



Northeast Fisheries Science Center Reference Document 24-05

# Estimates of cetacean and pinniped bycatch in the Northeast and Mid-Atlantic bottom trawl fisheries, 2022

January 2024



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National Oceanic and Atmospheric Administration  
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## **TABLE OF CONTENTS**

Summary.....	1
Methods.....	2
Tables.....	3
Figures.....	9
References Cited.....	13

## SUMMARY

This report provides estimated bycatch of 8 species of small cetaceans and pinnipeds bycaught in the Northeast bottom trawl (NEBT) and Mid-Atlantic bottom trawl (MABT) fisheries in 2022.

The data presented here are an update from Lyssikatos et al. (2020, 2021), Lyssikatos and Chavez-Rosales (2022), and Chavez-Rosales et al. (2018), which cover the fishing operations from 2012-2019. The bycatch estimation methodology is similar to that used since 2008 (Lyssikatos 2015; Chavez-Rosales et al. 2017). For details on the bycatch estimation methodology, please refer to Chavez-Rosales et al. (2018). The marine mammal species observed bycaught in 2022 are white-sided dolphin (*Lagenorhynchus acutus*), common dolphin (*Delphinus delphis delphis*), bottlenose dolphin (*Tursiops truncatus*), Risso's dolphin (*Grampus griseus*), harbor porpoise (*Phocoena phocoena phocoena*), long-finned pilot whale (*Globicephala melas*), harbor seal (*Phoca vitulina vitulina*), and gray seal (*Halichoerus grypus atlantica*). The aim of this report is to document bycatch estimates for 2022 to support the U.S. Atlantic and Gulf of Mexico 2024 marine mammal stock assessment reports. Individual marine mammal stock assessment reports for the Northwest Atlantic are available online (Marine...updated 2024).

The 2022 NEBT estimates are based on observed bycatch (mortalities and injured animals) consisting of 3 white-sided dolphins, 6 common dolphins, 2 bottlenose dolphins, 1 harbor porpoise, 2 harbor seals, 7 gray seals, and 3 long-finned pilot whales. MABT estimates are based on observed bycatch (mortalities and injured animals) consisting of 29 common dolphins, 1 bottlenose dolphin, 4 Risso's dolphins, and 6 gray seals. Refer to Josephson and Lyssikatos (2023) for details on injury determinations attributed to interactions with bottom trawl gear. The final 2022 serious injury determinations will be published at a later date; serious injury determinations for 2022 that are used in this report are preliminary. The proportions of observed bycatch of each species that was seriously injured or dead are used to apportion the total estimated bycatch to serious injuries and mortalities. The locations of observed tows and incidental takes are shown in Figure 1. Incidental takes of unknown species were excluded from the bycatch estimation; this included 1 unidentified seal and 2 unidentified whales in the Northeast region, and 1 unidentified seal and 1 unidentified dolphin in the Mid-Atlantic region.

Observer coverage in 2022, defined as the percentage of vessel trip report (VTR) trips on which an observer was on board a fishing vessel, was 27.9% in the NEBT fishery (Table 1) and 8.1% in the MABT fishery (Table 2).

Mean annual bycatch estimates from the NEBT fishery were 5 (coefficient of variation [CV] = 0.32) bottlenose dolphins, 17 (CV = 0.30) common dolphins, 25 (CV = 0.22) gray seals, 3 (CV = 0.56) harbor porpoises, 7 (CV = 0.39) harbor seals, 10 (CV = 0.54) long-finned pilot whales, and 13 (CV = 0.40) white-sided dolphins (Table 3). Mean annual bycatch estimates from the MABT fishery were 11 (CV = 0.87) bottlenose dolphins, 293 (CV = 0.27) common dolphins, 64 (CV = 0.37) gray seals, and 45 (CV = 0.63) Risso's dolphins (Table 4). Total bycatch estimates, mean annual bycatch estimates over 5 years, and the associated CVs are shown for each species in Table 5. Bycatch estimates for 2022 are shown graphically in Figure 2 and Figure 3.

## METHODS

The bycatch is estimated largely as described in Chavez-Rosales et al. (2018), with minor differences as described below to clean up coding errors and comply with new guidelines in Bettridge (2023).

