



Northeast Fisheries Science Center Reference Document 21-02

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by Marjorie C Lyssikatos<sup>1</sup>, Samuel Chavez-Rosales<sup>2</sup>, Joshua Hatch<sup>1</sup>

<sup>1</sup>*NOAA Fisheries, Northeast Fisheries Science Center, 166 Water Street, Woods Hole, MA 02543*

<sup>2</sup>*Integrated Statistics, 16 Sumner Street, Woods Hole, MA 02543*

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## **Northeast Fisheries Science Center Reference Documents**

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This report provides bycatch estimates, calculated by using mortality and serious injury counts combined, for 6 cetacean and 2 pinniped species incidentally captured by Northeast bottom trawl (NEBT) and Mid-Atlantic bottom trawl (MABT) fishing operations from 2014 to 2018 (Table 1). The data presented here are an update from Lyssikatos et al. (2019) and Chavez-Rosales et al. (2018) which covers the fishing operations from 2012 to 2017. The bycatch estimation methodology does not differ from earlier years dating back to 2008 (Lyssikatos 2015; Chavez-Rosales et al. 2017). Stratified bycatch estimates were produced by using a ratio estimator by region, year, trimester, and ecoregion (Table 2). For details on the bycatch estimation methodology, please refer to recent documentation in Chavez-Rosales et al. 2018. The marine mammal species included for the 2014-2018 time period are: Atlantic white-sided dolphin (*Lagenorhynchus acutus*), common dolphin (*Delphinus delphis delphis*), common bottlenose dolphin- offshore stock (*Tursiops truncatus truncatus*), Risso's dolphin (*Grampus griseus*), long-finned pilot whale (*Globicephala melas*), harbor porpoise (*Phocoena phocoena phocoena*), harbor seal (*Phoca vitulina vitulina*), and gray seal (*Halichoerus grypus atlantica*). The aim of this report is to document bycatch estimates for the 5-year period 2014 through 2018 to support the US Atlantic and Gulf of Mexico 2020 marine mammal stock assessment reports. Individual marine mammal stock assessment reports for the Northwest Atlantic are available online: <https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-stock-assessment-reports-species-stock>

The 2014 to 2018 NEBT estimates are based on observed bycatch (mortalities and injured animals) consisting of 12 white-sided, 13 common, 2 Risso's, and 7 offshore bottlenose dolphins, 1 harbor porpoise, 9 pilot whales, and 3 harbor and 15 gray seals. MABT estimates are based on observed bycatch consisting of 1 white-sided, 187 common, 17 Risso's, and 8 offshore bottlenose dolphins, and 3 harbor and 16 gray seals. (Table 3; Figure 1). Refer to Josephson et al. (2019) for details on injury determinations attributed to interactions with bottom trawl gear. The final 2018 serious injury determinations will be published at a later date.

Mean annual bycatch estimates from the NEBT fishery were 16.54 (coefficient of variation [CV] = 0.26) common dolphins, 4.18 (CV = 0.73) Risso's dolphins, 12.16 (CV = 0.36) long-finned pilot whales, 1.10 (CV = 0.86) harbor porpoises, 14.71 (CV = 0.26) Atlantic white-sided dolphins, 10.42 (CV = 0.62) offshore common bottlenose dolphins, 17.80 (CV = 0.24) gray seals, and 3.80 (CV = 0.55) harbor seals. Mean annual bycatch estimates in the MABT fishery were 268.21 (CV = 0.13) common dolphins, 28.68 (CV = 0.31) Risso's dolphins, 12.08 (CV = 0.39) offshore common bottlenose dolphins, 1.93 (CV = 0.94) Atlantic white-sided dolphins, 23.06 (CV = 0.33) gray seals, and 4.53 (CV = 0.57) harbor seals (Table 1). Total annual bycatch estimate and composite coefficient of variation for each species and annual estimate are shown in Table 1. There was no significant change in temporal or spatial bycatch patterns attributed to NEBT and MABT gear among the species described in this report (Figures 2-3), comparable to interannual values reported in Chavez-Rosales et al. (2017, 2018) and Lyssikatos (2019).

Observer coverage, defined as the percentage of the vessel trip report (VTR) trips in which an observer was on board a fishing vessel, averaged 14.92% for the Northeast (NE), ranging from 12.12% for 2016 with a maximum coverage of 19.30% in 2014. For the Mid-Atlantic (MA) region, average coverage was 10.62%, ranging from 8.99% for 2014 with a maximum coverage 13.93% in 2017 (Table 2). Mean annual observer coverage continued to be higher in the NE compared to the MA because of the allocation of at-sea monitors in addition to traditional fisheries observers in the NE region.

