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Estimates of Cetacean and Pinniped Bycatch in the 2016 New England Sink and Mid-Atlantic Gillnet Fisheries

by Christopher D Orphanides

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EXECUTIVE SUMMARY

This report provides estimated bycatch of 5 species of small cetaceans and pinnipeds bycaught in the New England sink (NESG) and Mid-Atlantic (MAG) gillnet fisheries. The bycatch estimation methodology approach used for these data does not differ from the previous year's estimates. For details on the bycatch estimation methodology, please refer to Orphanides and Hatch (2017).

Bycatch estimates in New England were conducted by using a stratified ratio estimation approach using the seasons, port groups, and management areas used in recent years (Orphanides and Hatch 2017). Observer coverage for the NESG averaged 10% during 2016 (Table 1). The 2016 serious injuries and total mortalities in the NESG fishery were 125 (coefficient of variation [CV] = 0.34) harbor porpoises (*Phocoena phocoena phocoena*), 80 (CV = 0.38) common dolphins (*Delphinus delphis delphis*), 498 (CV = 0.33) gray seals (*Halichoerus grypus*), 245 (CV = 0.29) harbor seals (*Phoca vitulina vitulina*), and 85 (CV = 0.50) harp seals (*Pagophilus groenlandicus*) (Tables 2-6). The NESG estimates are based on observed bycatch consisting of 11 harbor porpoises, 8 common dolphins, 43 gray seals, 36 harbor seals, and 5 harp seals (Tables 2-6, Figure 1). New England compliance with the 2010 Harbor Porpoise Take Reduction Plan (HPTRP) pinger regulations was 75% in 2016, where compliance refers to the correct number of pingers used, not the pingers' functionality (Table 7).

The Mid-Atlantic ratio estimator stratification was done as in recent years by mesh size, soak duration, and season based on historical patterns of bycatch coinciding with previous bycatch estimates in this region (Orphanides and Hatch 2017). The spatial stratification for all Mid-Atlantic bycatch was the Waters off New Jersey management area (Figure 1). The season used for harbor porpoises and gray seals was January to April, December to January for common dolphins, and December to March for harbor seals (Orphanides and Hatch 2017). February was used as the temporal stratum for hooded seals (*Cystophora cristata*) as little is known about their distribution in the Mid-Atlantic. Observer coverage for the MAG averaged 8% during 2016 (Table 8) and between 6% and 14% in strata used to estimate bycatch (Table 9). The 2016 total serious injuries and mortalities in the MAG fishery were 23 (CV = 0.64) harbor porpoises, 7 (CV = 0.97) common dolphins, 7 (CV = 0.93) gray seals, 18 (CV = 0.95) harbor seals, and 3 (CV = 1.12) hooded seals (Table 10). The MAG estimates are based on observed bycatch consisting of 2 harbor porpoises, 1 common dolphin, 1 gray seal, 2 harbor seals, and 1 hooded seal (Table 10, Figure 1). HPTRP compliance rates in the 2016 MAG fishery were low for large mesh gillnets (45%) and relatively high for small mesh gillnets (83%) (Table 11). The 5 year mean bycatch estimates for both the MAG and NESG can be found in Table 12.

REFERENCES CITED

Orphanides C, Hatch J. 2017. Estimates of cetacean and pinniped bycatch in the 2015 New England sink and mid-Atlantic gillnet fisheries. US Dept Commer, Northeast Fish Sci Cent Ref Doc 17-18; 21 p.

TABLES

Table 1. 2016 New England sink gillnet fishery summaries of observed hauls, observed trips, observed landings, prorated commercial landings, and observer coverage by season and port group (PG)/management area (MA). Seasons were defined as "W" (winter: January - May), "S" (summer: June - August), and "F" (fall: September - December).