The bycatch rate, rather than the bycatch estimate, is bootstrapped, resulting in slightly lower CVs than in the past.

The finite population correction is calculated based on the population of trips, rather than based on the number of days fished, and is applied when observer coverage exceeded 10% of trips with effort reported (rather than 10% of days fished) in a stratum.

The bycatch estimates are calculated by adding the observed bycatch to the product of the estimated bycatch rate per day fished and the total unobserved days fished (rather than setting the bycatch estimate equal to the product of the estimated bycatch rate per day fished and the total days fished).

Rounding was performed subsequent to calculations and prior to display in tables and text, and the upper and lower confidence interval bounds were rounded to the next higher and next lower integer, respectively.

The CVs for the 5-year mean annual estimates in Tables 7B and 7C are calculated as suggested in Method 1 of Bettridge (2023, p. 34). Specifically, the variance of the mean annual estimate is calculated by summing the variances for years that have a non-zero variance and dividing by the square of the number of years with a non-zero variance. The square root of that variance is then divided by the mean annual estimate to obtain the CV of the mean annual estimate.

In addition to the bycatch estimation differences above, a comment should be made on the calculation of the CV for the mean annual bycatch estimate over the 5-year period from 2018-2022, which makes use of the annual bycatch estimates and their CVs over that period. In 2020, observer coverage was very low (Precoda and Lyssikatos 2023) and estimates were performed using observer data pooled over 2017-2019. Consequently, the information on which the 2018 and 2019 CVs are based is also included in the calculation of the CVs associated with the 2020 estimates. Treating the 2020 CV as if it were independent results in some underestimation of the CV of the 5-year (2018-2022) mean annual bycatch estimate.

## TABLES

**Table 1. Summaries of 2022 observer and vessel trip report (VTR) data: observed tows, observed trips, commercial trips from VTRs, observed days fished, VTR days fished, and observer coverage by season and ecological production unit (EPU: GB=Georges Bank, GOM=Gulf of Maine) for the Northeast bottom trawl fishery (Figure 1).**

Season	EPU	Observed Tows	Observed Trips <sup>a</sup>	VTR Trips	Observed Days Fished	VTR Days Fished	Observer Coverage (trips)	Observer Coverage (days fished)
Jan-Apr	GB	275	44	163	45.04	315.31	27.0%	14.3%
Jan-Apr	GOM	2,923	298	1,321	530.14	1,792.39	22.6%	29.6%
Jan-Apr	Subtotal	3,198	308	1,484	575.18	2,107.70	20.8%	27.3%
May-Aug	GB	1,320	91	280	162.70	558.99	32.5%	29.1%
May-Aug	GOM	3,420	446	1,197	503.12	1,089.01	37.3%	46.2%
May-Aug	Subtotal	4,740	459	1,477	665.82	1,647.99	31.1%	40.4%
Sep-Dec	GB	494	53	138	76.10	262.25	38.4%	29.0%
Sep-Dec	GOM	4,160	367	922	713.77	1,138.65	39.8%	62.7%
Sep-Dec	Subtotal	4,654	369	1,060	789.87	1,400.90	34.8%	56.4%
Total	Total	12,592	1,123	4,021	2,030.86	5,156.59	27.9%	39.4%

<sup>a</sup>The subtotal and total rows may be smaller than the sum of the observed trips across all strata. This is because an observed trip may include tows in different strata, while totals include only unique trips.

**Table 2. Summaries of 2022 observer and vessel trip report (VTR) data: observed tows, observed trips, commercial trips from VTRs, observed days fished, VTR days fished, and observer coverage by season and ecological production unit (EPU: MAB=Mid-Atlantic Bight) for the Mid-Atlantic bottom trawl fishery (Figure 1).**

Season	EPU	Observed Tows	Observed Trips <sup>a</sup>	VTR Trips	Observed Days Fished	VTR Days Fished	Observer Coverage (trips)	Observer Coverage (days fished)
Jan-Apr	MAB	1,065	118	1,832	130.00	1,581.48	6.4%	8.2%
May-Aug	MAB	1,984	335	3,867	217.08	2,290.98	8.7%	9.5%
Sep-Dec	MAB	2,167	288	3,448	272.12	2,169.51	8.4%	12.5%
Total		5,216	740	9,147	619.20	6,041.97	8.1%	10.2%

<sup>a</sup>The subtotal and total rows may be smaller than the sum of the observed trips across all strata. This is because an observed trip may include tows in different strata, while totals include only unique trips.



