

## 21. Other Removals

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### Background

Ship strikes remove baleen whales from the ecosystem, and bycatch or entanglements in fishing gear remove pinnipeds, baleen whales, and odontocetes. This section describes how the biomass of these removals was calculated.

### Data Sources and Quantitative Approach for Biomass of Removal Estimates

The average annual numbers of animals removed by ship strikes and fishing gear are documented in Waring *et al.* (2004). These numbers were decomposed into the numbers by species within each of the EMAX ecoregions (Table 21.1). The biomass (in metric tons) of the removals of species  $k$  in ecoregion  $i$  was then estimated as the product of the number of removals of species  $k$  in ecoregion  $i$  and the average weight of an individual (in kg). The total biomass (in metric tons) of removal within ecoregion  $i$  is the sum of biomass removed over all species  $k$ :

$$(EQ. 21.1) \quad \text{biomass of removals}_i = \sum_{\text{species } k} (\text{number of individuals removed}_{ki} \cdot \text{average weight}_k) / 1000 .$$

Biomass removed per area (in  $\text{g m}^{-2}$ ) was calculated as biomass removed by ship strikes and fishing gear (in metric tons) per area of the ecoregion (in  $\text{km}^2$ ; Table 21.1).

### Example Results

Baleen whales were removed by both fishing gear and ship strikes. The most biomass per area (in  $\text{g m}^{-2}$ ) removed by fishing gear was from Southern New England and Georges Bank, and the most removed by ship strikes was from the Mid-Atlantic Bight and Southern New England ecoregions (Table 21.1; Figure 21.1). The amount of odontocetes biomass removed due to fishing gear was fairly evenly distributed among the four ecoregions, where most of the biomass was from harbor porpoises, common dolphins and white-sided dolphins (Figure 21.2A). Nearly all the pinniped biomass removed by fishing gear was from harbor seals in the Gulf of Maine region (Figure 21.2B).

### References

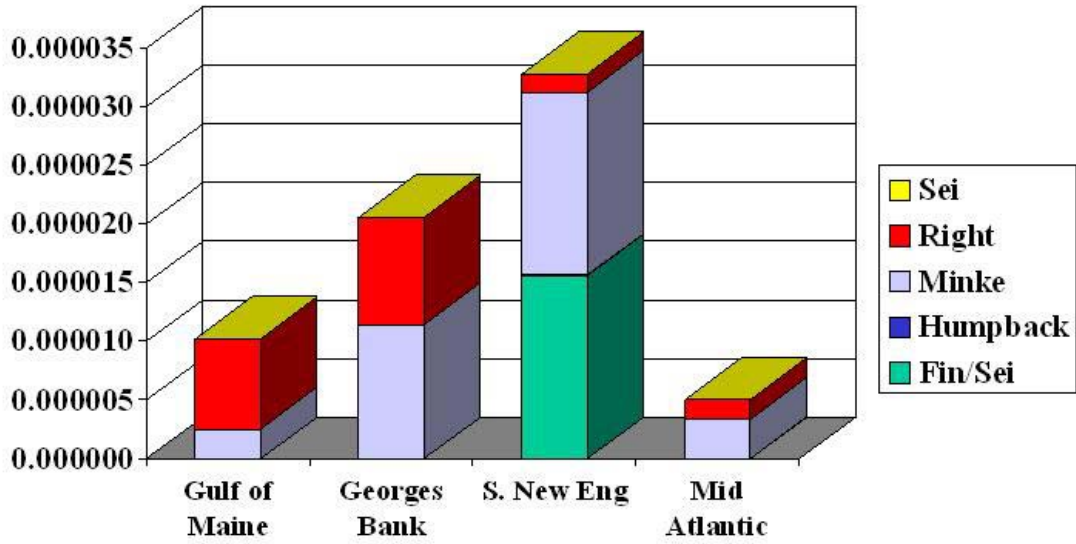
Waring, G; Pace, RM; Quintal, JM; Fairfield, CP; Maze-Foley, K, eds. 2004. U.S. Atlantic and Gulf of Mexico marine mammal stock assessments – 2003. *NOAA Technical Memorandum NMFS-NE-182*. [www.nefsc.noaa.gov/nefsc/publications/tm/tm182](http://www.nefsc.noaa.gov/nefsc/publications/tm/tm182)

Table 21.1. By species and ecoregion, average number of animals removed per year by ship strikes and fishing gear.  
 Note: blank cell indicates no animals were removed.

Species	Average Number of Animals Removed Per Year								Total
	By Ship Strikes				By Fishing Gear				
	GOM	GB	SNE	MAB	GOM	GB	SNE	MAB	
Fin W.	0.2		0.4	0.8			1		2.4
Hump W.	0.1		0.1	0.2					0.4
Minke W.	0.2				0.2	0.5	1	0.2	2.1
Right W.		0.2	0.2	0.2	0.6	0.4	0.1	0.1	1.8
Sei W.			0.2						0.2
Beaked									0
Bottlen D.							26	134	160
Common					29	17	22	76	144
Grampus						3			3
Har. Por.					160	77	40	33	310
Kogia									0
Pilot W.						11	51	16	78
Sperm W.						0.2			0.2
Spotted D.									0
Striped D.									0
Whiteside					40	21	25		86
Grey S.					131				131
Harbor S.					953		2		953
Harp S.					106			3	106
Hooded S.					16				16
TOTAL	0.5	0.2	0.9	1.2	1435.8	130.1	168.1	262.3	1994.1

Figure 21.1. Biomass (in  $\text{g m}^{-2}$ ) of removals of baleen whales (A) by fishing gear and (B) by ship strikes.

