Harbor Porpoise Take Reduction Team Meeting

March 24, 2022, 4-5:30 p.m.

Jennifer Goebel, HPTRT Coordinator, GARFO
Dr. Debra Palka, Research Fishery Biologist, NEFSC
Dr. Chris Orphanides, Research Zoologist, NEFSC
Dr. Kristin Precoda, Fisheries Biologist, Integrated Statistics/NEFSC

HPTRT Webinar:
The meeting will begin at 4:00

For technical support:
Type your issue into the 'Questions' box

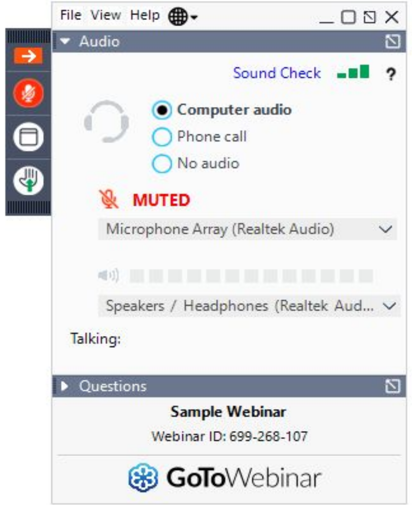
Unmuted (green) **Muted (red)**

This is the control panel

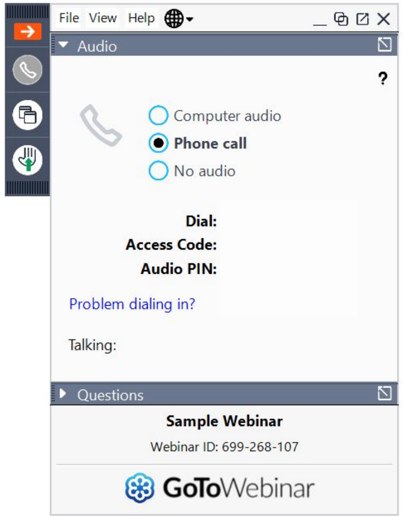
Find the **Control Panel** and open it by clicking the orange arrow. You can usually find this on the right hand side of your screen. You can expand the grey option bars by clicking the triangle on the left hand side of "Audio" and "Questions".

The **Control Panel** also allows you to mute/unmute by clicking the microphone symbol.

Computer Audio (Preferred)



Cell phone for audio (limited internet)

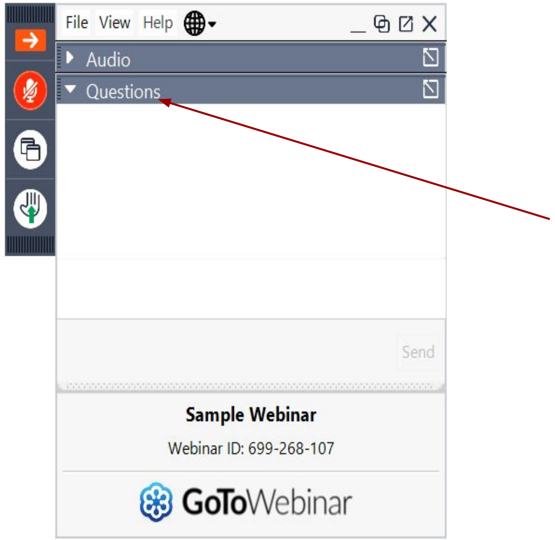


Make sure you can see a red microphone symbol n  to your name in attendees. If you cannot, you will not be able to speak.

Select your **audio settings**. Computer audio is recommended. If you dialed in on your phone and did not enter your audio pin, please redial and enter your audio pin.

Access the audio options by clicking on the grey bar that says "Audio".

This is the questions box



This is the **Questions box**, you will use this to 'get in line' for the Q&A. You can also use it to let us know if you are experiencing technical difficulties.

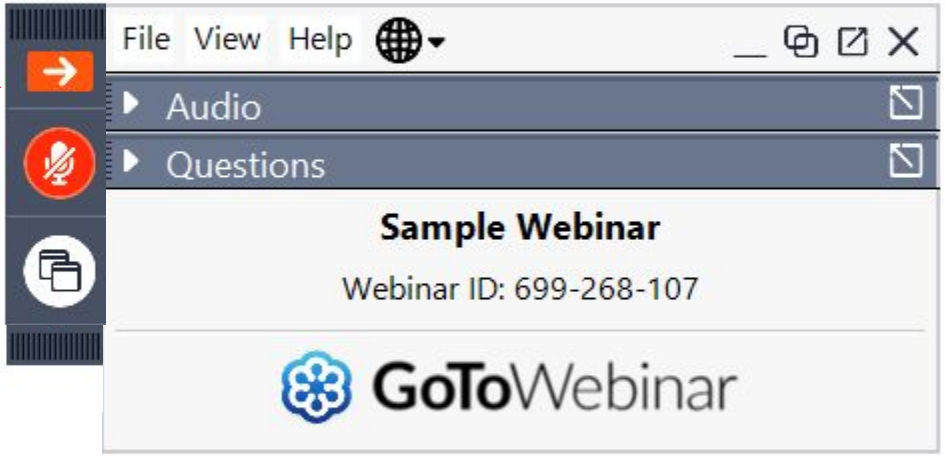
Access the questions box by clicking the grey bar that says "questions".

The Control Panel - 3 views

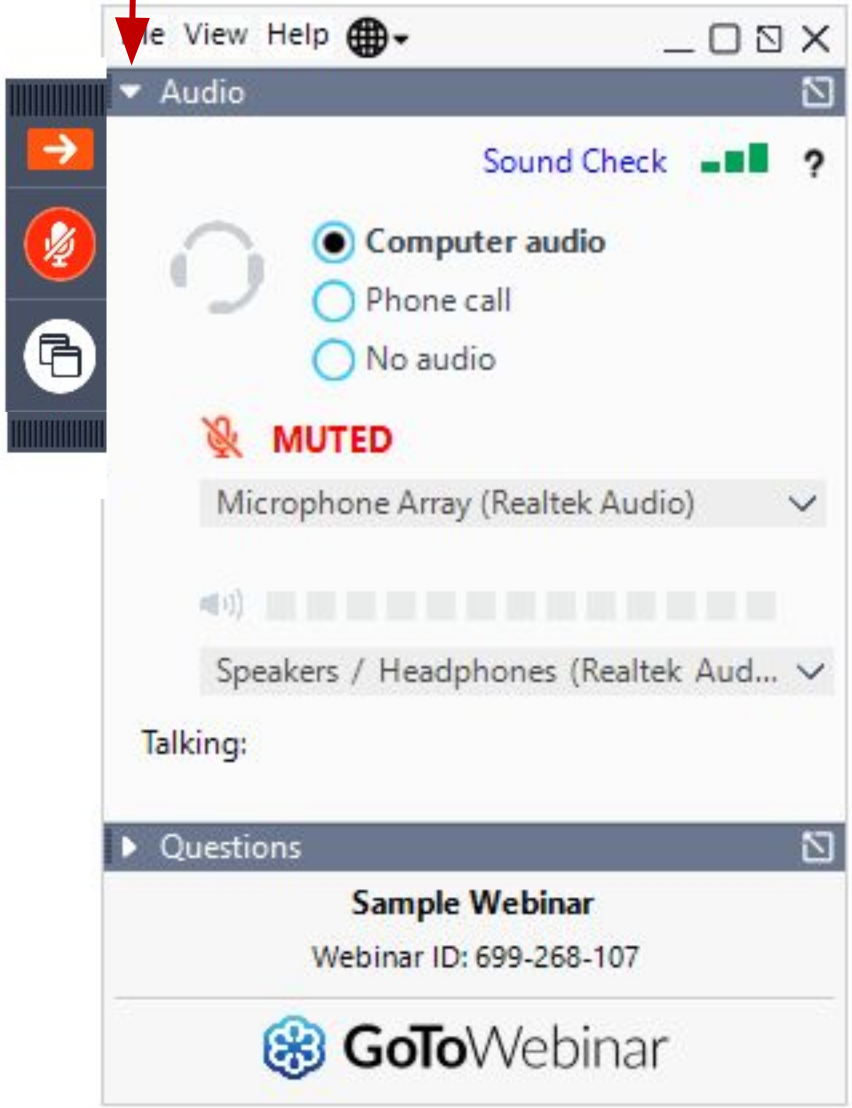
1. Hidden

Often found on the right hand side of your screen

2. Open

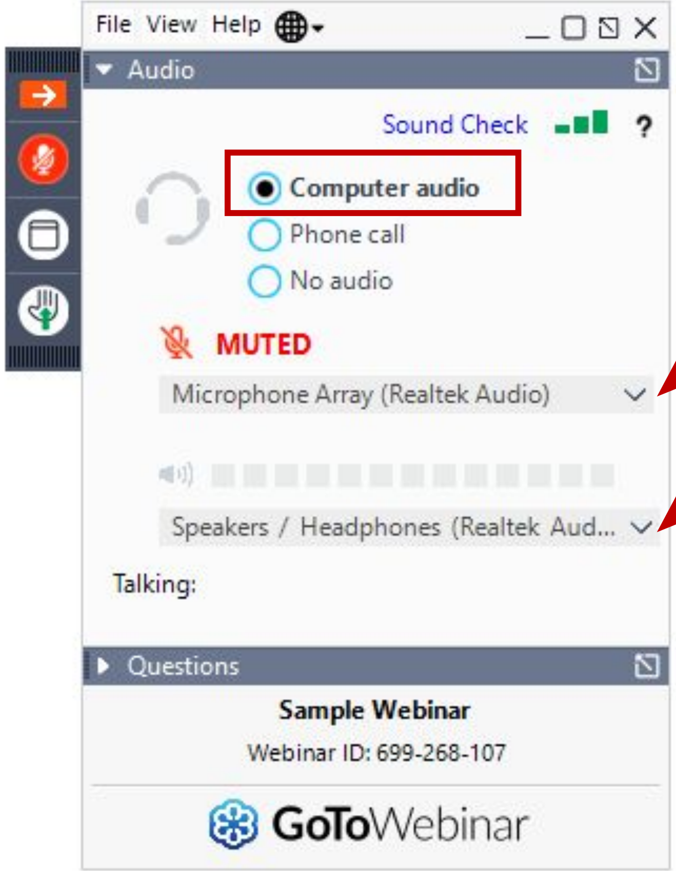


3. Expanded



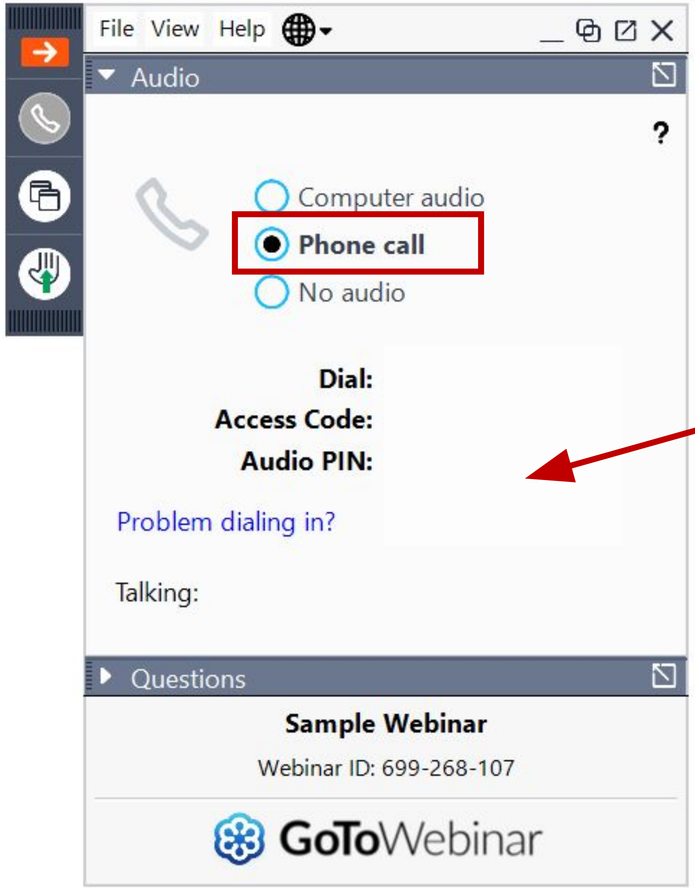
Selecting your audio settings - if joining by computer

Computer Audio - Preferred



Make sure these settings are your computer speakers/ microphone or the correct headphones.

Use phone to call in for audio



If dialed in and did not enter your audio pin, you will not be able to speak. Please redial and enter your audio pin.

Your pin is unique to you, do not share it.

Muting and unmuting

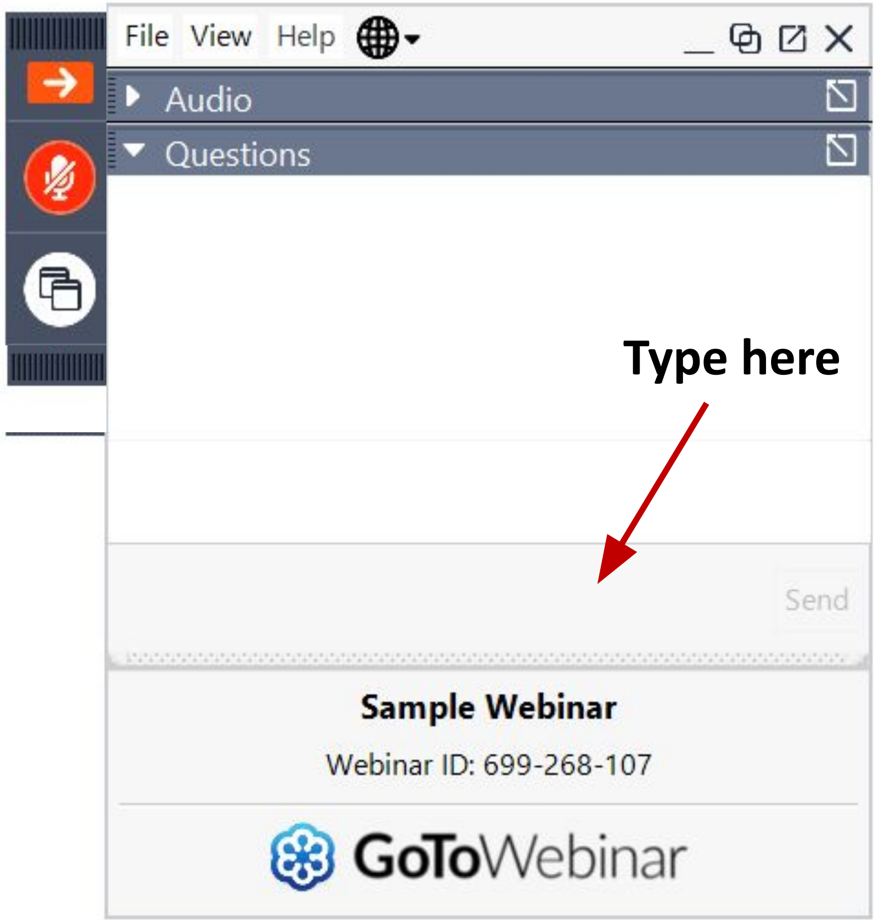
The microphone symbol will be:
GREEN if you are <u>unmuted</u>
RED if you are <u>muted</u>

Unmuted

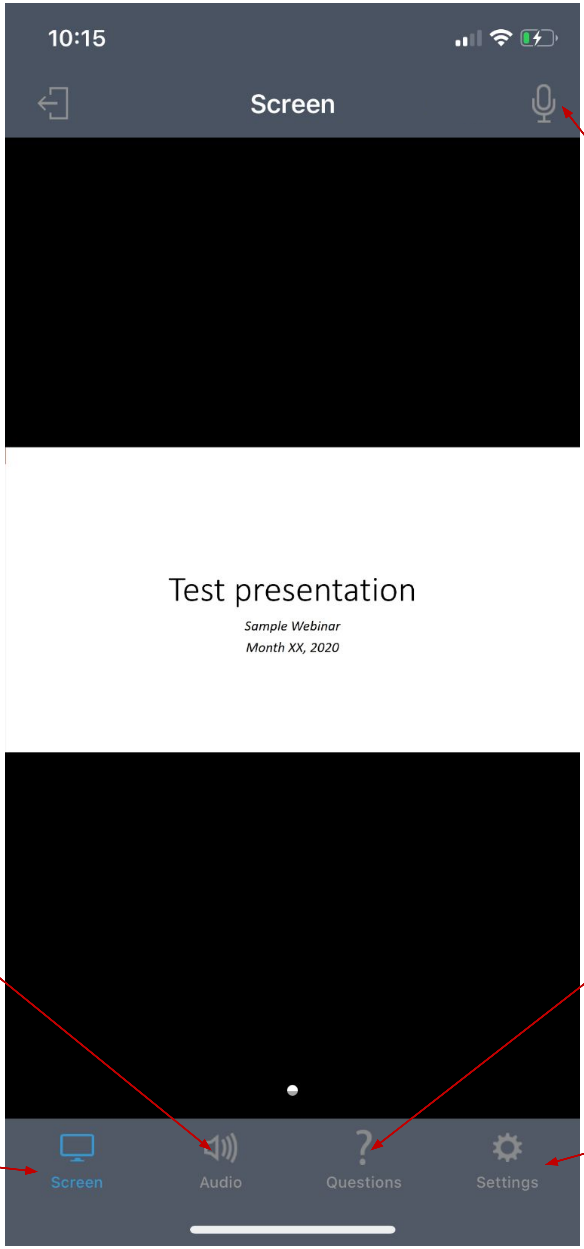
Muted

Questions Box

Only organizers can see the information typed into this box.
This information is being recorded.



iPhone



Mute/unmute

Audio controls

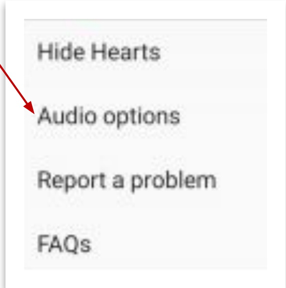
Questions box

Get back to the slides

Settings

Mute/unmute

Settings



Questions box

Android

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Welcome

Meeting Goal:
Review 2018-2021 abundance and, bycatch numbers, trends

Agenda

3:45 pm	Tech Support/Troubleshooting
4-4:15 pm	Welcome, Attendance, and Agenda Review, New Member Introduction (Goebel)
4:15-4:35 p.m.	Current Stock Structure, Abundance, and Trends (Palka, NEFSC)
4:35-5:00 pm	Bycatch and Compliance (Precoda and Orphanides, NEFSC)
5:00-5:15 pm	Updates on Special Projects (Orphanides and Precoda, NEFSC)
5:15-5:30 pm	Other Updates, Emerging Issues, Public Comment, Wrap up, Adjourn

Welcome New Members & Alternates*

Somers Smott, Virginia Marine Resources Commission

Meghan Rickard, New York Dept. of Environmental Conservation

Erin Wilkinson, Maine Dept. of Marine Resources

Stacy VanMorter, New Jersey Division of Fish, Game, and Wildlife

Barbie Byrd, North Carolina Division of Marine Fisheries

Dennis Heinemann, Marine Mammal Commission

Karson Coutre, Mid-Atlantic Fishery Management Council

Toni Kerns, Atlantic States Marine Fisheries Commission

Robin Frede, New England Fishery Management Council

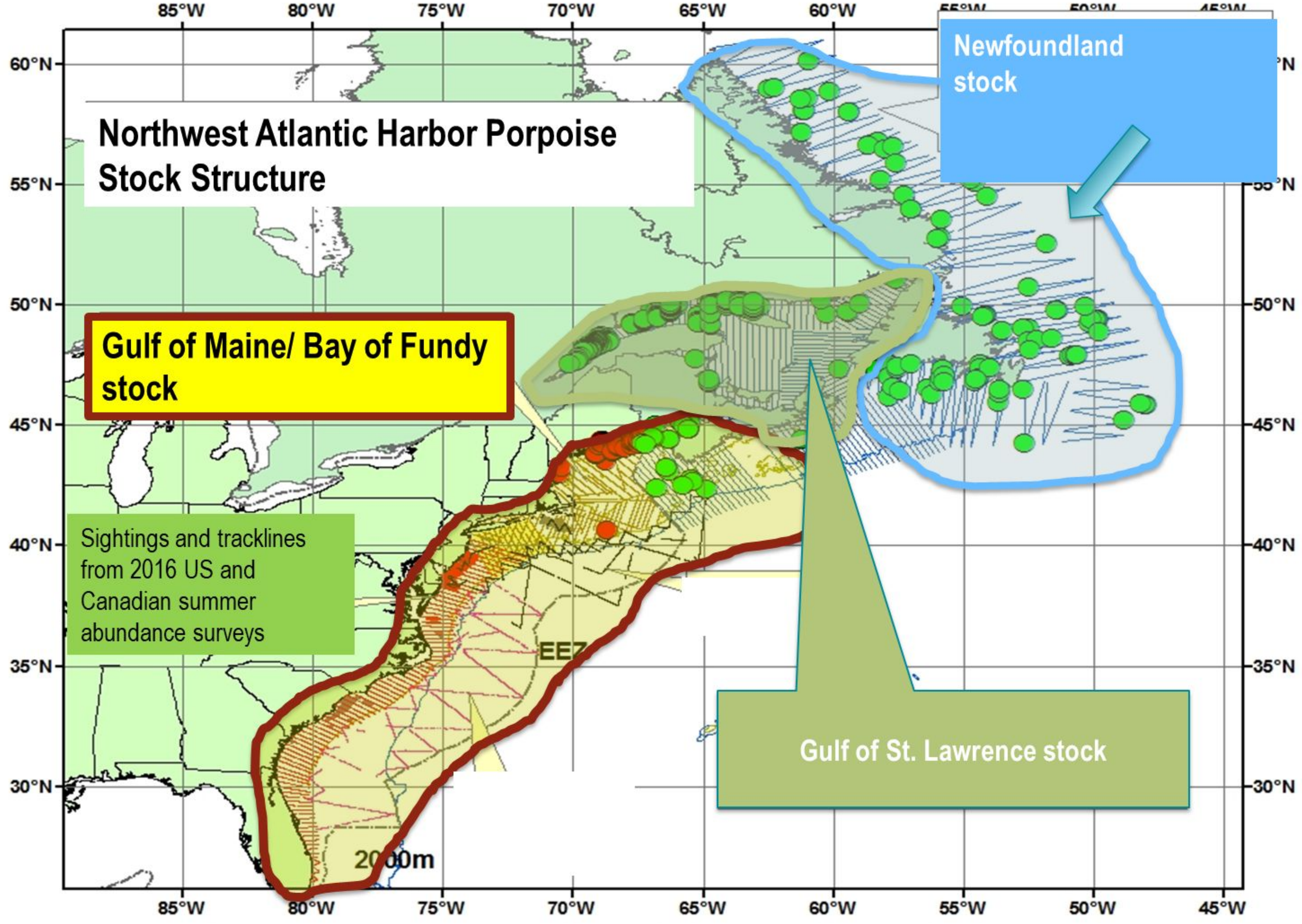
Alternates:

Meredith Mendelson (ME), Renee Zobel (NH), and Lisa Bonacci (NY), Chris Rainone (for Rick Marks)

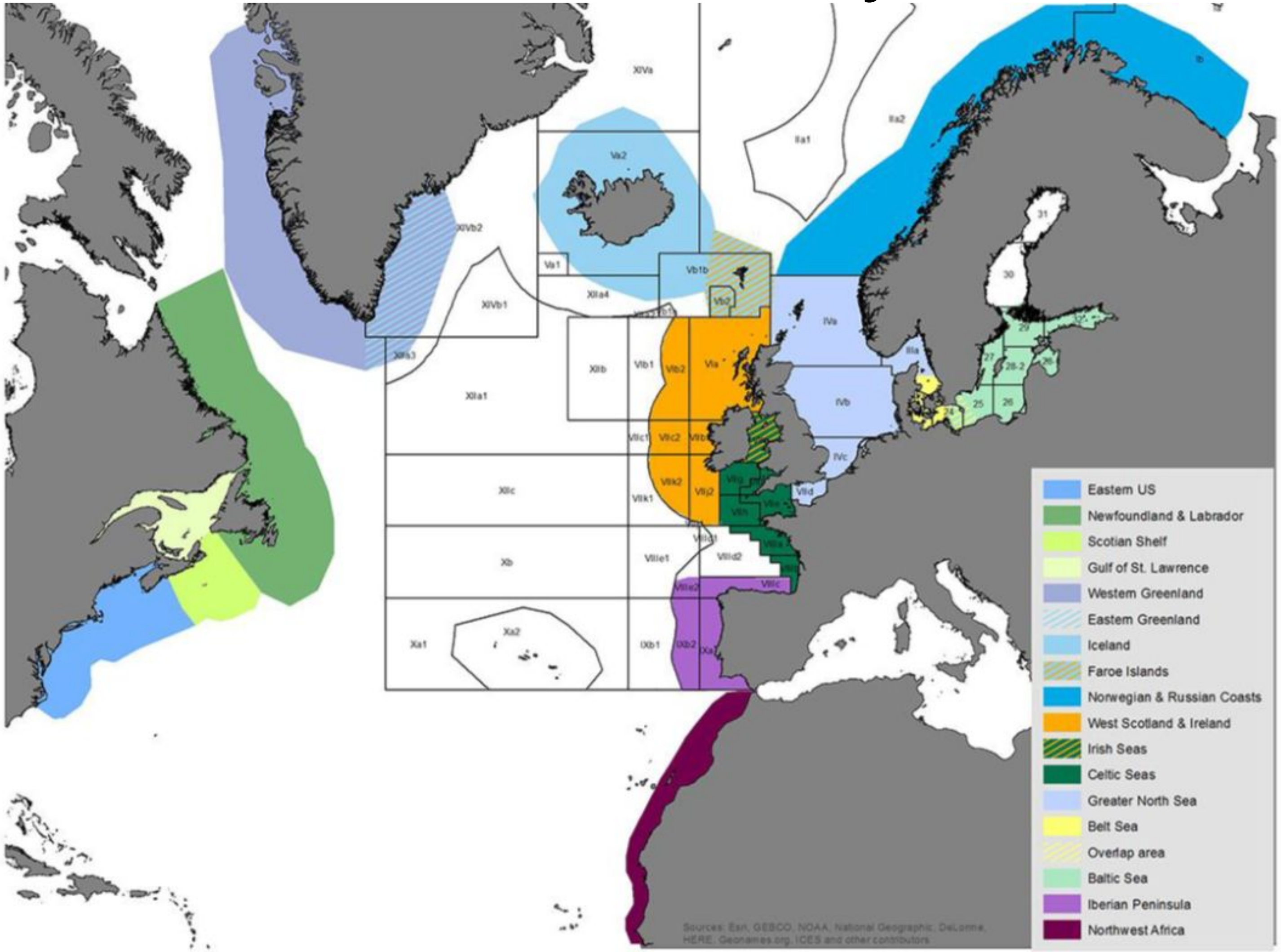
*Pending approval

HARBOR PORPOISES

- Coastal and offshore waters
- Prey on small schooling fish and squid
- Stock: Gulf of Maine/Bay of Fundy
- Bycatch primarily in: Northeast Sink Gillnet (most), Mid-Atlantic Gillnet, and Northeast Bottom Trawl fisheries


Northwest Atlantic Harbor Porpoise Stock Structure
Newfoundland stock
Gulf of Maine/ Bay of Fundy stock
Gulf of St. Lawrence stock
Sightings and tracklines from 2016 US and Canadian summer abundance surveys
EEZ
2000m
85°W
80°W
75°W
70°W
65°W
60°W
55°W
50°W
45°W
60°N
55°N
50°N
45°N
40°N
35°N
30°N

New stock structure analyses of North Atlantic harbor porpoises



From: North Atlantic Marine Mammal Commission and the Norwegian Institute for Marine Research. (2019). *Report of the Status of Harbour Porpoise in the North Atlantic Workshop.* Tromsø, Norway.

How has the stock structure changed over the past 3 decades, if at all?

Currently, Drs. Michael Fontaine and Ben Chehida from the University of Groningen in The Netherlands are conducting a project to address this question by genotype thousands of samples from throughout the North Atlantic collected during 1990 to the present (including 200+ new samples from US waters).