Season	Port Group (PG)/ Management Area (MA)	Observed Hauls ^a	Observed Trips	Observed Landings (mt)	Commercial Landings (mt)	Observer Coverage
W	Cape Cod South (MA)	119 (101)	33	65.86	835.09	0.08
W	Cashes Ledge (MA)	0 (0)	0	0	12.22	0.00
W	East of Cape Cod (PG)	6 (6)	2	4.62	71.64	0.06
W	Massachusetts Bay (MA)	9 (0)	3	0.51	4.05	0.13
W	Mid-Coast (MA)	64 (18)	20	10.89	68.87	0.16
W	New Hampshire (PG)	0 (0)	0	0	0	NA
W	North of Boston (PG)	18 (7)	5	8.04	5.98	1.34
W	Offshore (MA)	40 (11)	7	19.68	126.72	0.16
W	Offshore (PG)	20 (15)	3	6.81	68.20	0.10
W	South of Boston (PG)	0 (0)	0	0	7.34	0.00
W	South of Cape Cod (PG)	19 (12)	8	4.34	49.27	0.09
W	Southern Maine (PG)	0 (0)	0	0	15.98	0.00
W	Southern New England (MA)	256 (120)	61	134.83	2394.53	0.06
W	Stellwagen Bank (MA)	168 (56)	46	25.70	72.01	0.36
W	Subtotal	719 (346)	188	281.28	3731.90	0.08
S	East of Cape Cod (PG)	179 (47)	65	251.76	3736.09	0.07
S	New Hampshire (PG)	70 (2)	27	54.74	381.35	0.14
S	North of Boston (PG)	187 (29)	51	74.02	553.45	0.13
S	Offshore (PG)	161 (0)	13	39.27	272.57	0.14
S	South of Boston (PG)	65 (9)	19	23.91	196.95	0.12
S	South of Cape Cod (PG)	237 (102)	64	82.52	1524.82	0.05
S	Southern Maine (PG)	81 (3)	19	36.31	75.54	0.48
S	Subtotal	980 (192)	258	562.53	6740.77	0.08
F	Cape Cod South (MA)	87 (48)	21	56.20	270.95	0.21
F	East of Cape Cod (PG)	179 (121)	67	247.26	2049.28	0.12
F	Massachusetts Bay (MA)	0 (0)	0	0	3.94	0.00
F	Mid-Coast (MA)	139 (41)	45	37.21	234.39	0.16
F	New Hampshire (PG)	2 (0)	1	1.81	49.62	0.04
F	North of Boston (PG)	84 (42)	29	17.58	48.88	0.36
F	Offshore (MA)	58 (52)	7	15.96	83.13	0.19
F	Offshore (PG)	98 (12)	7	42.49	116.61	0.36
F	South of Boston (PG)	16 (0)	4	3.94	58.99	0.07
F	South of Cape Cod (PG)	490 (167)	96	139.38	864.95	0.16
F	Southern Maine (PG)	46 (32)	6	14.18	56.42	0.25
F	Southern New England (MA)	52 (10)	13	23.90	193.08	0.12
F	Stellwagen Bank (MA)	23 (15)	7	10.66	64.69	0.16
F	Subtotal	1274 (540)	303	610.57	4094.93	0.15
Total		2973 (1078)	749	1454.38	14567.60	0.10

^a Parentheses indicate the number of limited hauls out of the total (i.e., complete + limited).

Table 2. Harbor porpoise (*Phocoena phocoena phocoena*) bycatch in the New England sink gillnet fishery during 2016. Provided are the observed number of bycatch, estimated bycatch rates, estimated bycatch, coefficient of variation (CV), and lower (L) and upper (U) limits on 95% confidence intervals (CI) by season and port group (PG)/management area (MA). Seasons were defined as "W" (winter: January - May), and "F" (fall: September - December).

