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Harbor Porpoise Bycatch Rates and Estimates

Methods and Results

HPTRP, November 28th, 2012

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Presentation Overview

Focus on how bycatch rates and estimates were calculated

1. Consequence closure bycatch rates
2. Analysis for shifting closure
3. Pinger functionality and compliance
4. Landings as the choice for the unit of effort (measure of fishing effort)
5. Annual bycatch estimates

Consequence Closure Bycatch Rates

How consequence closure bycatch rates were calculated and possible alternate methods of calculating these rates.

Consequence Closure Bycatch Rates - Methodology

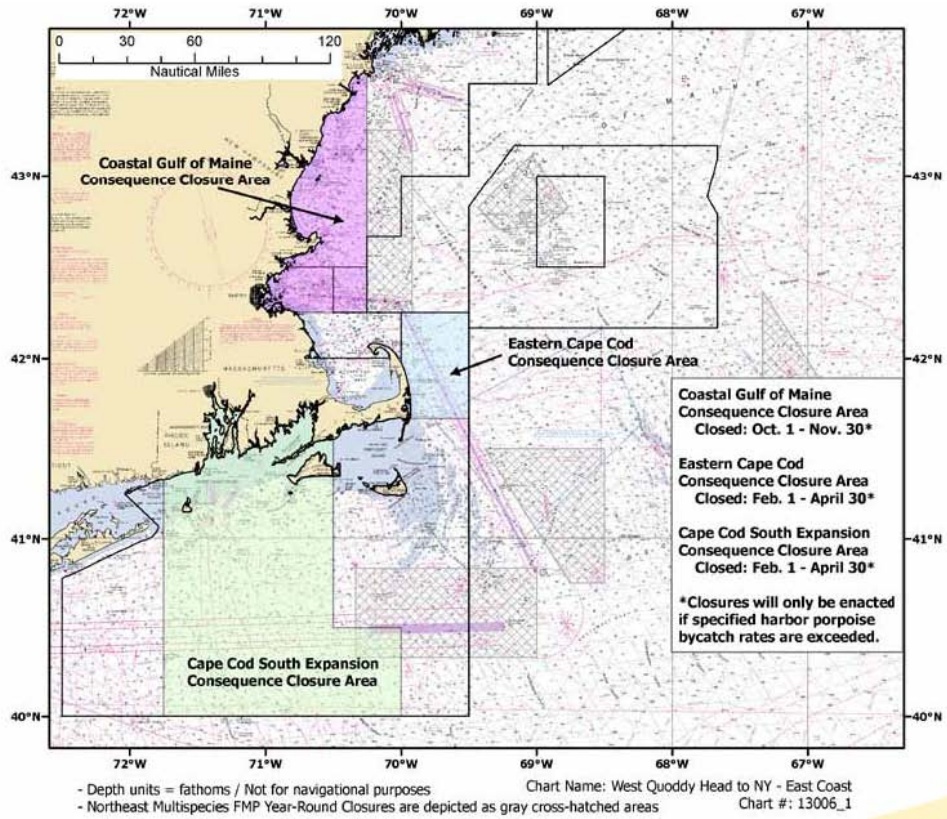
- Bycatch rates were:

$$\frac{\text{harbor porpoise}}{\text{mtons of landings}}$$

- No adjustments for pinger use
- Only NEFOP (traditional observer data) used to determine whether closure was enacted

Consequence Closure Bycatch Rates - Methodology

- Times and areas used in bycatch rates were larger than the possible closure areas
- CGOM used Mass Bay, Stellwagen Bank, and MidCoast areas
- CCSE and ECC used S. New England area



Consequence Closure Bycatch Rates – Possible regression-based trigger rates

Coastal Gulf of Maine

			Trigger Rates		
Measure of Fishing Effort	Observed Rate	R^2	Observed	Regression Point Estimate	Regression Upper 95% CI
Landings	0.057	0.77	0.031	0.042	0.052
Hauls	0.012	0.51	0.005	0.006	0.009

- Coastal Gulf of Maine observed bycatch rate would be above the triggers no matter whether hauls or landings were used
- The same holds for whether observed bycatch rates were used, or whether regression based methods were used (point est. and upper 95% confidence interval)

Consequence Closure Bycatch Rates – Alternate units of effort

Coastal Gulf of Maine

		Actual Bycatch Rates	
Measures of Fishing Effort	Trigger Bycatch Rate	2010	2011
landings (mtons)	**0.0310**	0.0780	0.0430
number of hauls	**0.0052**	0.0181	0.0063
soak duration (days)	**0.0028**	0.0110	0.0035
string length (km)	**0.0061**	0.0210	0.0062
soak duration * string length (days*km)	**0.0031**	0.0120	0.0035
soak duration * string length * net height (days*km^2)	**0.9711**	5.7348	1.3913

- For all possible units of effort the Coastal Gulf of Maine bycatch rate would be larger than the trigger rate

