Chapter 7: Summary of boat survey data

Final Report to the Maryland Department of Natural Resources and the Maryland Energy Administration, 2015

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Chapter 7 Highlights

Results from boat-based survey data collected in the Maryland study area.

Context[1]

Standardized boat-based surveys are widely used to obtain density data for birds, sea turtles, and marine mammals. Chapter 6 describes the standardized protocol used to collect data. This chapter describes the basic results of the boat surveys, including counts of various species and groups, and a discussion of identification rates. Chapter 8 describes the methods used to collect data on relative biomass of aquatic prey below the study vessel, using a scientific echo sounder that was deployed on all surveys. Chapter 9 uses data presented here in hierarchical Bayesian statistical approaches to estimate abundances and distribution patterns of seabirds in relation to habitat variables, while correcting for certain biases associated with boat methodologies (e.g., distance bias). Part IV of this report (Chapters 10-14) combines data from boat-based surveys with data from digital video aerial survey approaches to develop a more comprehensive understanding of marine wildlife populations that use the Mid-Atlantic and Maryland study areas.

Study goal/objectives addressed in this chapter

Summarize animal distribution and abundance data that were collected in the Maryland study area using a well-known and widely used survey method.

Highlights

- There were 10,078 animals observed over two years of surveys; most of the animals were birds (over 9,700) though there were aquatic animals observed as well.
- The highest counts of animals occurred in February, October, and November.
- The most abundant animals observed were gulls and terns (*Laridae* spp., 33% of the data).
- Other abundant or commonly observed animals included several species of scoters (*Melanitta* spp.), Northern Gannets (*Morus bassanus*), loons (*Gavia* spp.), and dolphins (*Odontoceti*).
- Rates of identification of animals to species were high for most animals, with the exception of scoters.

Implications

Boat-based surveys are a well-established means to collect distribution and abundance data for marine animals, and the study design used for these surveys may have been particularly useful for monitoring many species of birds. Many taxa were readily identified using this method, though there were few aquatic animals observed relative to birds.

[1] For more detailed context for this chapter, please see the introduction to Part III of this report.

Abstract

Information on bird, sea turtle, and marine mammal movements and abundance was collected from a boat platform using a standardized protocol. Between 2012 and 2014, 16 surveys were conducted along twelve transect lines that focused on three offshore Wind Energy Areas (WEAs) in the Mid-Atlantic U.S.; data from four of these 12 transects, located offshore of Maryland, are summarized here. A total of 10,078 animals were observed on the survey, including over 9,700 birds and 300 aquatic animals in a cumulative 2,607 km of transects. The most animals were observed in February, October, and November, when large flocks of wintering birds were present in the study area. Gulls and Terns (*Laridae*) were the most abundant animal, making up 33% of observations, and were primarily Laughing Gulls (*Leucophaeus atricilla*) and Bonaparte's Gulls (*Choicocephalus philadelphia*). Scoters (*Melanitta* spp.) were the next most abundant animal group, at 25% of observations. Northern Gannets (*Morus bassanus*), loons (*Gavia* spp.), and auks (*Alcidae* spp.) were also commonly observed. Smaller numbers of aquatic animals such as dolphins, sea turtles, and baleen whales were observed. Rare observations included two Roseate Terns (*Sterna dougallii*), three Minke Whales (*Balaenoptera acutorostrata*), and one Humpback Whale (*Megaptera novaeangliae*). Most animals were successfully identified to species, save for scoters, which were often observed in large flocks at some distance from the vessel. More in-depth analyses of the boat survey data can be found in subsequent chapters in this report.

