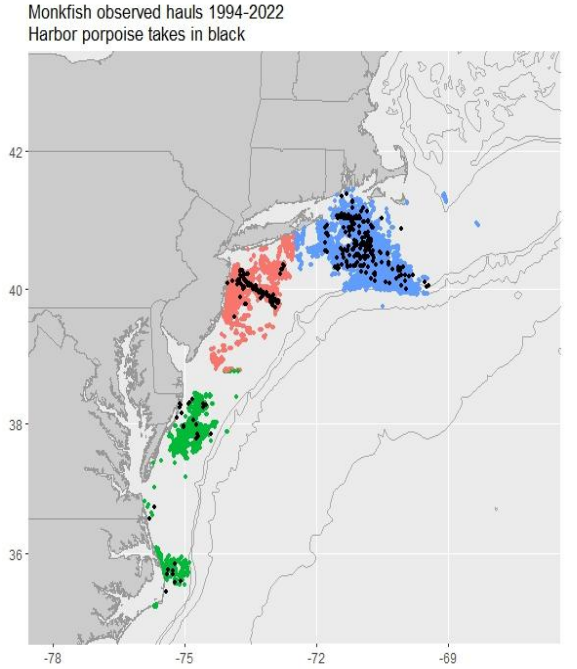
Deeper dive into characteristics of monkfish hauls related to harbor porpoise bycatch

- **Data:** 1994-2022 Massachusetts-North Carolina
  - 15,053 hauls observed targeting monkfish
  - Of which 10,790 hauls with 0.9mm and 729 hauls with 0.81mm
- **Method:** Generalized Additive Models of bycatch rate (takes/tons fish landed). Potential covariates:
  - **latitude**[1], **longitude**, ocean depth
  - **year**, **month**, **monthly North Atlantic Oscillation**
  - average mesh size, net height, number of vertical meshes, tie down length, hang ratio
  - **twine size**, **soak duration**, **floatline length**



[1] **Bold variables in orange are included in best fitting model**

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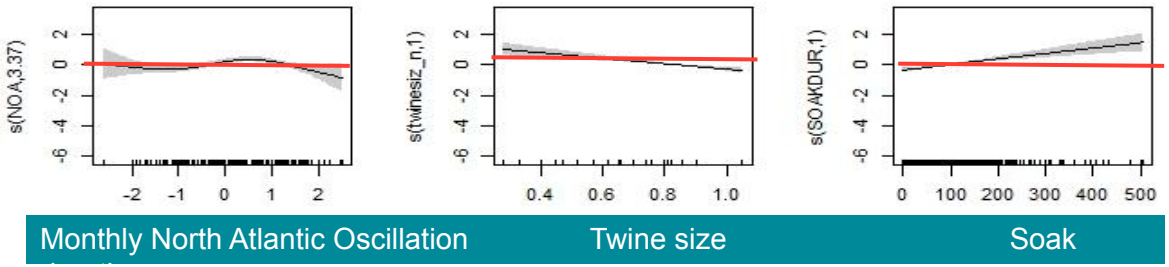
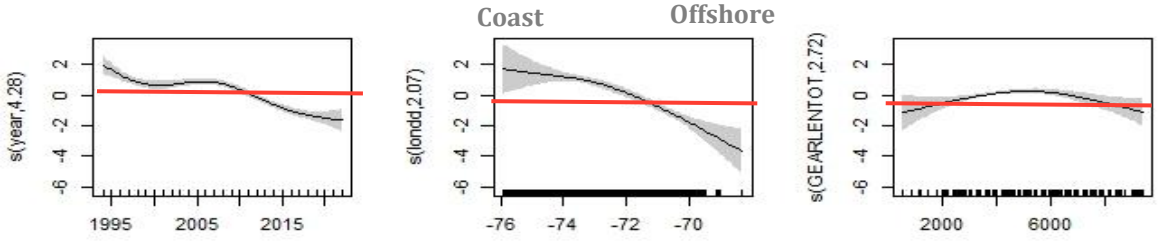
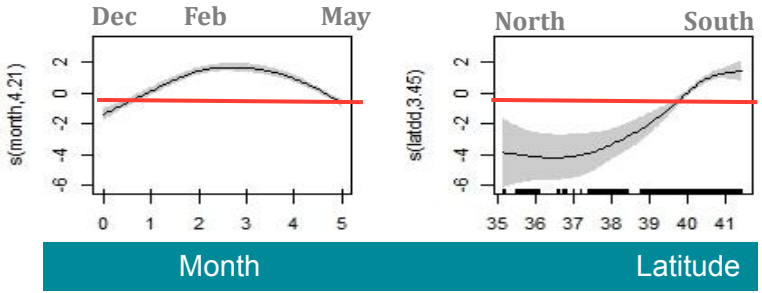