[https://www.greateratlantic.fisheries.noaa.gov/ro/fso/reports//Sectors/ASM/FY2018\\_Multispeci](https://www.greateratlantic.fisheries.noaa.gov/ro/fso/reports//Sectors/ASM/FY2018_Multispeci)

es\_Sector\_ASM\_Requirements\_Summary.pdf. However, observer coverage in MABT fisheries did increase during the 2014 to 2018 time period as a result of increased allocation of observer sea days to monitor bycatch of sea turtles and federally-regulated species (NEFSC and GARFO 2019).

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**Table 1 Total and mean annual bycatch estimates in Northeast and Mid-Atlantic commercial bottom trawl trips for years 2014-2018 by species and region. The annual coefficients of variation (CV) are in parentheses. NA = not applicable.**

Species	Region	2014	2015	2016	2017	2018	5 year Total Bycatch	Annual Mean Bycatch	CV
Common dolphin <i>(Delphinus delphis delphis)</i>	Northeast	17.47 (0.53)	21.58 (0.45)	15.93 (0.46)	0.00 (0.00)	27.72 ( 0.54)	82.70	16.54	0.26
	Mid-Atlantic	328.81 (0.29)	250.11 (0.32)	177.17 (0.33)	379.99 (0.23)	204.96 (0.21)	1,341.04	268.21	0.13
Risso's dolphin <i>(Grampus griseus)</i>	Northeast	4.16 (0.91)	0.00 (NA)	16.73 (0.88)	0.00 (NA)	0.00 (NA)	20.89	4.18	0.73
	Mid-Atlantic	21.15 (0.93)	40.08 (0.63)	38.96 (0.56)	43.23 (0.51)	0.00 (NA)	143.42	28.68	0.31
Long-finned pilot whale <i>(Globicephala melas)</i>	Northeast	31.75 (0.44)	0.00 (NA)	29.05 (0.58)	0.00 (NA)	0.00 (NA)	60.80	12.16	0.36
Gray seal <i>(Halichoerus grypus atlantica)</i>	Northeast	19.01 (0.45)	22.69 (0.46)	0.00 (NA)	15.71 (0.66)	31.59 ( 0.42)	89.00	17.80	0.24
	Mid-Atlantic	6.96 (0.96)	0.00 (NA)	25.94 (0.57)	26.44 (0.40)	55.94 ( 0.58)	115.28	23.06	0.33
Harbor porpoise <i>(Phocoena phocoena phocoena)</i>	Northeast	5.50 (0.86)	0.00 (NA)	0.00 (NA)	0.00 (NA)	0.00 (NA)	5.50	1.10	0.86
Atlantic white-sided dolphin <i>(Lagenorhynchus acutus)</i>	Northeast	16.21 (0.50)	14.86 (0.52)	27.65 (0.46)	14.83 (0.64)	0.00 (NA)	73.55	14.71	0.26
	Mid-Atlantic	9.67 (0.94)	0.00 (NA)	0.00 (NA)	0.00 (NA)	0.00 (NA)	9.67	1.93	0.94
Harbor seal <i>(Phoca vitulina vitulina )</i>	Northeast	10.70 (0.63)	0.00 (NA)	0.00 (NA)	8.30 (0.96)	0.00 (NA)	19.0	3.80	0.55
	Mid-Atlantic	9.67 (0.95)	7.41 (1.00)	0.00 (NA)	0.00 (NA)	5.56 ( 0.94)	22.64	4.53	0.57
Common bottlenose dolphin offshore stock <i>(Tursiops truncatus truncatus)</i>	Northeast	0.00 (NA)	18.65 (0.60)	33.47 (0.89)	0.00 (NA)	0.00 (NA)	52.12	10.42	0.62
	Mid-Atlantic	24.62 (0.66)	0.00 (NA)	7.33 (0.93)	22.11 (0.66)	6.33 ( 0.91)	60.39	12.08	0.39

**Table 2. Stratified observed bycatch (OBS Byc), bycatch rates (Byc Rate), total vessel trip report days fished (VTR DF) and observed days fished (OBS DF), percent coverage (Cov %), total bycatch mortality (M), and coefficient of variation (CV) by species, region (NE = Northeast, MA = Mid-Atlantic; shaded rows), year (2014-2018), season (w = January-April, s = May-August, f = September-December), and ecoregion (ECO; GOM = Gulf of Maine, GB = Georges Bank, MA = Mid-Atlantic) in Northeast and Mid-Atlantic commercial bottom trawl trips. Years and seasons absent from the 5-year time series mean no bycatch events were observed; thus, the estimated total bycatch for that year is defined as zero.**