Season	Port Group (PG)/ Management Area (MA)	Observed Bycatch	Bycatch Rate	Estimated Bycatch	CV	95% CI	
						L	U
W	Mid-Coast (MA)	1	0.083	5.72	0.95	1	33
W	Cape Cod South (MA)	4	0.055	45.93	0.56	9	123
W	Southern New England (MA)	3	0.023	55.07	0.56	17	144
W	Subtotal	8	-	106.72	0.38	47	220
F	Mid-Coast (MA)	1	0.027	6.33	1.01	1	37
F	Southern New England (MA)	1	0.031	5.99	1.22	1	41
F	Stellwagen Bank	1	0.094	6.08	1.08	1	37
F	Subtotal	3	-	18.40	0.64	5	66
	Total	11	-	125.12	0.34	63	241

Table 3. Common dolphin (*Delphinus delphis delphis*) bycatch in the New England sink gillnet fishery during 2016. Provided are the observed number of bycatch, estimated bycatch rates, estimated bycatch, coefficient of variation (CV), and lower (L) and upper (U) limits on 95% confidence intervals (CI) by season and port group (PG)/management area (MA). Seasons were defined as "W" (winter: January - May), and "F" (fall: September-December).

Season	Port Group (PG)/ Management Area (MA)	Observed Bycatch	Bycatch Rate	Estimated Bycatch	CV	95% CI	
						L	U
W	Cape Cod South (MA)	2	0.029	24.22	0.69	2	76
W	Southern New England (MA)	1	0.008	19.16	0.98	1	89
W	Subtotal	3	-	43.38	0.57	12	134
F	South of Cape Cod (PG)	1	0.008	6.92	0.88	1	39
F	Cape Cod South (MA)	2	0.037	10.03	0.70	2	38
F	Southern New England (MA)	2	0.100	19.31	0.64	2	58
F	Subtotal	5	-	36.26	0.43	12	91
	Total	8	-	79.64	0.38	34	166

Table 4. Gray seal (*Halichoerus grypus atlantica*) bycatch in the New England sink gillnet fishery during 2016. Provided are the observed number of bycatch, estimated bycatch rates, estimated bycatch, coefficient of variation (CV), and lower (L) and upper (U) limits on 95% confidence intervals (CI) by season and port group (PG)/management area (MA). Seasons were defined as "W" (winter: January - May), "S" (summer: June - August), and "F" (fall: September - December).

Season	Port Group (PG)/ Management Area (MA)	Observed Bycatch	Bycatch Rate	Estimated Bycatch	CV	95% CI	
						L	U
W	Cape Cod South (MA)	5	0.071	59.29	0.46	21	139
W	Southern New England (MA)	11	0.074	177.20	0.41	72	388
W	Subtotal	16	-	236.49	0.33	122	451
S	East of Cape Cod (PG)	5	0.019	70.99	0.45	15	146
S	North of Boston (PG)	2	0.023	12.73	0.65	2	40
S	Subtotal	7	-	83.72	0.40	33	171
F	East of Cape Cod (PG)	12	0.067	137.30	0.94	55	791
F	Mid-Coast (MA)	1	0.027	6.33	1.00	1	35
F	North of Boston (PG)	1	0.066	3.23	0.84	1	18
F	Cape Cod South (MA)	5	0.092	24.93	0.62	5	85
F	Stellwagen Bank	1	0.094	6.08	0.94	1	26
F	Subtotal	20	-	177.87	0.72	89	814
	Total	43	-	498.08	0.33	317	983

Table 5. Harbor seal (*Phoca vitulina vitulina*) bycatch in the New England sink gillnet fishery during 2016. Provided are the observed number of bycatch, estimated bycatch rates, estimated bycatch, coefficient of variation (CV), and lower (L) and upper (U) limits on 95% confidence intervals (CI) by season and port group (PG)/management area (MA). Seasons were defined as "W" (winter: January - May), "S" (summer: June - August), and "F" (fall: September - December).