Monthly North Atlantic Oscillation | Twine size | Soak



Year | Longitude | Gear



Month | Latitude

- Values of variables above red line are associated with higher than average bycatch rates.
- Grey shade is confidence interval.

Best Model

Variable	Percent Deviance Explained
Month	7.40
Year	6.00
Longitude	5.64
Latitude	1.85
Twine size (mm)	0.98
Monthly North Atlantic Oscillation	0.80
Gear length (ft)	0.79
Soak duration (hrs)	0.75

Variables that explain the most

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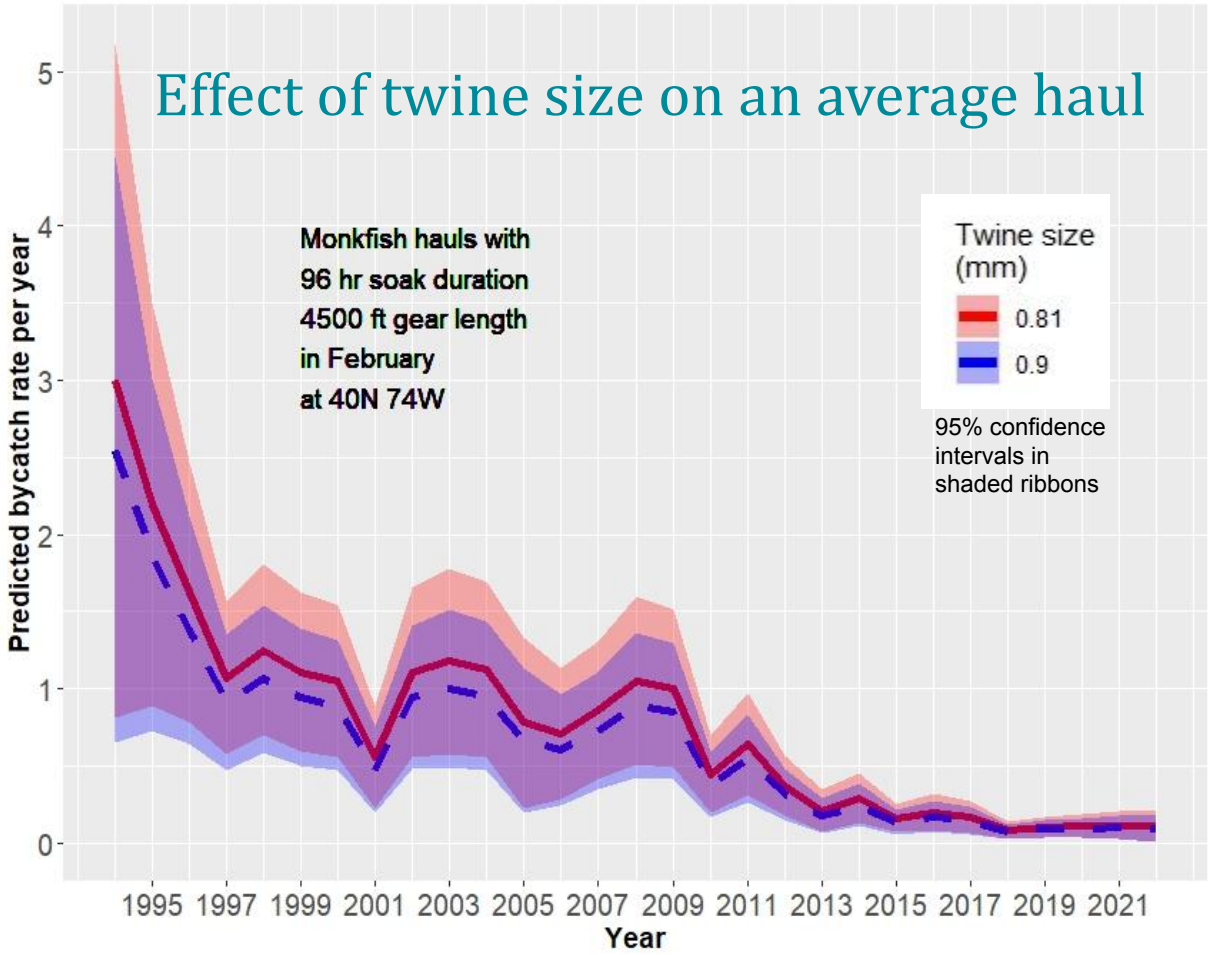