**Table 3. For the 2022 Northeast bottom trawl fishery, the observed number of bycatch, estimated bycatch rate per day fished, estimated bycatch, and coefficient of variation (CV) and 95% confidence interval (CI) of the bycatch estimates of bottlenose dolphin (*Tursiops truncatus*), common dolphin (*Delphinus delphis delphis*), gray seal (*Halichoerus grypus atlantica*), harbor porpoise (*Phocoena phocoena phocoena*), harbor seal (*Phoca vitulina vitulina*), long-finned pilot whale (*Globicephala melas*), and white-sided dolphin (*Lagenorhynchus acutus*) by season and ecological production unit (EPU: GB=Georges Bank, GOM=Gulf of Maine).**

Species	Season	EPU	Observed Bycatch	Bycatch Rate	Estimated Bycatch	CV	95% CI
bottlenose dolphin	Sep-Dec	GB	1	0.013	3.45	0.46	1-16
bottlenose dolphin	Sep-Dec	GOM	1	0.001	1.60	0.22	1-4
bottlenose dolphin	Sep-Dec	Total	2	0.005	5.04	0.32	2-17
common dolphin	Jan-Apr	GOM	4	0.008	13.52	0.43	4-45
common dolphin	May-Aug	GOM	1	0.002	2.16	0.34	1-8
common dolphin	Sep-Dec	GOM	1	0.001	1.60	0.22	1-4
common dolphin	Total	GOM	6	0.005	17.28	0.30	8-47
gray seal	Jan-Apr	GB	1	0.022	7.00	0.63	1-31
gray seal	May-Aug	GB	3	0.018	10.31	0.26	5-22
gray seal	Jan-Apr	GOM	1	0.002	3.38	0.55	1-15
gray seal	May-Aug	GOM	2	0.004	4.33	0.24	2-11
gray seal	Total	Total	7	0.007	25.02	0.22	14-49
harbor porpoise	Jan-Apr	GOM	1	0.002	3.38	0.56	1-14
harbor seal	Jan-Apr	GOM	2	0.004	6.76	0.39	2-19
long-finned pilot whale	Jan-Apr	GOM	3	0.006	10.14	0.54	3-48
white-sided dolphin	Jan-Apr	GB	1	0.022	7.00	0.68	1-36
white-sided dolphin	Jan-Apr	GOM	1	0.002	3.38	0.54	1-14

Species	Season	EPU	Observed Bycatch	Bycatch Rate	Estimated Bycatch	CV	95% CI
white-sided dolphin	May-Aug	GOM	1	0.002	2.16	0.33	1-8
white-sided dolphin	Total	Total	3	0.005	12.55	0.40	4-43

**Table 4. For the 2022 Mid-Atlantic bottom trawl fishery, the observed number of bycatch, estimated bycatch rate per day fished, estimated bycatch, coefficient of variation (CV), and 95% confidence interval (CI) of bottlenose dolphin (*Tursiops truncatus*), common dolphin (*Delphinus delphis delphis*), gray seal (*Halichoerus grypus atlantica*), and Risso's dolphin (*Grampus griseus*) bycatch by season and ecological production unit (EPU: MAB=Mid-Atlantic Bight).**

Species	Season	EPU	Observed Bycatch	Bycatch Rate	Estimated Bycatch	CV	95% CI
bottlenose dolphin	May-Aug	MAB	1	0.005	10.55	0.87	1-49
common dolphin	Jan-Apr	MAB	13	0.100	158.15	0.40	71-356
common dolphin	May-Aug	MAB	3	0.014	31.66	0.69	3-115
common dolphin	Sep-Dec	MAB	13	0.048	103.64	0.42	41-231
common dolphin	Total	MAB	29	0.049	293.45	0.27	170-501
gray seal	Jan-Apr	MAB	2	0.015	24.33	0.65	2-79
gray seal	May-Aug	MAB	3	0.014	31.66	0.51	12-85
gray seal	Sep-Dec	MAB	1	0.004	7.97	0.88	1-41
gray seal	Total	MAB	6	0.011	63.96	0.37	29-131
Risso's dolphin	Jan-Apr	MAB	2	0.015	24.33	0.89	2-122
Risso's dolphin	May-Aug	MAB	2	0.009	21.11	0.89	2-108
Risso's dolphin	Total	MAB	4	0.012	45.44	0.63	4-152