Introduction

In terms of major geographic features, the marine environment of Maryland is dominated by the massive and highly productive Chesapeake Bay, but Maryland also has a significant swath of oceanic waters off its eastern shore. These offshore waters lie centrally within the broader Mid-Atlantic region, and support a high level of productivity. As such, Mid-Atlantic is an extremely important area for a broad range of marine wildlife species throughout the year. Some species breed in the area, such as coastal birds and sea turtles, while others visit from the southern hemisphere in their non-breeding season, such as shearwaters. In the fall, many summer residents migrate south to breed or winter in warmer climes, and they are replaced by species that have travelled south from their northern breeding grounds to winter in the Mid-Atlantic. Additionally, many pelagic, coastal, and terrestrial species make annual migrations up and down the eastern seaboard and travel directly through the Mid-Atlantic region in spring and fall. Thus, many species use or funnel through the Mid-Atlantic region each year, resulting in a complex ecosystem where community composition is constantly shifting, and the temporal and geographic patterns are highly variable.

In this study, we aimed to produce the baseline data required to inform siting and permitting processes for offshore wind energy development in the Mid-Atlantic. We collected information on bird, sea turtle, and marine mammal abundance and movements over a two-year period (2012-2014) using a variety of technologies and methods to examine spatial patterns and trends. Standardized boat-based surveys are a widely used method of estimating densities for coastal and marine birds, sea turtles, and marine mammals (Gjerdrum et al., 2012; Tasker et al., 1984), and are a key part of the Department of Energy-funded Mid-Atlantic Baseline Studies (MABS) project and state-funded Maryland Project. We conducted boat surveys for wildlife within the MABS and Maryland study areas on the Outer Continental Shelf to accompany and compare with the data from simultaneously conducted digital aerial surveys (for more information on aerial surveys, and for analyses synthesizing boat and aerial datasets, see Parts II and IV of this report).

The broader MABS study area encompasses the coastal area from Delaware to Virginia, extending from 3 nautical miles from the coastline out to the 30 m isobath or the eastern extent of the Wind Energy Areas (WEAs) (Figure 7-1). Maryland funded an expansion of the study area and extended three of the original DOE aerial and boat survey transects in the Maryland WEA west into Maryland's state waters (Figure 7-1). In this report, we include all transect lines that fall within the extended state boundaries for Maryland, including those funded by the Department of Energy (Figure 7-1). Here, we examine the boat survey results for the Maryland study area in detail, including discussion of observation rates and species identification rates.

Methods

Between April 2012 and April 2014, project partners conducted sixteen large-scale boat based visual surveys (Table 7-1) across the MABS study area along 12 transect lines that focused on three offshore WEAs (total transect length = 559 km, Figure 7-1). Details on survey design for our boat surveys can be found in Chapter 6. In the second year of surveys (March 2013-January 2014), the western ends of three survey lines off of Maryland were extended into state waters (total transect length = 571 km, Figure 7-1). Data presented here include boat survey observations from all four transect lines off of Maryland (Figure 7-1).

This chapter presents summaries of raw count data from the boat surveys on a monthly, seasonal, and annual basis. We also discuss identification rates for the most common species groups. Chapter 9 presents additional analyses of the boat survey data, and Chapters 10-14 present additional information comparing the results of digital aerial and boat-based survey results, and integrating data from both survey platforms in in-depth analyses of wildlife distributions and relative abundances.

Results

A total of 10,078 animals were observed in the sixteen surveys in the Maryland study area, including over 9,700 birds and 353 aquatic animals (including cetaceans, sea turtles, sharks, and fish; Appendix 7A). At least 61 species of birds and 6 species of aquatic animals are represented in this dataset. Seventy-seven percent of animals observed in the study were identified to species level; most unidentified animals were scoters, with an approximately 91% identification rate excluding this taxon. The greatest numbers of animals were observed in February, October, and November, when large flocks of marine birds were in the study area (Table 7-2). It should be noted that data collected between the two years are not entirely compatible, as the study area was slightly different between the two years, and exact timing of surveys can have a huge effect on species counts, particularly in migration periods when large numbers of wintering birds could be moving in or out of the study area, and a week's difference in survey dates could affect overall abundance observed.