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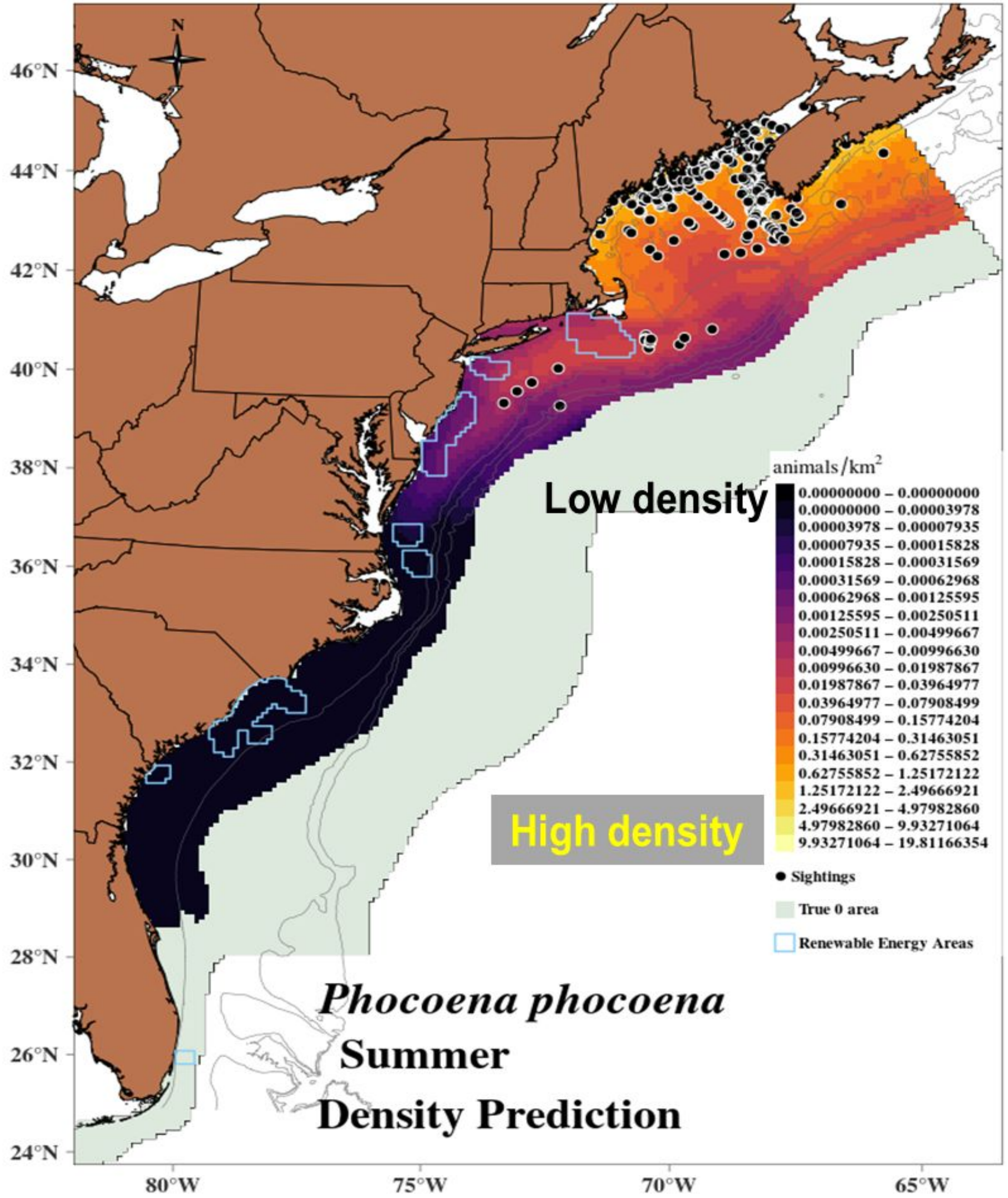

Seasonal distribution - summer

June – August:

Highest densities of harbor porpoises are concentrated in the Gulf of Maine and Bay of Fundy region in US and Canadian waters

From: Palka et al. 2021. Atlantic Marine Assessment Program for Protected Species: FY15 – FY19. Washington DC: US Department of the Interior, Bureau of Ocean Energy Management. OCS Study BOEM 2021-051. 330 p. https://marinecadastre.gov/espis/#/search/study/100066

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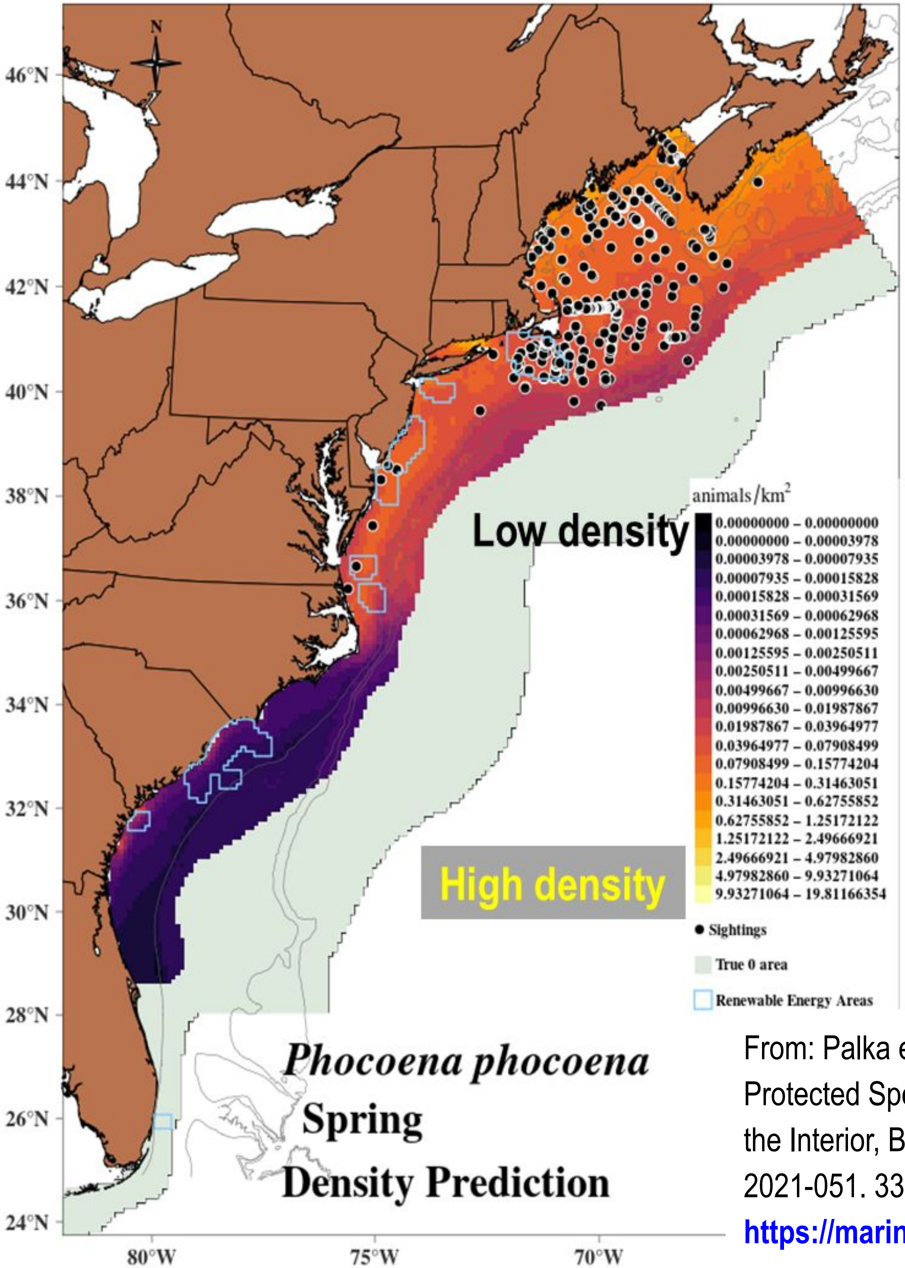


Seasonal distribution - spring and fall

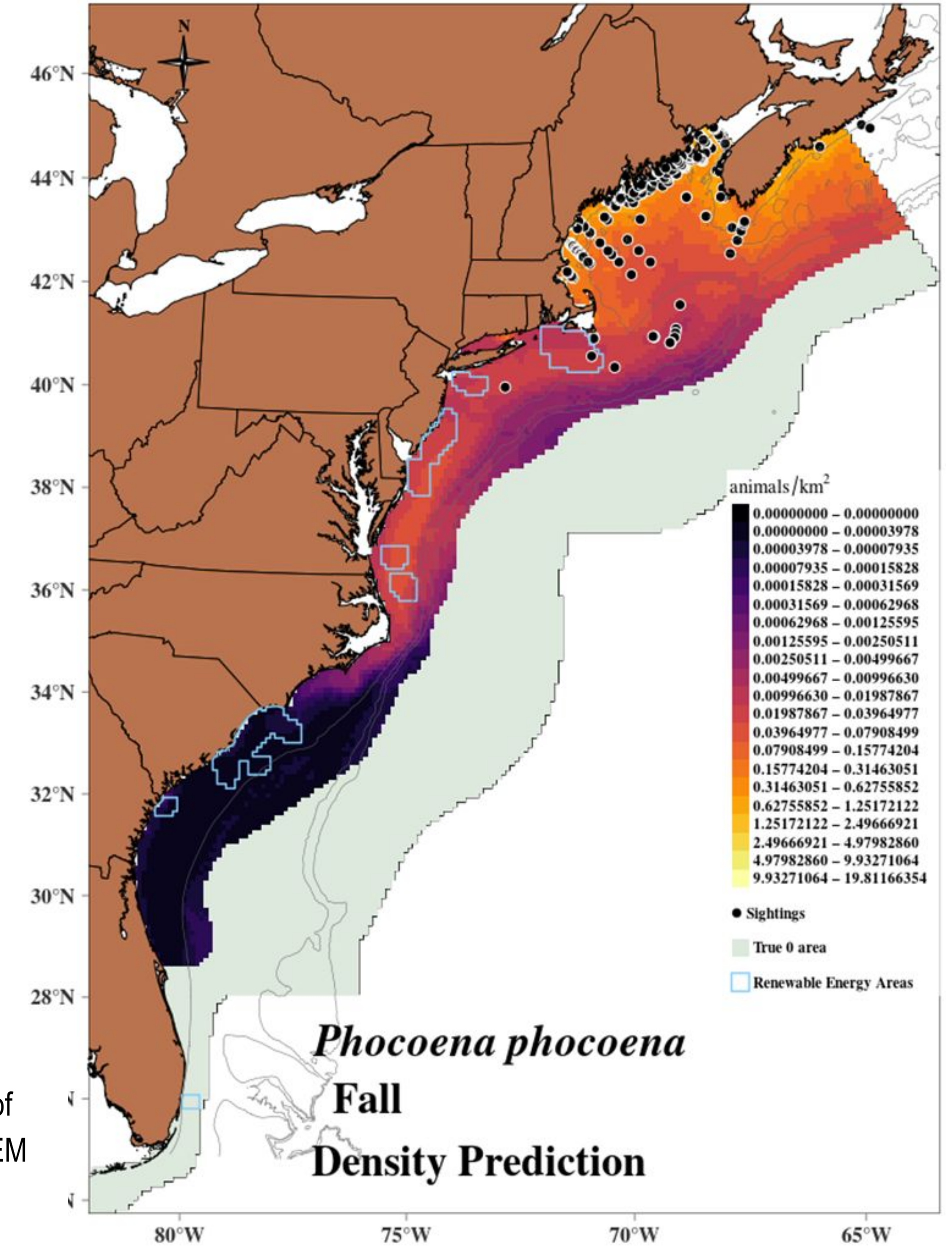
March – May

September - November:

Most harbor porpoises are found in the region between the Gulf of Maine and New Jersey

From: Palka et al. 2021. Atlantic Marine Assessment Program for Protected Species: FY15 – FY19. Washington DC: US Department of the Interior, Bureau of Ocean Energy Management. OCS Study BOEM 2021-051. 330 p.

https://marinecadastre.gov/espis/#/search/study/100066



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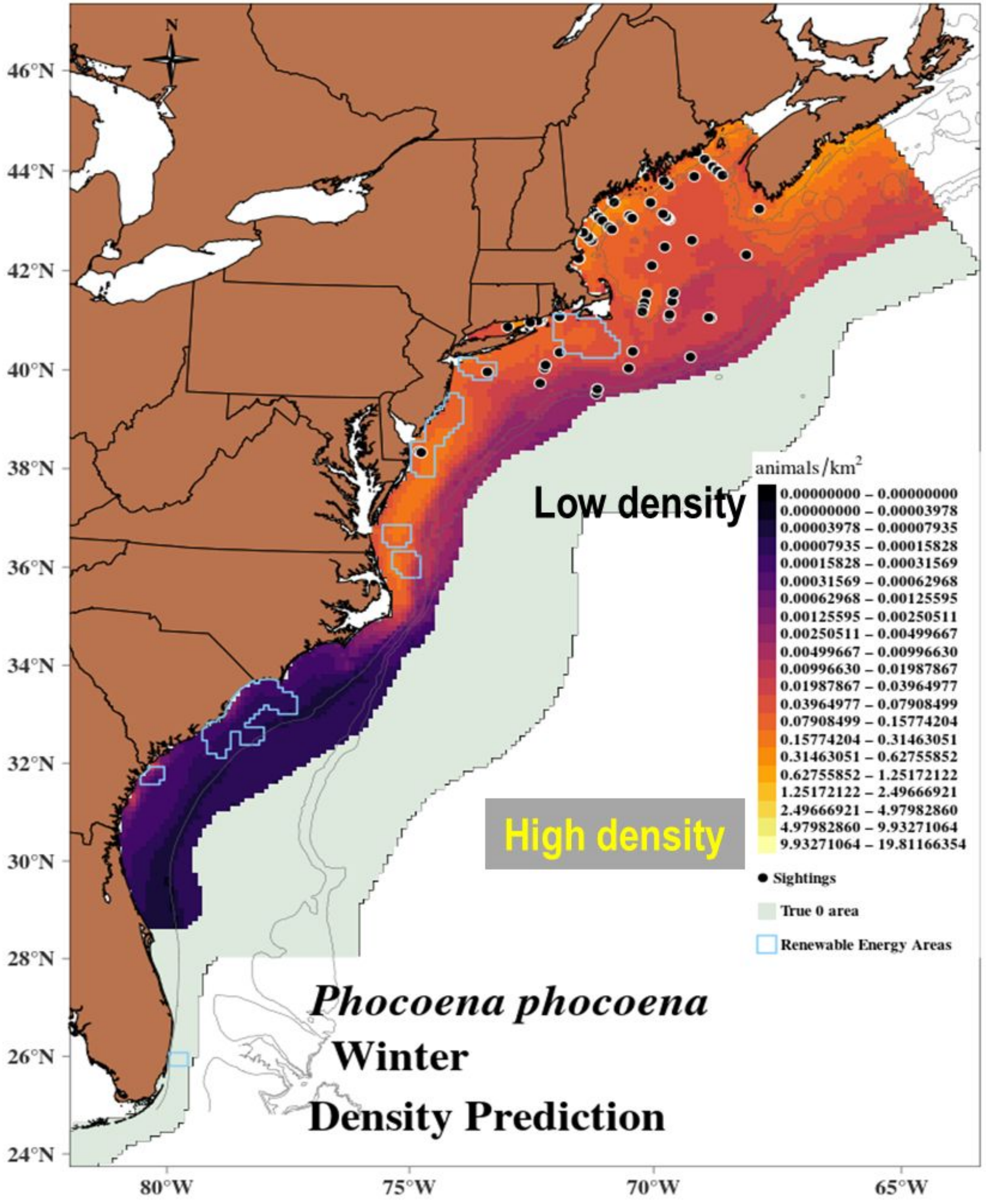
Seasonal distribution - winter



December – February:

Low densities of harbor porpoises that are spread out from North Carolina to Nova Scotia

From: Palka et al. 2021. Atlantic Marine Assessment Program for Protected Species: FY15 – FY19. Washington DC: US Department of the Interior, Bureau of Ocean Energy Management. OCS Study BOEM 2021-051. 330 p. https://marinecadastre.gov/espis/#/search/study/100066

Harbor Porpoise Take Reduction Team

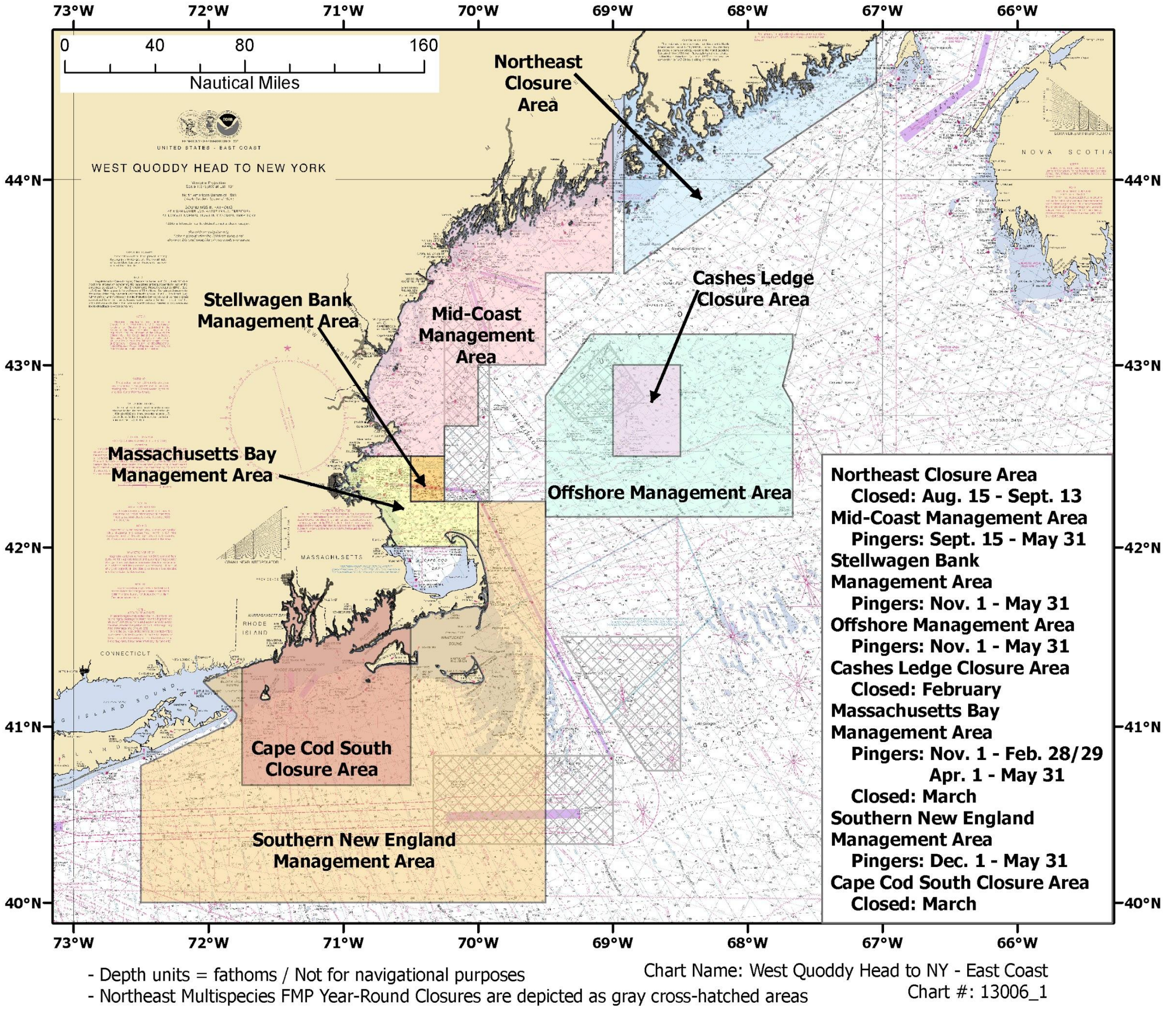
Purpose: to develop a plan to reduce the serious injury and mortality of harbor porpoises due to incidental interactions with gillnet fisheries

Harbor Porpoise Take Reduction Plan

Plan implemented: December 1998

- New England component
  - Seasonal pinger requirements
  - Seasonal closures
- Mid-Atlantic component
  - Seasonal gear modification requirements
  - Seasonal closures

New England HPTRP §229.33



All fishing with sink gillnets and other gillnets capable of catching multispecies in New England waters from Maine through Rhode Island

8 Management Areas

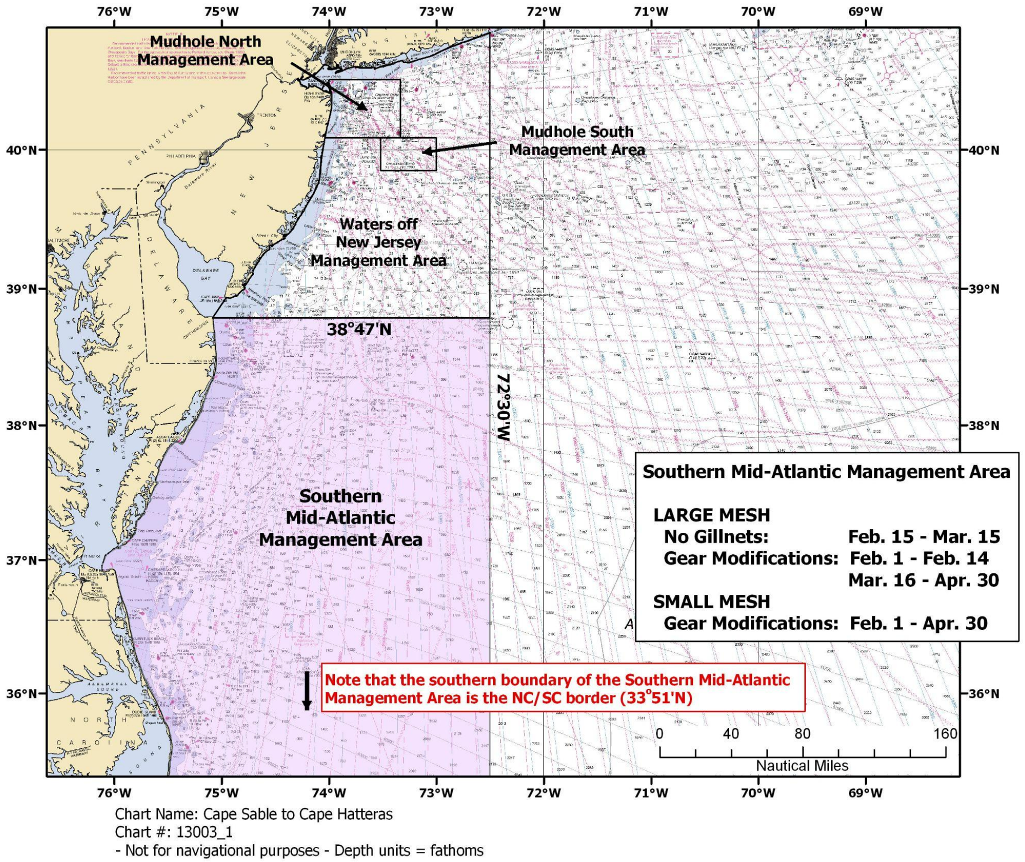
Mid Atlantic HPTRP §229.34

4 Management Areas

- Waters off New Jersey Management Area
- Mudhole North Management Area
- Mudhole South Management Area
- Southern Mid-Atlantic Management Area

Different Requirements for Small (5-7 inches) and Large (7-18 inches) Mesh Gear

Floatline Length	Net Size
Twine Size	Net Number
Tie Down	Nets in a String



Large Mesh Gillnet Requirements

Management Area	Floatline	Twine Size	Tie-downs	Net Size	Nets per vessel	Nets per String
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
Mudhole N	3900 ft max					13 panels max
Mudhole S						
S Mid Atlantic						

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Small Mesh Gillnet Requirements

<table>
<tr><th>Management Area</th><th>Floatline</th><th>Twine Size</th><th>Tie-downs</th><th>Net Size</th><th>Nets per vessel</th><th>Nets per String</th></tr>
<tr><td>Waters off NJ</td><td rowspan="3">3000 ft max</td><td rowspan="4">Min .81mm</td><td rowspan="4">Prohibited</td><td rowspan="4">300 ft max</td><td rowspan="4">45 max</td><td rowspan="3">10 panels max</td></tr>
<tr><td>Mudhole N</td></tr>
<tr><td>Mudhole S</td></tr>
<tr><td>S Mid Atlantic</td><td>2811 ft max</td><td>7 panels max</td></tr>
</table>

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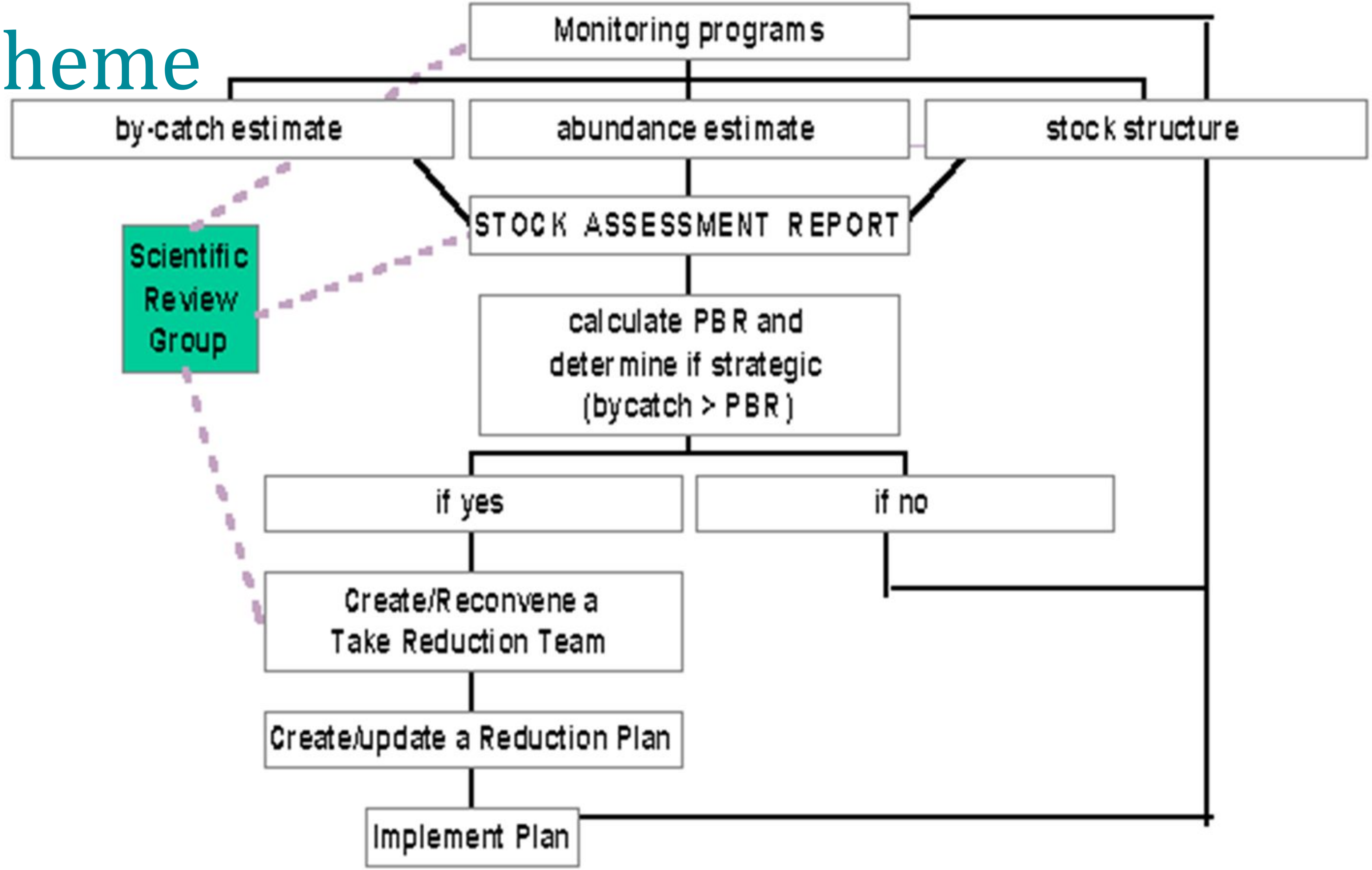
Current Abundance and Trends

Dr. Debra Palka, NEFSC

Overall Scheme



Gulf of Maine/Bay of Fundy Harbor Porpoise

$$PBR = N_{min} \cdot 1/2\, R_{max} \cdot F_R$$

Year	N_{best}	$CV(N_{best})$	N_{min}	R_{max}	F_r	PBR
1991	37,500	0.29	--	--		--
1992	67,500	0.23	40,297*	0.040	0.5	403
1995	74,000	0.20	48,289**	0.040	0.5	483
1999	89,739	0.22	74,695	0.040	0.5	747
2006	89,054	0.47	60,970	0.040	0.5	610
2011	79,883	0.32	61,415	0.046[2]	0.5	706
2016[1]	95,543	0.31	74,034	0.046[2]	0.5	844
2021 DRAFT	80,005	0.53	52,623	0.046[2]	0.5	605

* 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 ate-at-death data. Ecol. Appl. 18(8):1914-1931.