Species	Region	Year	Season	ECO	VTR DF	OBS DF	Cov %	OBS Byc	Byc Rate	M	CV
Common dolphin ( <i>Delphinus delphis delphis</i> )	NE	2014	f	GB	947	145	15.31	2	0.0137	12.97	0.65
	NE	2014	f	GOM	2144	471	21.97	1	0.0021	4.50	0.89
	NE	2015	f	GB	881	141	16.00	1	0.0071	6.26	0.88
	NE	2015	s	GB	1183	229	19.36	2	0.0087	10.29	0.66
	NE	2015	w	GOM	2397	481	20.07	1	0.0021	5.03	0.89
	NE	2016	f	GOM	1626	203	12.48	2	0.0098	15.93	0.67
	NE	2018	w	GB	277	41	14.80	2	0.0493	13.66	0.86
	NE	2018	f	GOM	1357	164	12.09	1	0.0061	8.28	0.96
	NE	2018	w	GOM	1865	321	17.21	1	0.0031	5.78	0.90
	MA	2014	f	MA	1990	285	14.32	19	0.0666	132.53	0.25
	MA	2014	s	MA	2274	214	9.41	13	0.0607	138.03	0.65
	MA	2014	w	MA	2249	231	10.27	6	0.0259	58.25	0.54
	MA	2015	f	MA	1808	207	11.45	16	0.0775	140.12	0.47
	MA	2015	s	MA	2320	93	4.01	2	0.0216	50.11	0.67
	MA	2015	w	MA	1901	254	13.36	8	0.0315	59.88	0.41
	MA	2016	f	MA	1789	247	13.81	15	0.0608	108.77	0.32
	MA	2016	w	MA	2265	232	10.24	7	0.0302	68.4	0.68
	MA	2017	f	MA	1339	237	17.70	52	0.2190	293.0	0.27
	MA	2017	s	MA	1612	306	19.00	8	0.0262	42.2	0.78
	MA	2017	w	MA	1675	227	13.60	6	0.0265	44.4	0.53
MA	2018	f	MA	1463	264	18.05	21	0.0795	116.31	0.29	
MA	2018	w	MA	1759	278	15.80	14	0.0504	88.65	0.29	

**Table 2, continued. Stratified observed bycatch (OBS Byc), bycatch rates (Byc Rate), total vessel trip report days fished (VTR DF) and observed days fished (OBS DF), percent coverage (Cov %), total bycatch mortality (M), and coefficient of variation (CV) by species, region (NE = Northeast, MA = Mid-Atlantic; shaded rows), year (2014-2018), season (w = January-April, s = May-August, f = September-December), and ecoregion (ECO; GOM = Gulf of Maine, GB = Georges Bank, MA = Mid-Atlantic) in Northeast and Mid-Atlantic commercial bottom trawl trips. Years and seasons absent from the 5-year time series mean no bycatch events were observed; thus, the estimated total bycatch for that year is defined as zero.**

Species	Region	Year	Season	ECO	VTR DF	OBS DF	Cov %	OBS Byc	Byc Rate	M	CV
Long-finned pilot whale ( <i>Globicephala melas</i> )	NE	2014	w	GB	478	40	8.37	1	0.0252	12.05	1.01
	NE	2014	f	GOM	2144	471	21.97	2	0.0042	9.00	0.63
	NE	2014	w	GOM	3058	570	18.64	2	0.0035	10.70	0.64
	NE	2016	f	GOM	1626	203	12.48	2	0.0098	15.93	0.92
	NE	2016	w	GOM	2262	344	15.21	2	0.0058	13.12	0.65
Atlantic white-sided dolphin ( <i>Lagenorhynchus acutus</i> )	NE	2014	w	GOM	3058	570	18.64	3	0.0053	16.21	0.51
	NE	2015	w	GOM	2397	481	20.07	3	0.0062	14.86	0.52
	NE	2016	f	GOM	1626	203	12.48	1	0.0049	7.97	0.93
	NE	2016	w	GOM	2262	344	15.21	3	0.0087	19.68	0.53
	NE	2017	s	GB	656	88	13.40	2	0.0226	14.80	0.64
	MA	2014	w	MA	2249	231	10.27	1	0.0043	9.67	0.95