Season	Port Group (PG)/ Management Area (MA)	Observed Bycatch	Bycatch Rate	Estimated Bycatch	CV	95% CI	
						L	U
W	Cape Cod South (MA)	3	0.038	31.73	1.00	3	141
W	Southern New England (MA)	3	0.023	55.07	0.57	17	153
W	Stellwagen Bank	2	0.077	5.54	0.86	2	35
W	Subtotal	8	-	92.34	0.49	28	220
S	North of Boston (PG)	4	0.046	25.46	0.50	6	63
S	Southern Maine (PG)	1	0.029	2.19	0.69	1	11
S	Subtotal	5	-	27.65	0.50	8	66
F	Mid-Coast (MA)	13	0.345	80.86	0.53	33	262
F	North of Boston (PG)	4	0.243	11.88	0.42	4	29
F	Southern Maine (PG)	2	0.136	7.67	0.96	2	43
F	Stellwagen Bank	4	0.375	24.26	0.73	4	86
F	Subtotal	23	-	124.67	0.38	65	294
Total		36	-	244.66	0.29	141	419

Table 6. Harp seal (*Pagophilus groenlandicus*) bycatch in the New England sink gillnet fishery during 2016. Provided are the observed number of bycatch, estimated bycatch rates, estimated bycatch, coefficient of variation (CV), and lower (L) and upper (U) limits on 95% confidence intervals (CI) by season and port group (PG)/management area (MA). "W" indicates the season (winter: January – May).

Season	Port Group (PG)/ Management Area (MA)	Observed Bycatch	Bycatch Rate	Estimated Bycatch	CV	95% CI	
						L	U
W	Cape Cod South (MA)	2	0.033	27.56	1.06	2	153
W	Southern New England (MA)	3	0.024	57.47	0.53	3	134
W	Subtotal	5	-	85.03	0.50	19	201
Total		5	-	85.03	0.50	19	201

Table 7. Summary of 2016 full pinger deployment for Northeast Fisheries Observer Program observed hauls within times and areas where pingers were required by the 2010 Harbor Porpoise Take Reduction Plan (HPTRP). Seasons were defined as "Winter" (January - May) and "Fall" (September - December).

Season	Management Area	Observed Hauls	Pinger Violations	Compliance Rate
Fall	Cape Cod South ^a	87	28	68%
	Mid-Coast	139	34	76%
	Offshore	58	46	21%
	Southern New England	52	23	56%
	Stellwagen Bank	23	1	96%
Winter	Cape Cod South	119	11	91%
	MassBay	9	8	11%
	Mid-Coast	64	25	61%
	Offshore	40	3	93%
	Southern New England	256	53	79%
	Stellwagen Bank	168	17	90%
Total		1015	249	75%

^a Cape Cod South specification includes Dec-May, matching the period used for the bycatch estimation strata.

Table 8. 2016 Mid-Atlantic gillnet fishery summaries of observed landings, prorated commercial landings, and observer coverage, by state (Figure 1b). Effort from bays and sounds are not included.

State	Observed Landings (mt)	Commercial Landings (mt)	Observer Coverage
Delaware	0.10	2.07	0.05
Maryland	76.39	664.46	0.12
North Carolina	298.05	6605.88	0.05
New Jersey	399.59	3018.95	0.13
New York	8.91	238.59	0.04
Virginia	183.57	1705.57	0.11
Florida	0.00	11.41	0.00
Maine	0.00	1.25	0.00
Rhode Island	0.00	2.76	0.00
Total	966.61	12,250.94	0.08

Table 9. Summaries of observed hauls, observed trips, observed landings, prorated commercial landings, and observer coverage by species, season, region, mesh size, and soak duration for strata with bycatch of harbor porpoise (*Phocoena phocoena phocoena*), gray seal (*Halichoerus grypus atlantica*), common dolphin (*Delphinus delphis delphis*), harbor seal (*Phoca vitulina vitulina*), or hooded seal (*Cystophora cristata*) in the 2016 Mid-Atlantic gillnet fishery.