Relative abundance of counts

Birds

Gulls and terns (Laridae) were observed throughout the year (Figure 7-6) and were the most abundant animal group (33% of all data; Table 7-2). Laughing Gull (*Leucophaeus atricilla*) was the most abundant gull (11% overall), and was present in the study area from the spring, summer, and fall. Bonaparte's Gull (*Choicocephalus philadelphia)* was the next most common gull species observed (6.7% overall), and was most abundant in the winter months (Appendix 7A). Great Black-backed Gulls (*Larus Marinus*; 3.3%) and Herring Gulls (*L. smithsonianus,* 3.0%) were observed consistently throughout the year in almost every survey, but with peaks in abundance in the fall. Four other gull species were also observed in smaller numbers. Common Terns (*Sterna hirundo*) were abundant in several of the surveys, and present through the spring and fall (2.4%). Two federally endangered Roseate Terns (*Sterna dougallii*) were observed feeding May 9, 2013. Five other tern species were observed in the study area. There were approximately the expected number of gulls and terns observed in the study, given the proportion of the study area included in the Maryland surveys (Figure 7-3).

Scoters, a genus of sea ducks that in the Mid-Atlantic includes Black Scoter (*Melanitta americana*), White-winged Scoter (*M. fusca*), and Surf Scoter (*M. perspicillata*), were the next most abundant avian taxonomic group observed in the boat surveys (Figure 7-2), constituting 25% of the observations. Scoters were mostly in the region from the winter into the early spring, from December through April (Figure 7-6). Six other species of anatids (ducks and geese) were observed in the study area (Appendix 7A). There were many fewer scoters observed within the Maryland transects than expected based on the relative size of the Maryland study area to the MABS study area, and the high numbers of scoters observed within the MABS study area (Figure 7-3).

Northern Gannets (*Morus bassanus*) were the next most abundant bird observed (18% of all data; Figure 7-2), and were most common in the winter to early spring, with the highest numbers observed in the fall (Figure 7-6). Fewer Northern Gannets than expected were observed in the Maryland study area (Figure 7-3).

Other avian taxa observed in boat surveys included loons (Gaviidae), auks (Alcidae), storm-petrels (Hydrobatidae), shearwaters and fulmars (Procellariidae), shorebirds (Charadriiformes), and landbirds (Passeriformes). Loons made up 13% of all observations and were observed mostly in the winter and spring (Figure 7-4), with the highest number of loons observed in January of 2014. Common Loons (*Gavia immer*) were observed more frequently than Red-throated Loons (*G. stellata*; Figure 7-8). Auks were observed in the winter and early spring (Figure 7-6). Razorbills (*Alca torda*; 2.1%) were the most abundant, followed by Dovekies (*Alle alle*; 1.9%). Wilson's Storm-Petrels (*Oceanites oceanicus*) were observed in the study during summer surveys (1.5%). Six species of shorebirds and five species of procellarids were observed; procellarids were mostly Cory's Shearwater (*Calonectris diomedea*; 0.17%). Only three species of landbirds were observed in the study, many fewer than in the MABS area (21 species).

Aquatic animals
Dolphins were the most common non-avian animal group observed (Figure 7-4), with Bottlenose Dolphins (*Tursiops truncates*) the most abundant (2.4%); they were observed predominantly in warmer months (Figure 7-7). Fewer Common Dolphins (*Dellphinus delphis*) were observed (0.26%; Figure 7-9). Large whales were also observed in the study in winter (Figure 7-7), including three Minke Whales (*Balaenoptera acutorostrata*) and one Humpback Whale (*Megaptera novaeangliae*). Dolphins were mostly identified to species, but there were four sightings of unidentified whales (Figure 7-9). Two species of sea turtles were observed in the summertime (0.20%, Appendix 7A). Of the two species observed, Loggerhead Turtles (*Caretta caretta*) were the most common (0.15%), and Leatherback Turtles (*Dermochelys coriacea*) were less common (0.03%).

