



NOAA Technical Memorandum NMFS-NE-281

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**US DEPARTMENT OF COMMERCE
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Estimation of Cetacean and Pinniped Bycatch in Northeast and Mid-Atlantic Bottom Trawl Fisheries, 2015-2019

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EXECUTIVE SUMMARY

This report provides bycatch estimates, calculated using mortality and serious injuries combined, for 5 cetacean and 3 pinniped species incidentally captured by Northeast bottom trawl (NEBT) and Mid-Atlantic bottom trawl (MABT) fishing operations from 2015-2019 (Table 1). The data presented here are an update from Lyssikatos et al. (2020; 2021) and Chavez-Rosales et al. (2018), which cover the fishing operations from 2012-2018. 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 using a ratio estimator by region, year, trimester, and eco-region (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 2015-2019 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*), harp seal (*Pagophilus groenlandicus*), and gray seal (*Halichoerus grypus atlantica*). The aim of this report is to document bycatch estimates for the 5-year period of 2015-2019 to support the U.S. Atlantic and Gulf of Mexico 2020 marine mammal stock assessment reports. Individual marine mammal stock assessment reports for the Northwest Atlantic are available online at <https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-stock-assessment-reports-species-region>.

The 2015-2019 NEBT estimates are based on observed bycatch (mortalities and injured animals) consisting of 14 Atlantic white-sided dolphins, 2 common dolphins, 1 common bottlenose (offshore) dolphin, 1 long-finned pilot whale, 2 harbor porpoises, 1 harbor seal, 1 harp seal, and 6 gray seals. MABT estimates are based on observed bycatch consisting of 54 common dolphins, 1 harbor seal, and 3 gray seals (Table 3; Figure 1). Refer to Josephson et al. (2022) for details on injury determinations attributed to interactions with bottom trawl gear.

Mean annual bycatch estimates from the NEBT fishery were 27.27 (CV = 0.21) for Atlantic white-sided dolphins, 15.05 (coefficient of variation [CV] = 0.27) for common dolphins, 11.53 (CV = 0.56) for common bottlenose (offshore) dolphins, 3.35 (CV = 0.88) for Risso's dolphins, 6.89 (CV = 0.51) for long-finned pilot whales, 2.16 (CV = 0.63) for harbor porpoises, 2.74 (CV = 0.68) for harbor seals, 1.08 (CV = 0.89) for harp seals, and 20.03 (CV = 0.23) for gray seals. , and. Mean annual bycatch estimates in the MABT fishery were 281.39 (CV = 0.12) for common dolphins, 7.15 (CV = 0.48) for common bottlenose (offshore) dolphins, 24.45 (CV = 0.33) for Risso's dolphins, 4.05 (CV = 0.56) for harbor seals, and 26.02 (CV = 0.30) for gray seals.(Table 1). Total annual bycatch estimate, composite coefficient of variation for each species, and annual estimate are shown in Table 1. The harp seal was added as a new species bycaught in the NEBT. Otherwise, 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 and 3), comparable to inter-annual values reported in Chavez-Rosales et al. (2017; 2018) and Lyssikatos et al. (2020; 2021).

Observer coverage—defined as the percentage of the VTR trips in which an observer was onboard a fishing vessel—averaged 14.25% for the Northeast region, ranging from 12.12% in 2016 with a maximum coverage of 18.59% in 2015. For the Mid-Atlantic region, average coverage was 11.34%, ranging from 9.44% in 2015 with a maximum coverage of 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 (NOAA 2022). Observer coverage in MABT fisheries did increase during the 2015-2019 time period as a result of increased allocation of observer sea days to monitor bycatch of sea turtles and federally-regulated species (NEFSC-GARFO 2019).

Table 1. Total and mean annual bycatch estimates in Northeast and Mid-Atlantic commercial bottom trawl trips for years 2015-2019 by species and region. The annual coefficients of variation (CV) are in parentheses. NA = not applicable.