**Table 5. Summaries for the 5-year period of 2018-2022. (A) Observer coverage by fishery and year. (B, C) Observed and estimated serious injuries and mortalities of marine mammals in the (B) Northeast bottom trawl and (C) Mid-Atlantic bottom trawl fisheries. The “Combined Estimate” is Estimated Mortality + Estimated Serious Injury.**

**A. Observer coverage as percent of trips, by fishery and year**

Fishery	Years	Data Type	Observer Coverage (trips)
Northeast bottom trawl	2018-2022	Obs. Data, Trip Logbook	12.14, 16.17, 7.44, 16.84, 27.93
Mid-Atlantic bottom trawl	2018-2022	Obs. Data, Trip Logbook	12.00, 11.61, 2.11, 4.83, 8.09

**B. Observed and estimated serious injuries and mortalities of marine mammals in the Northeast bottom trawl fishery for 2018-2022. CV = coefficient of variation. The combined estimate may vary from the sum of the estimated serious injuries and estimated mortalities due to rounding.**

Species	Observed Serious Injury	Observed Mortality	Estimated Serious Injury	Estimated Mortality	Combined Estimate	Estimated CV	Mean (CV) Combined Estimate
bottlenose dolphin ( <i>Tursiops truncatus</i> )	0, 0, 0, 0, 0	0, 1, 1, 1, 2	0, 0, 0, 0, 0	0, 5, 3, 4, 5	0, 5, 3, 4, 5	0.00, 0.73, 1.02, 0.56, 0.32	3 (0.41)
common dolphin ( <i>Delphinus delphis delphis</i> )	1, 0, 0, 1, 0	3, 2, 6, 7, 6	7, 0, 0, 5, 0	21, 11, 16, 36, 17	28, 11, 16, 41, 17	0.54, 0.47, 0.53, 0.35, 0.30	23 (0.21)
gray seal ( <i>Halichoerus grypus atlantica</i> )	0, 1, 1, 0, 0	5, 5, 12, 2, 7	0, 5, 2, 0, 0	32, 25, 28, 8, 25	32, 30, 31, 8, 25	0.42, 0.28, 0.28, 0.39, 0.22	25 (0.15)
harbor porpoise ( <i>Phocoena phocoena phocoena</i> )	0, 0, 0, 0, 1	0, 2, 2, 1, 0	0, 0, 0, 0, 3	0, 11, 4, 6, 0	0, 11, 4, 6, 3	0.00, 0.49, 0.70, 0.71, 0.56	5 (0.39)
harbor seal ( <i>Phoca vitulina vitulina</i> )	0, 0, 0, 0, 0	0, 1, 2, 1, 2	0, 0, 0, 0, 0	0, 5, 4, 6, 7	0, 5, 4, 6, 7	0.00, 0.67, 0.71, 0.70, 0.39	4 (0.38)
harp seal ( <i>Pagophilus groenlandicus</i> )	0, 0, 0, 0, 0	0, 1, 1, 0, 0	0, 0, 0, 0, 0	0, 5, 2, 0, 0	0, 5, 2, 0, 0	0.00, 0.70, 1.00, 0.00, 0.00	1 (1.45)
long-finned pilot whale ( <i>Globicephala melas</i> )	0, 0, 0, 0, 0	0, 1, 1, 0, 3	0, 0, 0, 0, 0	0, 5, 2, 0, 10	0, 5, 2, 0, 10	0.00, 0.68, 1.00, 0.00, 0.54	4 (0.66)
Risso’s dolphin ( <i>Grampus griseus</i> )	0, 0, 0, 0, 0	0, 0, 0, 1, 0	0, 0, 0, 0, 0	0, 0, 0, 4, 0	0, 0, 0, 4, 0	0.00, 0.00, 0.00, 0.60, 0.00	1 (3.02)