Identification rates
Identification rates for the Maryland study area were similar to the broader MABS project area (Figure 7-10). The bulk of the scoters (67%) were unidentified to the species level, but those identified were predominantly Surf Scoters and Black Scoters (4.6% and 2.7% respectively; Figure 7-8). Scoters were often observed in large flocks, some far from the boat, which led to lower levels of identification (for additional discussion of this topic, see Williams et al., 2015). Identification rates for other avian species were fairly high; most gull and tern observations were made to the species level (87%), as were 89% of alcids and 93% of loons (Figure 7-8). Toothed whales were primarily identified to species (90%), most commonly Bottlenose Dolphins (Figure 7-9). Larger whales were identified to species 50% of the time, and Minke Whales were the most commonly identified, but the "passing mode" in which surveys were conducted prevented accurate species identification and probably accurate estimation of group sizes for cetaceans in some cases (see Chapters 6 and 12 for more information). Sea turtles were almost always identified to species (90%), and most were Loggerhead Sea Turtles.

Discussion
The most abundant animals observed in the boat-based surveys were gulls, scoters, Northern Gannets, and loons, which is similar to the high resolution digital video aerial surveys (Chapter 5). One notable difference between the results of the two study methods was the number of aquatic animals observed relative to the number of animals observed overall; a much higher number of aquatic animals were seen from the digital video aerial study, likely in part as a result of the differences between the observers' perspectives. However, the boat observers' perspective looking forward from the survey vessel (Chapter 6) appeared to provide an excellent means to spot distant large birds (e.g., Northern Gannets, shearwaters), large flocks of birds (e.g., scoters), the spouts and surfaced body parts of large whales, and pods of dolphins. Further examination of the differences in results from the two survey methods may be found in Chapter 10.

Rates of identification to species level were quite high for boat surveys, especially for avian groups. The notable exception was scoters, likely because many large flocks of scoters were visible at great distances from the boat, and were called either unidentified scoters (*Melanitta* spp.) or "dark scoters" (Black Scoter or Surf Scoter). The ability to see large flocks of birds at a great distance may be an advantage of boat surveys, but depending on the taxon, identifications to species level may be difficult in these cases. Even closely related species often have differences in their conservation status, ecology, and habitat requirements, so obtaining species-specific information on distributions, abundance, and habitat use is often important for identifying potential conflicts with anthropogenic activities in the marine environment.

Many of the subsequent chapters in Parts III and IV of this report use modeling approaches to investigate the distribution and abundance data from the boat-based surveys (including Chapters 9 and 12-14). These methods estimate detection as well as abundance, which helps correct for various types of observation bias, including distance bias, where observers are less likely to see animals located farther from the survey transect (Gardner et al., 2008; Spear et al., 2004). These methods can also incorporate environmental covariates into the model structure, in order to predict animal distributions and abundance on a broader geographic scale than where surveys were actually conducted.

Estimating spatial patterns in relative abundance in the offshore environment can be difficult, as these systems are extremely dynamic, animals tend to show high degrees of spatial autocorrelation or aggregative behaviors, and surveys are logistically challenging and more expensive than terrestrial equivalents. In the past century, offshore surveys have mostly been carried out by direct visual observation of wildlife from boats (or aircraft). Standardized methods using strip or line transects are common for monitoring marine species on boat-based surveys (Camphuysen and Garthe, 2004; Camphuysen et al., 2004; Gjerdrum et al., 2012; Tasker et al., 1984), and have been refined over the last few decades to achieve more accurate estimates of population size (Buckland et al., 2001, 1993; Evans and Hammond, 2004; Kaschner et al., 2012). These survey results on the geographic distributions and relative abundance of wildlife in the Mid-Atlantic are expected to be useful for minimizing impacts to wildlife populations from offshore wind energy development in several ways. These data can inform the siting of future projects, and can also be used to inform the permitting process for projects, by contributing data towards National Environmental Protection Act (NEPA) and other regulatory requirements, and by helping to define target taxa or research priorities on which to focus on during site-specific pre- and post-construction monitoring studies. Detailed baseline survey data can also inform mitigation efforts, by presenting temporal data on community composition, distributions, and abundance that can be used to time certain activities to coincide with reduced potential for exposure of key populations.