Conclusions:

- Harbor porpoise bycatch rate from nets with 0.81 mm twine size slightly greater than that from 0.9 mm twine sizes, when comparing an average monkfish haul from the whole mid-Atlantic region
- However, there are other factors more highly correlated to the bycatch rate than twine size
  - Such as year, where bycatch rates were greatest in the mid 1990's
  - And month, where bycatch rates were greatest in the winter (when there are more porpoises present)
  - Note, the year-month North Atlantic Oscillation values explained some of the interannual differences (which related to different climatic environmental conditions)
  - Thus there is a lot of variation in the bycatch rates of the two twine size values resulting in overlapping non-significant confidence intervals (shaded areas).

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Twine Size and Harbor Porpoise Bycatch

Kristin Precoda, Samuel Chavez-Rosales, Debra Palka

Northeast Fisheries Science Center,
Protected Species Division

Outline

- Punchline
- Factors relating twine size to bycatch
  - Acoustic detectability
  - Breakability of twine
  - Twine stiffness
- Statistical analyses
- Summary

Punchline

What is Impact of 0.9 mm vs. 0.81 mm Twine?

- No evidence of a large impact
- Hints that 0.81mm twine may increase bycatch a bit
- Unable to be more precise, because observer data is limited:
  - 0.81mm twine hasn't been observed since 2016, and was much rarer than 0.9mm twine before that as well
- Bycatch is likely affected by a combination of
  - Gear characteristics
  - Fishing effort
  - Environmental factors influencing harbor porpoise presence
- Will probably take several years of observation to see any effect

What Mechanism Might Relate Twine Size to Bycatch?

Acoustic Detectability
Breakability of Twine
Twine Stiffness

Acoustic Detectability

- Depends on
  - Acoustic reflectivity of net
    - Twine diameter
    - Twine stiffness
    - Mesh size (density of twine per area)
  - Angle of approach
  - Ambient noise level
  - Loudness of echolocation signals

- Echolocating animals have a lower chance of detecting smaller-diameter and more flexible twine

Theoretically, based on acoustic detectability alone:

Twine size ↓ Bycatch ↑

Breakability of Twine

- Breaking strength of 0.81mm twine is about 80% of strength of 0.9mm twine

- Animals have a higher chance of breaking smaller-diameter twine

Theoretically, based on breaking strength alone:

Twine size  Bycatch 

Twine Stiffness

- Smaller-diameter twine is less stiff (more tangly)
- Twine also becomes less stiff as it soaks
- Animals have a higher chance of becoming entangled in smaller-diameter or less stiff twine

Theoretically, based on stiffness alone:

Twine size  Bycatch  Soak duration  Bycatch 

Summarizing Mechanisms

Twine size ↓

Bycatch ↑ Acoustic detectability

Bycatch ↓ Breakability

Bycatch ↑ Stiffness/twine size

Bycatch ↓ Stiffness/shorter soaks

- Will the total effect be ↑ or ↓ ?