A. By fishing gear.



B. By ship strikes.

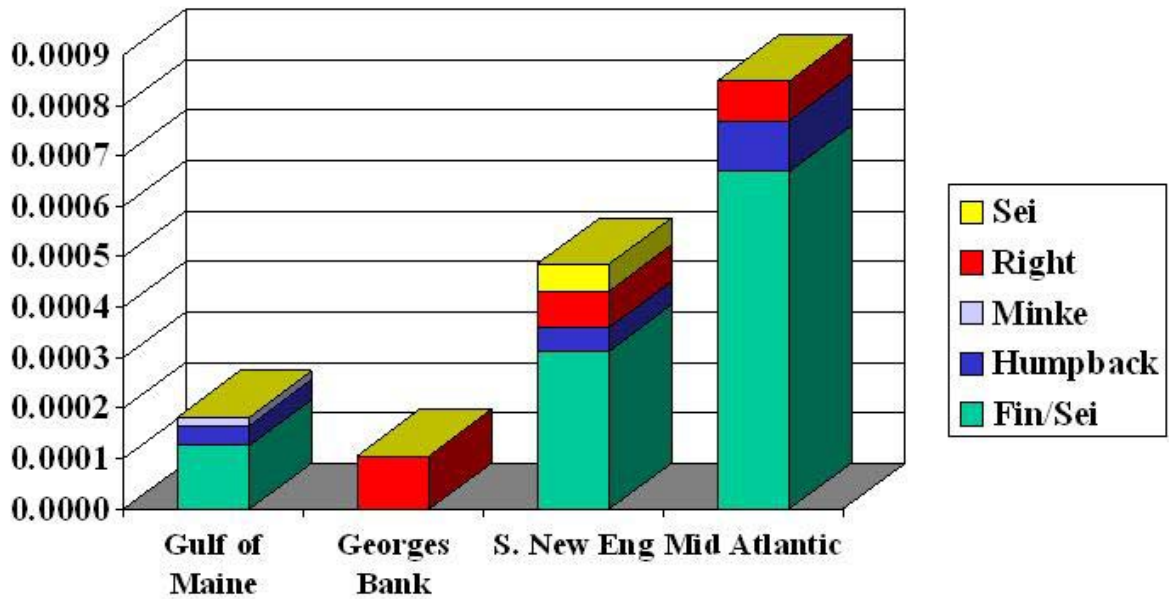
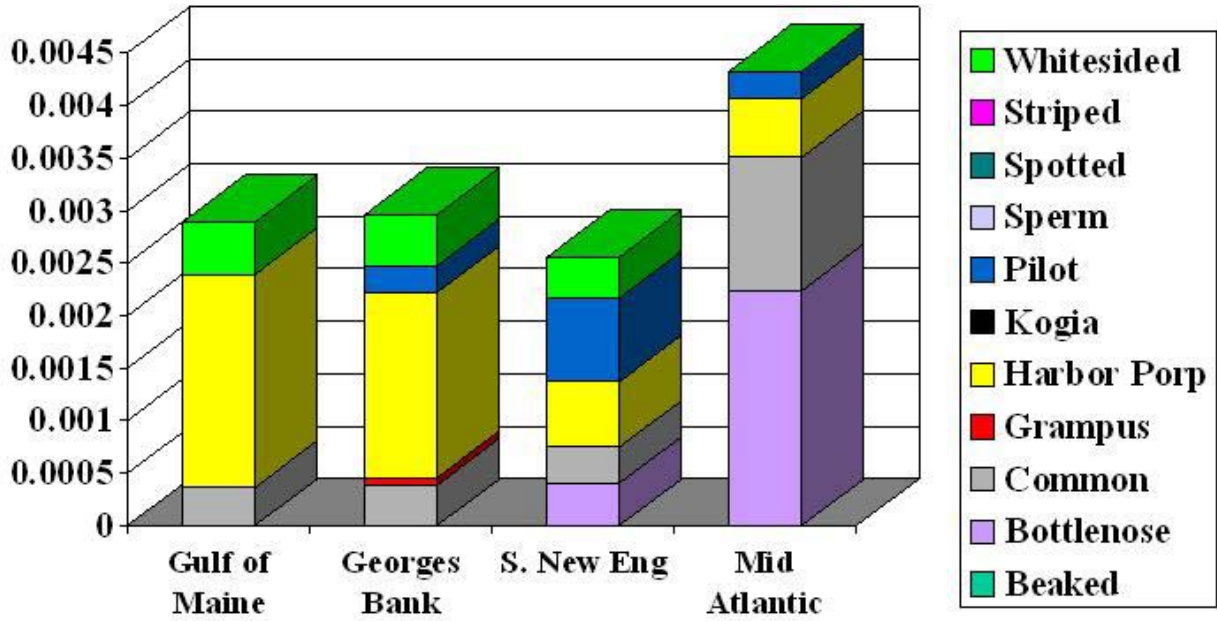


Figure 21.2. Biomass of removals by fishing gear of (A) odontocetes and (B) pinnipeds.

A. Odontocetes.



B. Pinnipeds.