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

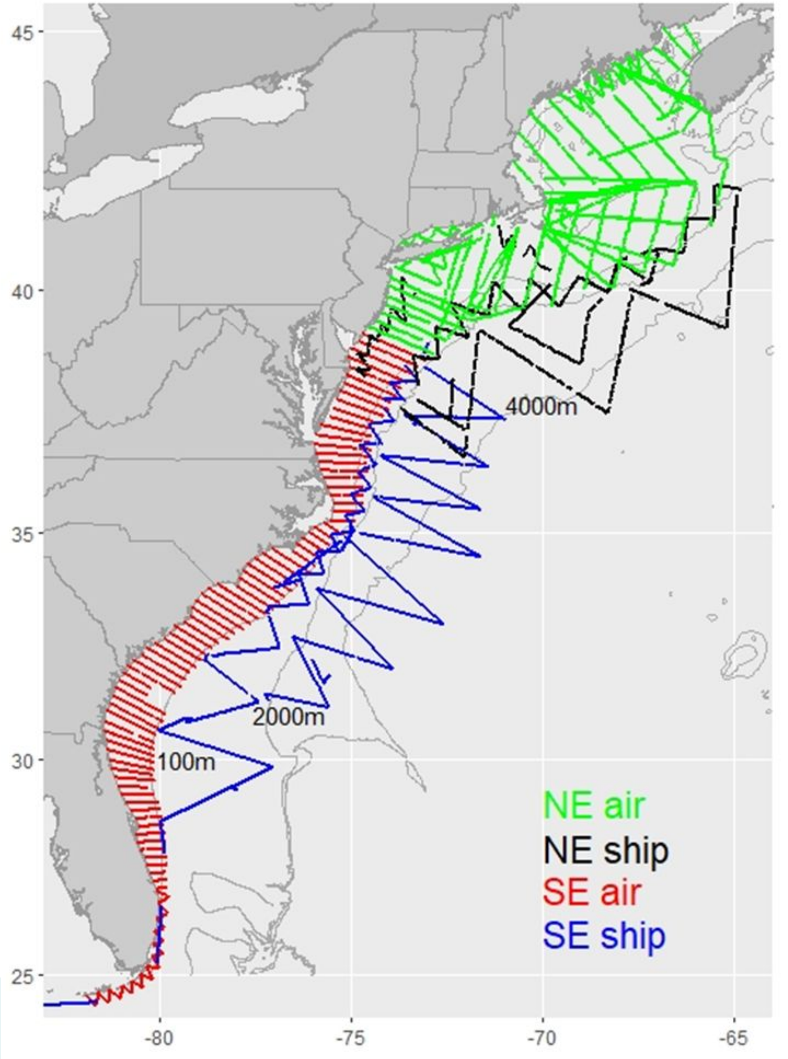
- Default = 0.04

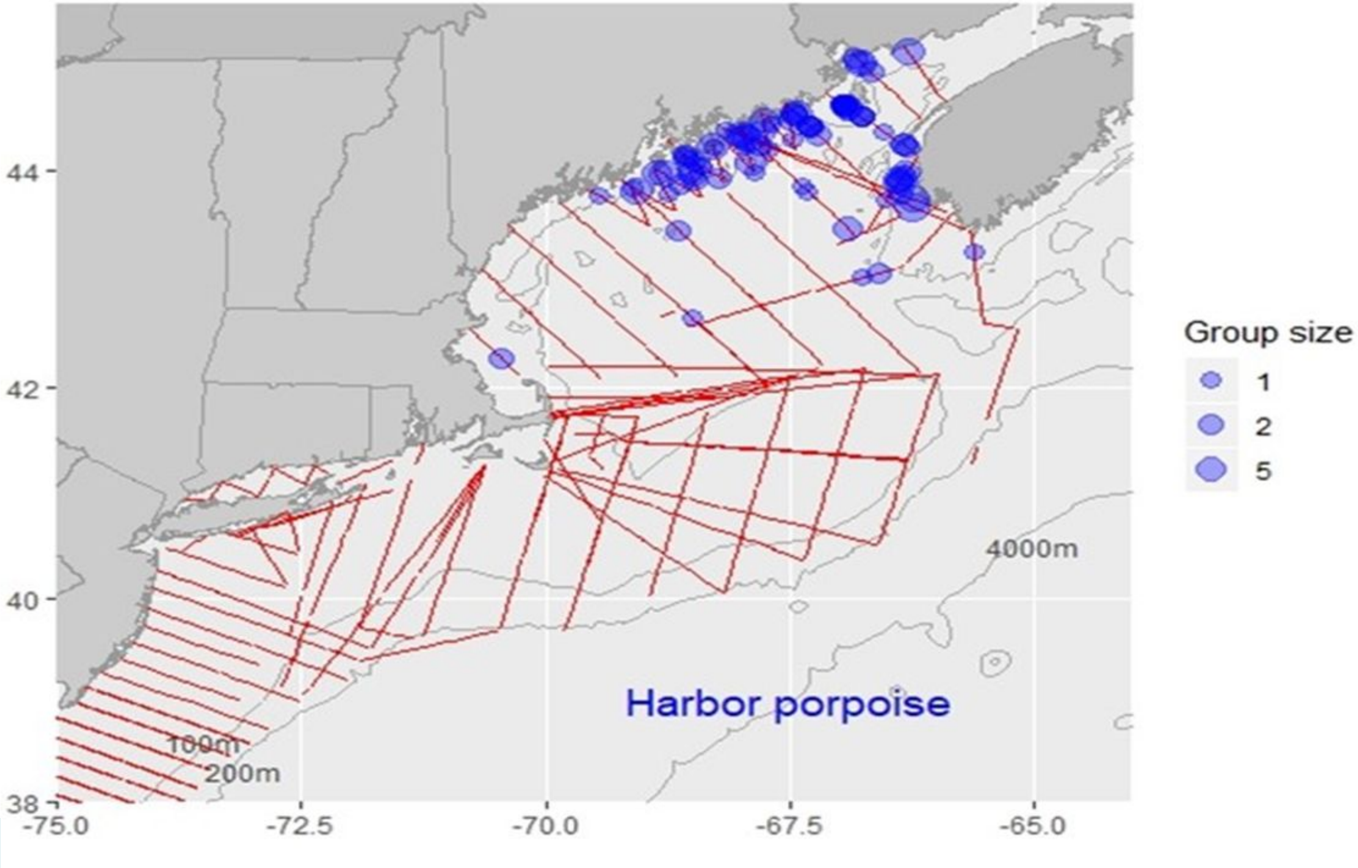
F_r = Recovery factor

- 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

[redacted]

2021 summer abundance survey





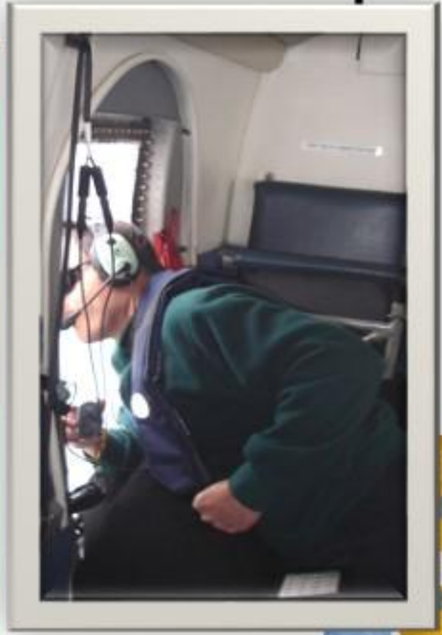
Calculate abundance estimate as accurate as possible

Front Team

Perception bias

- Due to animals that are available to be detected but are missed because of issues like poor sighting conditions.

- Accounted for in both ship and plane surveys by using 2 independent line transect platforms and mark-recapture distance analytical techniques to estimate g(0).

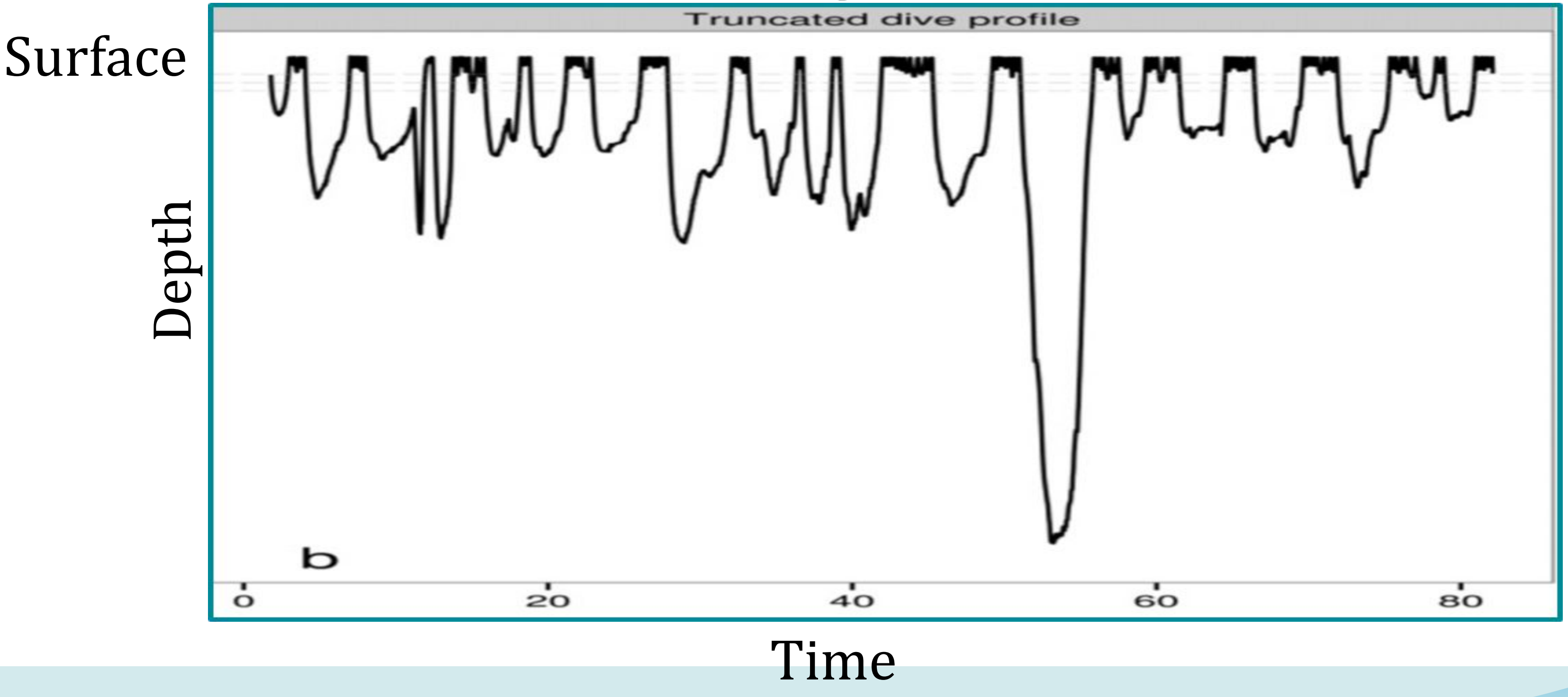


Back Team

Calculate abundance estimate as accurate as possible

Availability bias

- Due to animals that are not able to be detected because they are submerged.
- Accounted for using ancillary data on dive patterns and characteristics of the area that can be seen from the platform.



2021 abundance estimate

Density Estimate using Mark-recapture Techniques Accounting for Perception Bias:

$$\hat{N}_{perception} = \frac{A}{2wL} \sum_{i=1}^{n} \frac{s_i}{\hat{P}_a(z_i)\hat{p}_.(0,z_i)}$$

Density Estimate Accounting for Perception and Availability bias:

$$\hat{N}_{corrected} = \hat{N}_{perception} \cdot {}^{1}/_{\hat{a}(S,x)}$$

$$\hat{a}(S,x) = \frac{E(surface)}{E(surface)+E(dive)} + \frac{\hat{w}(x) - \hat{w}(x)^2 E(dive)^{-1} 0.5}{E(surface)+E(dive)}$$

PRELIMINARY ANALYSES SUBJECT TO REVISION

DRAFT

Gulf of Maine/Bay of Fundy stock

Abundance	80,005
Coefficient of variation (CV)	0.53

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Trends in Abundance

1. Investigate trends of summer abundance estimates from 1992 to 2016 data that were used in the PBR calculations, using MARSS models and habitat covariates

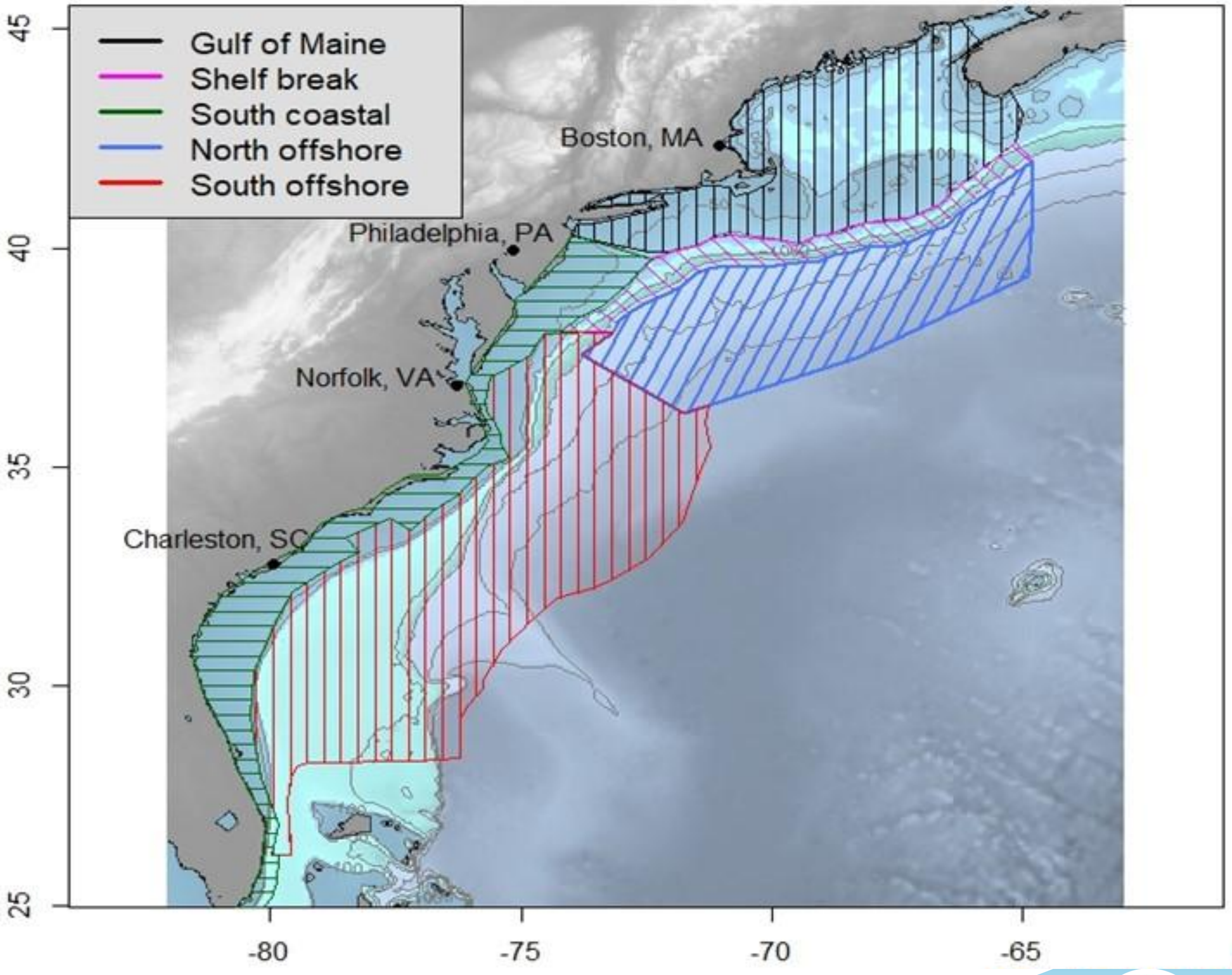
2. Investigate seasonal and annual trends during 2010 to 2017, using GAM models and habitat covariates

MARSS Input Data – 1992 to 2016

Standardized summer abundance estimates that were used in PBR

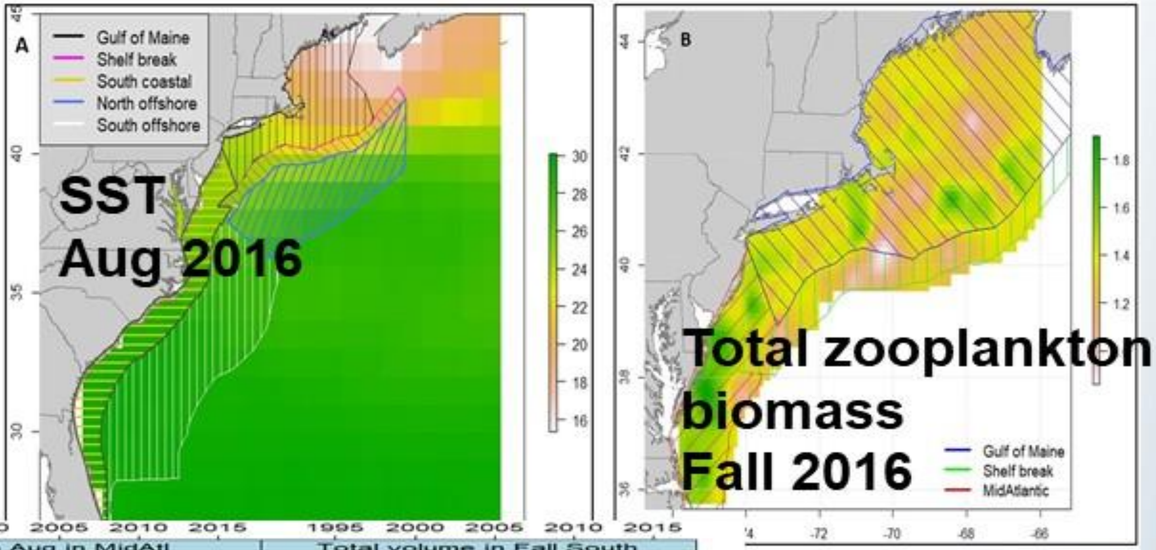
a. Original abundance estimates were independently analyzed from stratified shipboard and aerial data using standard distance sampling techniques

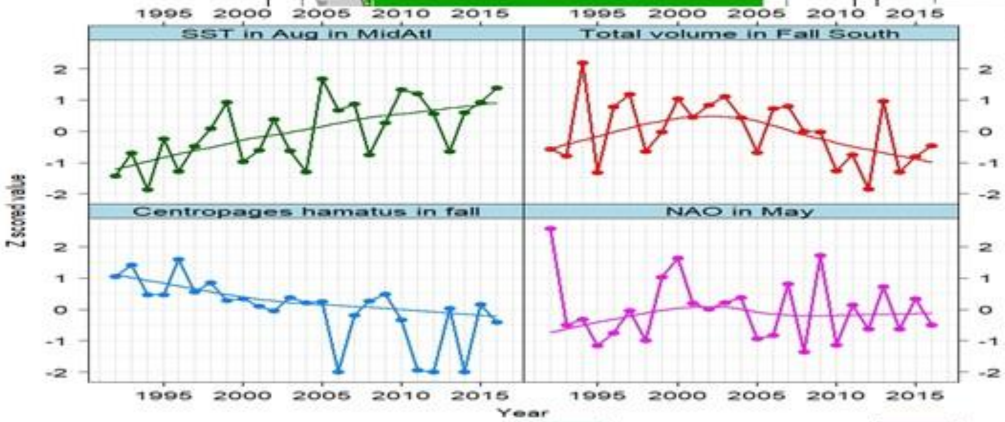
b. This analysis standardize abundance estimates to:
   a. Same ecosystem strata
   b. All estimates were corrected for availability and perception bias



MARSS Input Data - Covariates

1. Download habitat covariates
2. Divide into spatial strata
3. Develop monthly or seasonal (plankton only) time series within each spatial strata





<u>**Habitat Covariates**</u>

Atlantic Multidecadal Oscillation index

North Atlantic Oscillation

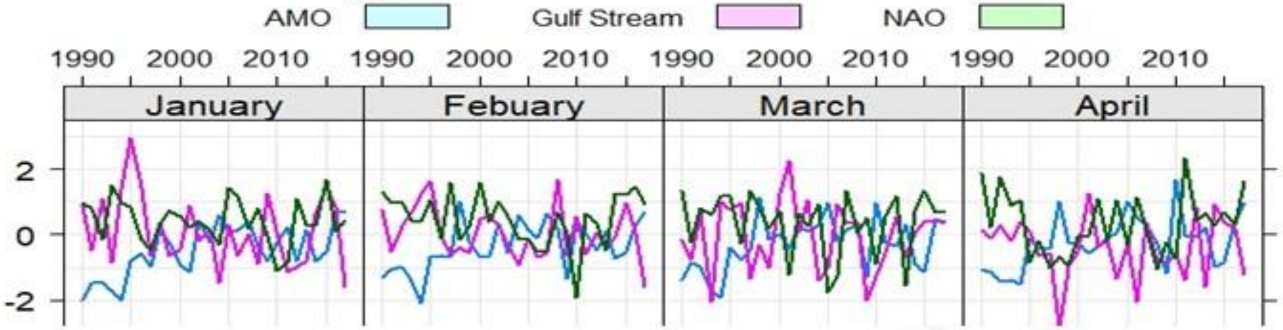
Gulf Stream north wall location index

Sea surface temperature

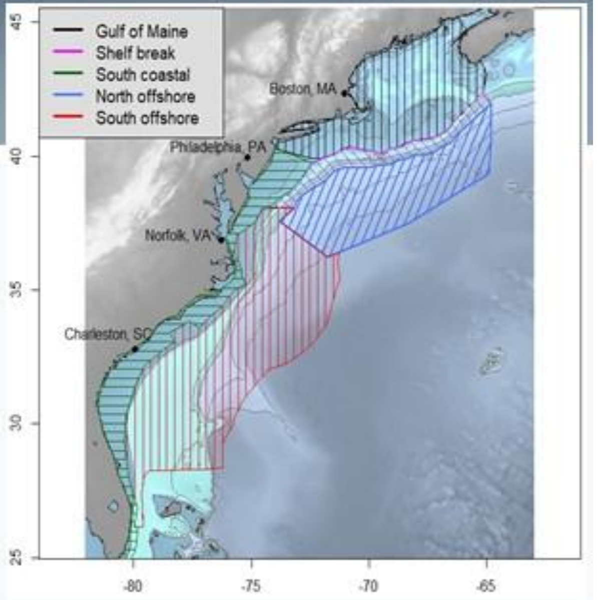
Bottom temperature

Zooplankton density

Planning to use fish density in future



Using Multivariate Autoregressive State Space models (MARSS)



- Assume density-independent, stochastic Gompertz exponential growth model.
- State-space model estimates process and observation error and incorporates covariates that influence the state space abundance trend

Habitat covariates at time t influencing state space

Rate of change over time series

Process error

Log (true abundance at time t)

$$x_t = Bx_{t-1} + Cc_t + u + w_t;\ w_t \sim MVN(0, Q)$$

Log (abundance estimate at time t)

$$y_t = Zx_{t-1} + Dd_t + v_t;\ v_t \sim MVN(0, R)$$

Observation error

MARSS = **M**ultivariate **A**utoregressive **S**tate-**S**pace model
MVN= **M**ulti-**V**ariate **N**ormal distribution
B = Autocorrelation in the states estimating density dependence
Z = Structural load of each state x_t on the observations y_t
D = Habitat covariates at time t influencing the observation process

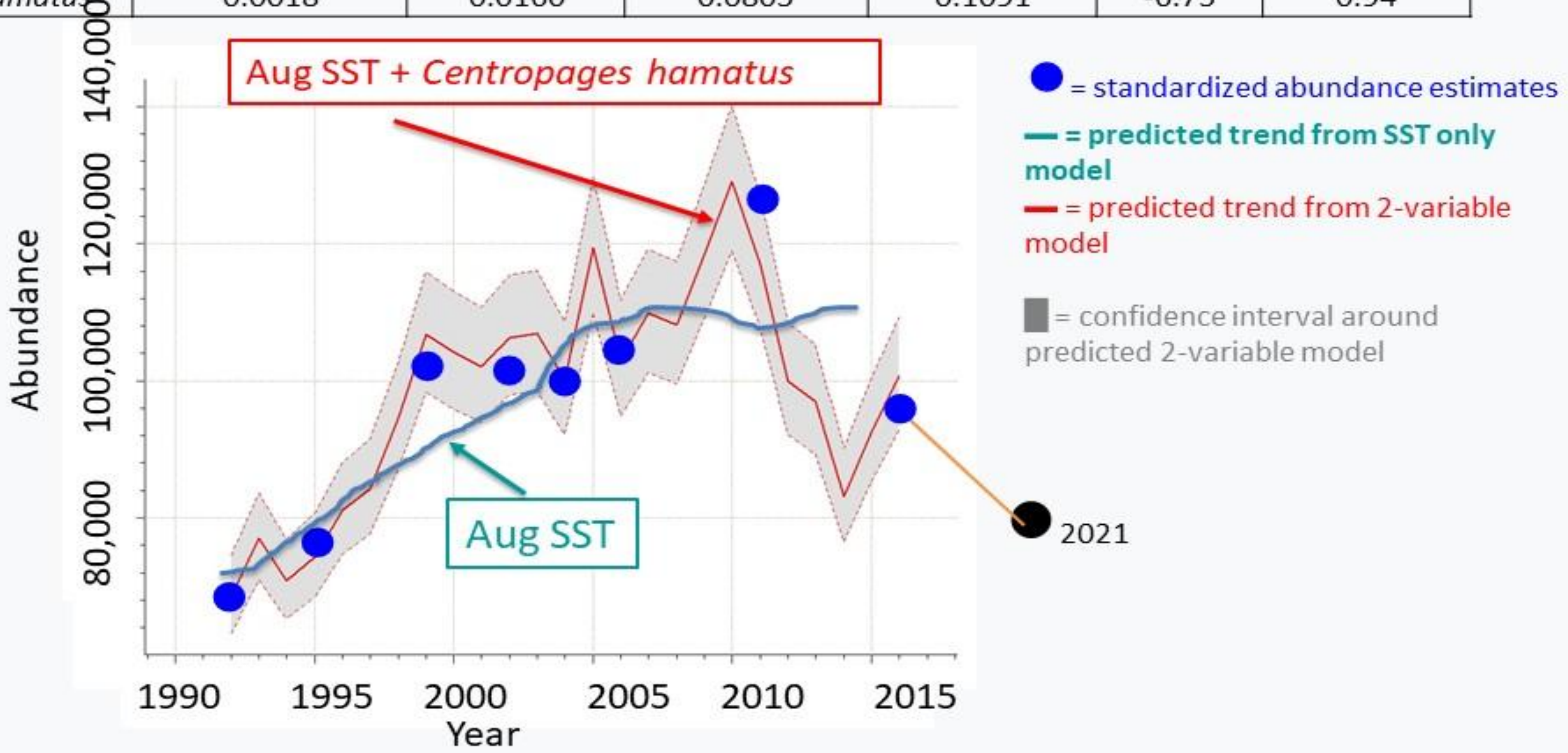
Preliminary Results – Harbor porpoise

PRELIMINARY ANALYSES SUBJECT TO REVISION

Coefficients of harbor porpoise MARSS 2-variable model

Initial log(abundance) = x0 = log(1992 estimate) = 11.11988. Process error = Q = 0.