Consequence Closure Bycatch Rates – Alternate units of effort

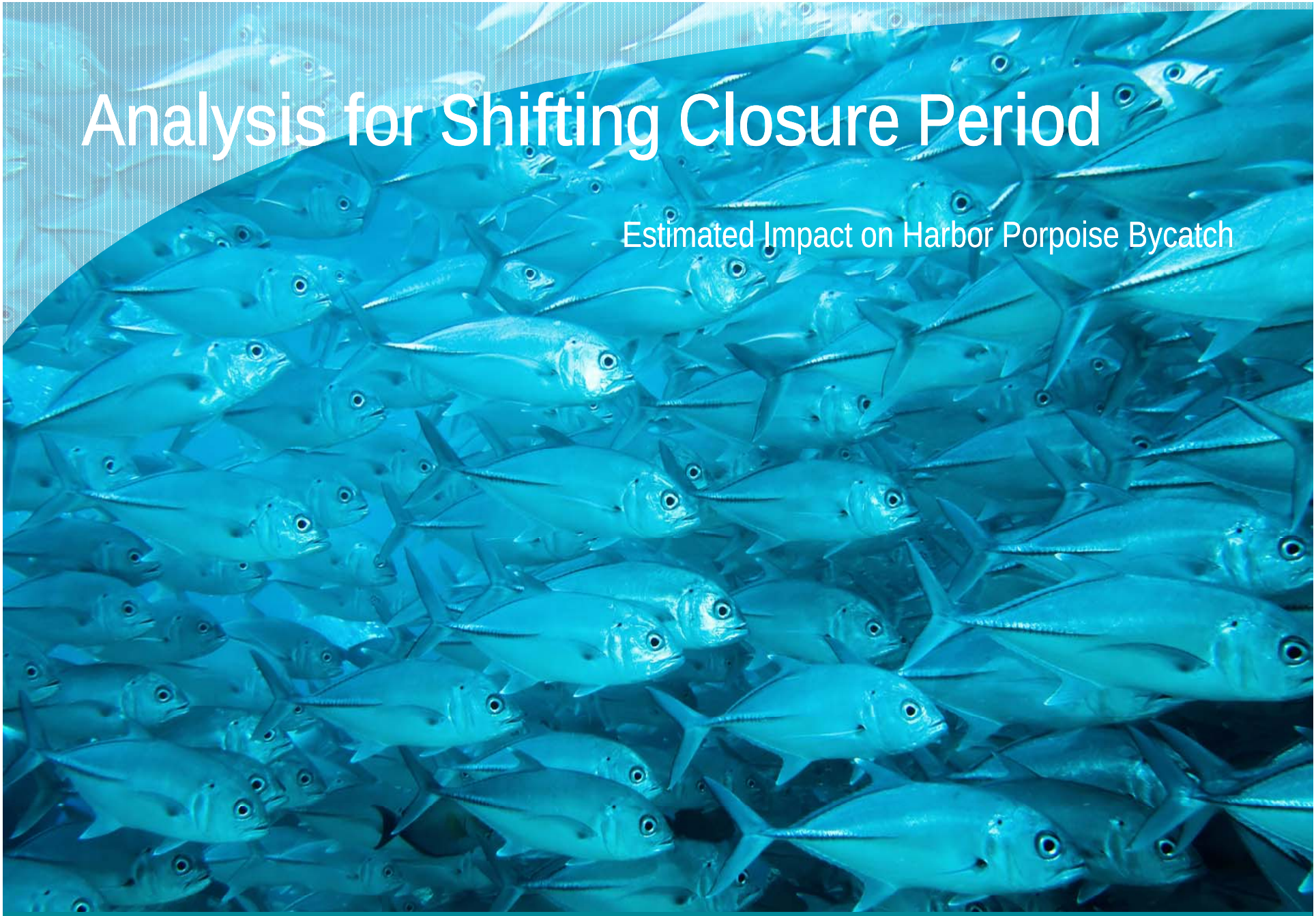
Southern New England

		Actual Bycatch Rates	
Measures of Fishing Effort	Trigger Bycatch Rate	2010	2011
landings (mtons)	**0.0230**	0.0120	0.0290
number of hauls	**0.0040**	0.0042	0.0146
soak duration (days)	**0.0020**	0.0010	0.0030
string length (km)	**0.0055**	0.0034	0.0115
soak duration * string length (days*km)	**0.0021**	0.0007	0.0024
soak duration * string length * net height (days*km^2)	**0.6299**	0.9091	1.5789

- All measures of fishing effort in 2011 were above the target rate, and 2 of 6 were above the target rate for 2010

Analysis for Shifting Closure Period

Estimated Impact on Harbor Porpoise Bycatch



Assessing impact of shifting closure

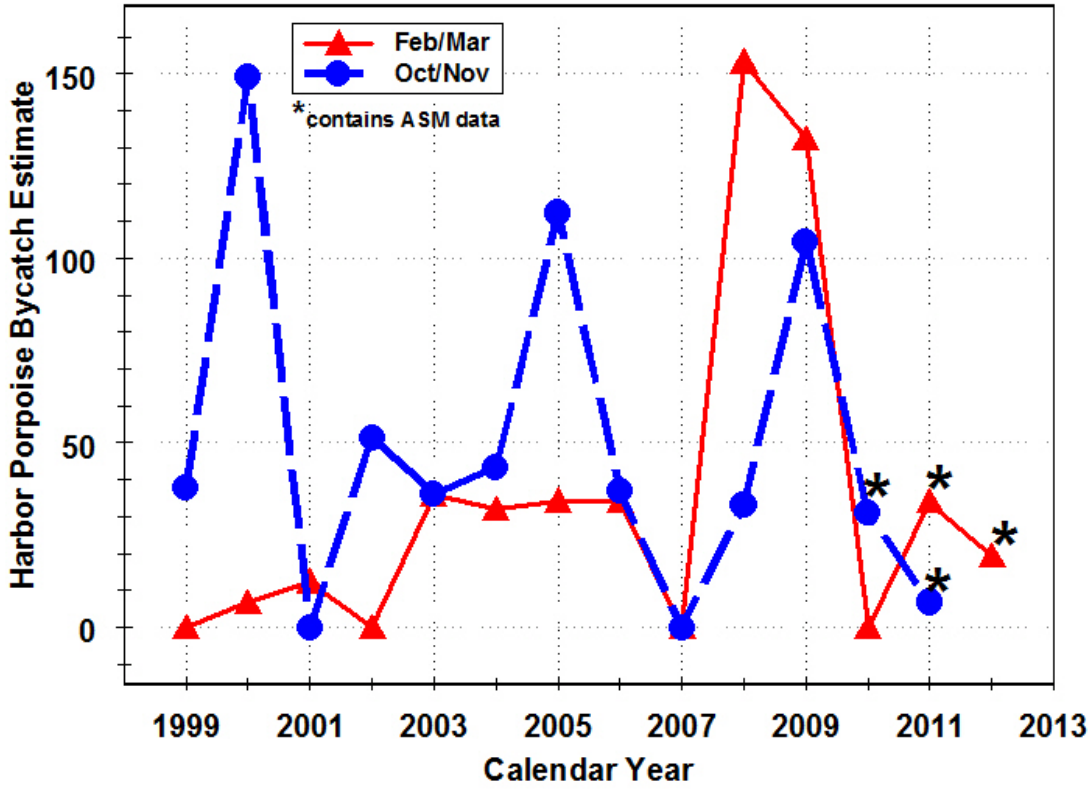
- Three time periods were examined
  - 1999-2012, 2008-2012, 2010-2012
- Approximate monthly average bycatch in closure areas were calculated for Oct, Nov, Feb, and March using NEFOP, ASM, and VTR data
- Oct-Nov estimate subtracted from Feb-Mar estimate to get average annual bycatch difference

Assessing impact of shifting closure

Time Period	Season	Total Bycatch Estimate	Average Bycatch Per Season	% of Total Landings Observed	CVs	95% CI low	95% CI high
Feb 99-Mar 12	Feb-Mar	511	37	11%	16%	25	49
	Oct-Nov	536	41	10%	16%	27	55
	Difference	-25	-4		22%	-22	14
Feb 08-Mar 12	Feb-Mar	305	61	15%	18%	37	85
	Oct-Nov	122	31	16%	21%	17	45
	Difference	183	30		28%	1	59
Oct 10-Mar 12	Feb-Mar	56	28	43%	23%	12	44
	Oct-Nov	43	22	34%	21%	11	33
	Difference	13	6		31%	-14	26