Species	Region	2015	2016	2017	2018	2019	5-year Total Bycatch	Annual Mean Bycatch	CV
Common dolphin (<i>Delphinus delphis delphis</i>)	Northeast	21.58 (0.45)	15.93 (0.46)	0.00 (0.00)	27.72 (0.54)	10.01 (0.62)	75.24	15.05	0.27
	Mid-Atlantic	250.11 (0.32)	177.17 (0.33)	379.99 (0.23)	204.96 (0.21)	394.74 (0.23)	1406.97	281.39	0.12
Risso's dolphin (<i>Grampus griseus</i>)	Northeast	0.00 (NA)	16.73 (0.88)	0.00 (NA)	0.00 (NA)	0.00 (NA)	16.73	3.35	0.88
	Mid-Atlantic	40.08 (0.63)	38.96 (0.56)	43.23 (0.51)	0.00 (NA)	0.00 (NA)	122.27	24.45	0.33
Long-finned pilot whale (<i>Globicephala melas</i>)	Northeast	0.00 (NA)	29.05 (0.58)	0.00 (NA)	0.00 (NA)	5.39 (0.88)	34.44	6.89	0.51
Gray seal (<i>Halichoerus grypus atlantica</i>)	Northeast	22.69 (0.46)	0.00 (NA)	15.71 (0.66)	31.59 (0.42)	30.18 (0.37)	100.17	20.03	0.23
	Mid-Atlantic	0.00 (NA)	25.94 (0.57)	26.44 (0.40)	55.94 (0.58)	21.78 (0.53)	130.10	26.02	0.30
Harbor porpoise (<i>Phocoena phocoena phocoena</i>)	Northeast	0.00 (NA)	0.00 (NA)	0.00 (NA)	0.00 (NA)	10.78 (0.63)	10.78	2.16	0.63
Atlantic white-sided dolphin (<i>Lagenorhynchus acutus</i>)	Northeast	14.86 (0.52)	27.65 (0.46)	14.83 (0.64)	0.00 (NA)	78.99 (0.28)	136.33	27.27	0.21
Harbor seal (<i>Phoca vitulina vitulina</i>)	Northeast	0.00 (NA)	0.00 (NA)	8.30 (0.96)	0.00 (NA)	5.39 (0.88)	13.69	2.74	0.68
	Mid-Atlantic	7.41 (1.00)	0.00 (NA)	0.00 (NA)	5.56 (0.94)	7.28 (0.93)	20.25	4.05	0.56
Common bottlenose dolphin offshore stock (<i>Tursiops truncatus truncatus</i>)	Northeast	18.65 (0.65)	33.47 (0.89)	0.00 (NA)	0.00 (NA)	5.55 (0.92)	57.67	11.53	0.56
	Mid-Atlantic	0.00 (NA)	7.33 (0.93)	22.11 (0.66)	6.33 (0.91)	0.00 (NA)	35.77	7.15	0.48
Harp seal (<i>Pagophylus groenlandicus</i>)	Northeast	0.00 (NA)	0.00 (NA)	0.00 (NA)	0.00 (NA)	5.39 (0.89)	5.39	1.08	0.89

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 (2015-2019), 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 means 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	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
	NE	2019	f	GB	306	66	21.57	1	0.0151	4.62	0.87
	NE	2019	w	GOM	2073	388	18.72	1	0.0026	5.39	0.89
	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
	MA	2019	f	MA	1798	257	14.29	35	0.1364	245.25	0.27
MA	2019	w	MA	2192	278	12.68	19	0.0682	149.49	0.41	

Table 2 (Cont'd). 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 (2015-2019), 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 means 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	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
	NE	2019	w	GOM	2073	388	18.72	1	0.0026	5.39	0.88
Atlantic white-sided dolphin (<i>Lagenorhynchus acutus</i>)	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
	NE	2019	s	GB	694	125	18.01	2	0.0160	11.10	0.92
	NE	2019	w	GB	200	26	13.00	2	0.0773	15.46	0.94
	NE	2019	s	GOM	1355	310	22.88	1	0.0032	4.34	0.86
	NE	2019	w	GOM	2073	388	18.72	9	0.0232	48.09	0.32

Table 2 (Cont'd). 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 (2015-2019), 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 means 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	2016	w	GB	461	55	11.93	2	0.0363	16.73	0.89
	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
	NE	2019	s	GB	694	125	18.01	1	0.0080	5.55	0.93
	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	2019	w	GOM	2073	388	18.72	2	0.0052	10.78	0.63