Species	Season	Region	Mesh Size (in)	Soak Duration (hrs)	Observed Hauls ^a	Observed Trips	Observed Landings (mt)	Commercial Landings (mt)	Observer Coverage
Harbor Porpoise	Jan-Apr	Waters off NJ	>=7	>72	55 (18)	11	19.1	140.18	13.63%
Harbor Porpoise	Jan-Apr	Waters off NJ	>=7	<=72	47 (1)	13	15.46	259.60	5.96%
Gray Seal	Jan-Apr	Waters off NJ	>=7	>72	55 (18)	11	19.1	140.18	13.63%
Common Dolphin	Dec-Jan	Waters off NJ	>=7	<=72	114 (6)	31	47.01	343.91	13.67%
Harbor Seal	Dec-Mar	Waters off NJ	>=7	>72	65 (18)	15	25.35	230.94	10.98%
Hooded Seal	Feb	Waters off NJ	>=7	<=72	31 (18)	7	33.46	344.77	9.71%

^a Parentheses indicate the number of limited hauls out of the total (i.e., complete + limited).

Table 10. Observed number of bycatch, estimated bycatch rates, estimated bycatch, coefficient of variation (CV), and lower and upper limits on 95% confidence intervals (CI) of estimated harbor porpoise (*Phocoena phocoena phocoena*), gray seal (*Halichoerus grypus atlantica*), common dolphin (*Delphinus delphis delphis*), harbor seal (*Phoca vitulina vitulina*), and hooded seal (*Cystophora cristata*) bycatch in the Mid-Atlantic gillnet fishery for 2016, by season, region, mesh size, and soak duration.

Species	Season	Region	Mesh Size (in)	Soak Duration (hrs)	Observed Bycatch	Bycatch Rate	Estimated Bycatch	CV	95% CI
Harbor Porpoise	Jan-Apr	Waters off NJ	>=7	>72	1	0.074	15.43	0.93	1-39
Harbor Porpoise	Jan-Apr	Waters off NJ	>=7	<=72	1	0.052	7.29	0.87	1-60
Harbor Porpoise	Jan-Apr	Waters off NJ	all	all	2	-	22.72	0.64	2-71
Gray Seal	Jan-Apr	Waters off NJ	>=7	>72	1	0.052	7.29	0.93	1-38
Common Dolphin	Dec-Jan	Waters off NJ	>=7	<=72	1	0.021	7.22	0.97	1-45
Harbor Seal	Dec-Mar	Waters off NJ	>=7	>72	2	0.079	18.24	0.95	2-100
Hooded Seal	Feb	Waters off NJ	>=7	<=72	1	0.092	3.24	1.12	2-27

Table 11. Observed number of hauls for large (7-18") and small mesh (<7") gillnets following requirements for the Mid-Atlantic 2010 Harbor Porpoise Take Reduction Plan (HPTRP). Observed hauls missing information for an assessed gear modification were assumed to be following the HPTRP for that gear characteristic. Locations are depicted in Figure 1b.

Management Area	General Violation Types			Specific Violation Types								
	Total Observed Hauls	Non-Compliant Hauls	Compliance %	Gear Modification	Closed Area	Multiple Violations per Haul	Number of Nets	Twine Size	Tie-Down Lengths	Tie-Down Use	Net Length	Unkown Gear Compliance ^a
Southern Mid-Atlantic Large Mesh	19	1	95%	1	0	1	1	1	0	2	0	0
Southern Mid-Atlantic Small Mesh	208	44	79%	44	0	3	3	17	0	0	27	9
Mudhole North Large Mesh	14	11	21%	11	3	0	11	0	0	0	0	0
Mudhole North Small Mesh	21	18	14%	16	2	8	8	0	0	0	16	0
Mudhole South Large Mesh	20	14	30%	2	14	0	2	0	0	0	0	5
Mudhole South Small Mesh	-	-	-	-	-	0	0	0	0	0	0	0
Waters off New Jersey Large Mesh	68	41	40%	41	0	2	26	8	9	0	0	17
Waters off New Jersey Small Mesh	160	6	96%	6	0	0	2	0	0	0	4	0
Totals	510	125	74%	121	19	14	53	26	9	0	47	65

^a At least one gear component was not recorded and therefore could not be checked for compliance

Table 12. Observed summaries for the 5-year period of 2012 – 2016. (A) Observer coverage by fishery and year. Observed and estimated serious injuries and mortalities of marine mammals in the (B) Northeast sink gillnet and (C) Mid-Atlantic gillnet fisheries.