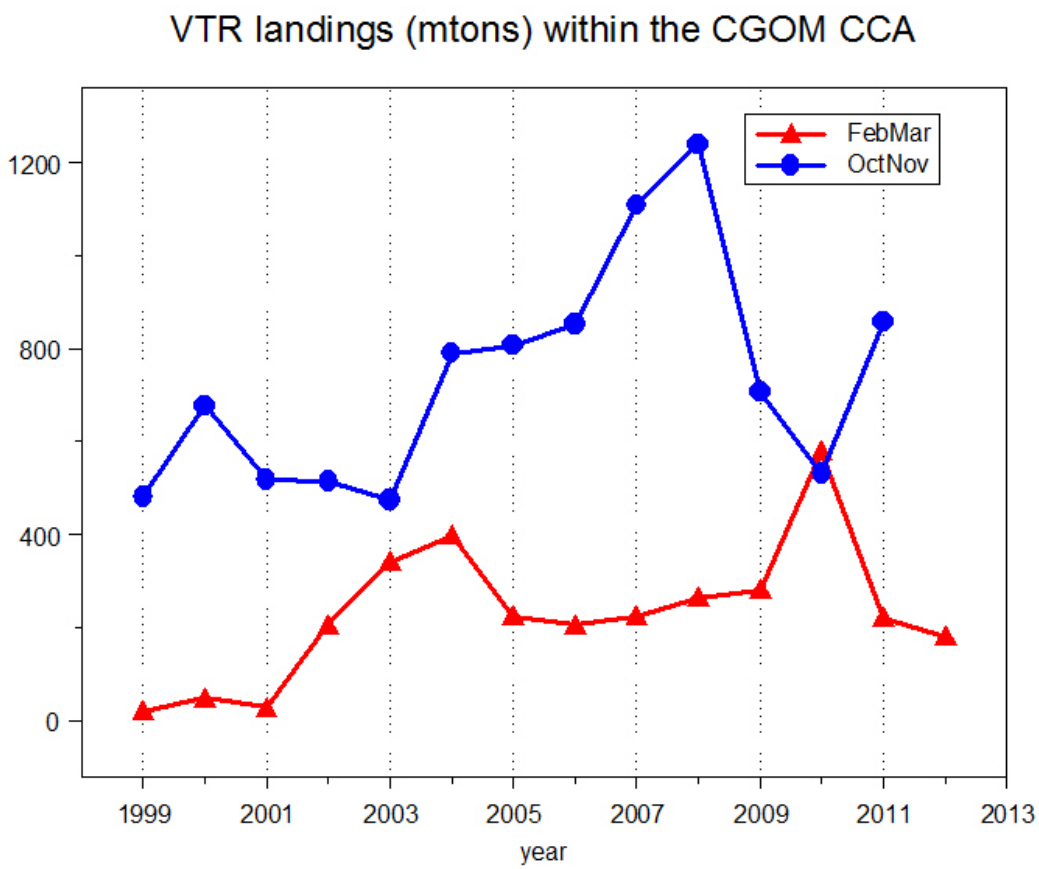
- 99-12 point bycatch estimate higher in Oct-Nov
- 08-12 point bycatch estimate higher in Feb-Mar
- 10-12 point bycatch estimate higher in Feb-Mar
- Confidence Intervals (CIs) suggest difference not significant in 99-12

Harbor porpoise estimates by period and year



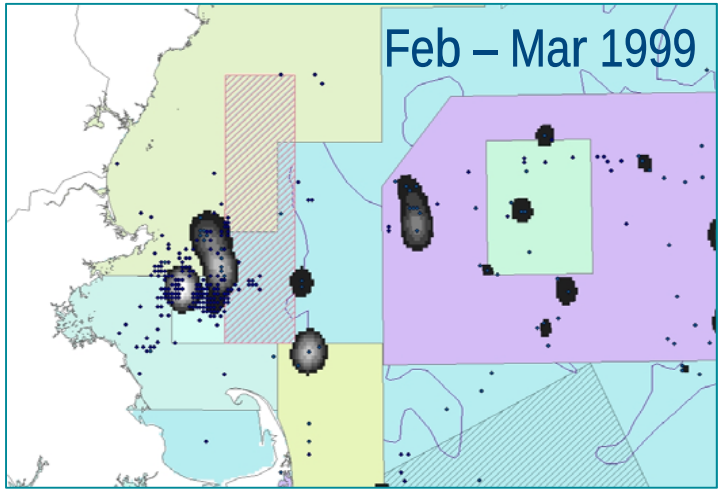
- Estimated bycatch generally higher in Oct-Nov until 2008

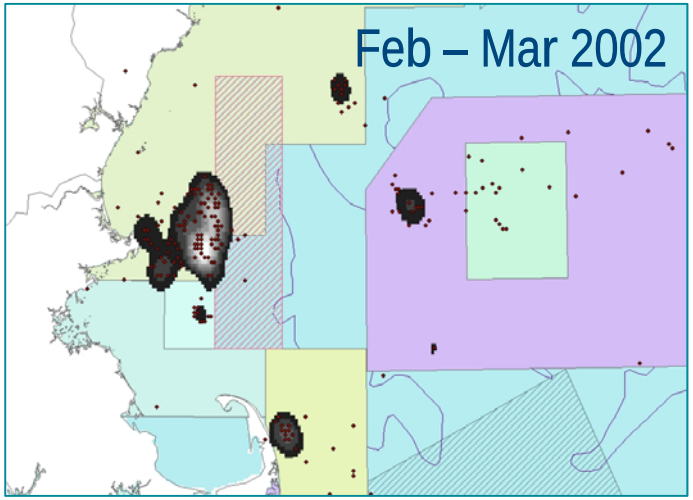
Landings by period and year

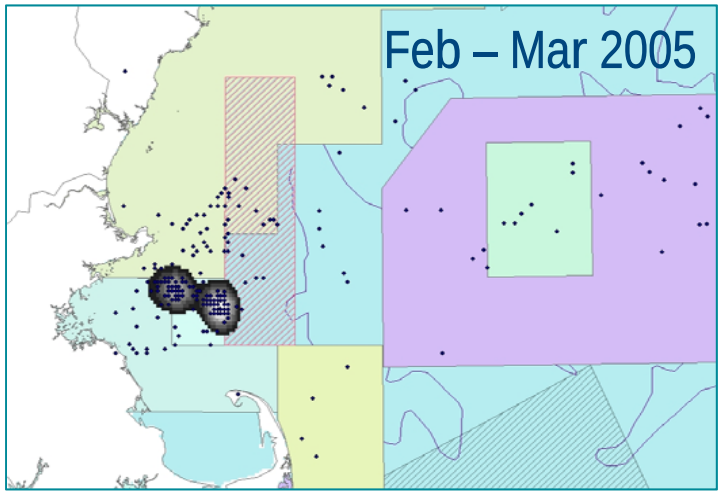


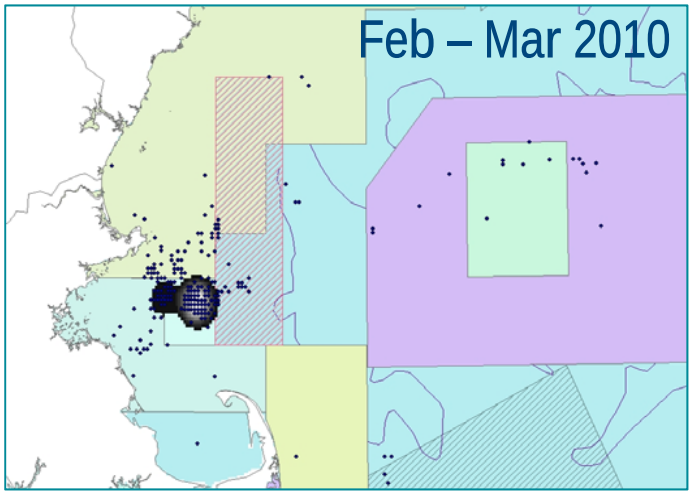
- Landings generally greater in Oct-Nov

February-March trip distribution over time









Pinger Functionality and Compliance

How was pinger tester data used to help calculate compliance

Pinger testing – how many are working?