Model	R (observation error)	U (rate of change)	State Covar – Aug SST	State Covar - plankton	AICc	R^2
Aug SST + *Centropages hamatus*	0.0018	0.0160	0.0803	0.1091	-6.75	0.94



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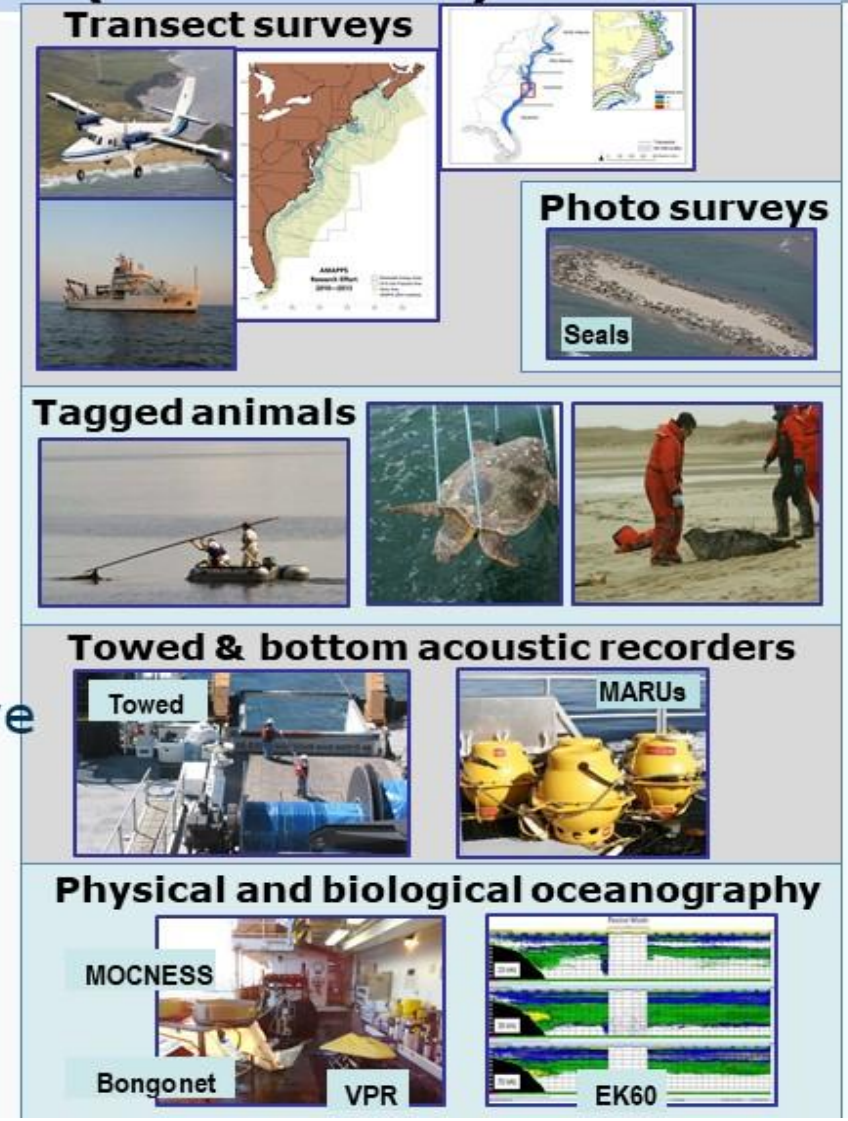
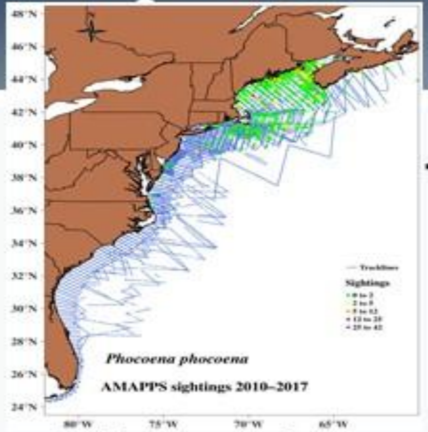
Atlantic Marine Assessment Program for Protected Species (AMAPPS)

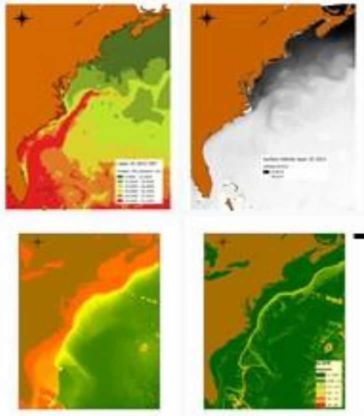
- NMFS, USFWS, BOEM, Navy + other organizations
- Cetaceans, sea turtles, seabirds, pinnipeds, other trophic levels
- Line and strip transects; towed and bottom mounted acoustic arrays; individual animal tags
- FY 2010-FY2023 (+?)
- Abundance, density maps, relative density, “hot spots”, migration patterns, relationships with physical and biological habitat
- Data archived in OBIS, “Seabird Compendium”, NEFSC databases



Spatiotemporal Density Analysis Process and Products

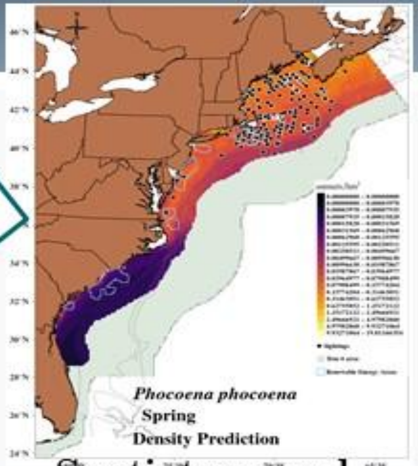


Transect data
+
6 static and 16 dynamic habitat covariate data



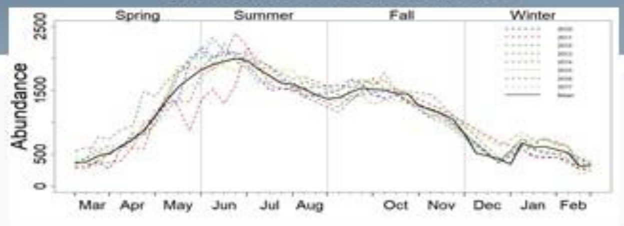
Distance sampling

GAM and Bayesian hierarchical modeling frameworks

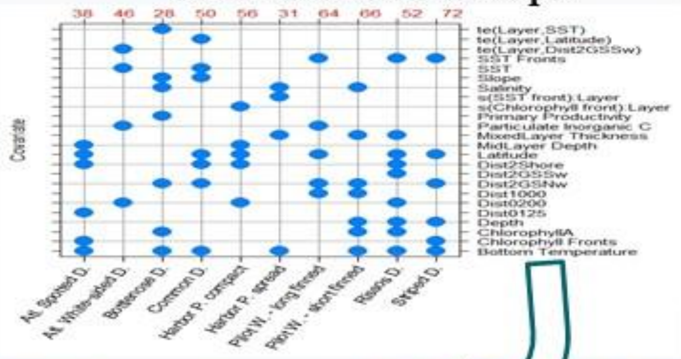


Spatiotemporal distribution density maps

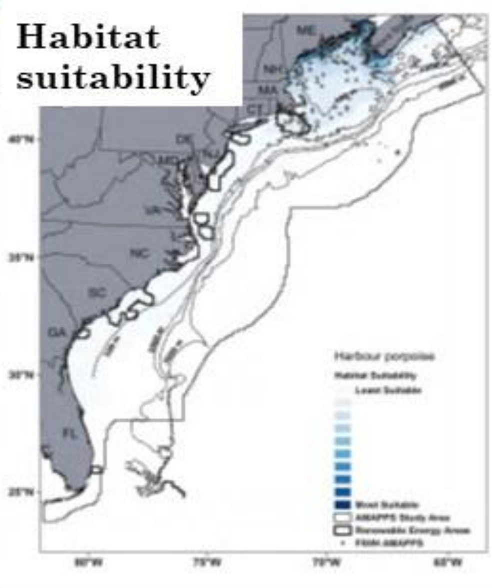
Abundance trends

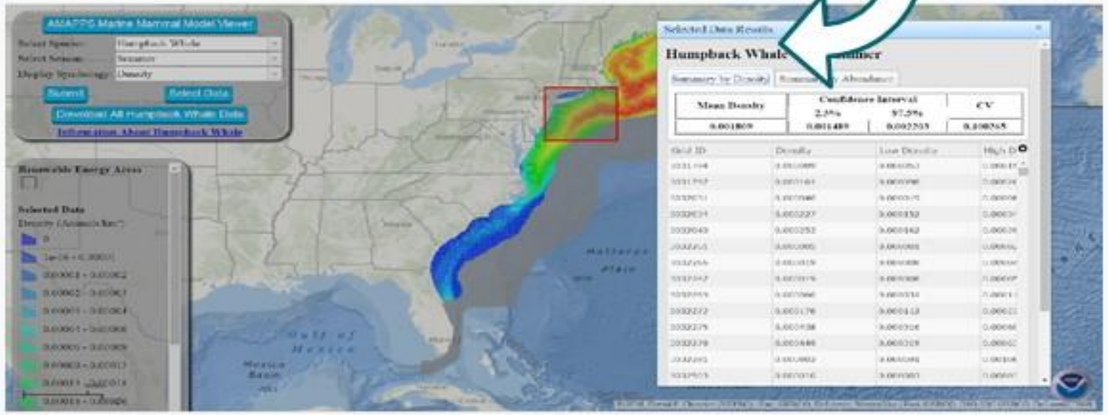


Habitat relationships



Habitat suitability





Available online for managers, scientists, stakeholders, general public

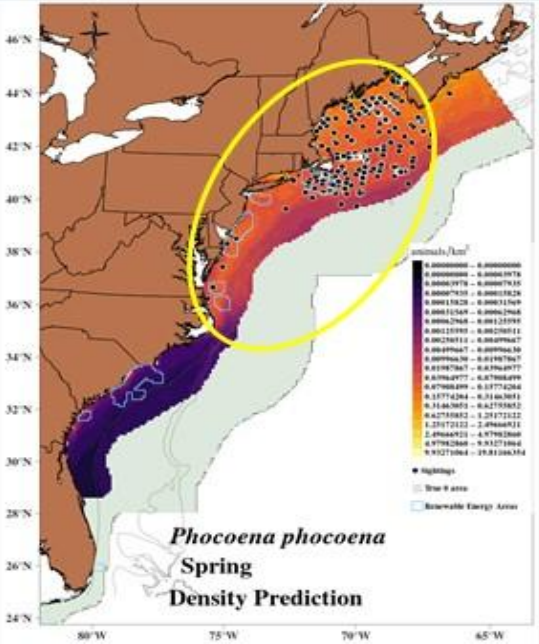
From: Palka et al. 2021. Atlantic Marine Assessment Program for Protected Species: FY15 – FY19. Washington DC: US Department of the Interior, Bureau of Ocean Energy Management. OCS Study BOEM 2021-051. 330 p.
https://marinecadastre.gov/espis/#/search/study/100066

https://apps-nefsc.fisheries.noaa.gov/AMAPPSviewer/
https://github.com/NEFSC/READ-PSB-AMAPPS-public

Complex relationships between density and environmental covariates

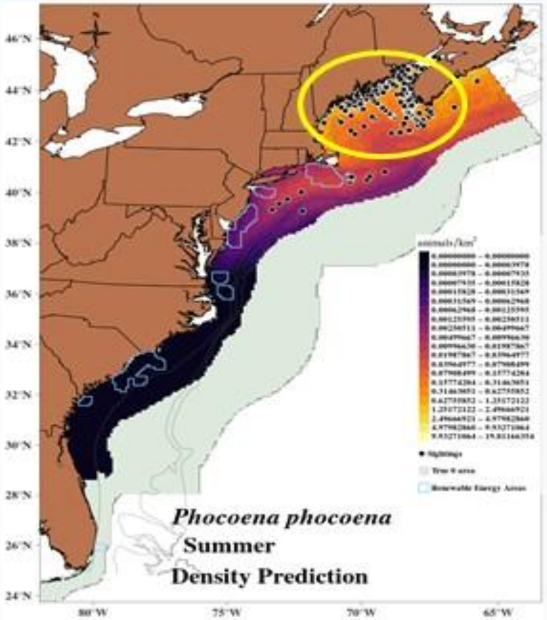
November – May: spread out distribution

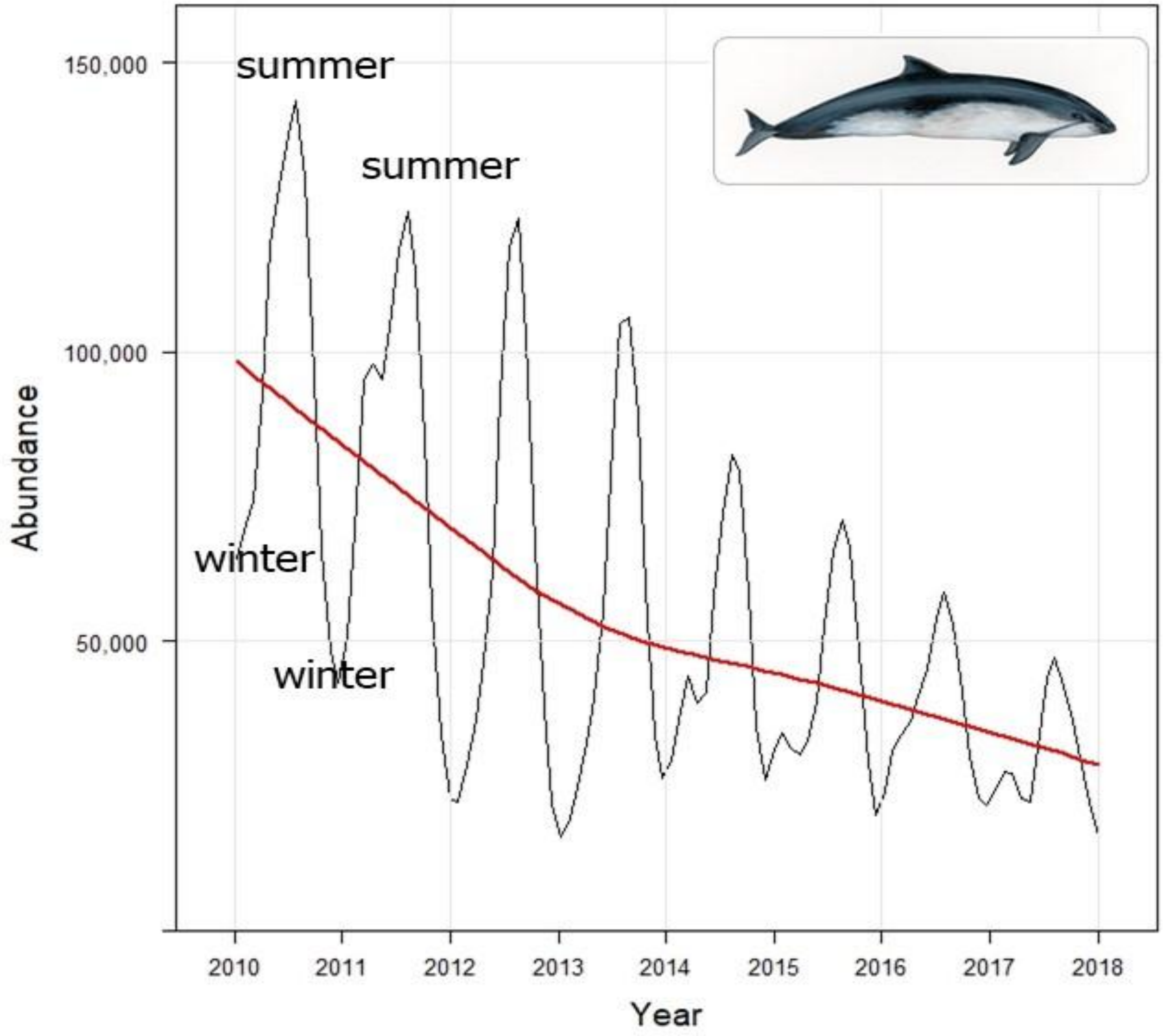
Deviance explained	Covariate
15.5	Surface salinity (psu)
8.7	Strength of sea surface temperature front * time of year
5.6	Mixed depth thickness (m)
1.1	Bottom temperature (°C)



June to October: compact distribution

Deviance explained	Covariate
29.3	Latitude (°N)
13.9	Strength of chlorophyll front * time of year
4.9	Mixed depth layer (m)
4.4	Distance to 200 m depth contour (m)
3.3	Distance to nearest shoreline (m)





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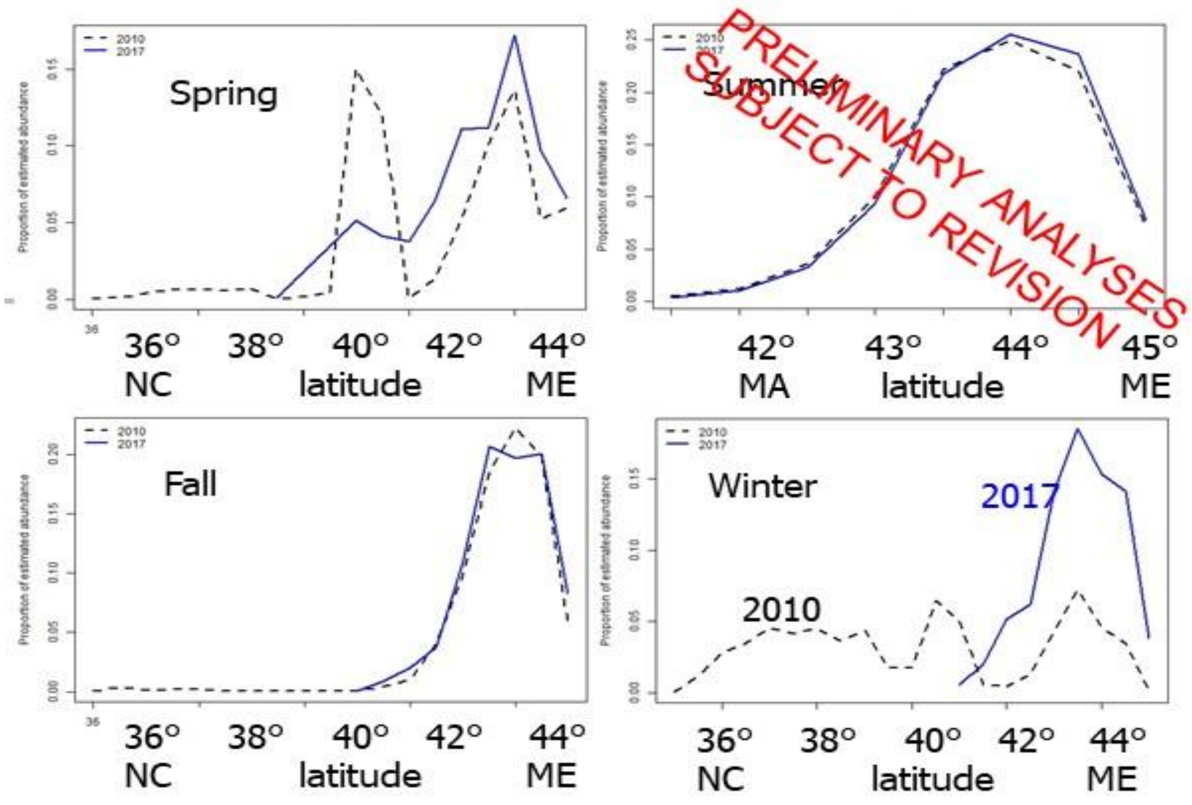
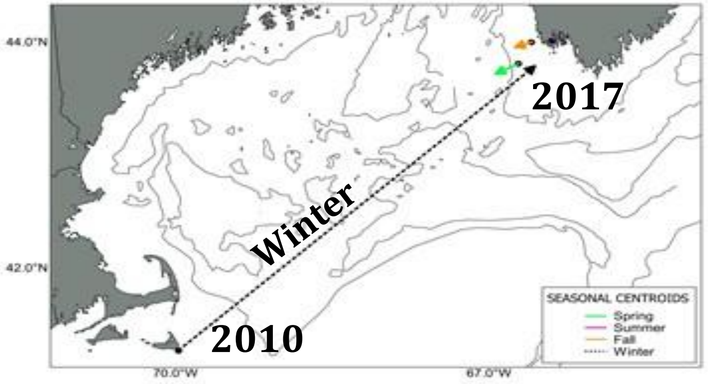




From: Chavez-Rosales et al. *Detection of habitat shifts of cetacean species: A comparison between 2010 and 2017 habitat suitability conditions in the Northwest Atlantic Ocean.* In review at Frontiers in Marine Science.

Summary of harbor porpoise abundance and trends

PRELIMINARY ANALYSES, SUBJECT TO REVISION

UPDATED ABUNDANCE ESTIMATE

From 2021 summer coastwise line transect abundance survey

- preliminary abundance estimate (N_{best}) = 80,005 CV = 0.53
- preliminary PBR = 605, if R_{max} = 0.046 and F_r = 0.5

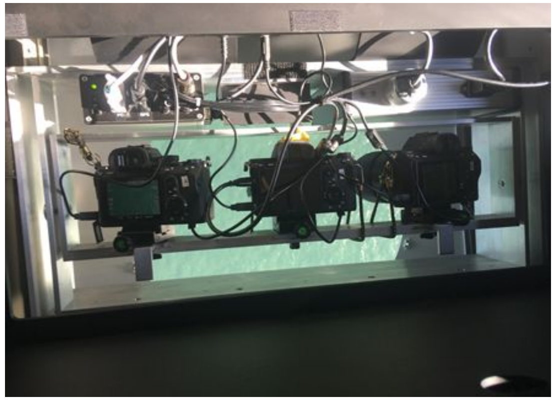
TRENDS

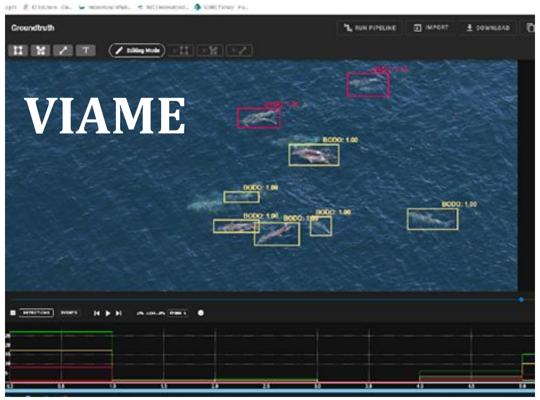
In US waters and the Canadian Gulf of Maine waters:

1. General seasonal patterns:
   - Summer abundance > spring and fall abundance > winter abundance
2. In the summer:
   - Between 1992 and 2010/2011, the numbers of harbor porpoises increased about 2-3% per year, on average
   - Between 2010/2011 and 2021, the numbers decreased
   - This pattern appears to be related to shifts in habitat characteristics, such as sea surface temperature and zooplankton distribution.
3. Between 2010 and 2017 (and maybe to 2021) :
   - In the winter, the number of harbor porpoises declined slightly, but the central region they inhabited shifted dramatically northeastern toward the Canadian Scotian shelf waters.
   - In the summer, the numbers of harbor porpoises declined, but the central region they inhabited remained relatively consistent

Work in progress

1. Finalize summer 2021 abundance estimate (then calculate PBR)
2. Collaborate with Canadians to describe harbor porpoise abundance and distribution in Canadian Gulf of Maine and Scotian shelf waters
3. Update stock structure analyses using recent samples
4. Complete population dynamic trends analysis using abundance data up to 2021 and using more covariates, such as fish spatiotemporal densities
5. Using 2018 – 2021 AMAPPS seasonal abundance survey data, develop updated habitat-density models and maps for all months
6. Due to 900 ft tall wind turbines, started pilot study to investigate flying at 1500 ft with cameras in belly window port of NOAA Twin Otters and using artificial intelligence and deep learning methods to develop algorithms to automatically identify species from images.





https://marinecadastre.gov/espis/#/search/study/100066

https://www.nefsc.noaa.gov/AMAPPSviewer/

https://www.fisheries.noaa.gov/new-england-mid-atlantic/population-assessments/atlantic-marine-assessment-program-protected

2018-20 Bycatch and Compliance

Kristin Precoda, Integrated Statistics/NEFSC

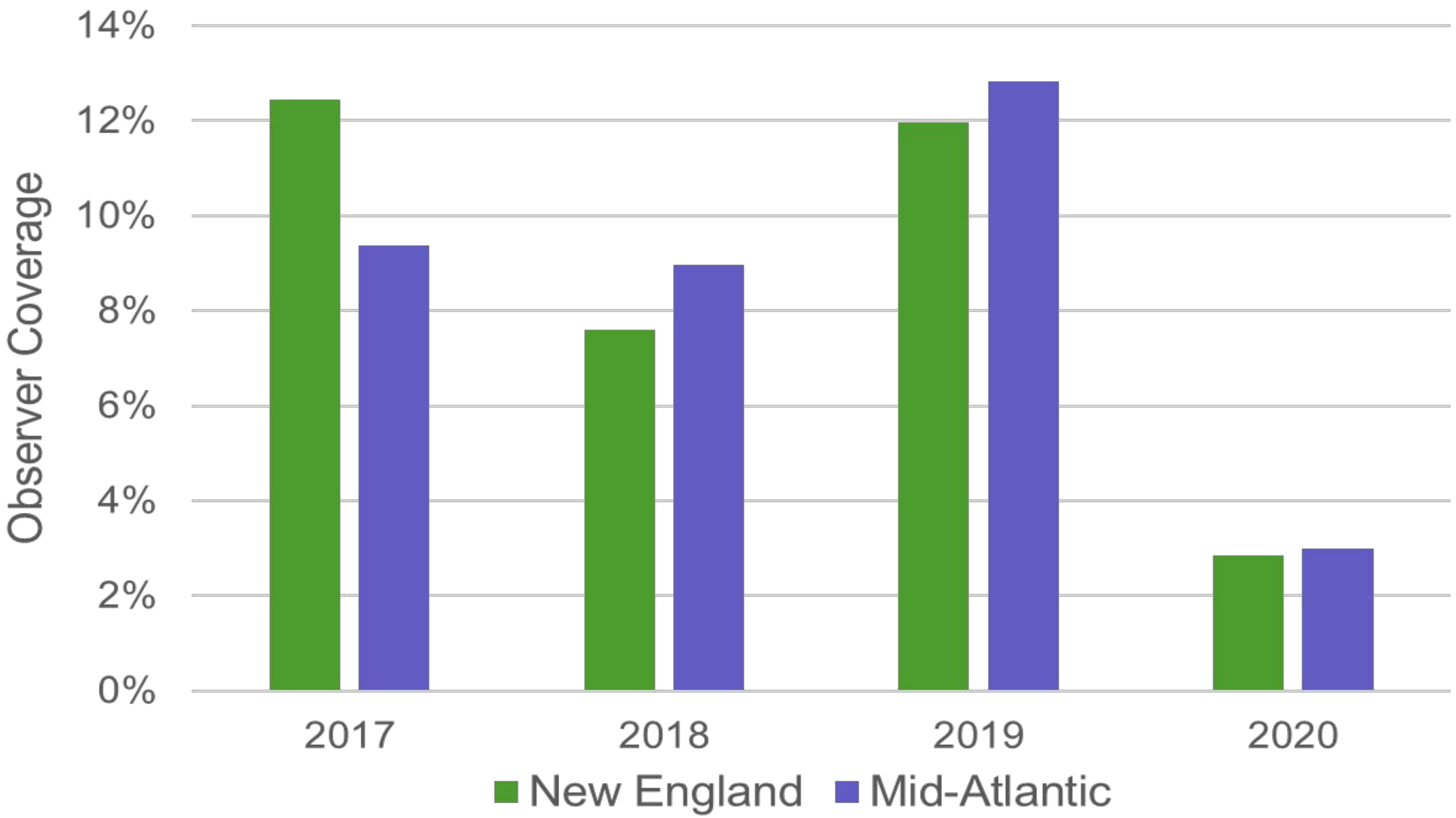
Chris Orphanides, NEFSC

Outline

- 2018-20 Bycatch Summary
  - Observer Coverage
  - Observed Harbor Porpoise Takes
  - Estimated Annual Takes
  - Gear Characteristics
- Longer Term Trends
- Compliance with HPTRP Pinger Use & Gear Modifications
- Outlook for 2021