A.

Fishery	Years	Data Type	Observer Coverage (mt)
Northeast sink gillnet	2012-16	Obs. Data, Trip Logbook, Allocated Dealer Data	0.15, 0.11, 0.18, 0.14, 0.10
Mid-Atlantic gillnet	2012-16	Obs. Data, Trip Logbook, Allocated Dealer Data	0.02, 0.03, 0.05, 0.06, 0.08

B.

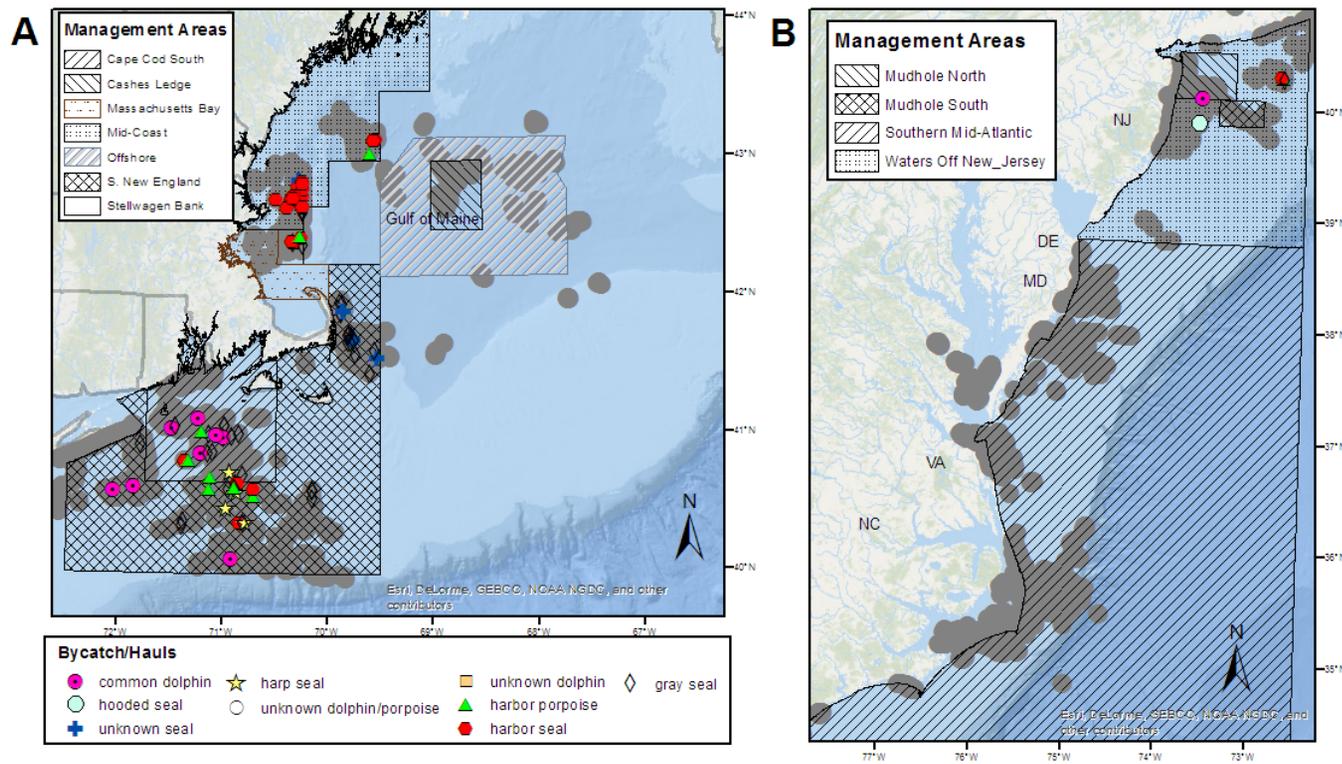
Species	Observed Serious Injury	Observed Mortality	Estimated Serious Injury	Estimated Mortality	Combined Estimate	Estimated CV	Mean (CV) Annual Combined
Harbor Porpoise	0, 0, 0, 0, 0	34, 20, 28, 23, 11	0, 0, 0, 0, 0	277, 399, 128, 177, 125	277, 399, 128, 177, 125	0.59, 0.33, 0.27, 0.28, 0.34	221 (0.20)
Common Dolphin	0, 0, 0, 0, 0	6, 5, 11, 3, 8	0, 0, 0, 0, 0	95, 104, 111, 55, 80	95, 104, 111, 55, 80	0.40, 0.46, 0.47, 0.54, 0.38	89 (0.20)
Gray Seal	0, 0, 0, 0, 0	91, 69, 159, 131, 43	0, 0, 0, 0, 0	542, 1127, 917, 1021, 498	542, 1127, 917, 1021, 498	0.19, 0.20, 0.14, 0.25, 0.33	821 (0.10)
Harbor Seal	0, 0, 0, 0, 0	37, 22, 59, 87, 36	0, 0, 0, 0, 0	252, 142, 390, 474, 245	252, 142, 390, 474, 245	0.26, 0.31, 0.39, 0.17, 0.29	301 (0.13)
Harp Seal	0, 0, 0, 0, 0	0, 2, 9, 12, 5	0, 0, 0, 0, 0	0, 22, 57, 119, 85	0, 22, 57, 119, 85	0, 0.75, 0.42, 0.34, 0.50	57 (0.23)