**Table 2, continued. Stratified observed bycatch (OBS Byc), bycatch rates (Byc Rate), total vessel trip report days fished (VTR DF) and observed days fished (OBS DF), percent coverage (Cov %), total bycatch mortality (M), and coefficient of variation (CV) by species, region (NE = Northeast, MA = Mid-Atlantic; shaded rows), year (2014-2018), season (w = January-April, s = May-August, f = September-December), and ecoregion (ECO; GOM = Gulf of Maine, GB = Georges Bank, MA = Mid-Atlantic) in Northeast and Mid-Atlantic commercial bottom trawl trips. Years and seasons absent from the 5-year time series mean no bycatch events were observed; thus, the estimated total bycatch for that year is defined as zero.**

Species	Region	Year	Season	ECO	VTR DF	OBS DF	Cov %	OBS Byc	Byc Rate	M	CV
Risso's Dolphin ( <i>Grampus griseus</i> )	NE	2014	s	GB	1299	310	23.86	1	0.0032	4.16	0.89
	NE	2016	w	GB	461	55	11.93	2	0.0363	16.73	0.89
	MA	2014	s	MA	2274	214	9.41	2	0.0093	21.15	0.98
	MA	2015	s	MA	2320	93	4.01	1	0.0108	25.06	0.93
	MA	2015	w	MA	1901	254	13.36	2	0.0079	15.02	0.63
	MA	2016	w	MA	2265	232	10.24	4	0.0172	38.96	0.56
	MA	2017	s	MA	1612	306	19.00	4	0.0131	21.10	0.89
	MA	2017	w	MA	1675	227	13.60	3	0.0132	22.10	0.53
Offshore common bottlenose dolphin ( <i>Tursiops truncatus truncatus</i> )	NE	2015	f	GB	881	141	16.00	2	0.0142	12.51	0.88
	NE	2015	w	GB	458	74	16.16	1	0.0134	6.14	0.90
	NE	2016	w	GB	461	55	11.93	4	0.0726	33.47	0.89
	MA	2014	f	MA	1990	285	14.32	2	0.0070	13.93	0.92
	MA	2014	s	MA	2274	214	9.41	1	0.0047	10.69	0.97
	MA	2016	f	MA	1789	247	13.81	1	0.0041	7.33	0.91
	MA	2017	w	MA	1675	227	13.60	3	0.0132	22.10	0.68
	MA	2018	w	MA	1759	278	15.80	1	0.0036	6.33	0.91
Harbor porpoise ( <i>Phocoena phocoena phocoena</i> )	NE	2014	w	GOM	3058	570	18.64	1	0.0018	5.50	0.87

**Table 2, continued. Stratified observed bycatch (OBS Byc), bycatch rates (Byc Rate), total vessel trip report days fished (VTR DF) and observed days fished (OBS DF), percent coverage (Cov %), total bycatch mortality (M), and coefficient of variation (CV) by species, region (NE = Northeast, MA = Mid-Atlantic; shaded rows), year (2014-2018), season (w = January-April, s = May-August, f = September-December), and ecoregion (ECO; GOM = Gulf of Maine, GB = Georges Bank, MA = Mid-Atlantic) in Northeast and Mid-Atlantic commercial bottom trawl trips. Years and seasons absent from the 5-year time series mean no bycatch events were observed; thus, the estimated total bycatch for that year is defined as zero.**

Species	Region	Year	Season	ECO	VTR DF	OBS DF	Cov %	OBS Byc	Byc Rate	M	CV
Gray seal ( <i>Halichoerus grypus atlantica</i> )	NE	2014	s	GB	129	310	23.86	2	0.0064	8.31	0.63
	NE	2014	w	GOM	3058	570	18.64	2	0.0035	10.70	0.6
	NE	2015	f	GB	881	141	16.00	1	0.0071	6.26	0.93
	NE	2015	s	GB	1183	229	19.36	2	0.0087	10.29	0.65
	NE	2015	w	GB	458	74	16.16	1	0.0134	6.14	0.90
	NE	2017	s	GB	656	88	13.40	1	0.0113	7.41	0.93
	NE	2017	w	GOM	2372	282	11.90	1	0.0035	8.30	0.95
	NE	2018	f	GOM	1357	164	12.09	1	0.0061	8.28	0.97
	NE	2018	w	GOM	1865	321	17.21	4	0.0125	23.31	0.45
	MA	2014	f	MA	1990	285	14.32	1	0.0035	6.96	0.94
	MA	2016	f	MA	1789	247	13.81	2	0.0081	14.49	0.67
	MA	2016	s	MA	1941	171	8.81	1	0.0059	11.45	1.00
	MA	2017	s	MA	1612	306	19.00	5	0.0164	26.4	0.39
	MA	2018	s	MA	1481	179	12.09	6	0.0335	49.61	0.66
	MA	2018	w	MA	1759	278	15.08	1	0.0036	6.33	0.94
Harbor seal ( <i>Phoca vitulina vitulina</i> )	NE	2014	w	GOM	3058	570	18.64	2	0.0035	10.70	0.64
	NE	2017	w	GOM	2372	282	11.90	1	0.0035	8.30	0.97
	MA	2014	w	MA	2249	231	10.27	1	0.0043	9.67	0.96
	MA	2015	w	MA	1901	254	13.36	1	0.0039	7.41	0.94
	MA	2018	f	MA	1463	264	18.05	1	0.0038	5.56	0.92