2018-20 Bycatch Summary

2017-20 Observer Coverage Per Region



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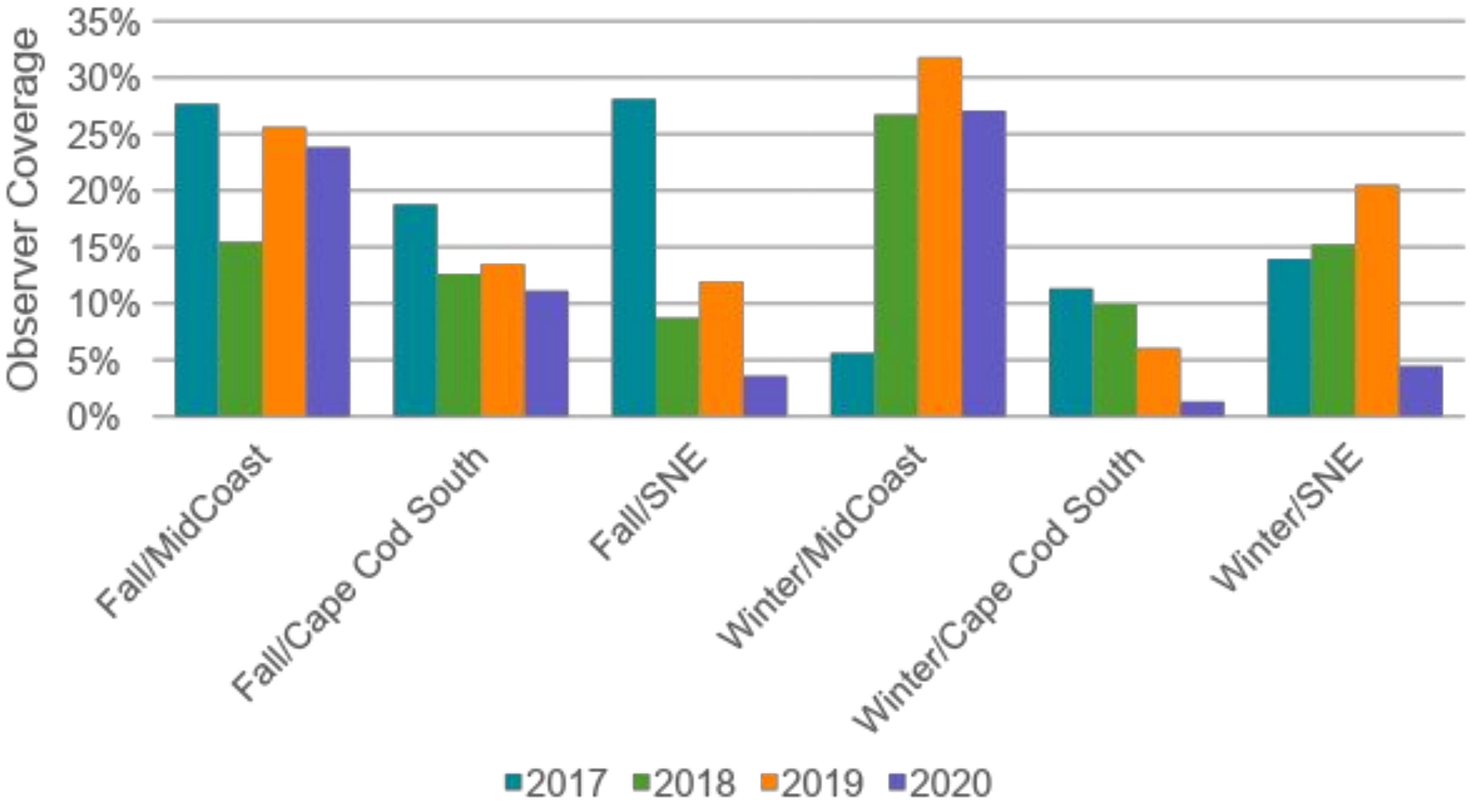
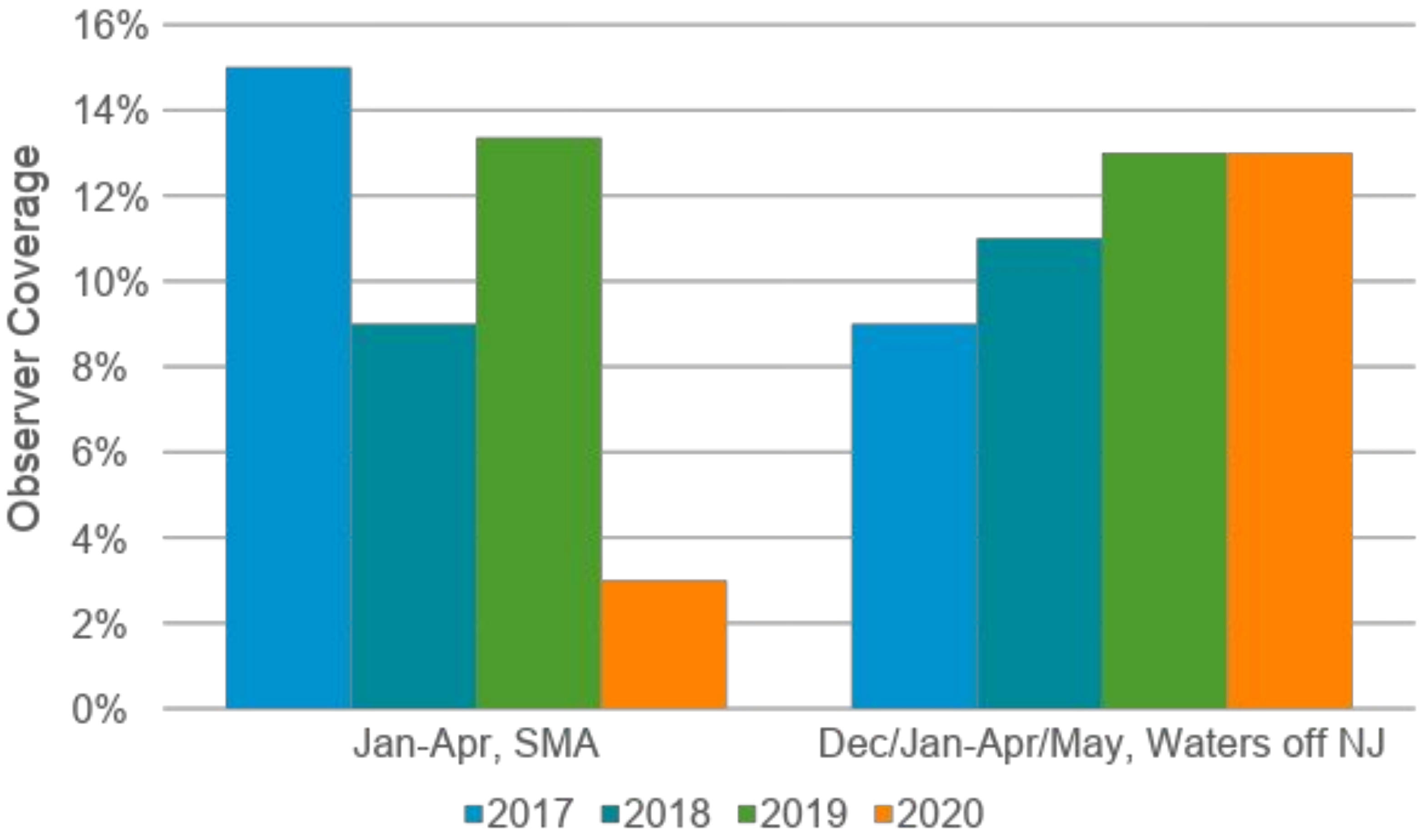
2017-20 Observer Coverage of Key Bycatch Times/Areas in New England

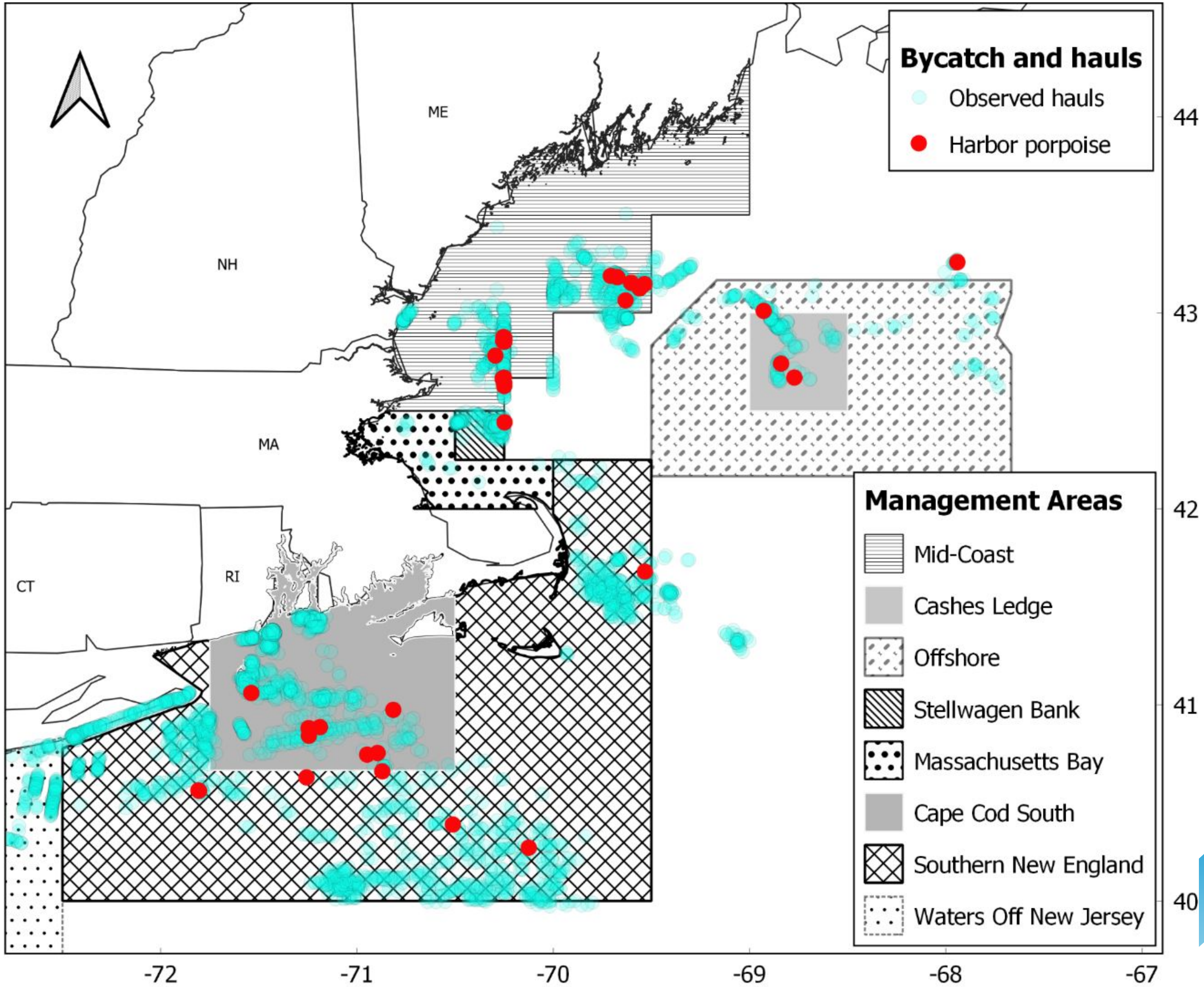


2017-20 Observer Coverage of Bycatch Times in Mid-Atlantic



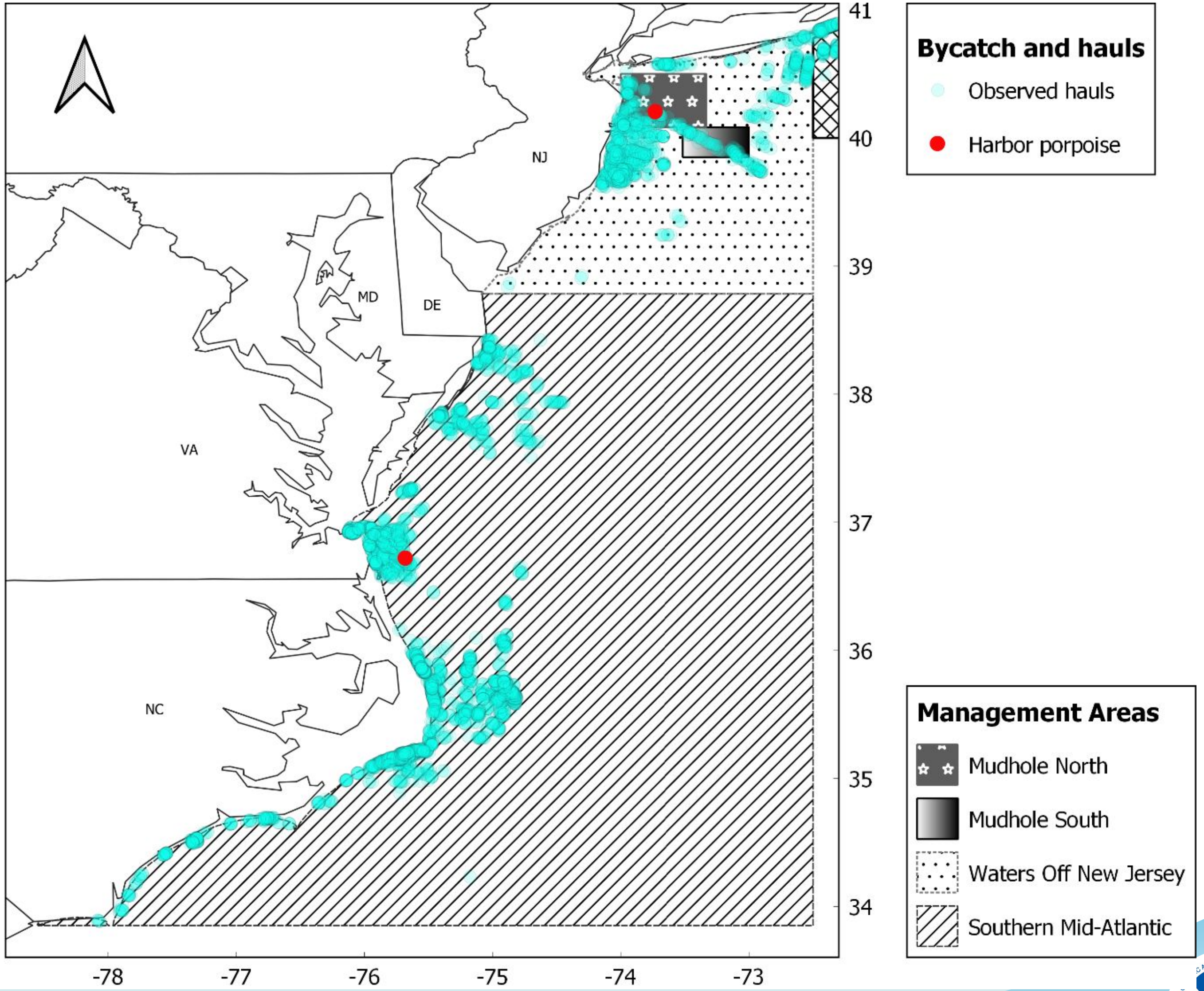
Bycatch Locations -

- 42 observed takes
  - 26 in GOM
  - 16 in SNE



Bycatch Locations – Mid-Atlantic – 2018-19

- 2 takes observed in the Mid-Atlantic



How to Estimate Total Bycatch

- Estimated total bycatch = bycatch rate * VTR landings

- Within each spatial area & season:
  bycatch rate = takes / mtons landed
  - On observed trips

- In New England: within each spatial area and season:
  - Calculate 4 rates:

Hauls with	Groundfish	Other
Pingers	Rate1	Rate2
No pingers	Rate3	Rate4

  - Weight by fractions of observed hauls with/without pingers and fraction of groundfish/other landings
  - Sum to get rate per area & season

2018 Estimated Takes – New England

Season	Portgroup (P) / Management Area (MA)	Observed Bycatch	Bycatch Rate	Estimated Bycatch	CV	95% CI
W	Mid-Coast (MA)	1	0.030	3.83	1.11	1-35
W	Southern New England (MA)	1	0.005	6.81	0.92	1-29
W	Subtotal	2	-	10.64	0.74	2-52
F	Mid-Coast (MA)	3	0.052	18.92	0.53	5-50
F	North of Boston (P)	1	0.071	2.97	0.88	1-17
F	Cape Cod South (MA)	2	0.066	15.88	0.63	2-46
F	Southern New England (MA)	1	0.184	43.96	1.01	1-318
F	Subtotal	7	-	81.73	0.52	30-303
	Total	**9**	**-**	**92.37**	**0.52**	**39-312**

DRAFT 2019 Estimated Takes – New England

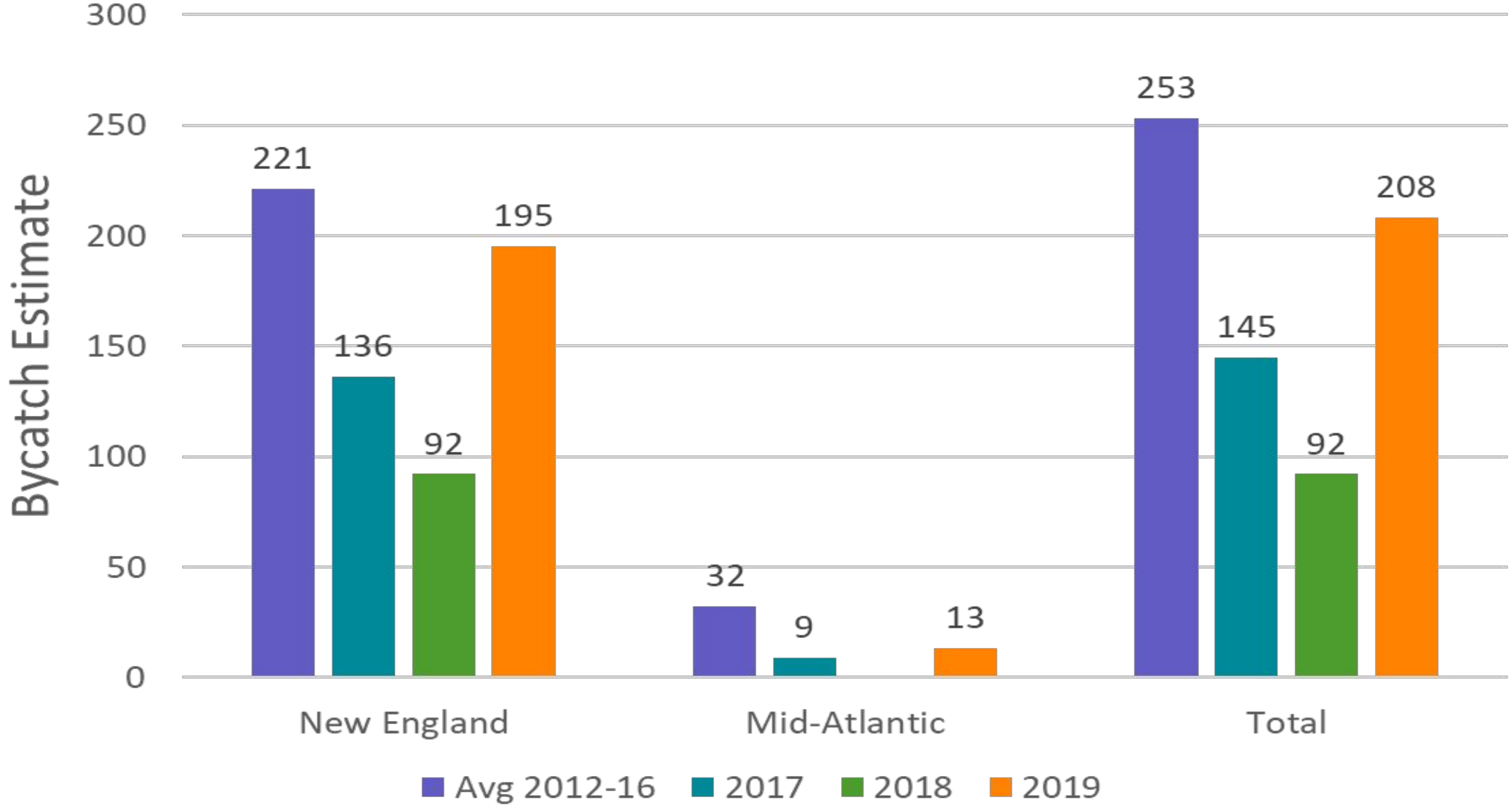
Season	Portgroup (P) / Management Area (MA)	Observed Bycatch	Bycatch Rate	Estimated Bycatch	CV	95% CI
W	Cape Cod South (MA)	4	0.090	65.54	0.58	17-178
W	Mid-Coast (MA)	7	0.262	21.57	0.44	8-76
W	Offshore (MA)	2	0.054	3.76	0.27	2-9
W	Offshore (P)	1	0.106	2.24	0.37	1-5
W	Southern New England (MA)	6	0.016	30.92	0.34	14-69
W	Subtotal	20	-	124.04	0.30	63-233
S	North of Boston (P)	1	0.034	9.05	0.99	1-58
S	Offshore (P)	1	0.043	9.07	0.80	1-38
S	Southern Maine (P)	3	0.060	15.88	0.41	6-39
S	Subtotal	5	-	34.00	0.39	13-77
F	Cape Cod South (MA)	1	0.043	9.77	1.57	1-74
F	Mid-Coast (MA)	7	0.089	27.34	0.25	15-51
F	Subtotal	8	-	37.12	0.42	18-99
	Total	**33**	**-**	**195.15**	**0.22**	**120-306**

DRAFT 2020 Observed Takes – New England

Season	Portgroup (P) / Management Area (MA)	Observed Bycatch
W	Mid-Coast (MA)	5
W	Subtotal	5
F	Mid-Coast (MA)	1
F	Stellwagen Bank (MA)	4
F	Subtotal	5
	Total	**10**

- Low observer coverage in 2020 gives an inaccurate picture of bycatch and high uncertainty
- Bycatch estimates would be hard to interpret and not easily comparable with past years
- Bycatch estimates have not been calculated for 2020

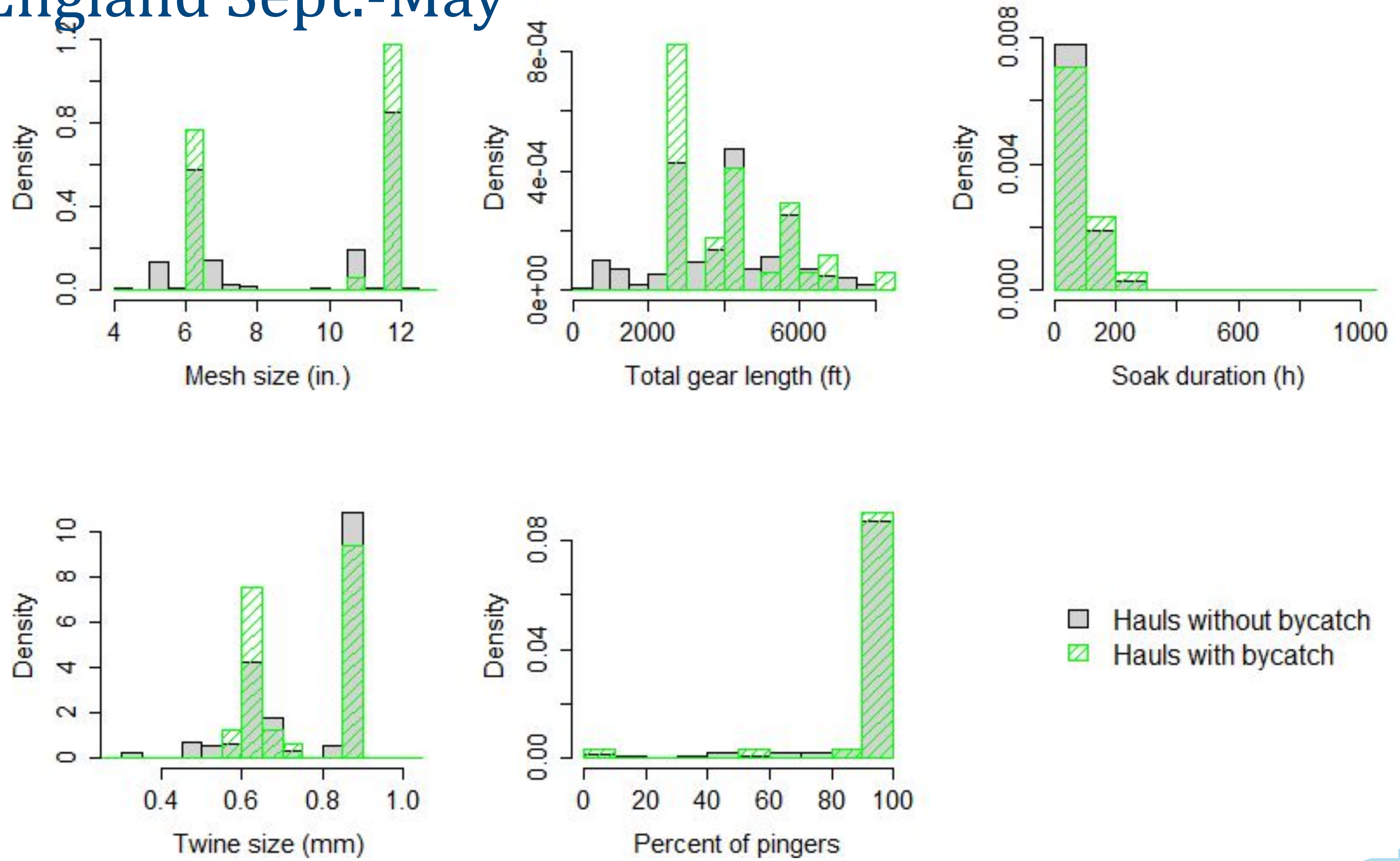
Estimated Total Takes for 2017, 2018, and DRAFT 2019



PBR: 706 844 851 851

2018-19 Bycatch Gear Characteristics

New England Sept.-May



 U.S. Department of Commerce | National Oceanic and Atmospheric Administration | National Marine Fisheries Service