- After removing ambiguous codes:
  - inaudible, not tested
  - unknown
  - absent (lost)
  - none used
  - other
- 93% working in 2011 (n=2422)
- 97% working so far in 2012 (n=1325)

Pinger testing – how many are working?

- Pingers working by brand since 2010:
  - Airmar = 94% (n =1795)
  - Dukane = 85% (n = 107))
  - Fumunda = 96% (n = 1834))
  - Unknown brand = 90% (n = 37)

Pinger testing and compliance estimates

- To estimate compliance, the percentage of hauls with the right number of pingers was multiplied by the percentage of hauls that had all pingers both present and working

- For example, in the 2011-2012 season, 80% of hauls had the proper number of pingers on their nets
- Among pinger tested hauls with the proper number of pingers on their nets, 77.5% (93/120) had all of those pingers functioning.

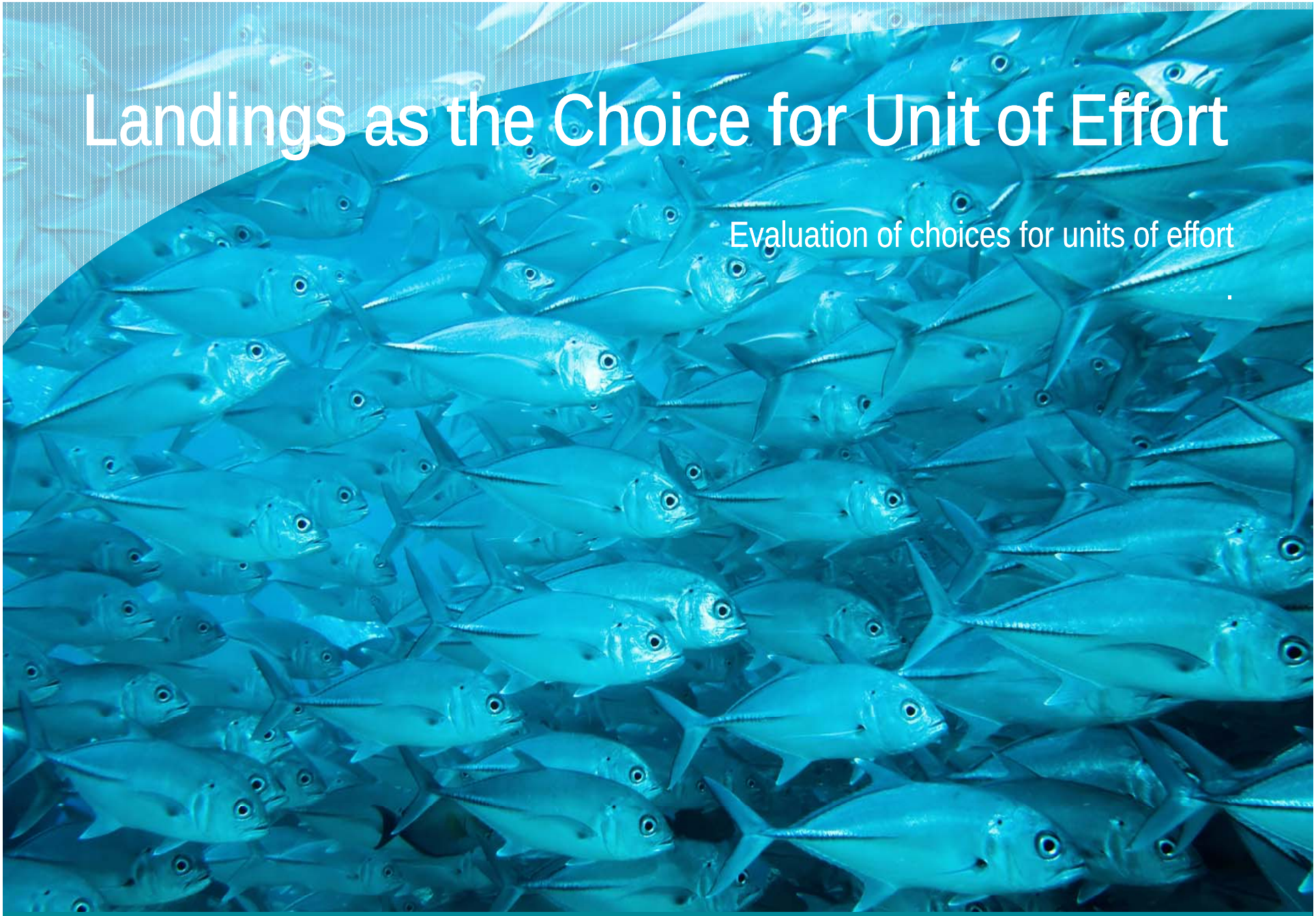
  - 80% x 77.5% = 62%

Summary of takes on hauls with pingers tested?

- In 2010 no takes were observed on hauls where pingers were tested for functionality
- In October of 2011 one harbor porpoise was taken on a haul with all pingers present where 2 pingers were recorded as working, and 9 were recorded as unknown since it was a trip focused on fish sampling
- In January of 2012 one harbor porpoise was taken on a haul with all working pingers
- In February of 2012 one harbor porpoise was taken on a haul short one pinger. Four were recorded as working, the rest were unknown since the trip was focused on fish sampling
- In November 2012 (preliminary data) one harbor porpoise was taken on a haul with all pingers present and fucntional.