Table 2 (Cont'd). 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 (2015-2019), 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 means 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	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
	NE	2019	s	GB	694	125	18.01	1	0.0080	5.55	0.88
	NE	2019	s	GOM	1355	310	22.88	2	0.0064	8.67	0.63
	NE	2019	w	GOM	2073	388	18.72	3	0.0077	15.96	0.52
	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
	MA	2019	f	MA	1798	257	14.29	1	0.0039	7.01	0.93
	MA	2019	s	MA	2205	299	13.56	2	0.0067	14.77	0.64
	Harbor seal (<i>Phoca vitulina vitulina</i>)	NE	2017	w	GOM	2372	282	11.90	1	0.0035	8.30
NE		2019	w	GOM	2073	388	18.72	1	0.0026	5.39	0.89
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
MA		2019	s	MA	2205	299	13.56	1	0.0033	7.28	0.93
Harp seal (<i>Pagophylus groenlandicus</i>)	NE	2019	w	GOM	2073	388	18.72	1	0.0026	5.39	0.90

Table 3. Total number of observed marine mammals bycaught, excluding decomposed animals, in Northeast and Mid-Atlantic commercial bottom trawl gear, 2015-2019. Observer coverage (Obs Cov%) is the percentage of observed trips relative to total Vessel Trip Report (VTR) trips.

Species	Region	2015	2016	2017	2018	2019	Total
Atlantic white-sided dolphin (<i>Lagenorhynchus acutus</i>)	Northeast	3	4	2	0	14	23
Common dolphin (<i>Delphinus delphis</i>)	Northeast	4	2	0	4	2	12
	Mid-Atlantic	26	22	66	35	54	203
Risso's dolphin (<i>Grampus griseus</i>)	Northeast	0	2	0	0	0	2
	Mid-Atlantic	3	4	7	0	0	14
Offshore Common bottlenose dolphin (<i>Tursiops truncatus</i>)	Northeast	3	4	0	0	1	8
	Mid-Atlantic	0	1	3	1	0	5
Harbor porpoise (<i>Phocoena phocoena</i>)	Northeast	0	0	0	0	2	2
Long-finned pilot whale (<i>Globicephala melas</i>)	Northeast	0	4	0	0	1	5
Harbor seal (<i>Phoca vitulina vitulina</i>)	Northeast	0	0	1	0	1	2
	Mid-Atlantic	1	0	0	1	1	3
Gray seal (<i>Halichoerus grypus atlantica</i>)	Northeast	4	0	2	5	6	17
	Mid-Atlantic	0	3	5	7	3	18
Harp seal (<i>Pagophylus groenlandicus</i>)	Northeast	0	0	0	0	1	1
Observed Trips	Northeast	857	590	635	613	831	3,526
	Mid-Atlantic	904	1,078	1,197	1,053	1,578	5,810
Observed Tows	Northeast	10,361	5,926	6,151	4,966	7,643	35,047
	Mid-Atlantic	5,486	6,834	7,984	7,180	8,627	36,111
Total VTR Trips	Northeast	4,611	4,868	5,201	5,048	5,138	24,866
	Mid-Atlantic	9,572	11,069	8,592	8,727	13,592	51,552
Obs Cov %	Northeast	18.59	12.12	12.21	12.14	16.17	14.18
	Mid-Atlantic	9.44	9.74	13.93	12.00	11.61	11.27