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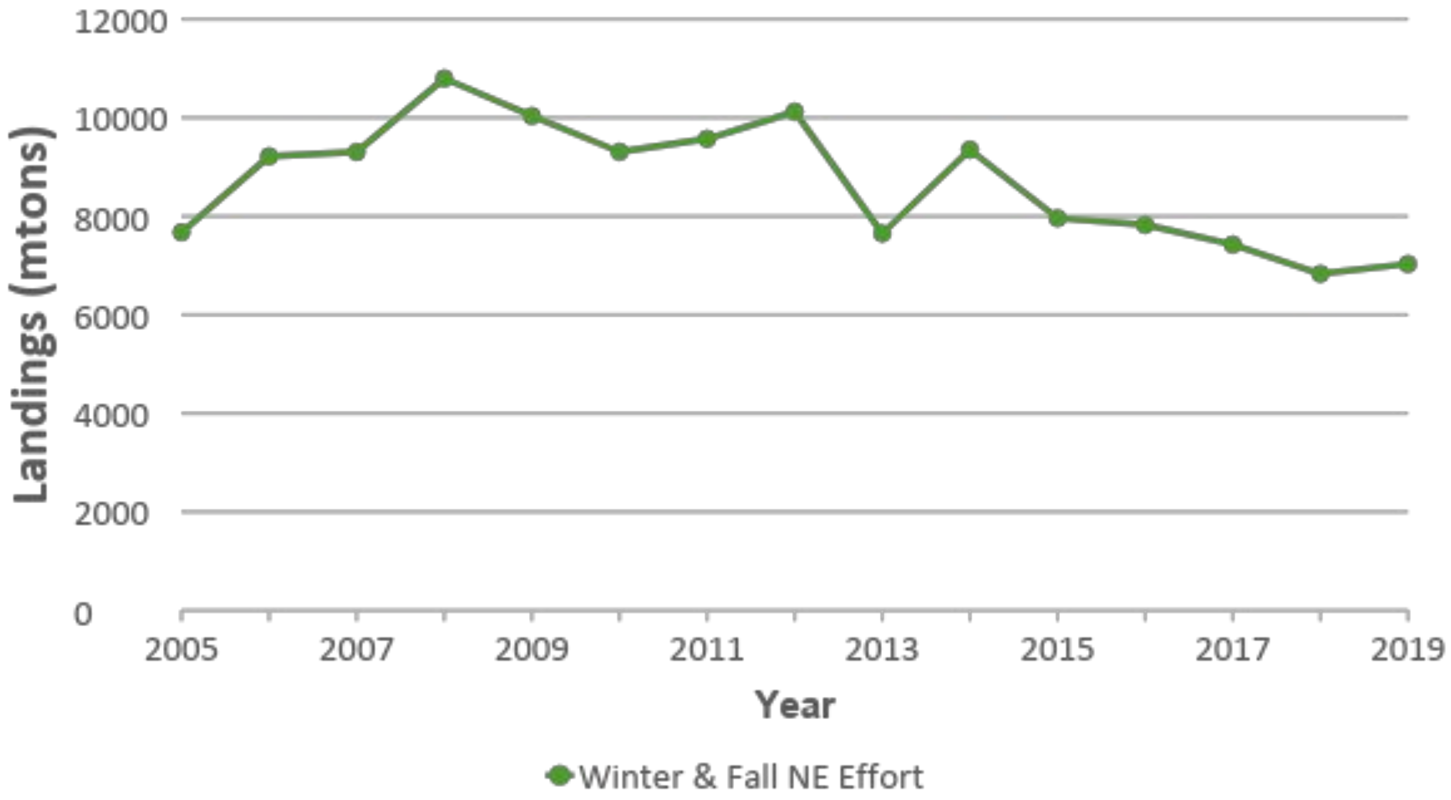
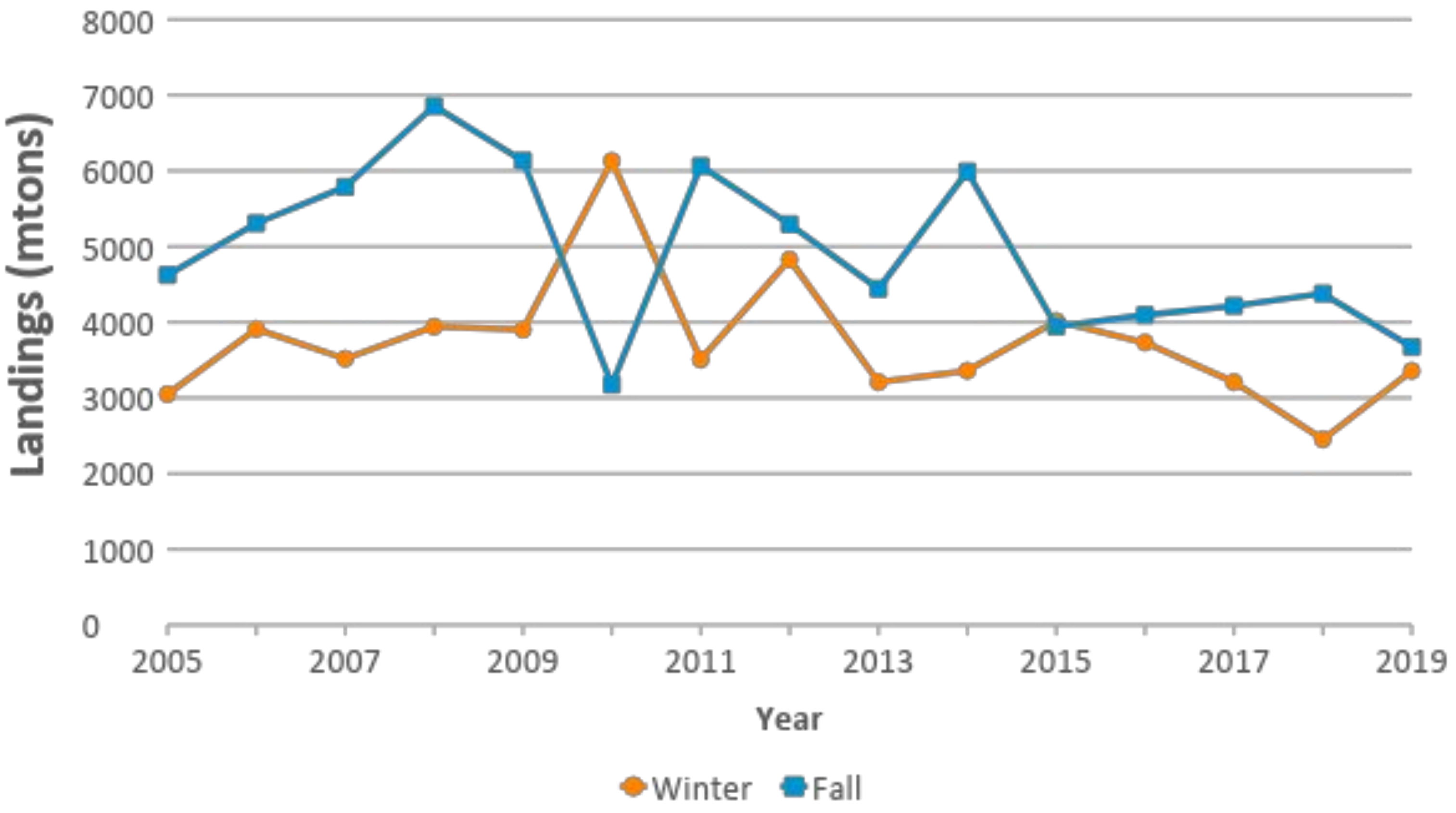
Longer-Term Effort and Bycatch Trends

New England Gillnet Effort Over Time



Combined winter and fall New England landings in 2019 are 25% lower than in 2014 and 35% lower than in 2008

New England Gillnet Effort Shifts Over Time



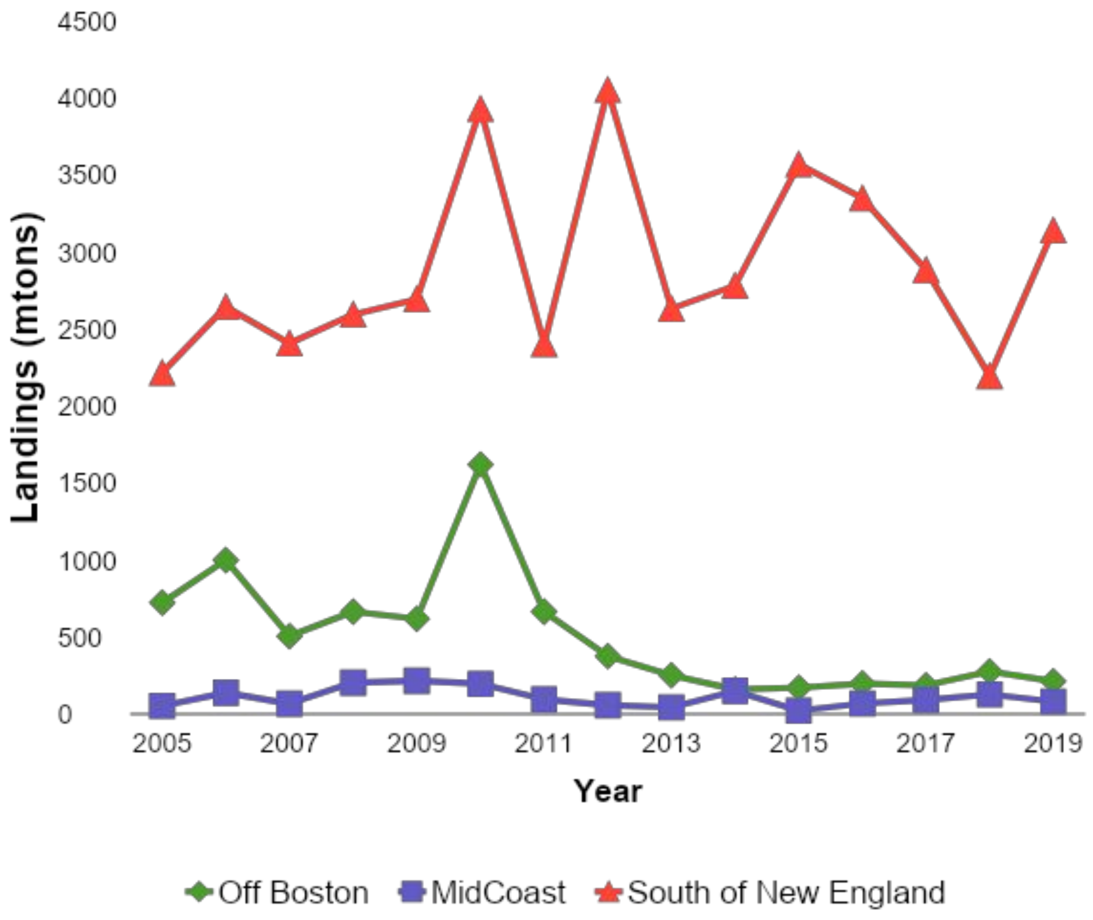
More long-term reduction in fall effort than in winter effort

New England Winter Gillnet Effort Over Time

Winter Gillnet Effort

(*Pooled port groups and management areas*)

- Landings south of New England (east of the mid-Atlantic) vary but not much trend
- Stable landings in the Gulf of Maine but lower than pre-2011

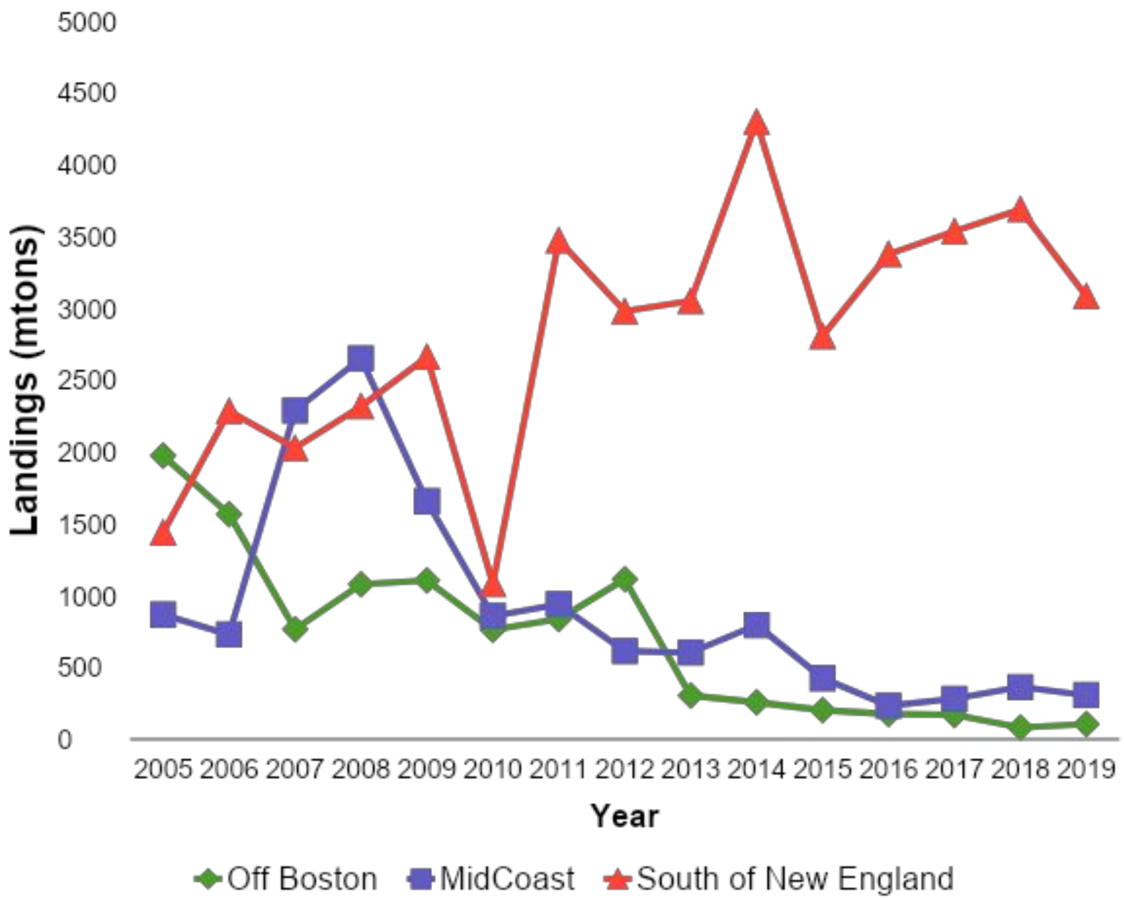


New England Fall Gillnet Effort Over Time

Fall Gillnet Effort

(*Pooled port groups and management areas*)

- Total landings similar since 2013, dominated by south of New England (east of the mid-Atlantic)
- Since 2010, distribution of fall effort has become more similar to winter effort



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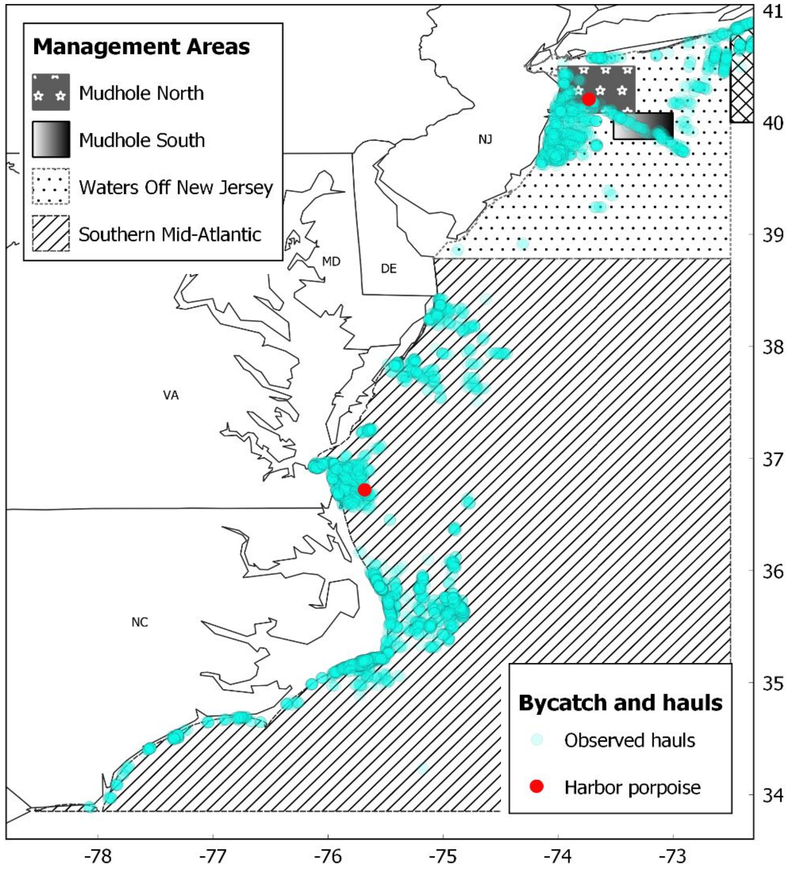
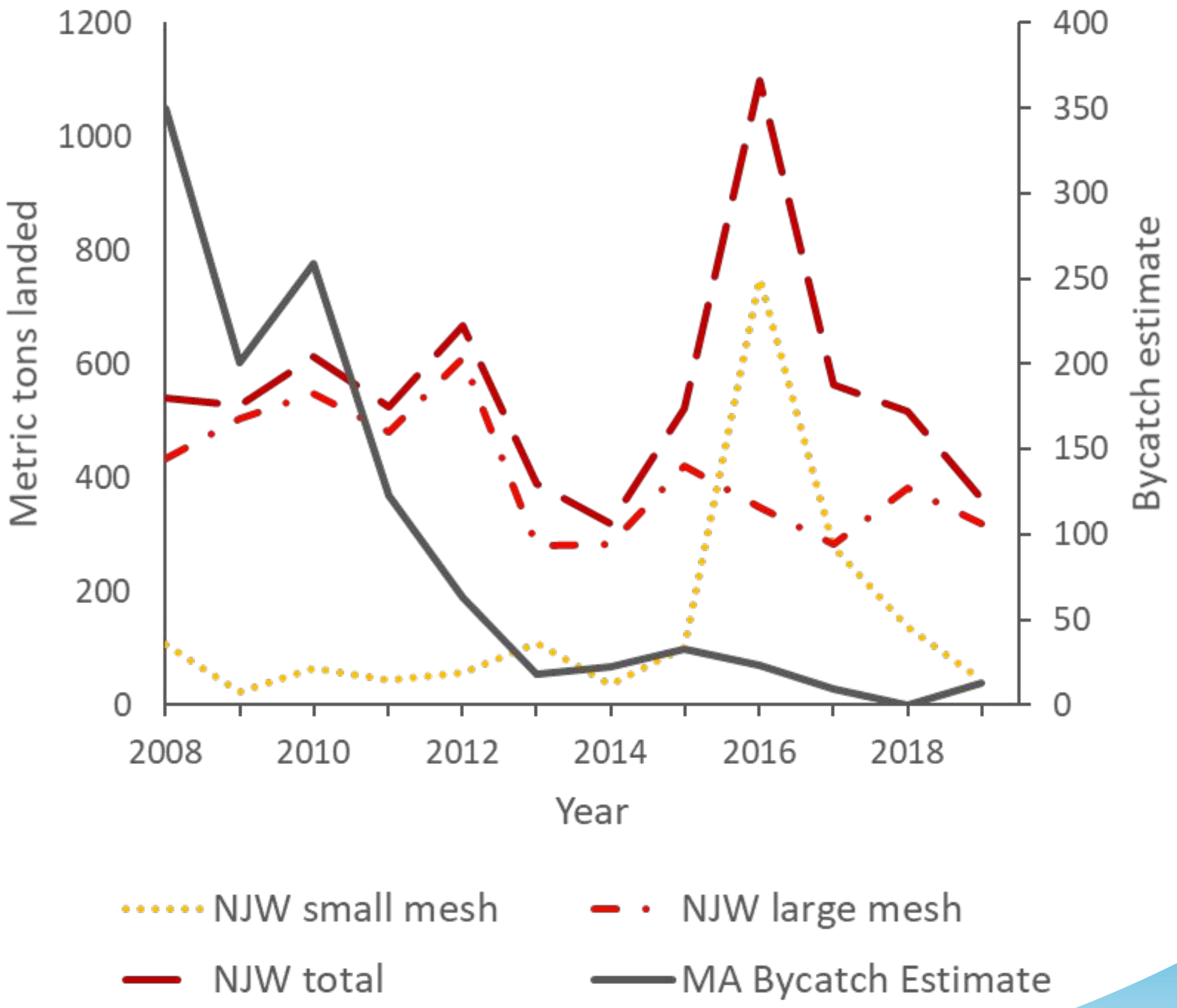
Effort in New Jersey Waters, Jan-Apr, 2018-19

Mid-Atlantic takes, 2018-19

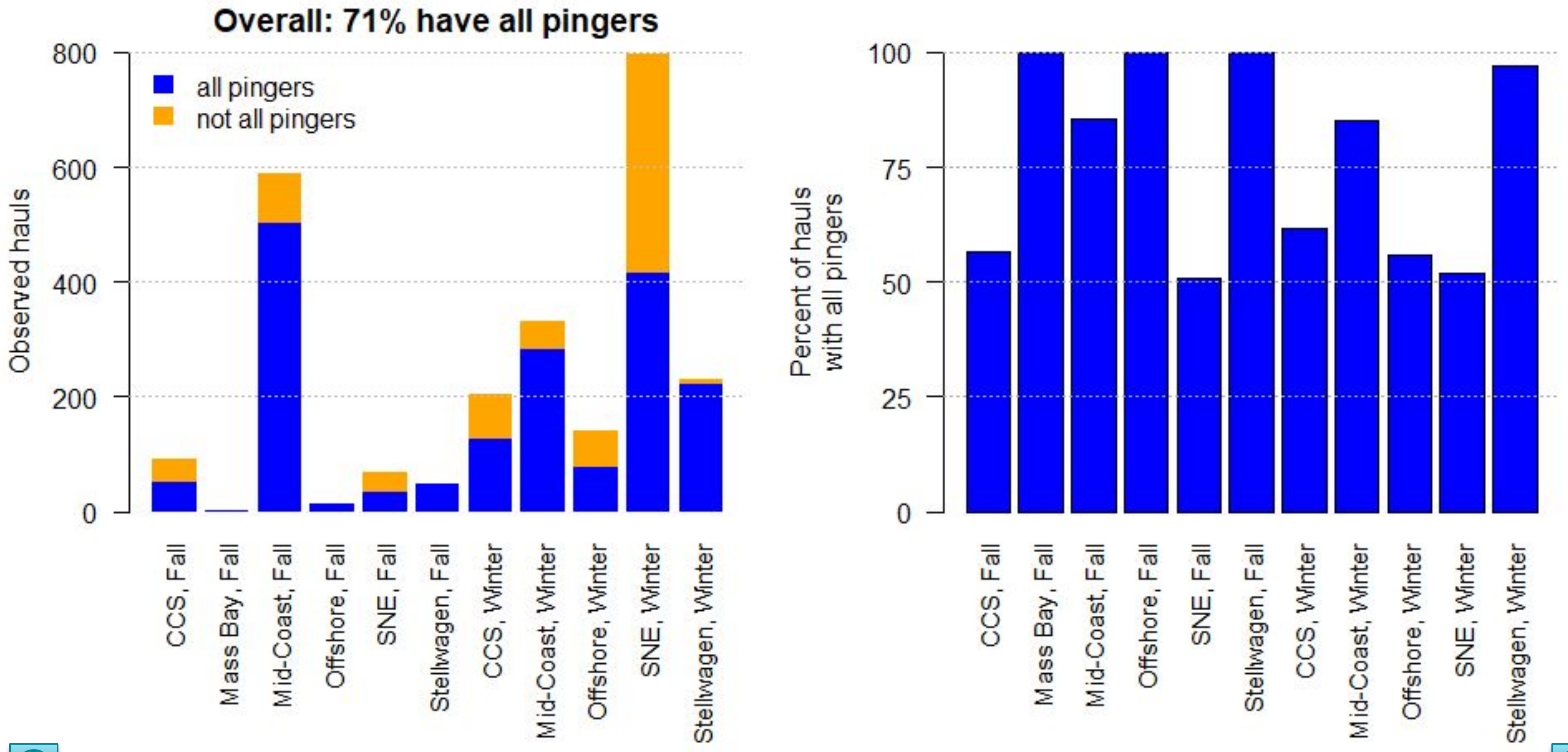




Compliance with HPTRP Pinger Use and Gear Modifications

New England TRP Pinger Use, 2018-20

- Only pinger presence, not functionality



Mid-Atlantic TRP Gear Mods & Closures, 2018-20

Management Area	Total Observed Hauls	Non-compliant Hauls	Compliant Hauls (%)		Noncompliant with Gear Modification	Hauls in Closed Area
Southern Mid-Atlantic Large Mesh	40	19	53%		19	0
Southern Mid-Atlantic Small Mesh	587	175	70%		175	0
Mudhole North Large Mesh	21	8	62%		8	0
Mudhole North Small Mesh	19	7	63%		7	0
Mudhole South Large Mesh	35	22	37%		19	12
Mudhole South Small Mesh	-	-	-		-	-
Waters off New Jersey Large Mesh	254	139	45%		139	0
Waters off New Jersey Small Mesh	72	15	79%		15	0
Totals	1028	385	63%		382	12

- Total Small Mesh Compliance = 71% (mostly SMA)
- Total Large Mesh Compliance = 46% (mostly WNJ)

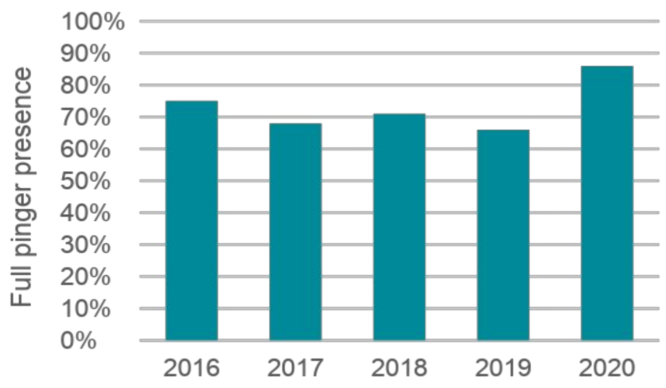
Mid-Atlantic TRP Gear Specifics, 2018-20

Management Area	Total Observed Hauls	Multiple Gear Issues per Haul	Number of Nets	Twine Size	Tie-Down Length	Tie-Down Use	Net Length	Unknown HPTRP Gear [a]
		Number of noncompliant hauls						
Southern Mid-Atlantic Large Mesh	40	0	0	0	0	7	0	0
Southern Mid-Atlantic Small Mesh	587	18	6	73	0	19	90	79
Mudhole North Large Mesh	21	5	12	0	0	2	0	6
Mudhole North Small Mesh	19	3	3	0	3	0	7	6
Mudhole South Large Mesh	35	0	19	0	0	0	0	14
Mudhole South Small Mesh	0	-	-	-	-	-	-	-
Waters off New Jersey Large Mesh	254	14	101	5	19	27	0	82
Waters off New Jersey Small Mesh	72	6	4	7	0	1	4	9
Totals	1028	46	145	85	22	56	101	196

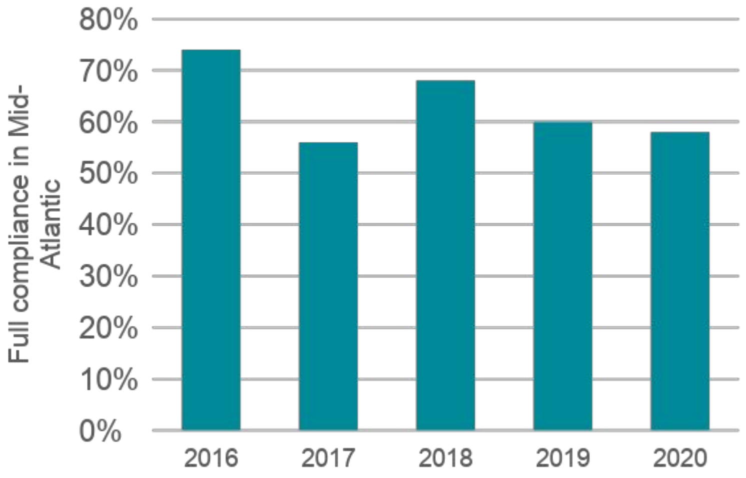
[a] Hauls in the unknown HPTRP gear category had at least one gear component that was not recorded and therefore could not be checked against the HPTRP

HPTRP Adherence Summary

- Pinger compliance in NE averaging about 70%



- Mid-Atlantic compliance below 70% since 2017



- Some fishing occurred in Mudhole South in closed season

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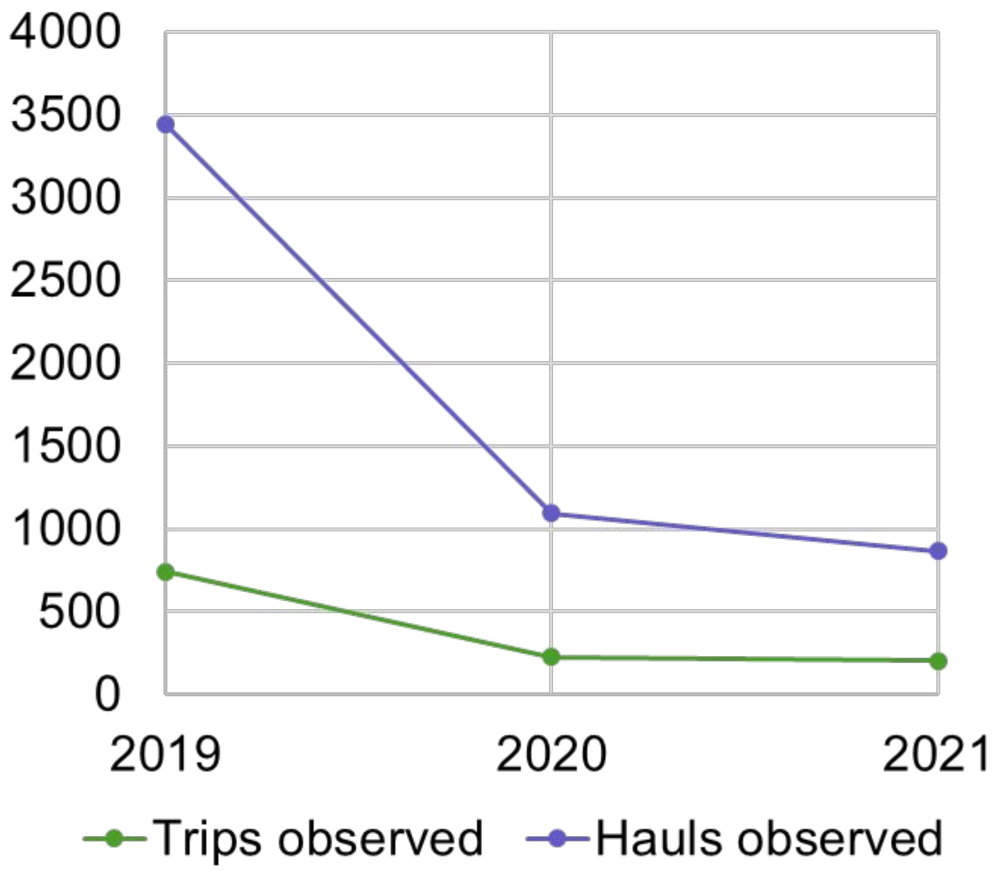
Outlook for 2021