Landings as the Choice for Unit of Effort

Evaluation of choices for units of effort



Data Quality Evaluation: VTR Effort

- Preferred indication of gillnet fishing effort is the length of time and space gear is in the water:

  soak time *x* total net length,

  where total net length = gear quantity *x* gear size
- Historically, VTR effort data quality was poor with respect to these variables
- Effort recently re-evaluated using 2007-2011 data to assess whether soaktime x total net length could be used as a unit of effort in bycatch rate analyses

Comparison of VTR and Observer Effort Data

- Over 2007-2011, observed trips were matched to the VTR log submitted for the same trip (n=3,342) via the VTR Serial number
- Data recorded on the observed log and the VTR log were compared for:
  - Gear quantity (average number of nets)
  - Gear size (average length of net)
  - Soak duration
  - Number of hauls

VTR Reporting Instructions:

- Gear quantity: For fixed gear, fishers are instructed to record the average number of nets per string on each haul.
- Gear size: Average length of the nets used in a string (not the entire string)

Results of Comparisons

	VTR			OBSERVER		
	Mean	Median	Range	Mean	Median	Range
Gear quantity	29.3	18.0	1-700	10.4	10.0	1-50
Gear size	330.4	300.0	30-4000	303.8	300.0	50-1400
Soak duration	48.3	24.0	1-450	48.2	24.0	0-672
Number of Hauls	3.1	3.0	1-54	4.3	4.0	1-35

Average VTR values for ‘gear quantity’ were 3x higher than those recorded by observers on the same trip

Why the Discrepancy?

- Fishers may be recording the total quantity of gear fished or onboard during a trip rather than the average number fished on a haul
- Using gear quantity in the calculation of total fishing effort would over-estimate total bycatch
- Decision was made to not use soak time *x* net length as a unit of effort
- Any use of alternate units of effort would have to be limited to analysis of observer data, and could not be used to estimate takes in the whole fishery

Annual Bycatch Estimates

2010 and preliminary 2011 annual harbor porpoise bycatch estimates

Bycatch Estimation – The Basics

Bycatch Estimate =
Observed Bycatch Rate * Total Fishery Effort

Observed Bycatch Rate =

$$\frac{\text{\# of incidental takes observed}}{\text{fishery effort observed}}$$

Total Fishery Effort = metric tons of fish landed

(all of the above is done by time, area, and pinger use)

Bycatch Estimation – Stratification

Northeast Estimates

- Estimates are calculated separately by season, port group, and management areas
- Estimates are adjusted for pinger use and groundfish coverage (because of possible over-represented groundfish hauls due to ASM coverage)

Mid-Atlantic Estimates

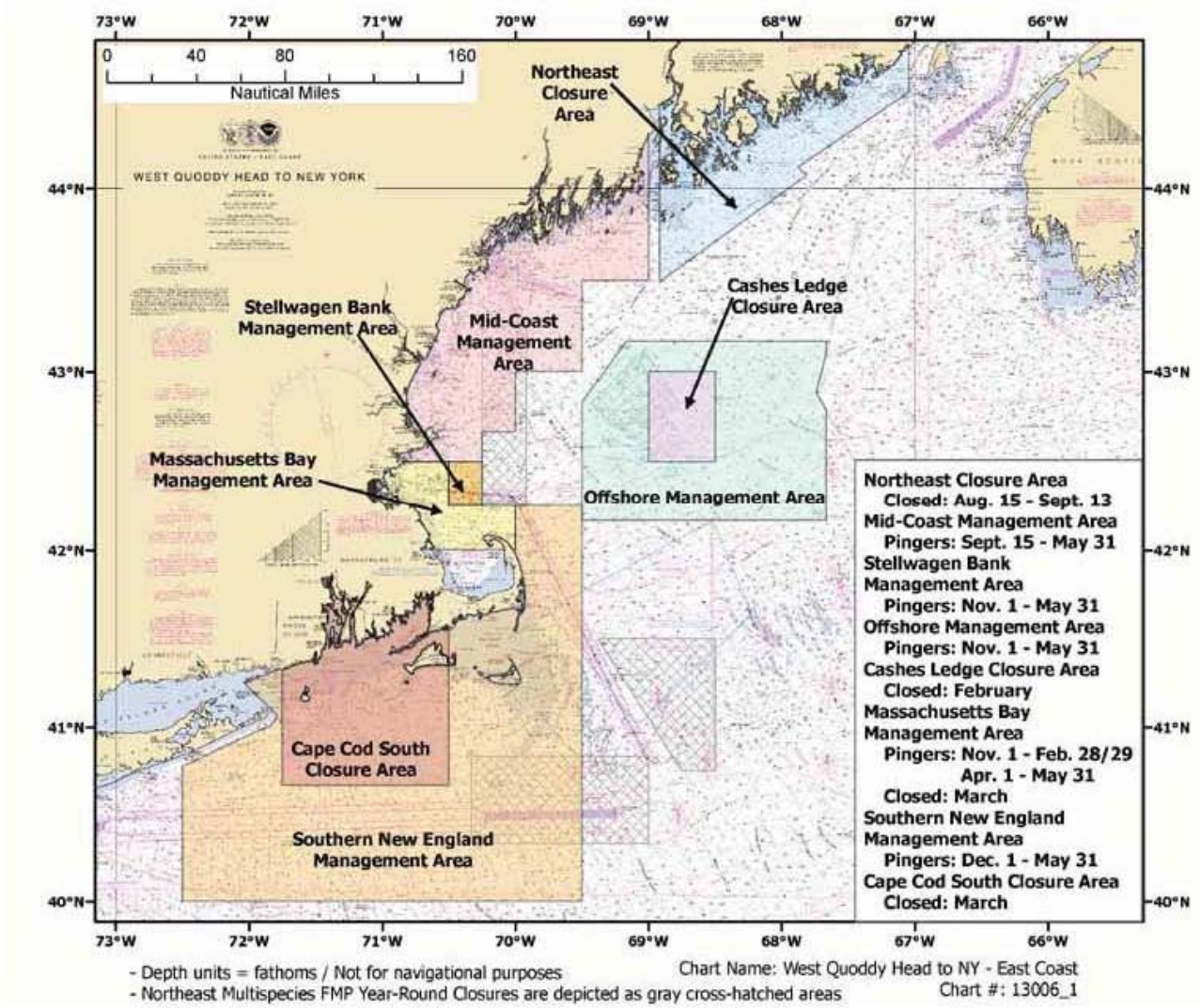
- Estimates are calculated by region/state and season based on historical bycatch

Bycatch Estimation – Stratification

Northeast Estimates Stratification

- Management Areas
  - Offshore, Cashes Ledge, Midcoast, Mass Bay, Stellwagen Bank, Cape Cod Bay, South Cape, Southern New England, and Great South Channel
- Port Groups:
  - Northern Maine, Southern Maine, New Hampshire, North of Boston, South of Boston, South of Cape Cod, East of Cape Cod, and Offshore
- Seasons
  - Fall (Sep-Dec), Winter (January – May), Summer (Jun-Aug)

Bycatch Estimation - Stratification



Bycatch Estimation – Example

Winter 2006	Observed Hauls	Observed Tons	Prorated Dealer Tons	Observed Bycatch	Bycatch Rate	Estimated Bycatch
South of Boston	96	11.45	437.41	1	0.087	38

- Bycatch rate = observed bycatch/observed tons

  (0.087 = 1/11.45)

- Bycatch estimate = bycatch rate*metric tons of effort

  (38.05 = 0.087*437.41)