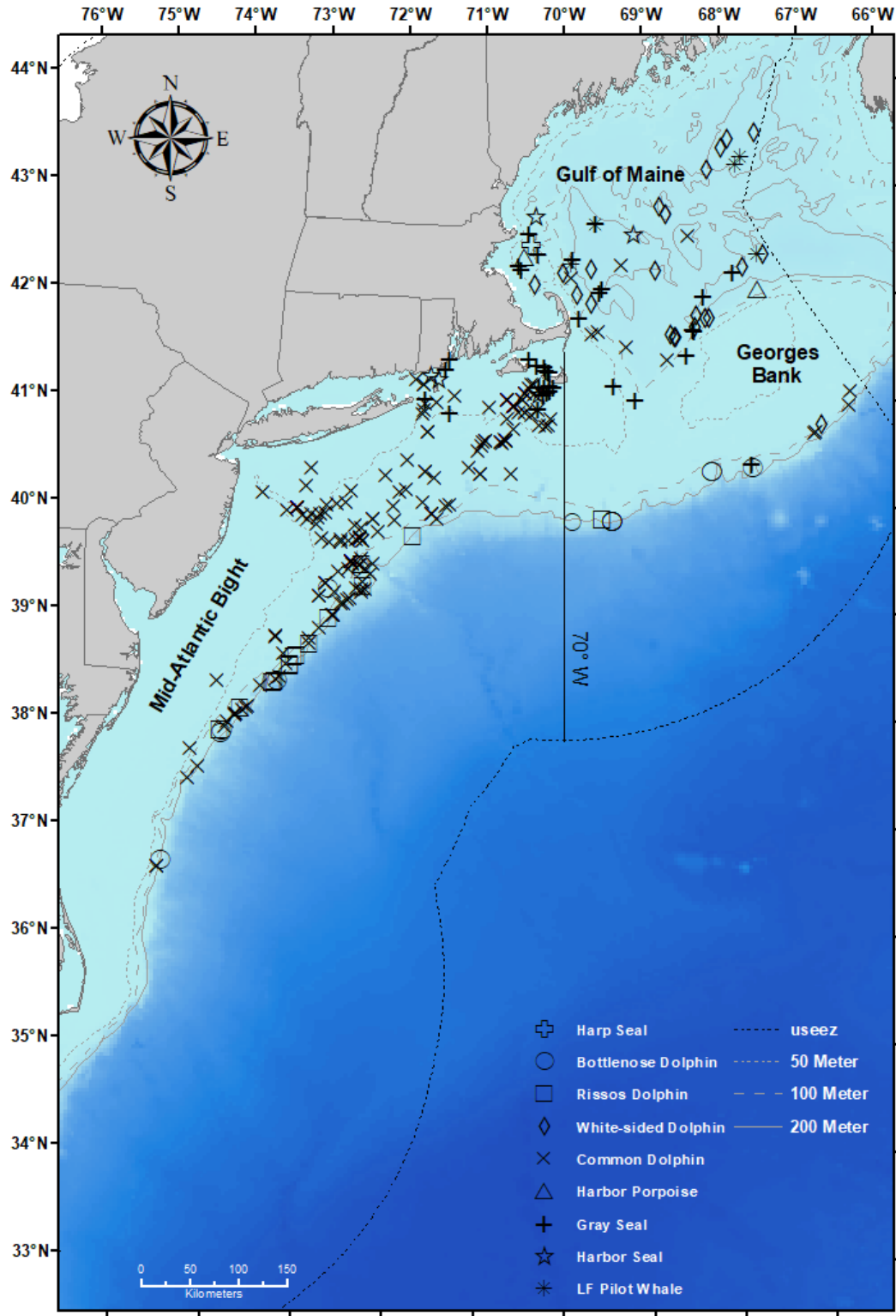


Figure 1. Incidental take locations from the observed commercial trips in the Northeast and Mid-Atlantic study areas from 2015-2019 for Atlantic white-sided dolphin (*Lagenorhynchus acutus*), common dolphin (*Delphinus delphis delphis*), long-finned pilot whale (*Globicephala melas*), offshore common bottlenose dolphin (*Tursiops truncatus truncatus*), Risso's dolphin (*Grampus griseus*), harbor seal (*Phoca vitulina vitulina*), harbor porpoise (*Phocoena phocoena phocoena*), harp seal (*Pagophilus groenlandicus*), and gray seal (*Halichoerus grypus atlantica*). The study areas delimited by the 70°W longitude.