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Figures and tables

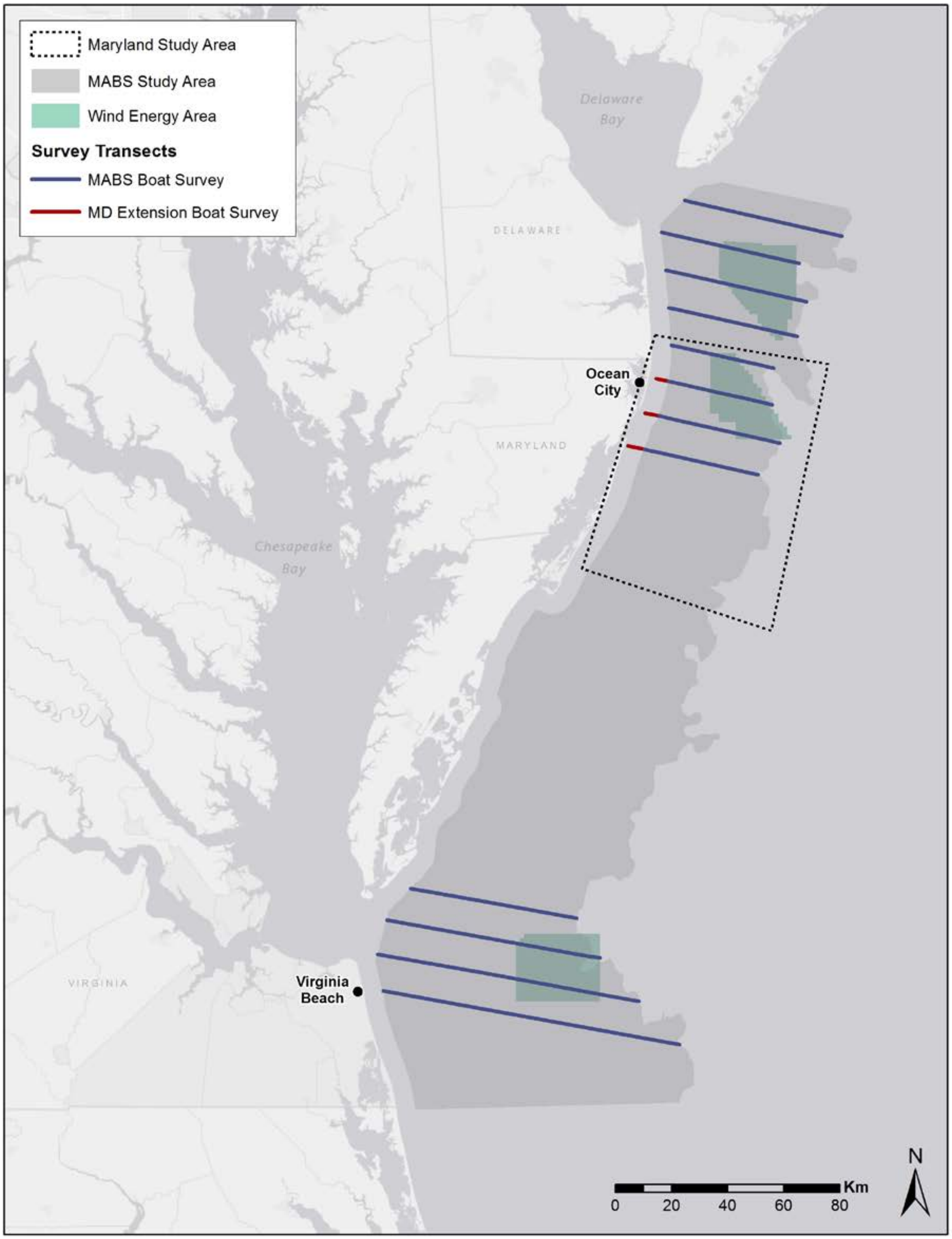

Figure 7-1. Map of boat survey transects for the Mid-Atlantic Baseline Studies and Maryland Projects. Lines in dark blue are part of the Mid-Atlantic Baseline Studies, and lines in dark red indicate the Maryland transects. See Chapter 5 for more details.