Bycatch Estimation – Example

- Estimates by area and season are then summed for a total bycatch estimate
- Mid-Atlantic is done the same way, except state or region is substituted for port group-management areas, and pingers do not play a role

2006 Winter (Jan-May)	Observed Takes	Bycatch Rate (Take/MTon)	Estimated Takes	C.V. (%)	95% C.I.
Port Group-Area Strata					
Northern Maine	0	0.000	0		
Southern Maine	0	0.000	0		
New Hampshire	0	0.000	0		
North of Boston	3[b]	0.111[c]	50	71%	3-124
South of Boston	1[b]	0.087	38	99%	1-128
South Of Cape Cod[d]	13[b]	0.188	265	48%	52-561
East Of Cape Cod	0	0.000	0		
Offshore	0	0.000	0		
Closure Strata					
Offshore Closure	0	0.000	0		
Cashes Ledge Closure	0	0.000	0		
Midcoast Closure	0	0.000	0		
Mass Bay Closure	0	0.000	0		
Cape Cod Bay Closure	0	0.000	0		
South Cape Closure[d]	5[b]	0.095[c]	67	80%	5-188
Great S. Channel Closure	0	0.000	0		
Subtotal	22		420	36%	168-740
Summer (Jun-Aug)	**Observed Takes**	**Bycatch Rate (Take/MTon)**	**Estimated Takes**	**C.V. (%)**	**95% C.I.**
Port Group-Area Strata					
Northern Maine	0	0.000	0		
Southern Maine	0	0.000	0		

Bycatch Estimation – Pinger Weighting

- Pinger Weighting is done by the number of hauls with and without pingers. The weighted bycatch rate is calculated with this formula:

$$\frac{\text{Bycatch rate of hauls with pingers} + \text{Bycatch rate of hauls without pingers}}{\text{Total Number of Hauls}}$$

- This has process is well established and has been done like this for since the pingers have been required

Bycatch Estimation – Incorporating ASM data

- To incorporate ASM data we had to make sure the total sample (ASM + NEFOP) was representative of all gillnet effort in the region.
- To do this, the percentage of groundfish fishing effort was calculated for each season-area stratum
- A declaration into the Northeast Multispecies Fishery was used to define a “groundfish” trip
- The bycatch rate was adjusted so that groundfish bycatch rates did not disproportionately influence the total bycatch rate for a season-area stratum

Bycatch Estimation – Incorporating ASM data

- The total bycatch rate for a season-area stratum was calculated using the below formula:

(Groundfish % effort x Groundfish Bycatch rate) +

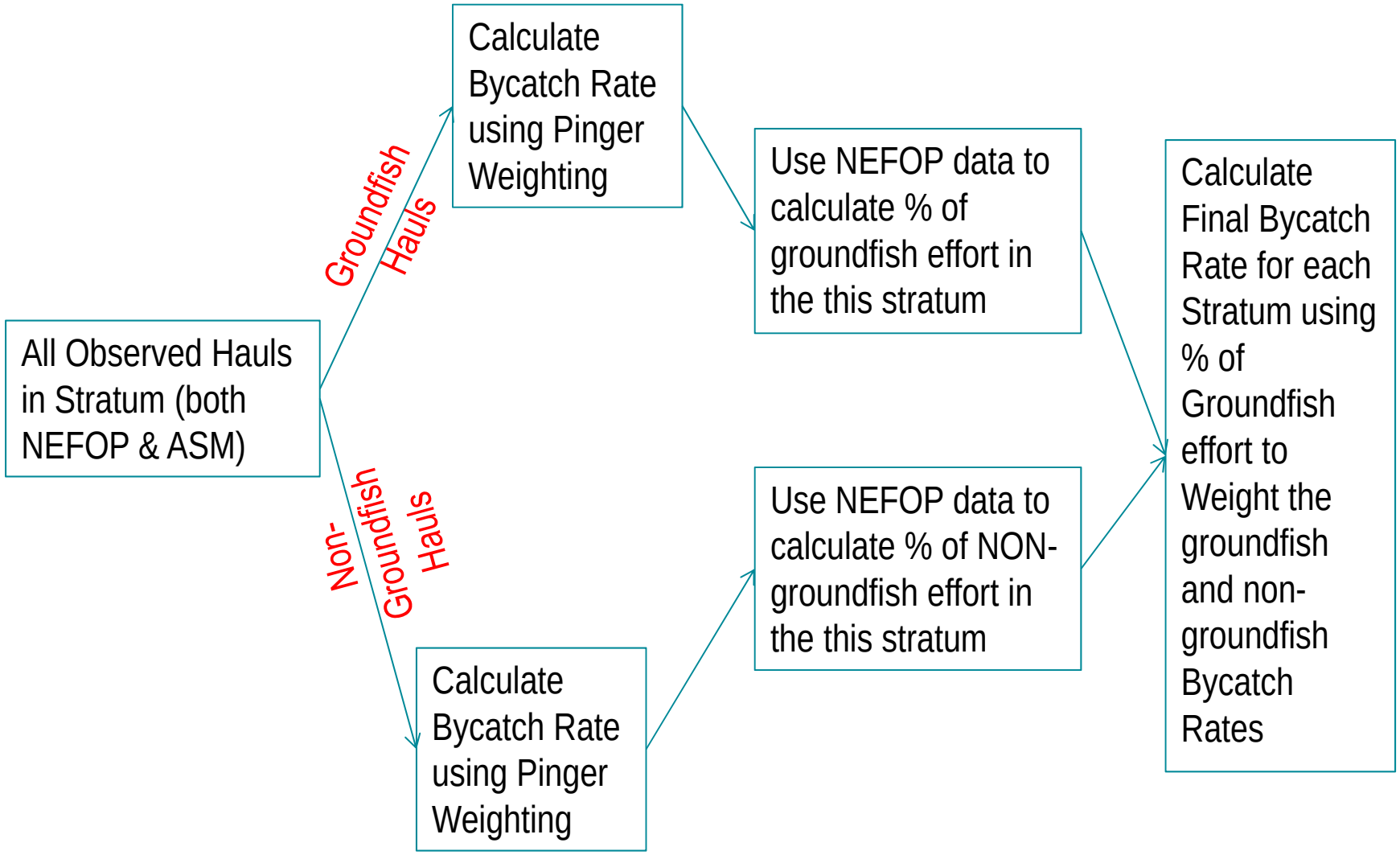
(Non-groundfish% effort x non-groundfish Bycatch rate)

- This had little impact in the Gulf of Maine where nearly all gillnet effort in times and areas with harbor porpoise bycatch was groundfish effort
- This has potential to have a larger impact when calcualting Southern New England bycatch rates