Species	Observed Serious Injury	Observed Mortality	Estimated Serious Injury	Estimated Mortality	Combined Estimate	Estimated CV	Mean (CV) Combined Estimate
white-sided dolphin ( <i>Lagenorhynchus acutus</i> )	0, 1, 1, 1, 0	0, 13, 15, 3, 3	0, 0, 0, 6, 0	0, 4, 2, 17, 13	0, 4, 3, 22, 13	0.00, 0.61, 0.99, 0.35, 0.40	8 (0.30)

**C. Observed and estimated serious injuries and mortalities of marine mammals in the Mid-Atlantic bottom trawl fishery for 2018-2022. CV = coefficient of variation. The combined estimate may vary from the sum of the estimated serious injuries and estimated mortalities due to rounding.**

Species	Observed Serious Injury	Observed Mortality	Estimated Serious Injury	Estimated Mortality	Combined Estimate	Estimated CV	Mean (CV) Combined Estimate
bottlenose dolphin ( <i>Tursiops truncatus</i> )	0, 0, 0, 0, 0	1, 0, 4, 2, 1	0, 0, 0, 0, 0	6, 0, 9, 37, 11	6, 0, 9, 37, 11	0.91, 0.00, 0.61, 0.95, 0.87	13 (0.74)
common dolphin ( <i>Delphinus delphis delphis</i> )	0, 3, 3, 0, 1	34, 51, 152, 13, 28	0, 22, 6, 0, 10	205, 374, 302, 222, 283	205, 396, 308, 222, 293	0.21, 0.19, 0.15, 0.54, 0.27	285 (0.12)
gray seal ( <i>Halichoerus grypus atlantica</i> )	1, 0, 1, 0, 0	5, 3, 13, 0, 6	9, 0, 2, 0, 0	47, 22, 23, 0, 64	56, 22, 25, 0, 64	0.58, 0.43, 0.31, 0.00, 0.37	33 (0.32)
harbor seal ( <i>Phoca vitulina vitulina</i> )	0, 0, 0, 0, 0	1, 1, 2, 0, 0	0, 0, 0, 0, 0	6, 7, 4, 0, 0	6, 7, 4, 0, 0	0.94, 0.74, 0.71, 0.00, 0.00	3 (0.80)
Risso's dolphin ( <i>Grampus griseus</i> )	0, 0, 2, 0, 0	0, 0, 5, 0, 4	0, 0, 4, 0, 0	0, 0, 10, 0, 45	0, 0, 14, 0, 45	0.00, 0.00, 0.57, 0.00, 0.63	12 (1.25)