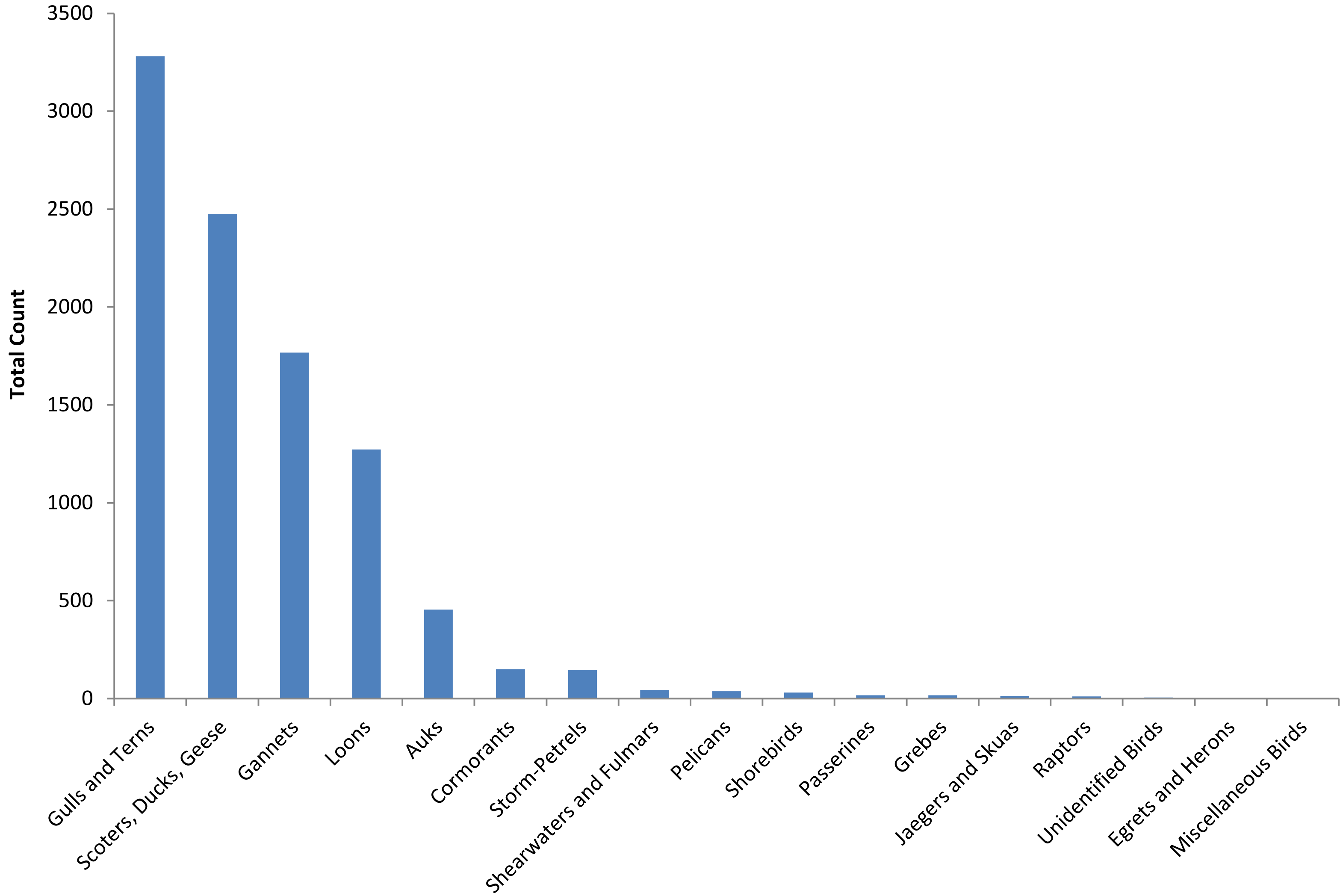

Figure 7-2. Avian observations from April 2012-April 2014 boat surveys within the Maryland study area by species group. "Miscellaneous birds" are coots. "Unidentified birds" were not identified to species or to a specific avian taxonomic group.