**Table 3 Total number of observed marine mammals bycaught, excluding decomposed animals, in Northeast and Mid-Atlantic commercial bottom trawl gear, 2014-2018. Observer coverage (Obs Cov%) is the percentage of observed trips relative to total Vessel Trip Report (VTR) trips.**

Species	Region	2014	2015	2016	2017	2018	Total
Atlantic white-sided dolphin ( <i>Lagenorhynchus acutus</i> )	Northeast	3	3	4	2	0	12
	Mid-Atlantic	1	0	0	0	0	1
Common dolphin ( <i>Delphinus delphis</i> )	Northeast	3	4	2	0	4	13
	Mid-Atlantic	38	26	22	66	35	187
Risso's dolphin ( <i>Grampus griseus</i> )	Northeast	0	0	2	0	0	2
	Mid-Atlantic	3	3	4	7	0	17
Offshore Common bottlenose dolphin ( <i>Tursiops truncatus</i> )	Northeast	0	3	4	0	0	7
	Mid-Atlantic	3	0	1	3	1	8
Harbor porpoise ( <i>Phocoena phocoena</i> )	Northeast	1	0	0	0	0	1
Long-finned pilot whale ( <i>Globicephala melas</i> )	Northeast	5	0	4	0	0	9
Harbor seal ( <i>Phoca vitulina vitulina</i> )	Northeast	2	0	0	1	0	3
	Mid-Atlantic	1	1	0	0	1	3
Gray seal ( <i>Halichoerus grypus atlantica</i> )	Northeast	4	4	0	2	5	15
	Mid-Atlantic	1	0	3	5	7	16
Observed Trips	Northeast	1,092	857	590	635	613	3,787
	Mid-Atlantic	1,096	904	1,078	1,197	1,053	5,328
Observed Tows	Northeast	12,215	10,361	5,926	6,151	4,966	39,619
	Mid-Atlantic	7,236	5,486	6,834	7,984	7,180	34,720
Total VTR Trips	Northeast	5,657	4,611	4,868	5,201	5,048	25,385
	Mid-Atlantic	12,191	9,572	11,069	8,592	8,727	50,151
Obs Cov %	Northeast	19.30	18.59	12.12	12.21	12.14	14.92
	Mid-Atlantic	8.99	9.44	9.74	13.93	12.07	10.62