# FIGURES

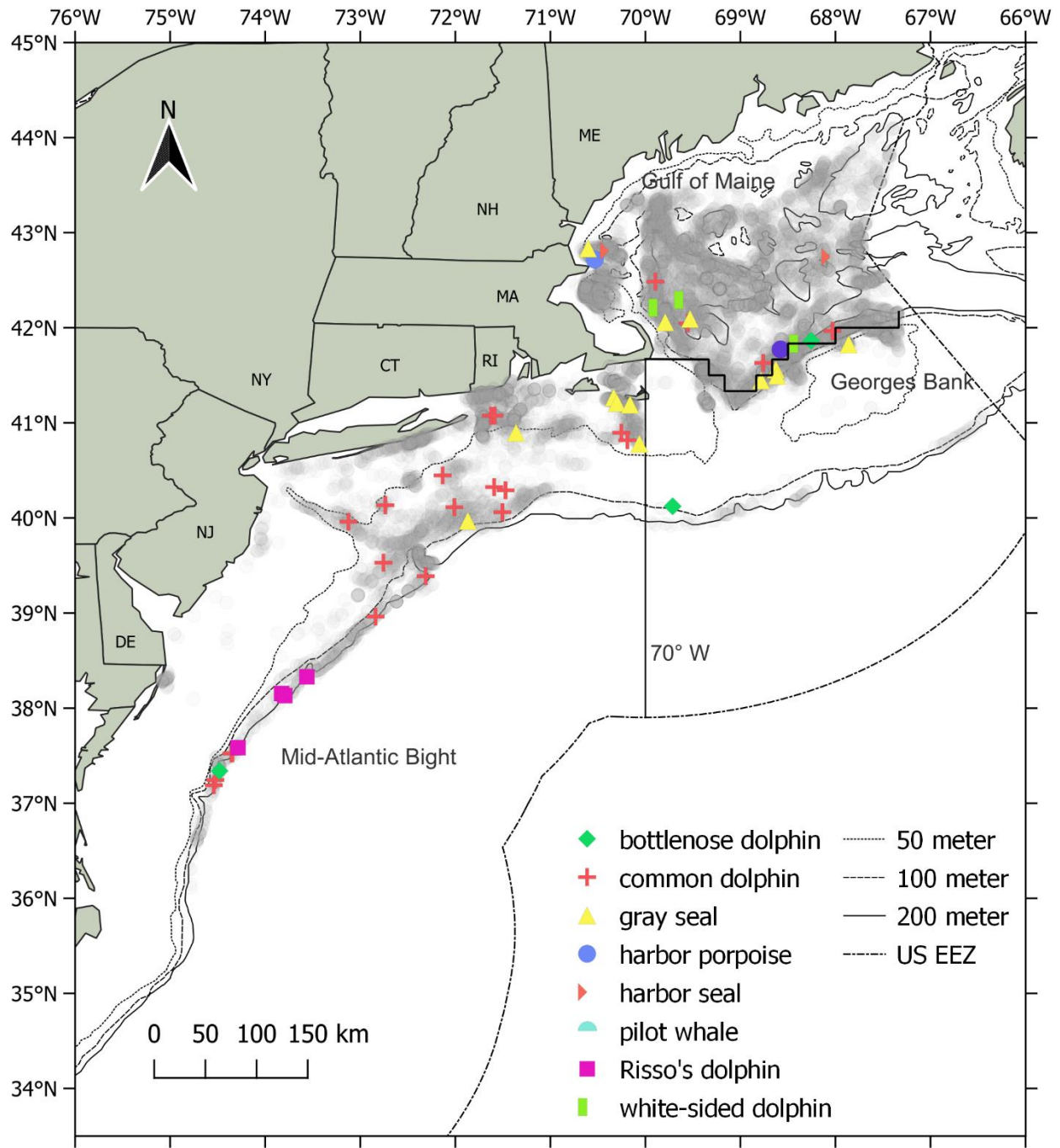


Figure 1. Locations of observed tows (gray circles) and incidental takes from observed commercial trips in the Northeast bottom trawl and Mid-Atlantic bottom trawl fisheries in 2022 for bottlenose dolphin (*Tursiops truncatus*), common dolphin (*Delphinus delphis delphis*), gray seal (*Halichoerus grypus atlantica*), harbor porpoise (*Phocoena phocoena phocoena*), harbor seal (*Phoca vitulina vitulina*), long-finned pilot whale (*Globicephala melas*), Risso's dolphin (*Grampus griseus*), and white-sided dolphin (*Lagenorhynchus acutus*).