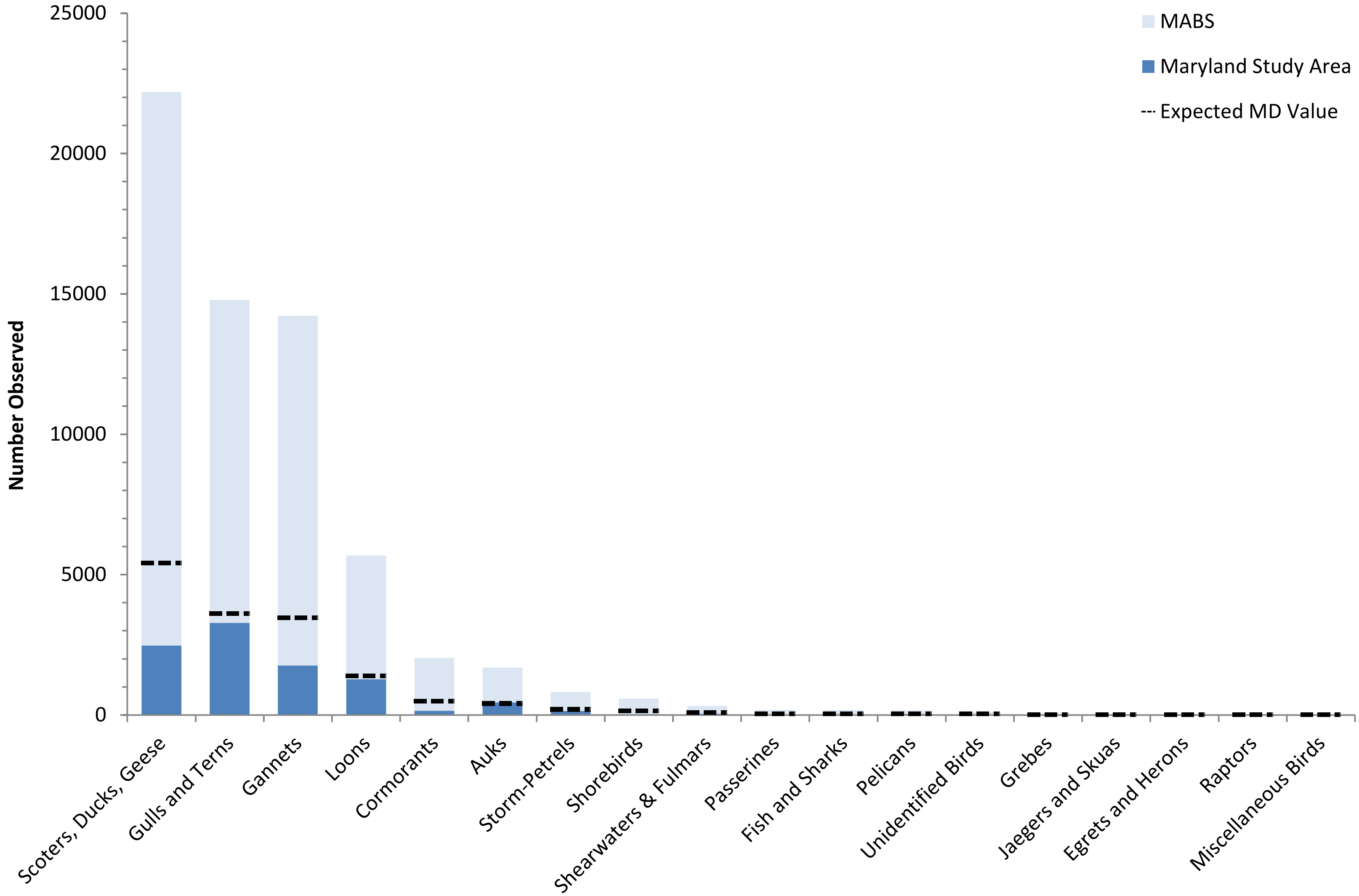

Figure 7-3. Birds observed in the Maryland study area and the Mid-Atlantic Baseline Studies project area (Figure 7-1). The expected number of animals given the proportion of the study area covered in the Maryland project area (24%) is shown for each bird group using a dashed line.