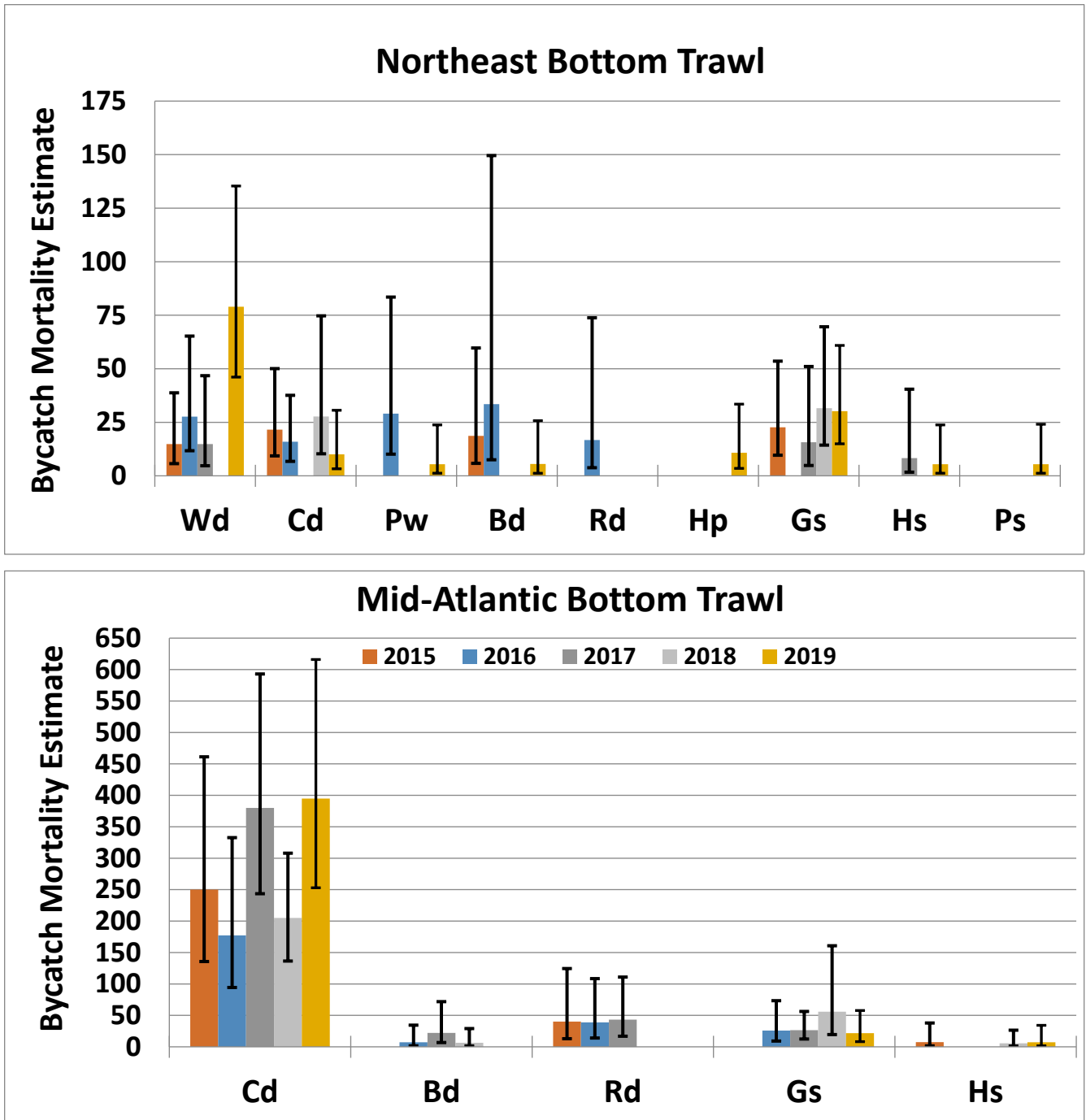


Figure 2. Annual bycatch mortality estimates (lognormal 95% Confidence interval) for bottom trawl gear by region, species and year in Northeast and Mid-Atlantic commercial bottom trawl trips, 2015-2019. Wd = Atlantic white-sided dolphin (*Lagenorhynchus acutus*), Cd = common dolphin (*Delphinus delphis 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*), Pg = harp seal (*Pagophilus groenlandicus*), and Hs = harbor seal (*Phoca vitulina vitulina*).