Observed Trips

- Comparing first 6 months of 2019, 2020, 2021:

Jan-June	Trips observed	Hauls observed
2019	744	3445
2020	230	1094
2021	207	869



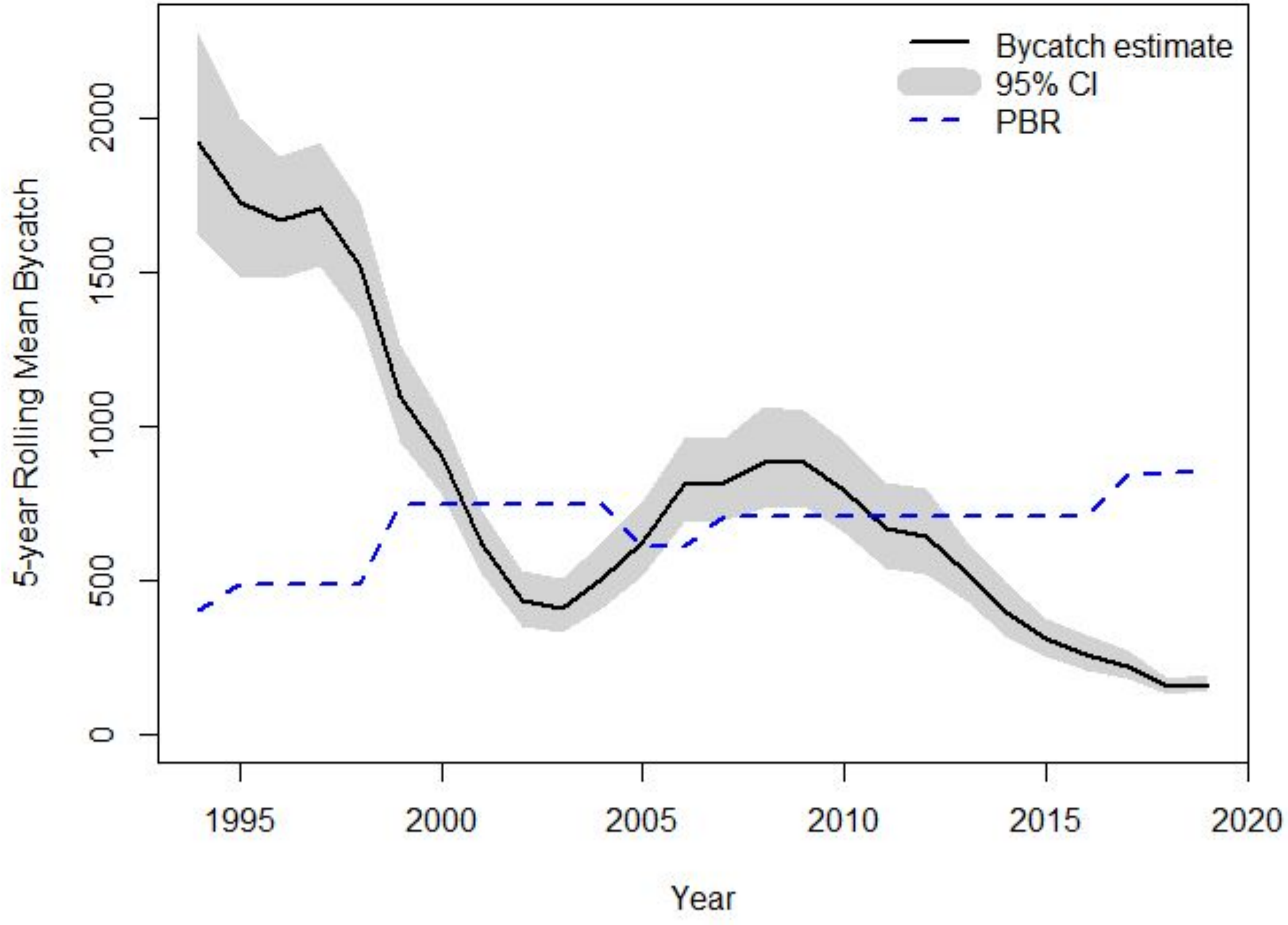
Harbor Porpoise Takes

- Comparing first 6 months of 2019, 2020, 2021:

Jan-June	Observed takes
2019	25
2020	6
2021	12

- Not all 2021 observer data ready yet, but will be at least 22 observed takes in 2021
  - 35 observed takes in all of 2019

Total 5-year Mean Estimated Bycatch since 1994



Bycatch Summary

- Bycatch estimates are the lowest since estimation began in 1994
- Most bycatch occurred in the winter, with more occurring in the Gulf of Maine than in the past
- Mid-Atlantic bycatch was very low
- New England gillnet effort (landings) has decreased about a third in the last 10 years
- NE pinger compliance is 68% in 2018-19
  - Southern New England pinger use is particularly low: 53% in 2018-19
- Mid-Atlantic compliance with TRP is 63% in 2018-19
- Bycatch so far looks like it might be higher in 2021, but still low by historical standards

Updates on Special Projects

Kristin Precoda, Integrated Statistics/NEFSC

Chris Orphanides, NEFSC

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Outline

- Bycatch Rate and Observer Protocol
- Harbor Porpoise Diet Study

Relationship between Observer Protocol and Observed Bycatch Rate?

Observer Protocols & Observed Bycatch Rate

- Two ways for animals to exit the net
  - Fall out of the net on their own
  - Have to be removed from the net

- Two types of observer protocol
  1. Focus on marine mammals
  2. Focus on fish sampling

Observer Protocols & Bycatch Rate

- Anecdotal data suggests fish-focused trips sometimes may not see takes that fall out of the net
- If protocols observe bycatch at different rates, we may be able to make bycatch estimates more accurate by taking protocol into account

How to Compare Bycatch Rates of Animals that Fall from Gear?

- Use only live or freshly dead animals
- Create sets of trips that are similar in date, location, depth, water temp, and all other fishing & gear characteristics but different in observer protocol

Marine mammal-focused trips	Fish-focused trips
Trip on 1/4/15 at 42.4N, 70.7W, 26 fathoms, large mesh, …	Trip on 1/8/15 at 42.5N, 70.6W, 25 fathoms, large mesh, …
Trip on 4/19/17 at 42.0N, 69.9W, 19 fathoms, extra-large mesh, …	Trip on 4/2/17 at 41.9N, 69.7W, 21 fathoms, extra-large mesh, …
Trip on 8/7/13 at 41.6N, 68.7W, 18 fathoms, large mesh, …	Trip on 8/13/13 at 41.7N, 69.8W, 16 fathoms, large mesh, …
...	…

- Do a statistical test of whether the bycatch rate is different across the two groups of trips

Do Both Observer Protocols See Animals that Fall from Gear?

PRELIMINARY ANALYSES, SUBJECT TO REVISION

Protocol	Removed from gear	Fell from gear
Fish-focused	63	11 = 15%
Mammal-focused	60	21 = 26%

similar

almost double

- Evidence suggests – but is not overwhelming – that mammal-focused observers might see more animals falling from the gear

Adjust for Animals that Fell Before Being Observed

PRELIMINARY ANALYSES, SUBJECT TO REVISION

- Example:
  - Fish-focused trips in 2019
    - 17 harbor porpoise removed from gear
    - 2 fell from gear (an additional 10%)
  - Marine mammal-focused trips, 2000-2019
    - **130** removed from gear
    - **51** fell from gear (an additional **39%**)
  - Estimate of unseen animals that fell from the gear in 2019 on fish-focused trips:

17	*	39%	-	2	=	4.7
Removed from gear		Estimated additional number that fell		Fell and were seen		Estimated number that fell unseen

  - That is, estimate **17** + **2** + **4.7** = **23.7** harbor porpoise were bycaught on fish-focused trips in 2019 (a 25% increase over **17** + **2**)

Effect on Annual Total Bycatch Estimate

- Haven't decided the best way to do this – there are several options
- One possible approach:
  - In 2019, conventional estimate of bycatch in NE was **195.15** animals based on **33** observed animals
  - **4.7** unseen animals on fish-focused trips
    - That is, an additional **14.2%**
  - Revised annual total estimate:

$$195.15 * 1.142 = 222.94$$

PRELIMINARY ANALYSES, SUBJECT TO REVISION

Harbor Porpoise Diet Study

Harbor Porpoise Diet in Southern New England

https://spo.nmfs.noaa.gov/sites/default/files/pdf-content/fish-bull/orphanides.pdf

Orphanides CD, Wenzel FW, Collie JS. 2020. Diet of harbor porpoises (Phocoena phocoena) on the continental shelf off southern New England. Fish Bull. 118(2):184-197

National Marine Fisheries Service
NOAA

Fishery Bulletin
established in 1881

Spencer F. Baird
First U.S. Commissioner of Fisheries and founder of *Fishery Bulletin*

Abstract—Little is known about the diet of harbor porpoises (*Phocoena phocoena*) in southern New England where bycatch was a highly contentious issue since the late 1990s until recently. To fill this data gap, stomach contents were examined from 46 harbor porpoises taken as bycatch over 24 years (1994–2017) between January and May. Prey species were identified to the lowest possible taxon through hard part analysis, primarily of otoliths and squid beaks. Size and species of harbor porpoise prey overlapped little with those of gillnet catch. Average prey size was larger for adult harbor porpoises (≥140 cm total length), females, and those taken during the first half of our study (1994–2006) than for smaller porpoises, males, and those caught during the second half (2007–2017). Average total biomass consumed per stomach was 2.3 kg, an estimate that represents approximately 12–24 h of feeding. Clupeids, true hakes (*Urophycis* spp.), squids (Decapodiformes), and silver hake (*Merluccius bilinearis*) constituted 85.5% of all estimated biomass. Cusk-eels (Ophidiidae) and small flatfish species (Pleuronectiformes) were frequently consumed (found in 29.8% and 27.7% of all stomach samples), but each taxon made up less than 1% of estimated biomass because of their small size. These results could help advance ecosystem-based management by better defining the diet of harbor porpoises in the context of potential climate changes.

Diet of harbor porpoises (*Phocoena phocoena*) on the continental shelf off southern New England

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Marine mammals are affected throughout their range by fisheries bycatch (Read et al., 2006; Lewison et al., 2014; Burgess et al., 2018; Gray and Kennelly, 2018) and increasingly by climate change (Learmonth et al., 2006; Simmonds and Isaac, 2007; Sydeman et al., 2015). In order to manage and mitigate these and other threats, we need to better understand the factors

America that are the primary habitat for harbor porpoises are predicted to warm at nearly 3 times the global average (Saba et al., 2016). This area has already seen documented shifts in distribution of some species (Nye et al., 2009; Kleisner et al., 2016), changes that may affect distribution and prey resources of harbor porpoises. The Gulf of Maine and Bay of Fundy stock of

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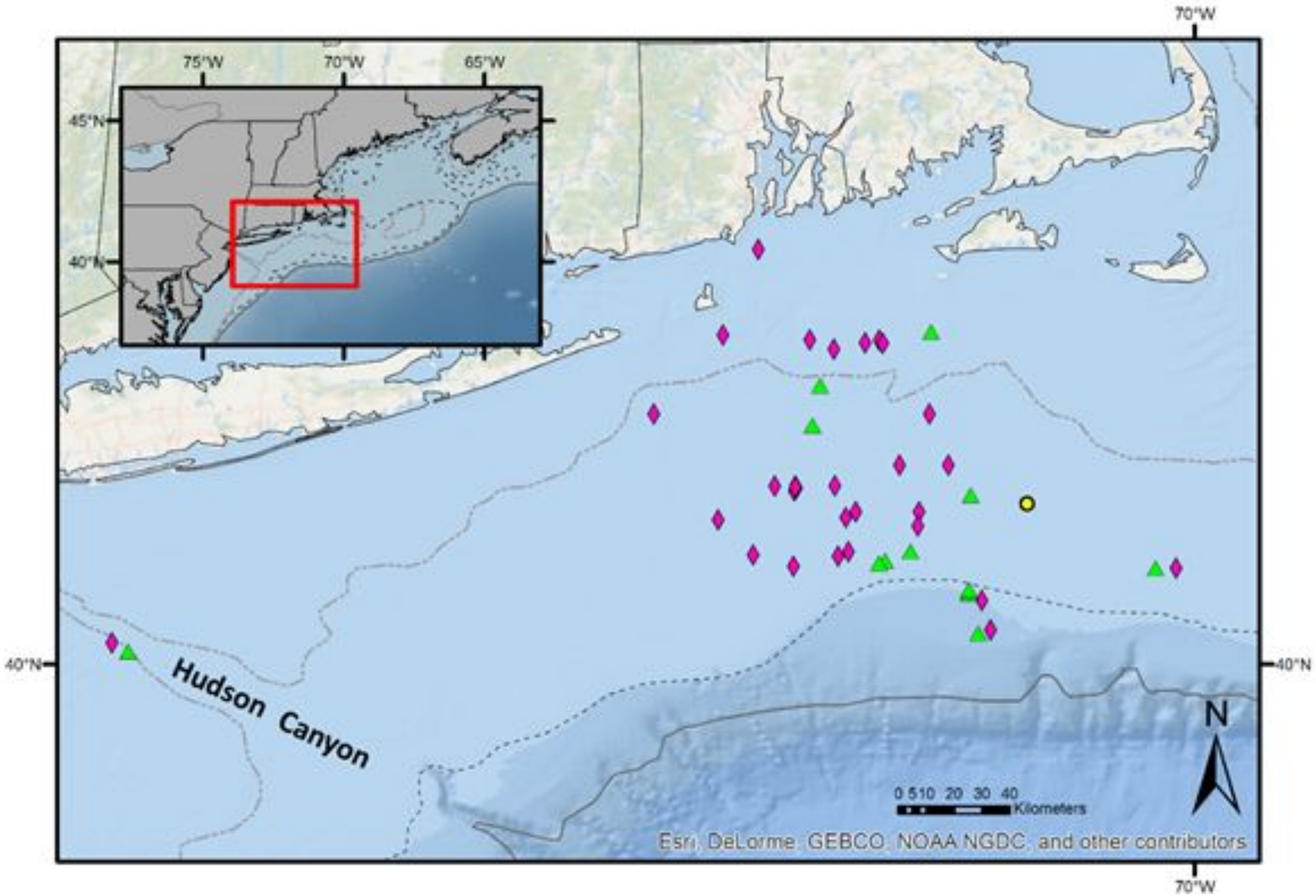
Bycatch Samples

- 46 stomach samples from porpoise incidentally caught in gillnets from 1994-2017 from January-May
- Diet not previously assessed between Jan & May, or in this region
- Area of high bycatch in recent years

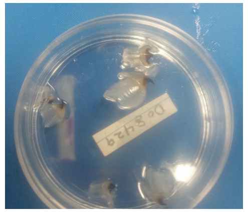


Stomach Sampling Process

Necropsy

Stomach

Contents



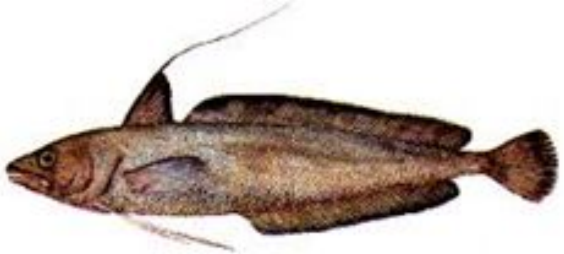
Hard Parts

Prey Lengths from Otoliths & Squid Beaks

Urophycis
(True Hakes)

$$FL/10 = 1.525 * OL^{1.1456}$$

Clay and Clay (1991)

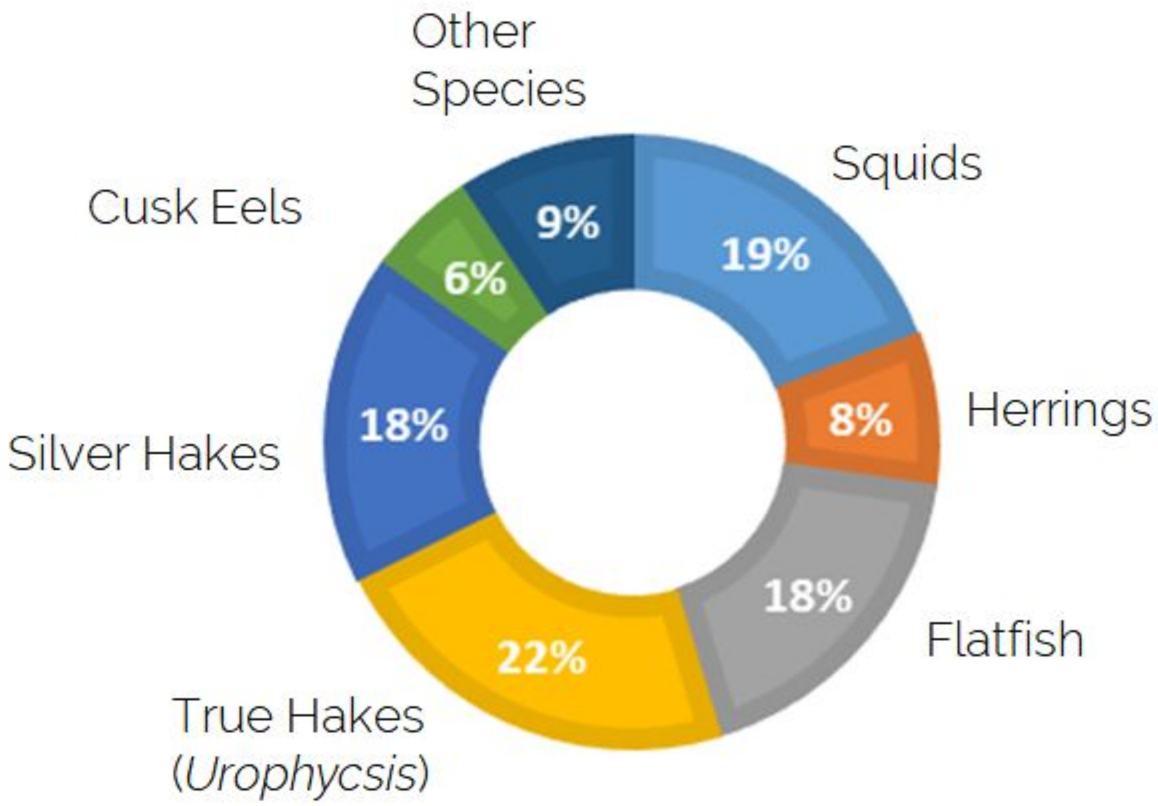


Gulfstream Flounder

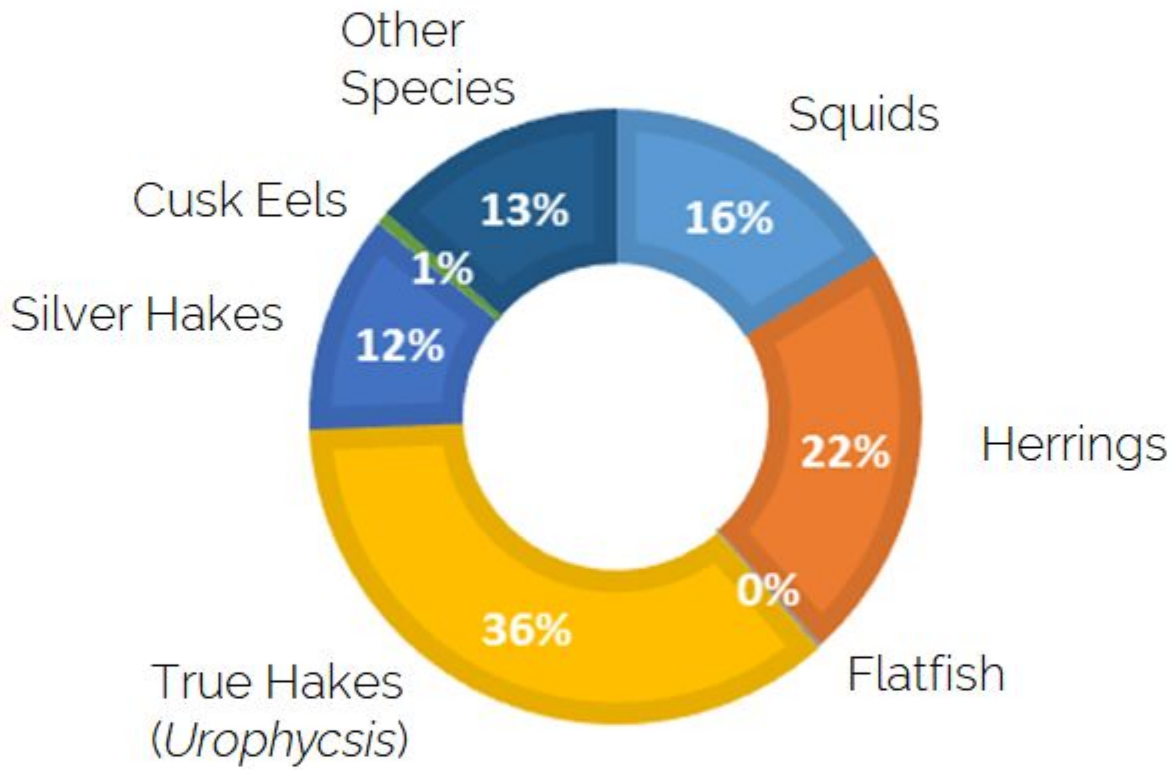
Atlantic Herring

Squid Beaks

Porpoise Diet



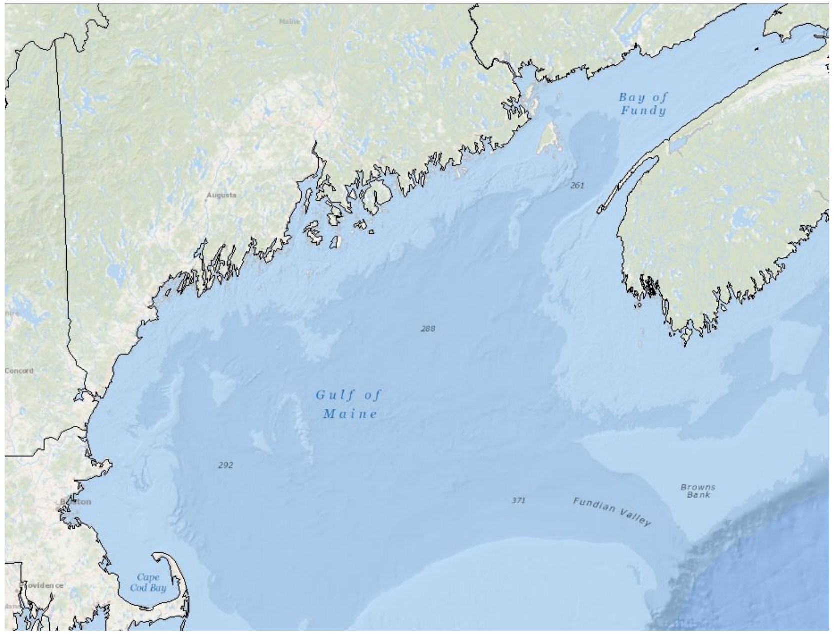
%N
(proportion of numerical abundance)



% Biomass

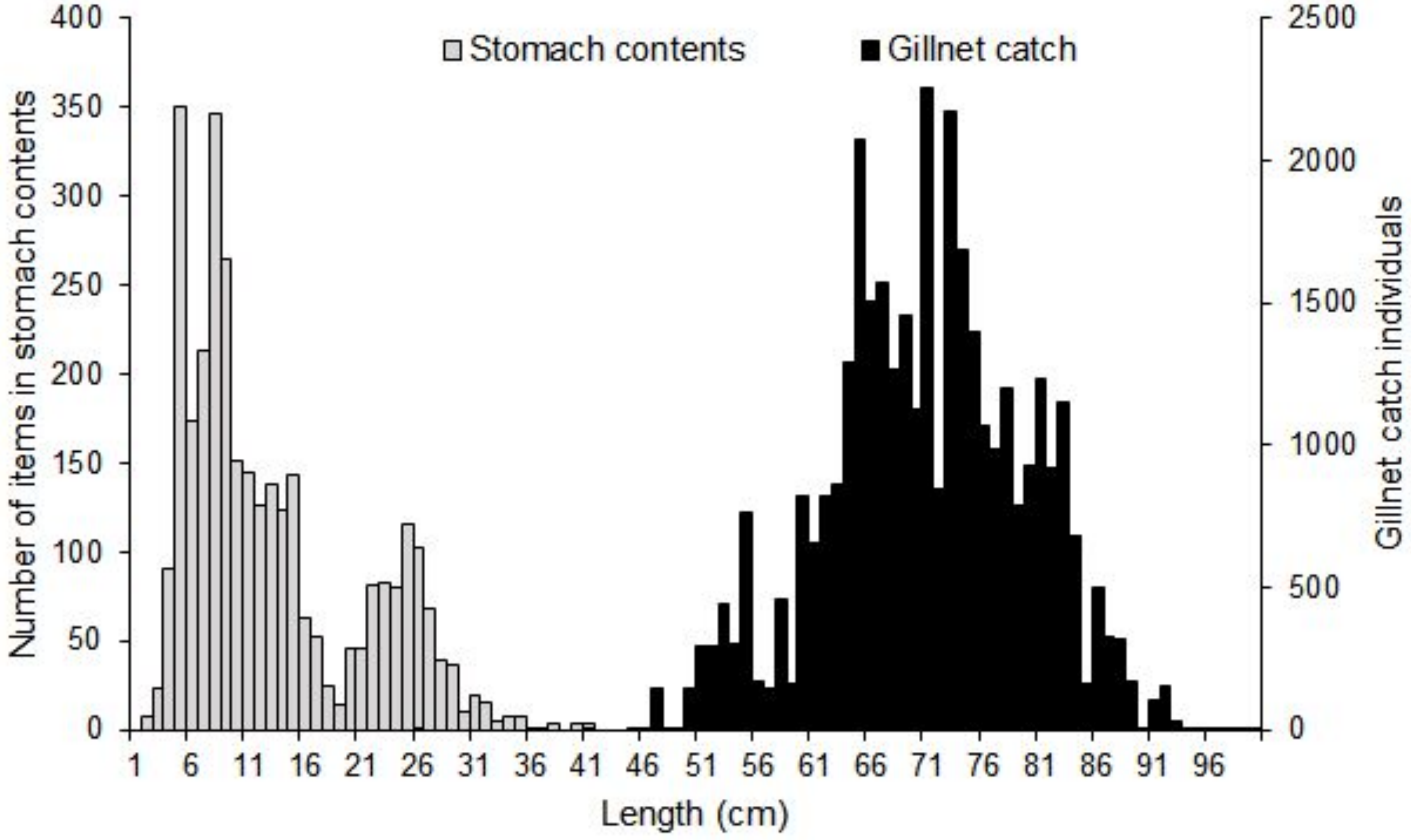
Gulf of Maine Harbor Porpoise Diet

- In the Gulf of Maine and Bay of Fundy, **Atlantic herring** made up **44%** of ingested biomass in the fall (Gannon et al., 1998) and **64%** from June through September (Recchia and Read, 1989)
  - Our study found roughly ½ to ⅔ less Atlantic herring (22%) biomass
- **Atlantic cod** were also found to be primary prey items during the summer in 2 studies (Smith and Gaskin, 1974; Recchia and Read, 1989)
  - Our study found a small amount of unidentified gadidae, but no cod
- **Squids** were a negligible portion of the diet during the summer and fall in the Gulf of Maine
- **Silver hake** were an important prey item in both regions