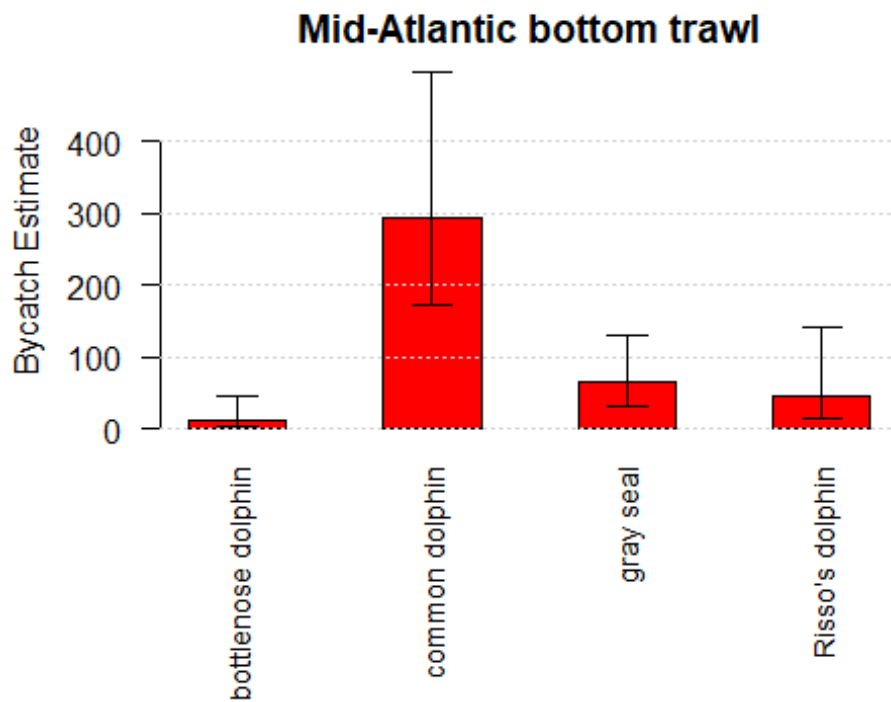
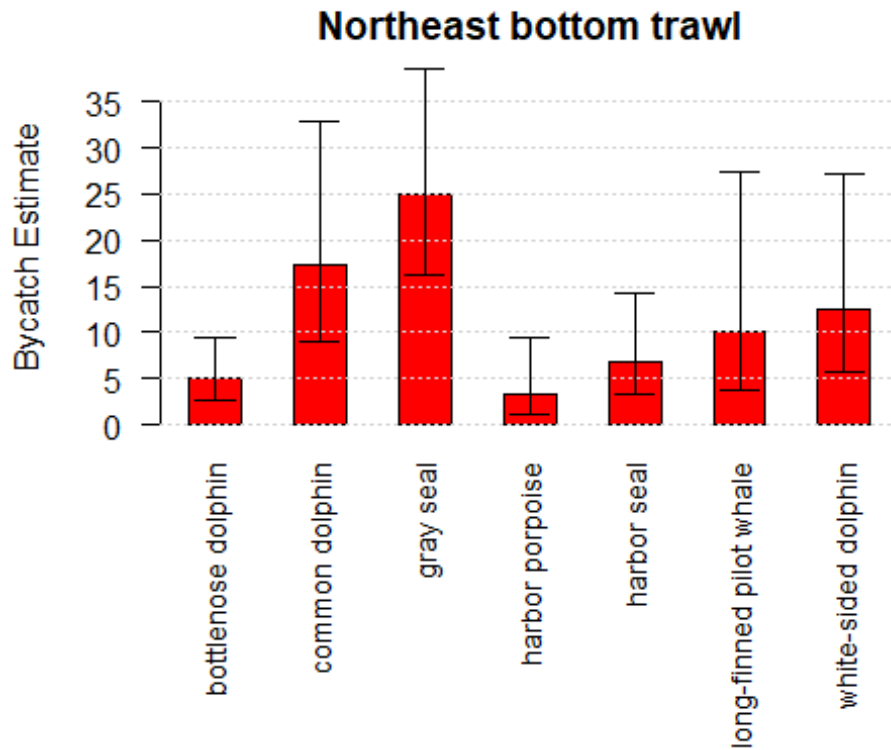
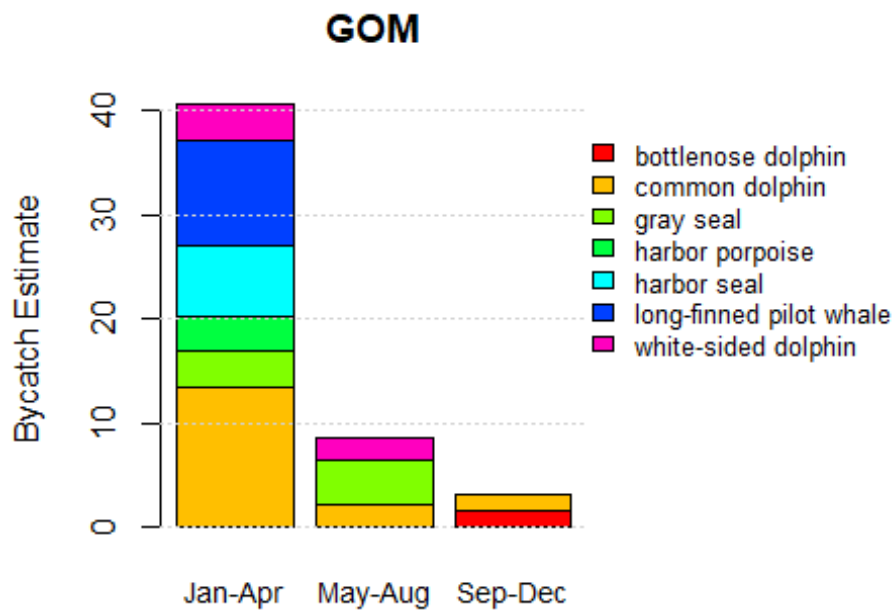
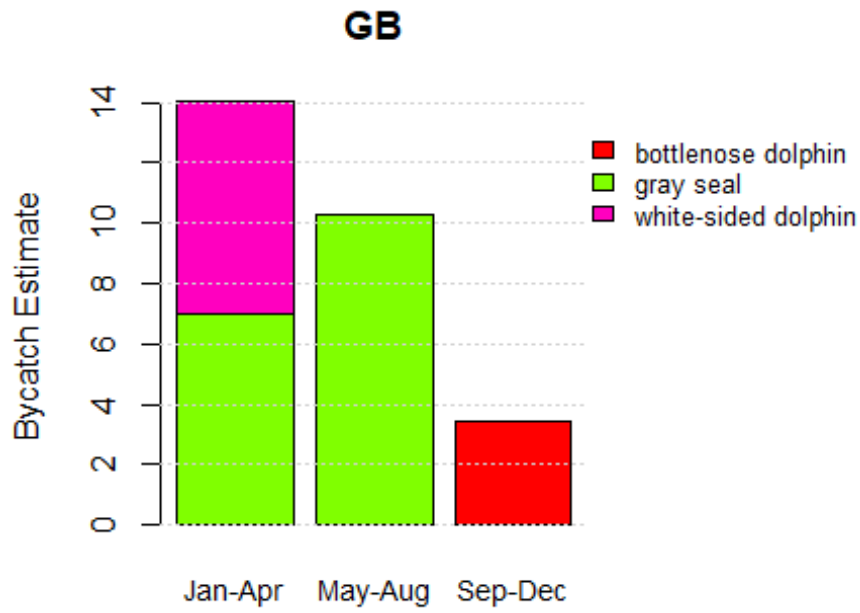