Bycatch Estimation – Unique situations

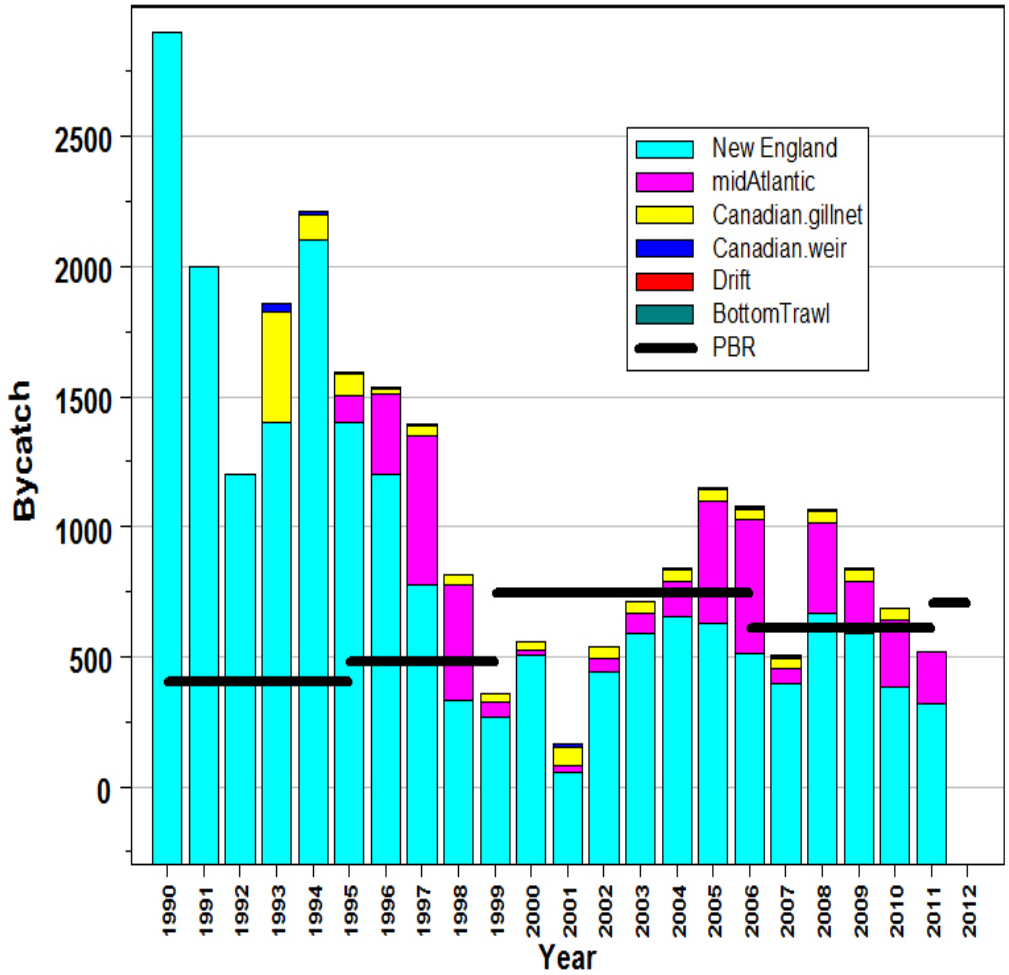
- ASM pinger data – until Sept 2011 there was confusion between situations where pingers were not recorded and where no pingers were used
- Therefore, until Sept 2011 ASM hauls with missing pinger information were dropped from calculations of ASM bycatch rates.
- Bycatch during NMFS experiments were not used to calculating bycatch rates for the fishery
- In both situations, bycatch was summed, but not used to calculate bycatch rates applied to the fishery.

Bycatch Estimation – Stratification



Annual Bycatch Estimates

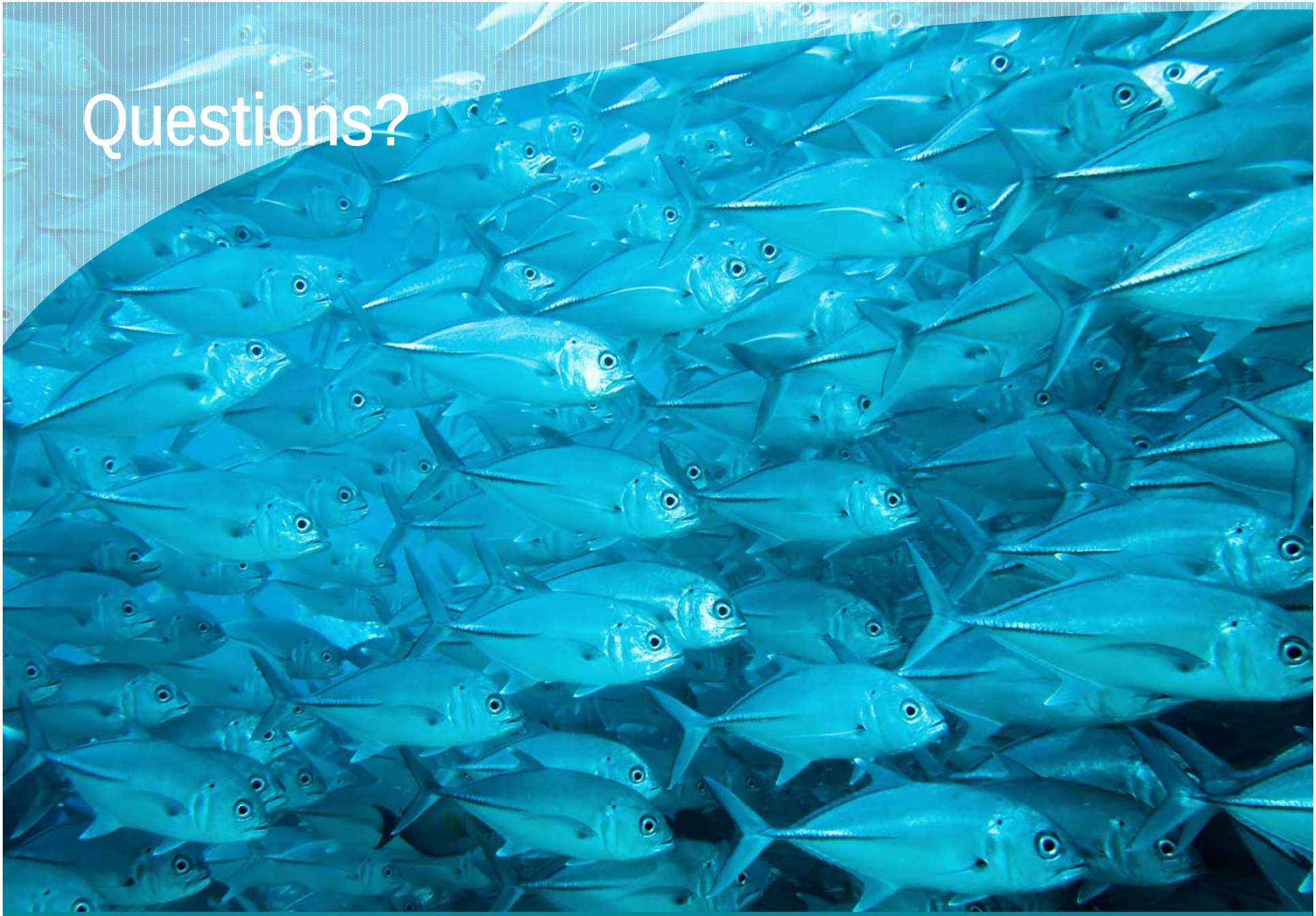
- 2010 Estimates
  - NE = 387
  - MA = 257
  - Total = 644
- 2011 Estimates, (preliminary)
  - NE = 322
  - MA = 194
  - Total = 516