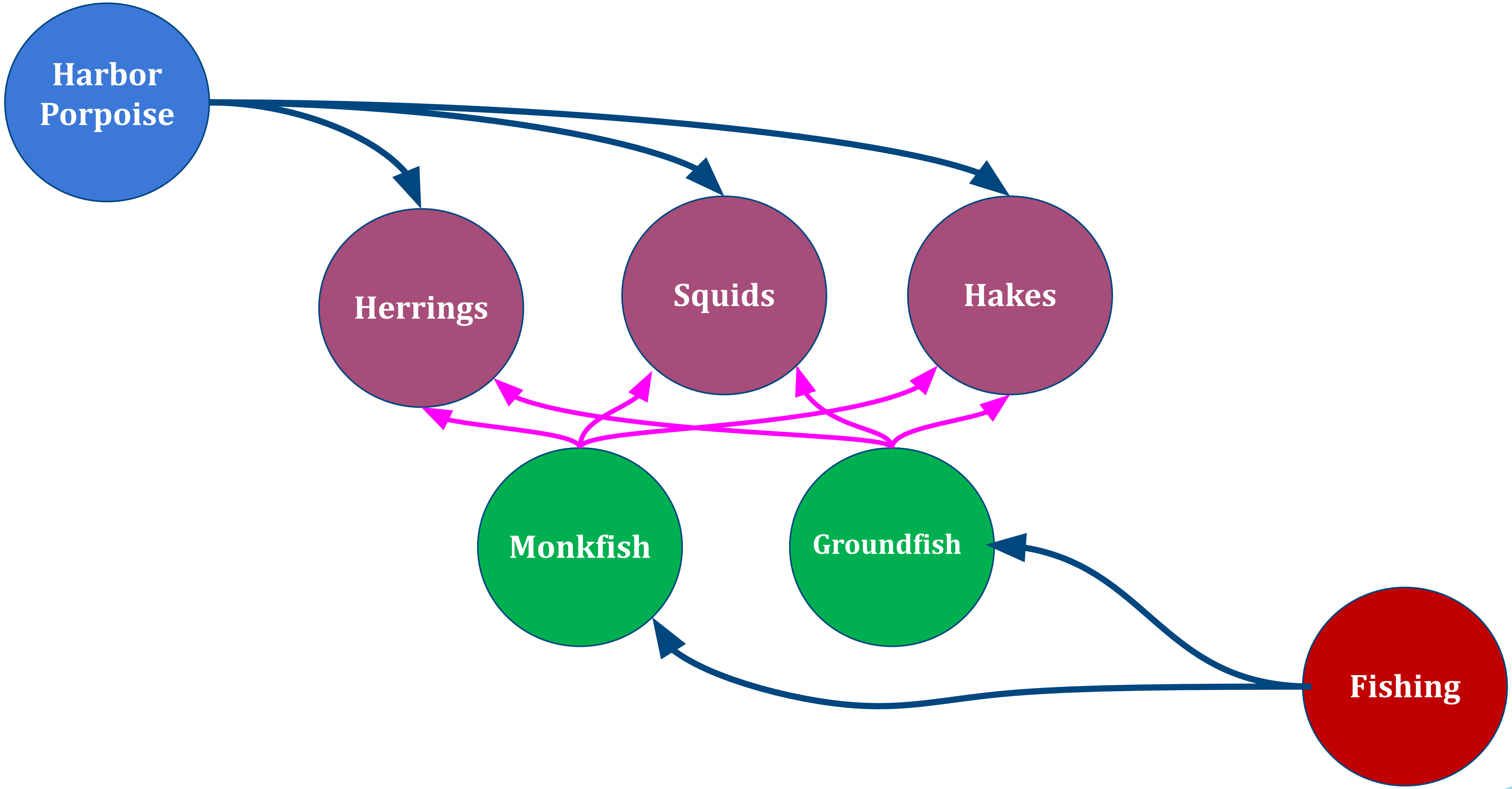


Porpoise Diet - No Overlap with Gillnet Catch

- Among **25** fish species caught in gillnets that also caught harbor porpoise used in this study, only **4** of the more rarely caught species were found in stomachs of harbor porpoises (**1.3% of catch by number**).
- Only 1 species, **Atlantic mackerel**, was found both in the harbor porpoises caught in that net and in the net catch
- **No monkfish or skate** found in harbor porpoise stomach



Relationship to Fishing



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Porpoise Diet - Shift Over Time

- Examined diet by species using a Permutation Analysis of Variance (PERMANOVA)
- Transitioned from focus on clupeids to hakes, generally diversified to more smaller species
- Average prey size was larger for adult harbor porpoises (≥140 cm total length), females, and those taken during the first half of our study (1994–2006)

	Raw count	
Species group	1994–2006	2007–2017
True hakes	56	619
Squids	191	391
Clupeids	207	37
Silver hake	492	35
Flatfish species	57	487
Cusk-eels	20	152
Others	29	252

Harbor Porpoise Diet Conclusions

1. More diversified diet than Gulf of Maine with less reliance on Atlantic Herring
2. Cusk eels and flatfish are common prey items, but contribute little biomass
3. Recent shift towards a more diverse prey base of smaller species
4. Prey has little to no overlap with observe landed gillnet catch

Other Updates: Electronic/At-Sea Monitoring

Amendment 23 to NE Multispecies FMP: Would revise groundfish sector monitoring program; sectors could choose human At-Sea Monitors (via ASM program) or Electronic Monitoring (EM).
Proposed rule out for comment through March 30.

Under operational EM program, **protected resources bycatch data would not be recorded during primary review. NEFOP observer data on protected resources will still be collected as usual.**

More vessels choose EM over ASM → decrease in collection of marine mammal bycatch data → decreases precision (wider coefficient of variation (CV))of the bycatch estimate

Implications: Increases possibility of bycatch being over- or underestimated relative to PBR.
- If overestimated, can result in unnecessary restrictions to fishery.
- If bycatch underestimated, can result in unsustainable impact to protected stock.

How Recovery Factor Influences PBR

Species	N_{min}	R_{max}	F_r	PBR	Conditions
Harbor porpoise	74,034	0.046	0.60	1,022	100% observer coverage
			0.50	851	No change in N_{min} or R_{max}, unknown stock status and bycatch CV <=0.3; Present conditions in 2020 stock assessment (Hayes et al. 2021)
			0.48	817	No change in N_{min} or R_{max}, unknown stock status and bycatch CV between 0.3 and 0.6
			0.45	766	No change in N_{min} or R_{max}, unknown stock status and bycatch CV between 0.6 and 0.8

Stakeholder Assessment for Marine Mammal Deterrents Workshop Planning

- Regional Marine Mammal Deterrents Workshops to:
  - Better understand the overall problem of marine mammal/gear interactions
  - Identify deterrents currently in use (effective or not), and
  - Develop a list of priority deterrents to evaluate in the future.
- Greater Atlantic workshop is being planned for May of this year and is expected to focus on seal interactions
- National workshop at the end of May/beginning of June

Stakeholder Assessment for Marine Mammal Deterrents Workshop Planning

Looking for volunteers to schedule a call with our facilitators

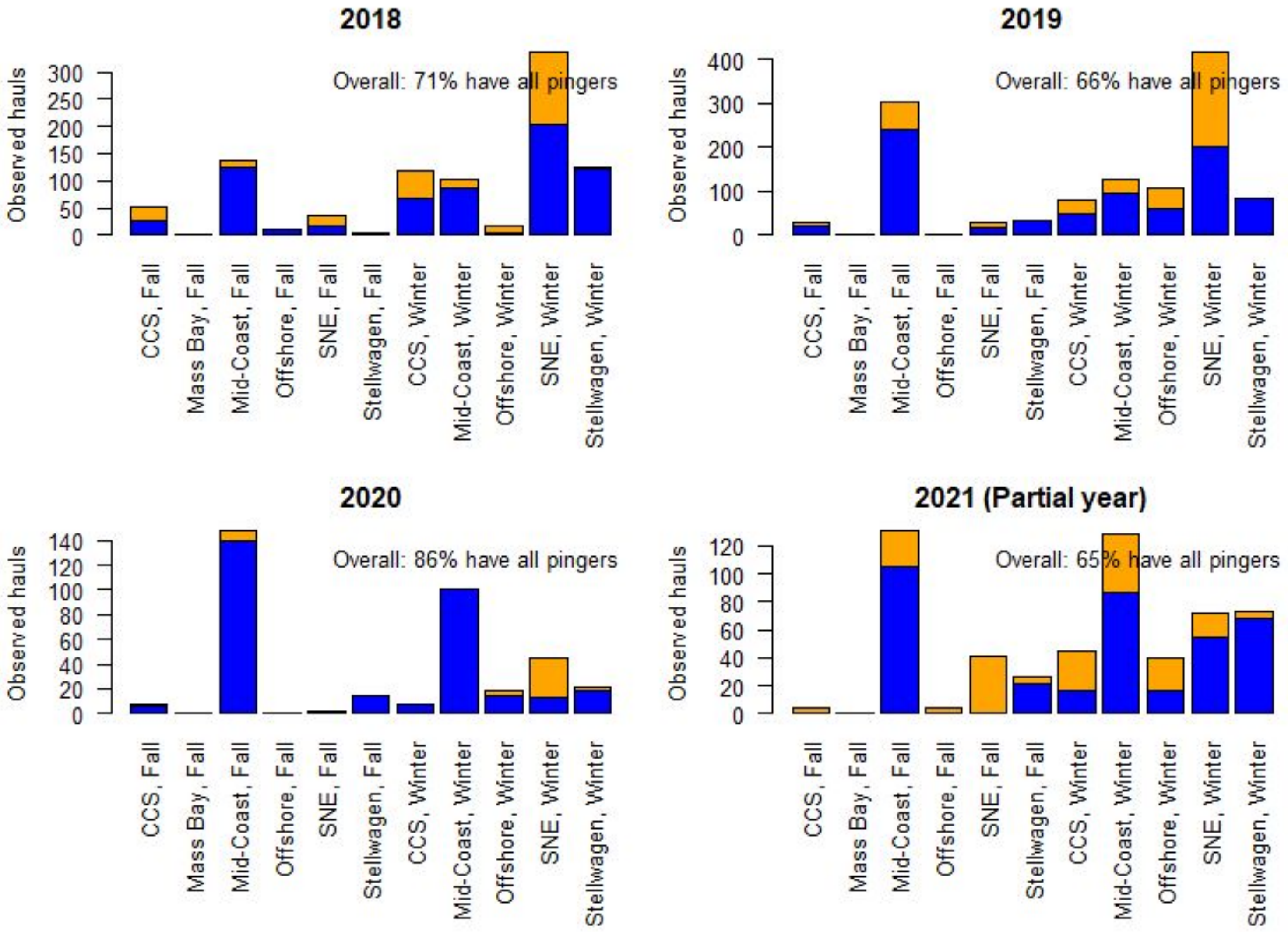
- Discuss issues, challenges, and opportunities surrounding marine mammal depredation and deterrents
- All information will be compiled in a non-attributable way and used to guide the workshop agendas

Contact Jean Higgins (jean.higgins@noaa.gov) if you're interested in participating or with referrals to other fishing community members that may be interested in participating

Take Reduction Team and Public Input

Backup Slides

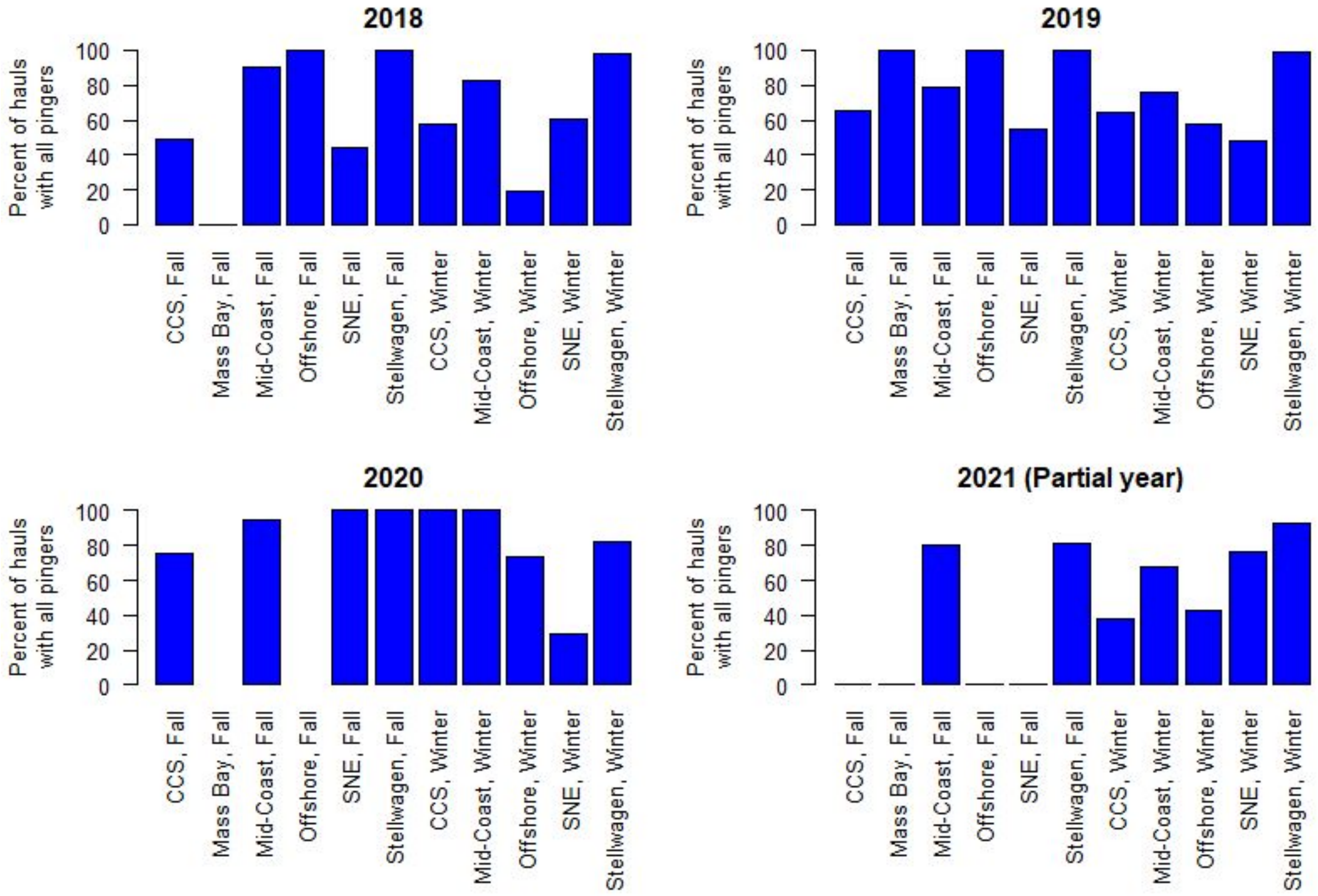
New England HPTRP Pinger Use (# hauls)



Cape Cod South specification includes Dec-May, matching that used for the bycatch estimation strata

2021 data is incomplete

New England HPTRP Pinger Use (%)



Cape Cod South specification includes Dec-May, matching that used for the bycatch estimation strata

2021 data is incomplete

2018 Mid-Atlantic HPTRP Gear Mods & Closures

Management Area	Total Observed Hauls	Non-compliant Hauls	Compliant Hauls (%)		Noncompliant with Gear Modification	Hauls in Closed Area
Southern Mid-Atlantic Large Mesh	28	12	57%		12	0
Southern Mid-Atlantic Small Mesh	197	38	81%		38	0
Mudhole North Large Mesh	6	5	17%		5	0
Mudhole North Small Mesh	6	0	100%		0	0
Mudhole South Large Mesh	23	10	57%		10	3
Mudhole South Small Mesh	-	-	-		-	-
Waters off New Jersey Large Mesh	71	45	37%		45	0
Waters off New Jersey Small Mesh	20	3	85%		3	0
Totals	351	113	68%		113	3

- Total Large Mesh Compliance = 44% (mostly WNJ)
- Total Small Mesh Compliance = 82% (mostly SMA)

2019 Mid-Atlantic HPTRP Gear Mods & Closures

Management Area	Total Observed Hauls	Non-compliant Hauls	Compliant Hauls (%)		Noncompliant with Gear Modification	Hauls in Closed Area
Southern Mid-Atlantic Large Mesh	12	7	42%		7	0
Southern Mid-Atlantic Small Mesh	257	93	64%		93	0
Mudhole North Large Mesh	8	3	62%		3	0
Mudhole North Small Mesh	13	7	46%		7	0
Mudhole South Large Mesh	3	3	0%		0	3
Mudhole South Small Mesh	-	-	-		-	-
Waters off New Jersey Large Mesh	87	49	44%		49	0
Waters off New Jersey Small Mesh	52	12	77%		12	0
Totals	432	174	60%		171	3

- Total Large Mesh Compliance = 44% (mostly WNJ)
- Total Small Mesh Compliance = 65% (mostly SMA)

2020 Mid-Atlantic HPTRP Gear Mods & Closures

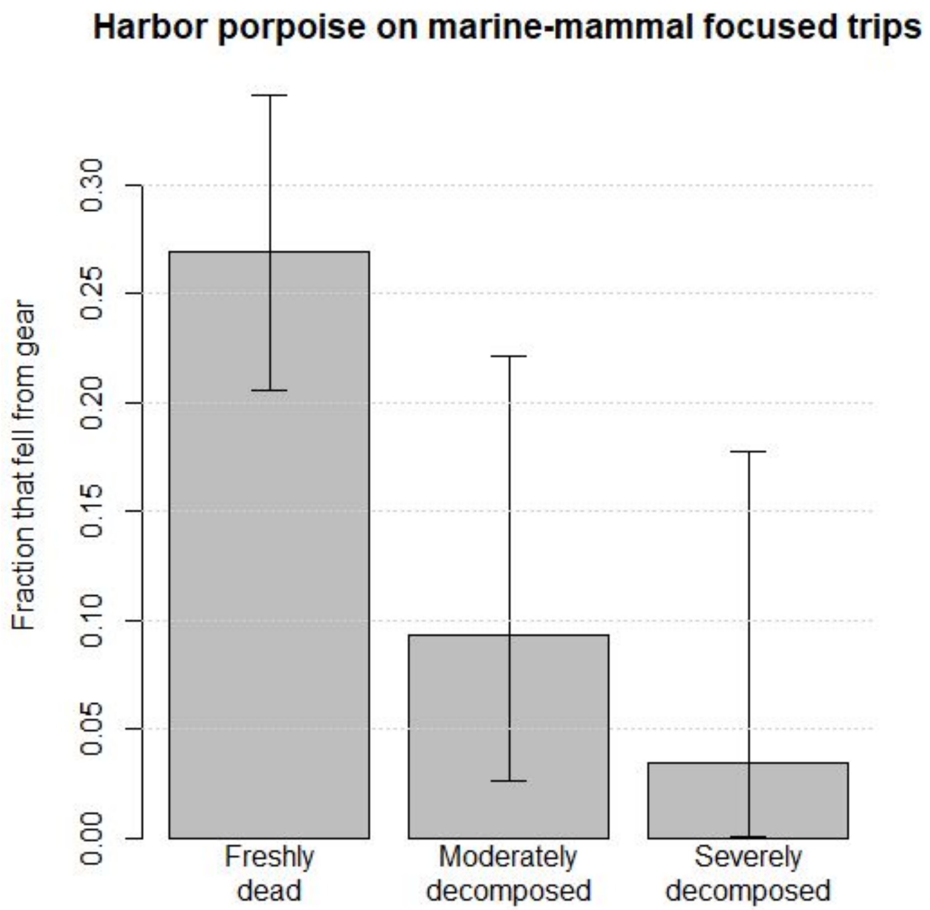
Management Area	Total Observed Hauls	Non-compliant Hauls	Compliant Hauls (%)		Noncompliant with Gear Modification	Hauls in Closed Area
Southern Mid-Atlantic Large Mesh	-	-	-		-	-
Southern Mid-Atlantic Small Mesh	133	44	67%		44	0
Mudhole North Large Mesh	7	6	14%		6	0
Mudhole North Small Mesh	-	-	-		-	-
Mudhole South Large Mesh	9	9	0%		9	6
Mudhole South Small Mesh	-	-	-		-	-
Waters off New Jersey Large Mesh	96	45	53%		45	0
Waters off New Jersey Small Mesh	-	-	-		-	-
Totals	245	104	58%		104	6

2021 (Partial Year) Mid-Atlantic HPTRP Gear Mods & Closures

Management Area	Total Observed Hauls	Non-compliant Hauls	Hauls with Proper Gear %	Noncompliant with Gear Modification	Hauls in Closed Area
Southern Mid-Atlantic Large Mesh	-	-	-	-	-
Southern Mid-Atlantic Small Mesh	5	0	100%	0	0
Mudhole North Large Mesh	1	0	100%	0	0
Mudhole North Small Mesh	3	0	100%	0	0
Mudhole South Large Mesh	-	-	-	-	-
Mudhole South Small Mesh	-	-	-	-	-
Waters off New Jersey Large Mesh	-	-	-	-	-
Waters off New Jersey Small Mesh	-	-	-	-	-
Totals	9	0	100%	0	0

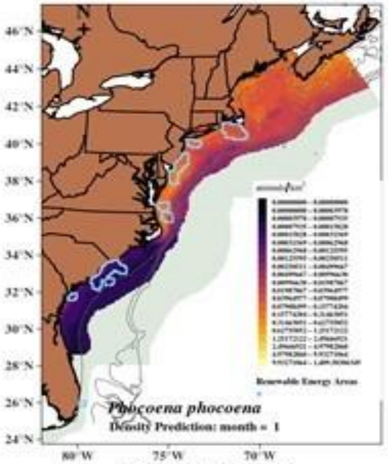
Are Takes Undercounted? Animal Condition & Falling or Being Removed from Gear

PRELIMINARY ANALYSES, SUBJECT TO REVISION



- Harbor porpoises on marine mammal focused trips 2000-2019
- Tentatively: a larger fraction of freshly dead animals fall from the gear than fraction of decomposed animals
- Might adjust estimates differently depending on animal condition
- Not many decomposed takes so analyze only fresh takes

Monthly average distribution maps



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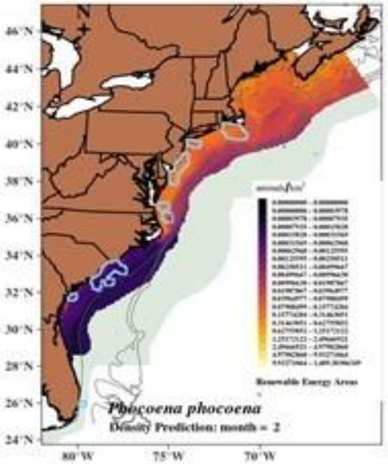

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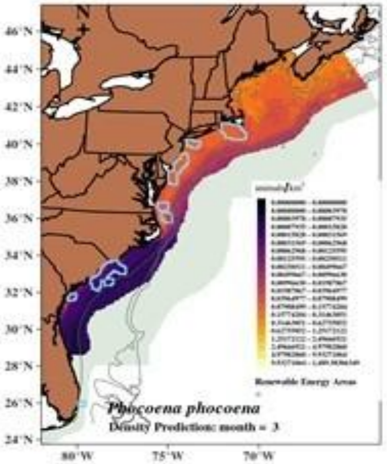
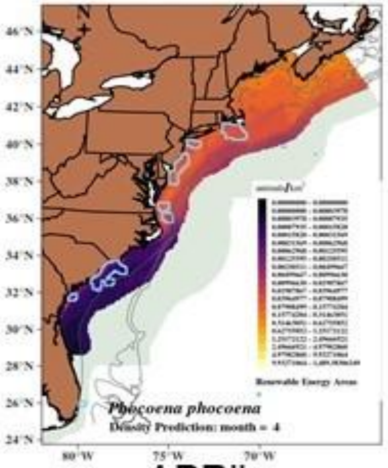
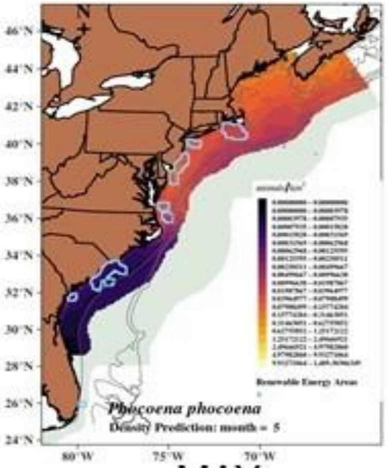


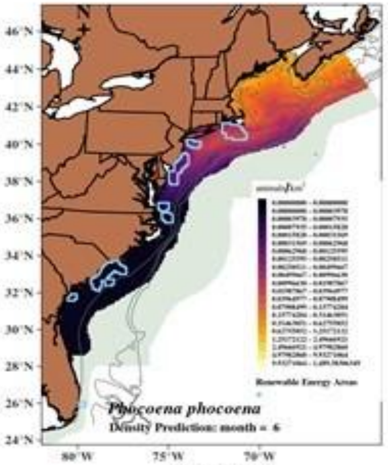
MARCH



APRIL



MAY



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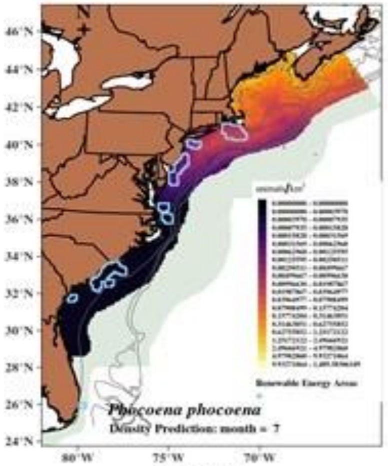

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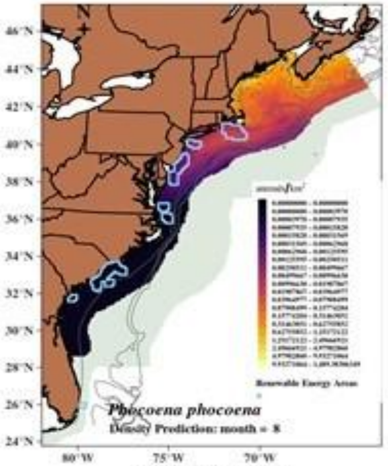

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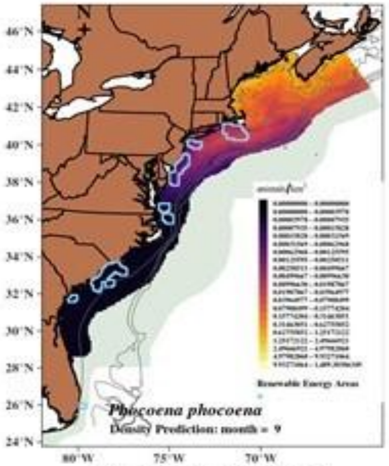

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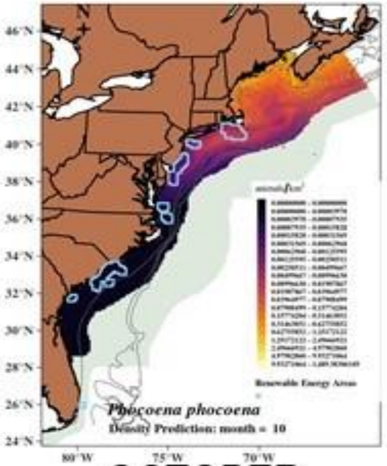

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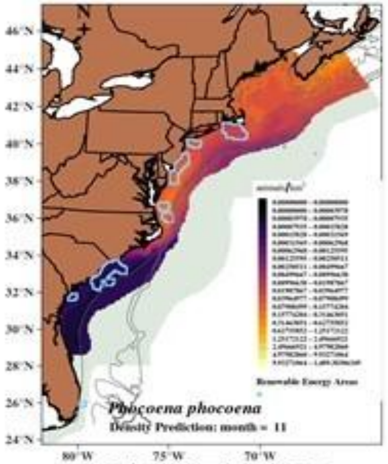

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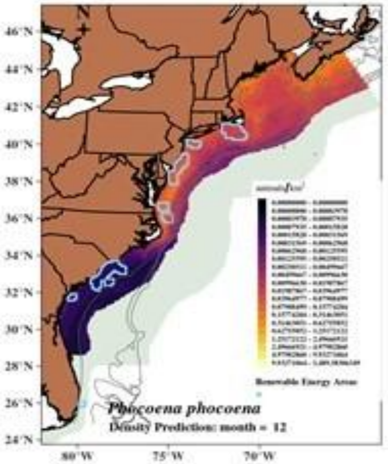

DECEMBER

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