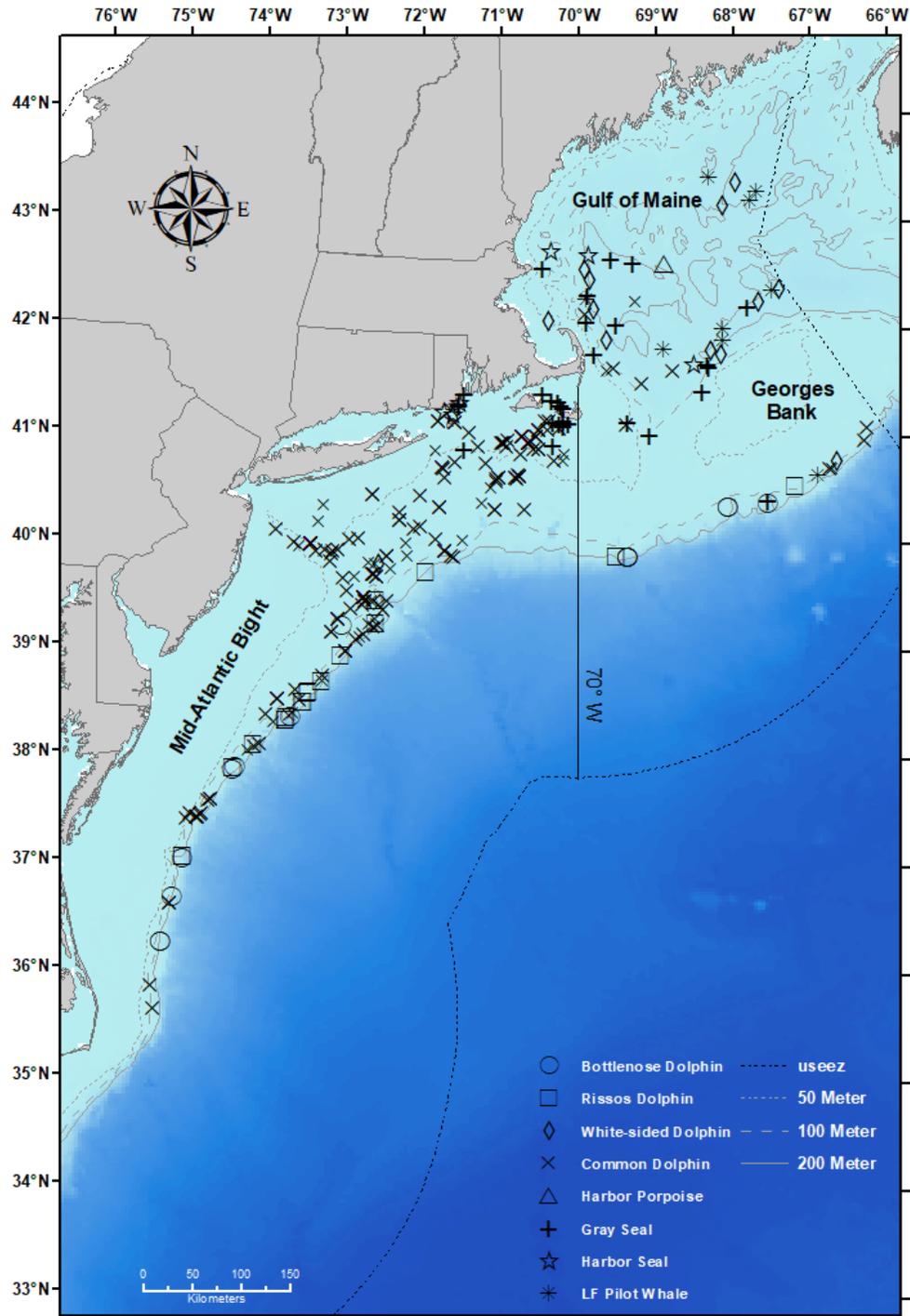


Figure 1. Incidental take locations from the observed commercial trips in the Northeast and Mid-Atlantic study areas 2014-2018 for Atlantic white-sided dolphin (*Lagenorhynchus acutus*), common dolphin (*Delphinus delphis delphis*), long-finned pilot whale (*Globicephala melas*), offshore common bottlenose dolphin (*Tursiops truncatus truncatus*), Risso's dolphin (*Grampus griseus*), harbor seal (*Phoca vitulina vitulina*), harbor porpoise (*Phocoena phocoena phocoena*), and gray seal (*Halichoerus grypus atlantica*). The strata were delimited by the 70°W longitude.