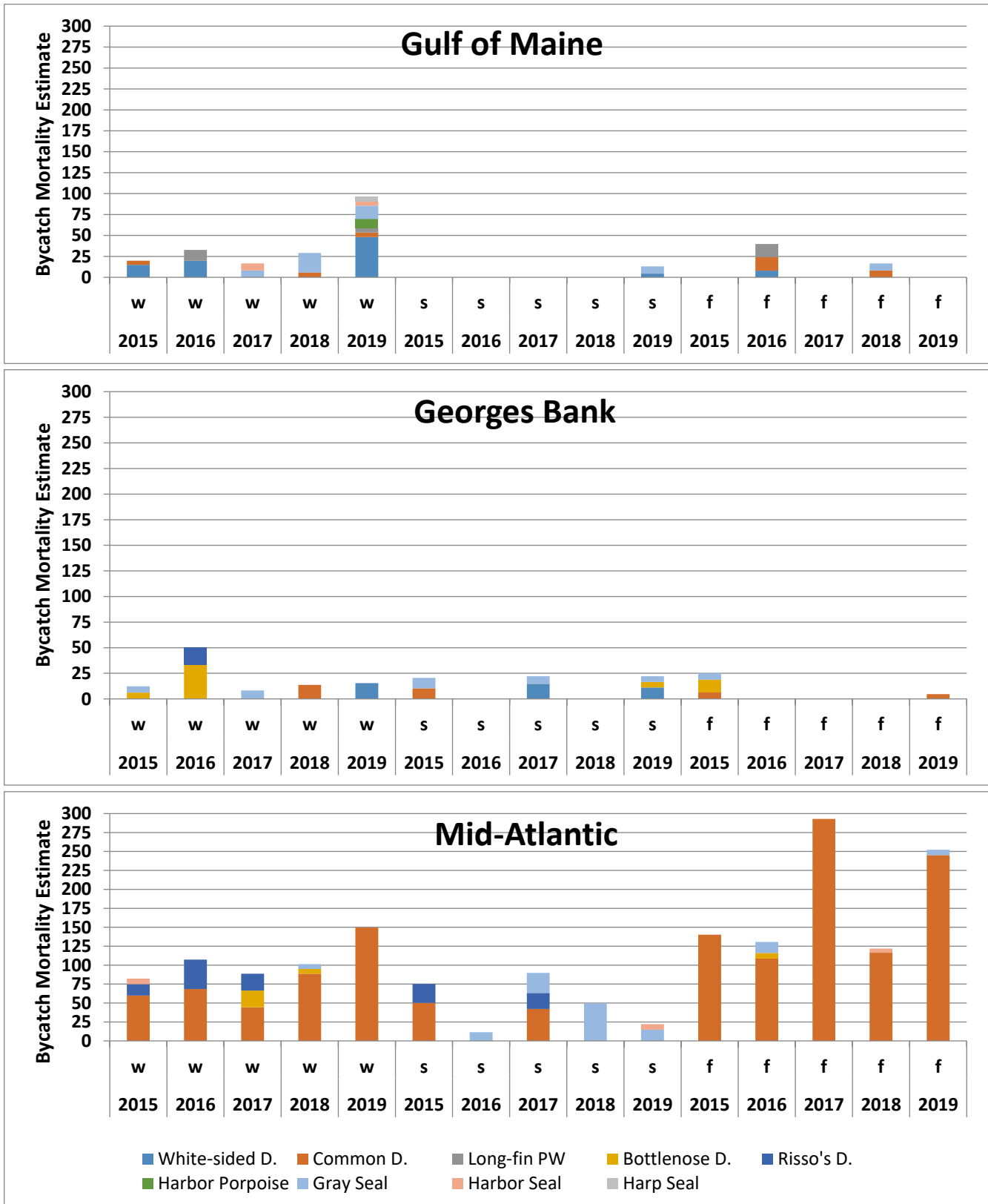


Figure 3. Bycatch mortality estimates for 2015-2019 in Northeast and Mid-Atlantic commercial bottom trawl trips stratified by ecoregion, year, season, and species (Atlantic white-sided dolphin [*Lagenorhynchus acutus*], common dolphin [*Delphinus delphis delphis*], long-finned pilot whale [*Globicephala melas*], offshore common bottlenose dolphin [*Tursiops truncatus truncatus*], Risso's dolphin [*Grampus griseus*], harbor porpoise [*Phocoena phocoena phocoena*], gray seal [*Halichoerus grypus atlantica*], harp seal [*Pagophylus groenlandicus*], and harbor seal [*Phoca vitulina vitulina*]).

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