…Don't know

Statistical Analyses

Models Examined

1. Logistic regression of presence/absence of harbor porpoise bycatch on a trip
2. Generalized additive model of number of harbor porpoise bycaught on a trip

Predictors of bycatch examined:

- Twine size, year, trip soak duration, weight of fish landed, latitude, longitude

Note: all analyses are based on 12-inch mesh in Jan.-Apr. in Mid-Atlantic HPTRP management areas

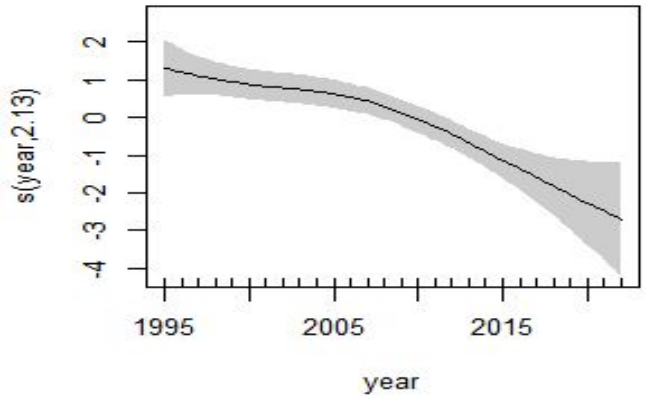
Statistical Results

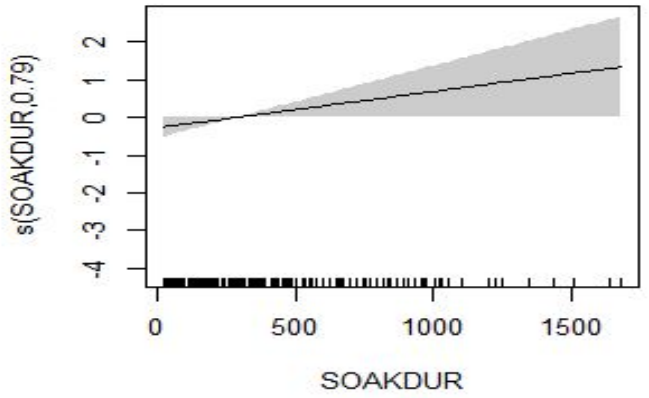
- Year, soak duration, and location: statistically significant predictors of bycatch
- Twine size on its own not significant
- May be a significant interaction between twine size and total trip soak duration:
  - For most total trip soaks, 0.81mm twine has higher bycatch than 0.9mm twine

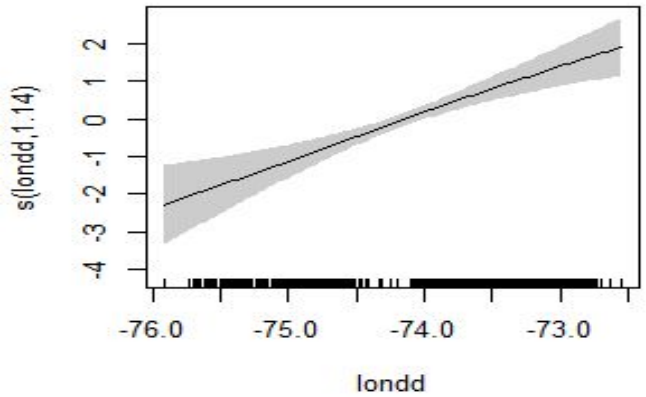
Statistical Model

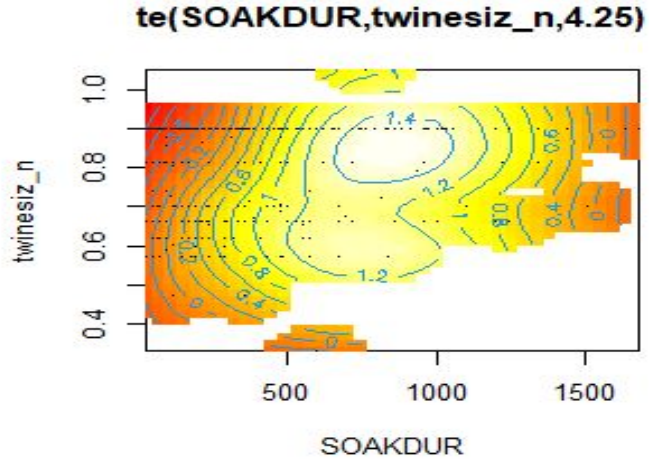
- Bycatch decreases with increasing year, decreasing soak duration, more westerly longitude