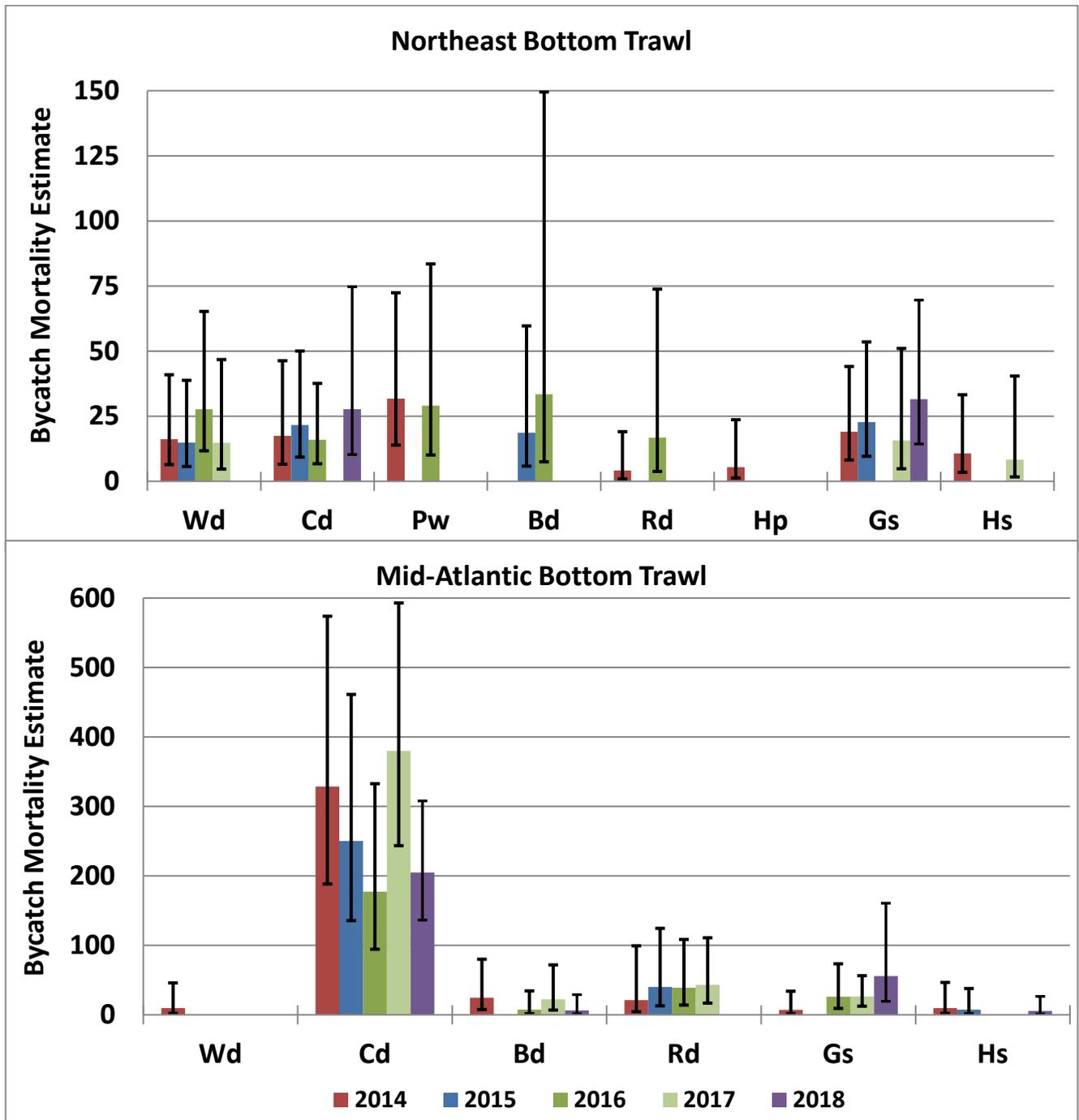


Figure 2. Annual bycatch mortality estimates (lognormal 95% Confidence interval) for bottom trawl gear by region, species and year in Northeast and Mid-Atlantic commercial bottom trawl trips, 2014-2018. Wd = Atlantic white-sided dolphin (*Lagenorhynchus acutus*), Cd = common dolphin (*Delphinus delphis delphis*), Pw = long-finned pilot whale (*Globicephala melas*), Bd = offshore common bottlenose dolphin (*Tursiops truncatus truncatus*), Rd = Risso's dolphin (*Grampus griseus*), Hp = harbor porpoise (*Phocoena phocoena phocoena*), Gs = gray seal (*Halichoerus grypus atlantica*), and Hs = harbor seal (*Phoca vitulina vitulina*).