C.

Species	Observed Serious Injury	Observed Mortality	Estimated Serious Injury	Estimated Mortality	Combined Estimate	Estimated CV	Mean (CV) Annual Combined
Harbor Porpoise	0, 0, 0, 0, 0	2, 1, 1, 2, 2	0, 0, 0, 0, 0	63, 19, 22, 33, 23	63, 19, 22, 33, 23	0.83, 1.06, 1.03, 1.16, 0.64	32 (0.46)
Common Dolphin	0, 0, 0, 0, 0	1, 2, 1, 3, 1	0, 0, 0, 0, 0	15, 62, 17, 30, 7	15, 62, 17, 30, 7	0.93, 0.67, 0.86, 0.55, 0.97	26 (0.38)
Gray Seal	0, 0, 0, 0, 0	1, 0, 1, 1, 1	0, 0, 0, 0, 0	14, 0, 22, 15, 7	14, 0, 22, 15, 7	0.98, 0, 1.09, 1.04, 0.93	12 (0.56)
Harbor Seal	0, 0, 0, 0, 0	0, 0, 1, 5, 2	0, 0, 0, 0, 0	0, 0, 19, 48, 18	0, 0, 19, 48, 18	0, 0, 1.06, 0.52, 0.95	17 (0.43)
Hooded Seal	0, 0, 0, 0, 0	0, 0, 0, 0, 1	0, 0, 0, 0, 0	0, 0, 0, 0, 3	0, 0, 0, 0, 3	0, 0, 0, 0, 1.12	0.06 (1.12)

FIGURES

Figure 1. Locations of observed hauls and marine mammal bycatch in the 2016 New England sink (A) and Mid-Atlantic (B) gillnet fisheries. Observed bycatch consisted of harbor porpoise (*Phocoena phocoena phocoena*), common dolphin (*Delphinus delphis delphis*), gray seal (*Halichoerus grypus atlantica*), harbor seal (*Phoca vitulina vitulina*), harp seal (*Pagophilus groenlandicus*), and hooded seal (*Cystophora cristata*).



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The CRD series uses the American Fisheries Society's guides to names of fishes, mollusks, and decapod

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