- At shorter trip soak durations, bycatch is lower for 0.9 mm twine than 0.81mm twine



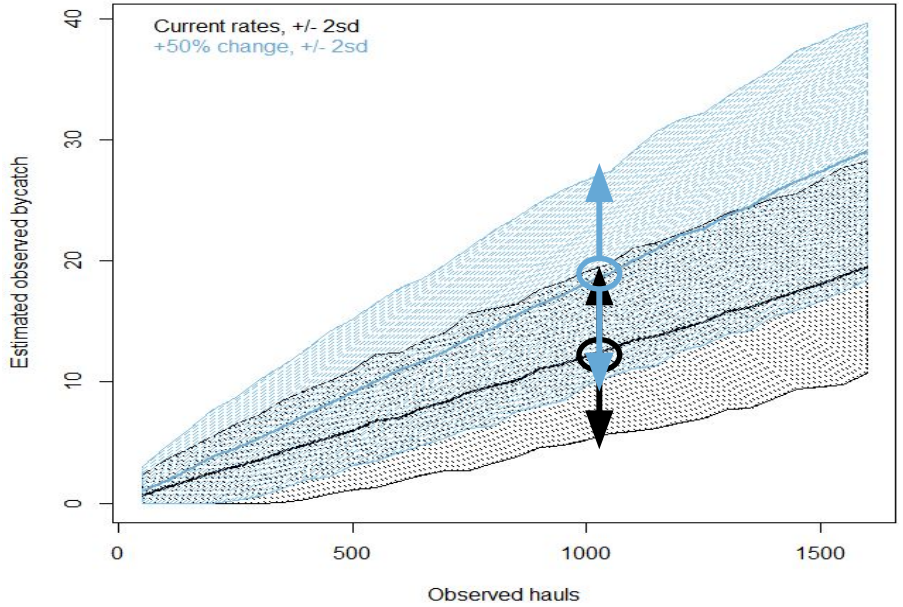






How Much Observation Needed to Detect an Impact?

- Depends on the size of the impact
- Suppose bycatch rate increases by 50%:
- Context for number of hauls:
  - Average of 62 hauls observed with 12-inch mesh, Jan.-Apr., in waters off New Jersey, annually over last 10 years
  - Average of 416 hauls on VTRs with those characteristics annually over 2019-2022



Other Proposed Gear Modifications

Proposed Gear/Fishing Changes

- Twine diameter is the only proposed change that conflicts with the HPTRP
- Other proposed changes are allowed under the HPTRP but differ from common fishing practice
  - Lower-profile nets, fewer vertical meshes (< 1% of hauls 1995-2022)
  - More closely spaced tiedowns
  - Generally shorter tiedowns
  - Shorter soak durations
- Unable to assess what the impact of changes in practice might be

Summary

Twine Size Impact

- High uncertainty, but indications that 0.81mm twine might have slightly higher harbor porpoise bycatch for most total trip soak durations
- Environmental and other factors play a large role
- Fewer harbor porpoises in Mid-Atlantic recently
- Probably substantial observer data needed to detect an impact

Q&A and Discussion

- Questions?

- Are we missing anything?
- Are there any other factors you think need to be considered in light of this proposed change?

Next Steps

- Summer – Council staff receives NMFS comments, finalizes framework
- TBD – NMFS Sustainable Fisheries Division publishes proposed rule
  - We send to the Team for comments
- TBD – NMFS Sustainable Fisheries publishes final rule
  - Note: Per the 2021 Biological Opinion, Action must be taken to reduce Atlantic Sturgeon bycatch *by the end of 2024*
- NMFS Protected Resources Division will review the proposed sturgeon rule to determine whether modifications to the TRP are needed.
  - Plan modification would require analysis of the effects of the change, proposed rule, opportunity for public comment


Thank you for joining us!
Questions? Contact Team Coordinator
Liz Stratton elizabeth.stratton@noaa.gov