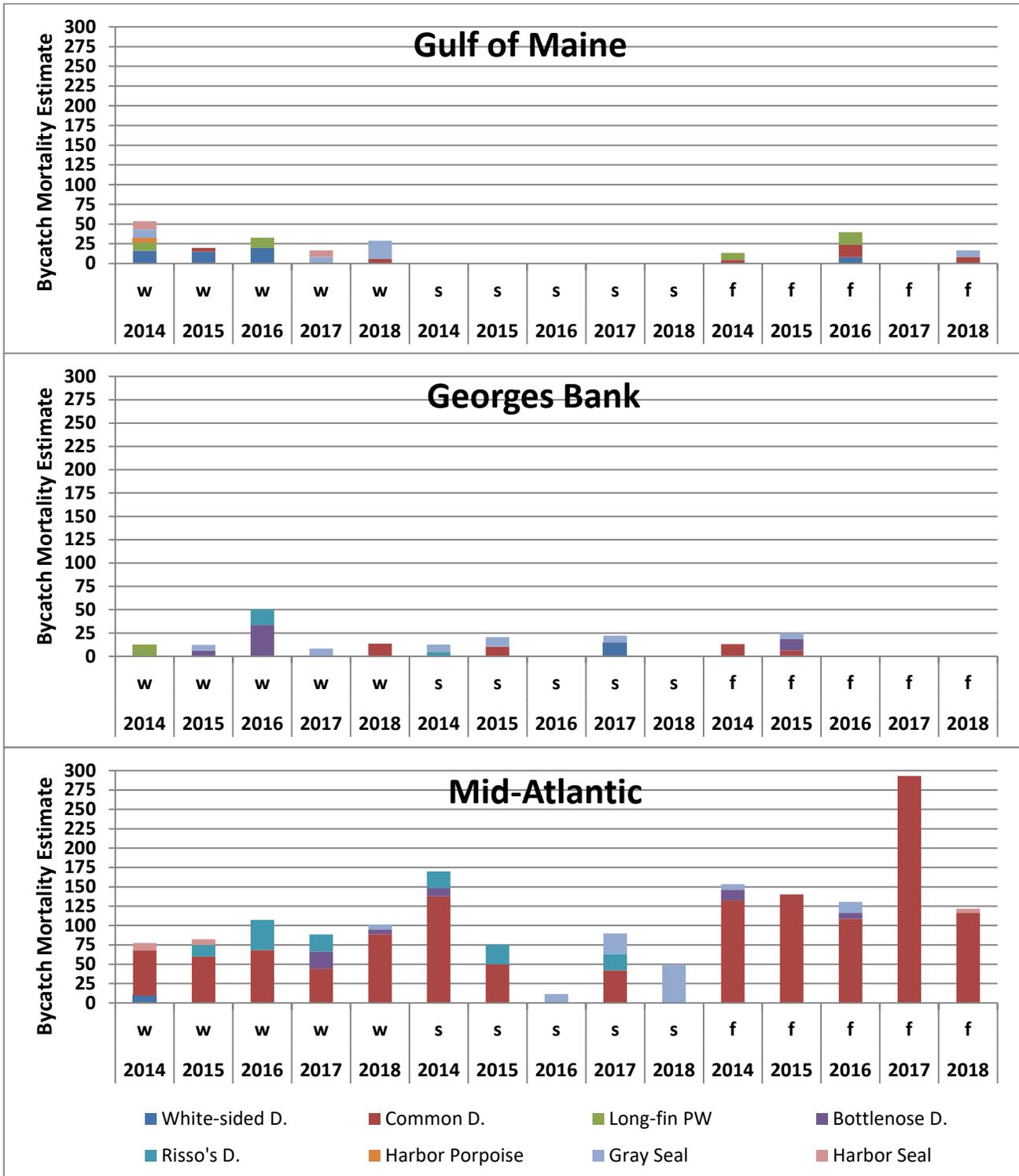


Figure 3. Bycatch mortality estimates for 2014-2018 in Northeast and Mid-Atlantic commercial bottom trawl trips stratified by ecoregion, year, season (w = January-April, s = May-August, f = September-December), and species (Atlantic white-sided dolphin [*Lagenorhynchus acutus*], common dolphin [*Delphinus delphis delphis*], long-finned pilot whale [*Globicephala melas*], offshore common bottlenose dolphin [*Tursiops truncatus truncatus*], Risso's dolphin [*Grampus griseus*], harbor porpoise [*Phocoena phocoena phocoena*], gray seal [*Halichoerus grypus atlantica*], and harbor seal [*Phoca vitulina vitulina*]).

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The mission of NOAA's National Marine Fisheries Service (NMFS) is "stewardship of living marine resources for the benefit of the nation through their science-based conservation and management and promotion of the health of their environment." As the research arm of the NMFS's Northeast Region, the Northeast Fisheries Science Center (NEFSC) supports the NMFS mission by "conducting ecosystem-based research and assessments of living marine resources, with a focus on the Northeast Shelf, to promote the recovery and long-term sustainability of these resources and to generate social and economic opportunities and benefits from their use." Results of NEFSC research are largely reported in primary scientific media (*e.g.*, anonymously-peer-reviewed scientific journals). However, to assist itself in providing data, information, and advice to its constituents, the NEFSC occasionally releases its results in its own media. Currently, there are three such media:

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