Figure 2. Bycatch estimates (with lognormal 95% confidence interval) by region and species, 2022.



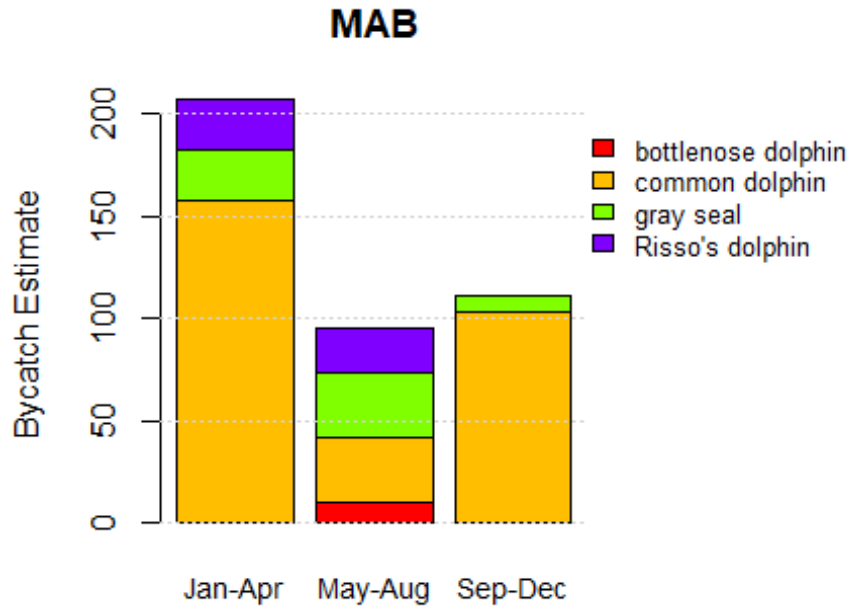


Figure 3. Bycatch estimates for 2022 by ecological production unit, season, and species. GB=Georges Bank, GOM=Gulf of Maine, MAB=Mid-Atlantic Bight.



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