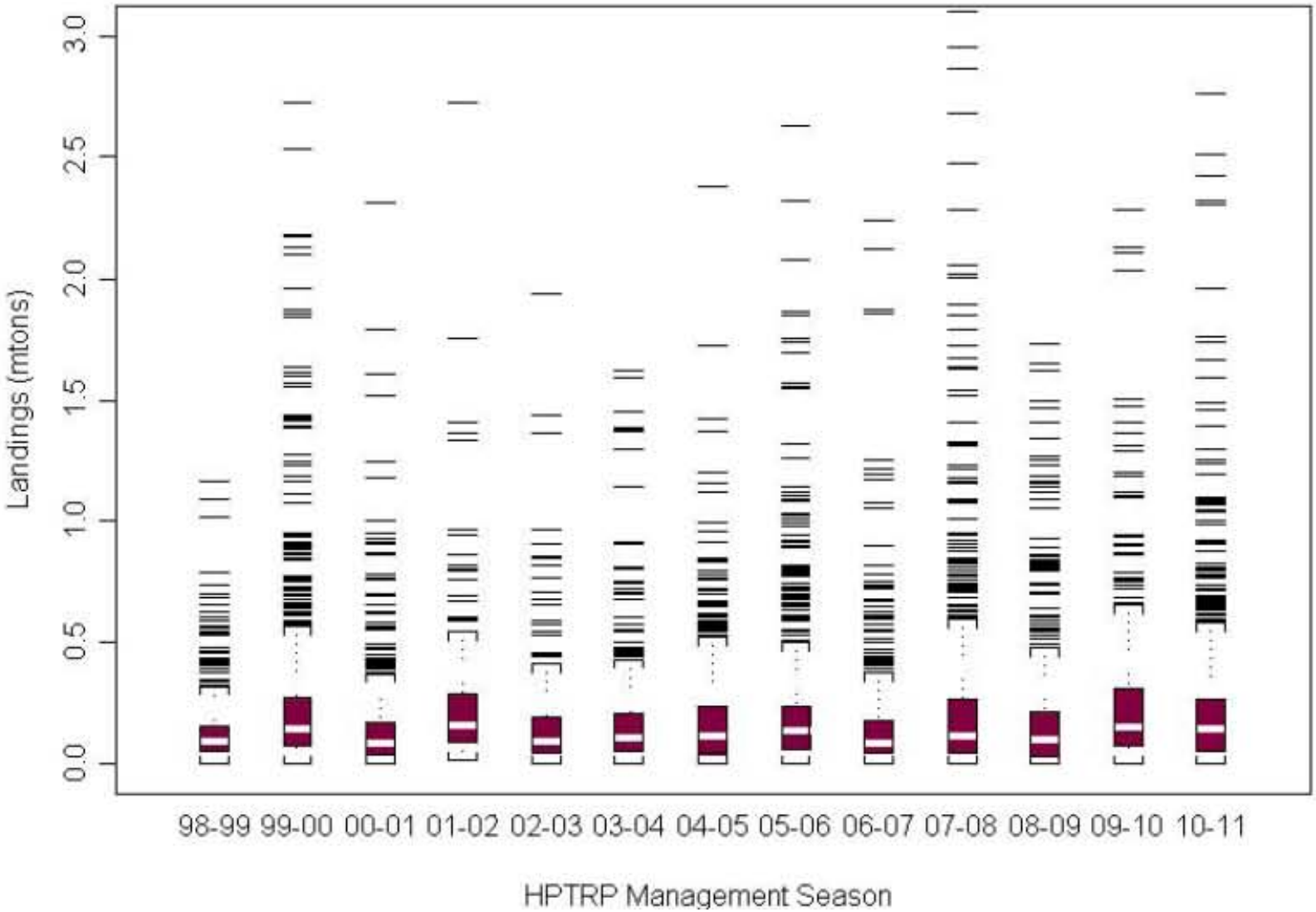
Preliminary 2012 Bycatch Data

- Disclaimer: 2012 winter bycatch estimates are only approximate. Only VTR data was used for the effort calculations and data was not weighted for pinger use
- Winter, Northeast = 138, Mid-Atlantic = 19
- 2012 Summer: 1 observed take in July
- 2012 Fall so far (preliminary):
  - Sept, 2 takes
  - Oct, 6 takes
  - Nov, 5 takes

Questions?



CGOM observed average landings per haul



Pinger Compliance Bycatch Rates

Table 3. Estimated Harbor Porpoise Take Reduction Plan (HPTRP) pinger compliance in the New England gillnet fishery during the 2010-2011 HPTRP management season.

CCA-Associated Area	Data Source	Full pinger deployment hauls	Non-Full Pinger Deployment Hauls	Total Observed Hauls	Full Pinger Deployment Percentage	Recorded Hauls (and Trips) Tested for Pinger Functionality	Full Pinger Deployment Hauls (and Trips) Tested for Pinger Functionality	Functionality on Full Pinger Deployment Hauls	Percent Compliant Estimate
Coastal Gulf of Maine	ASM	1106	600	1706	64.83%	0	0	NA	NA
Coastal Gulf of Maine	NEFOP	728	155	883	82.45%	38 (13)	26 (11)	50.00%	41.22%
Southern New England	ASM	220	193	413	53.27%	0	0	NA	NA
Southern New England	NEFOP	154	84	238	64.71%	15 (11)	8 (6)	100.00%	64.71%

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Coastal Gulf of Maine	NEFOP	1012	253	1265	80.00%	214 (56)	120 (38)	77.50%	62.00%
Coastal Gulf of Maine	ASM	1647	427	2074	79.41%	0	0	NA	NA
Southern New England	NEFOP	150	55	205	73.17%	12 (3)	10 (3)	100.00%	73.17%
Southern New England	ASM	578	142	720	80.28%	0	0	NA	NA

Pinger testing and compliance estimates

- Subset pinger tester data to hauls with the proper number of pingers
- Then, checked pinger tester data to see how many of these hauls had all pingers working.
- In the 2010-2011 season, 50% (13/26) of hauls that had the proper number of pingers on a string *also had* all of those pingers functioning.
- In the 2011-2012 season, this number was 77.5% (93/120) (% of tested hauls with the proper number of pingers hauled and had all pingers working)