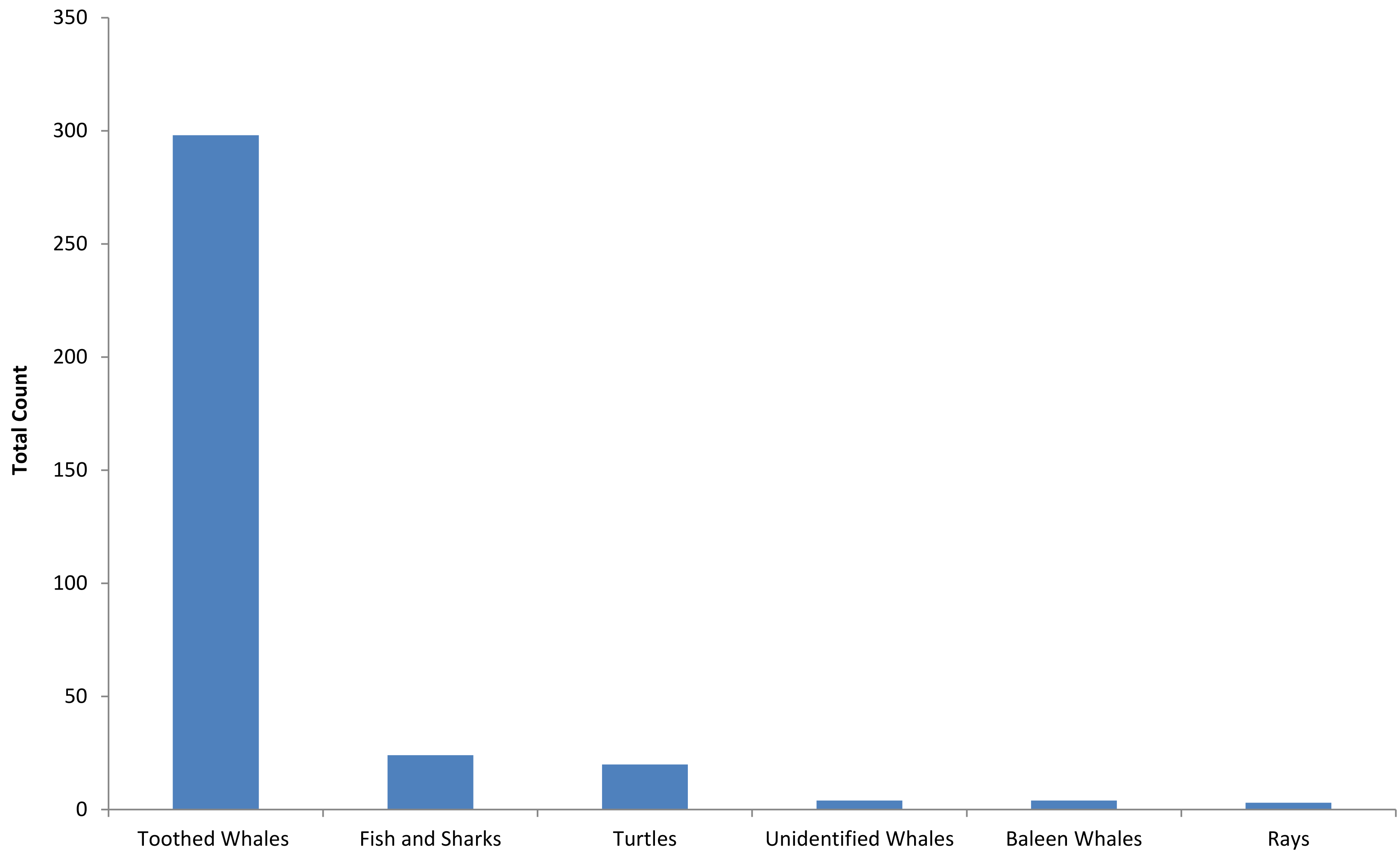

Figure 7-4. Observations of aquatic animals and bats from April 2012-April 2014 boat surveys within the Maryland study area by species group. Schools of fish were excluded from this figure.

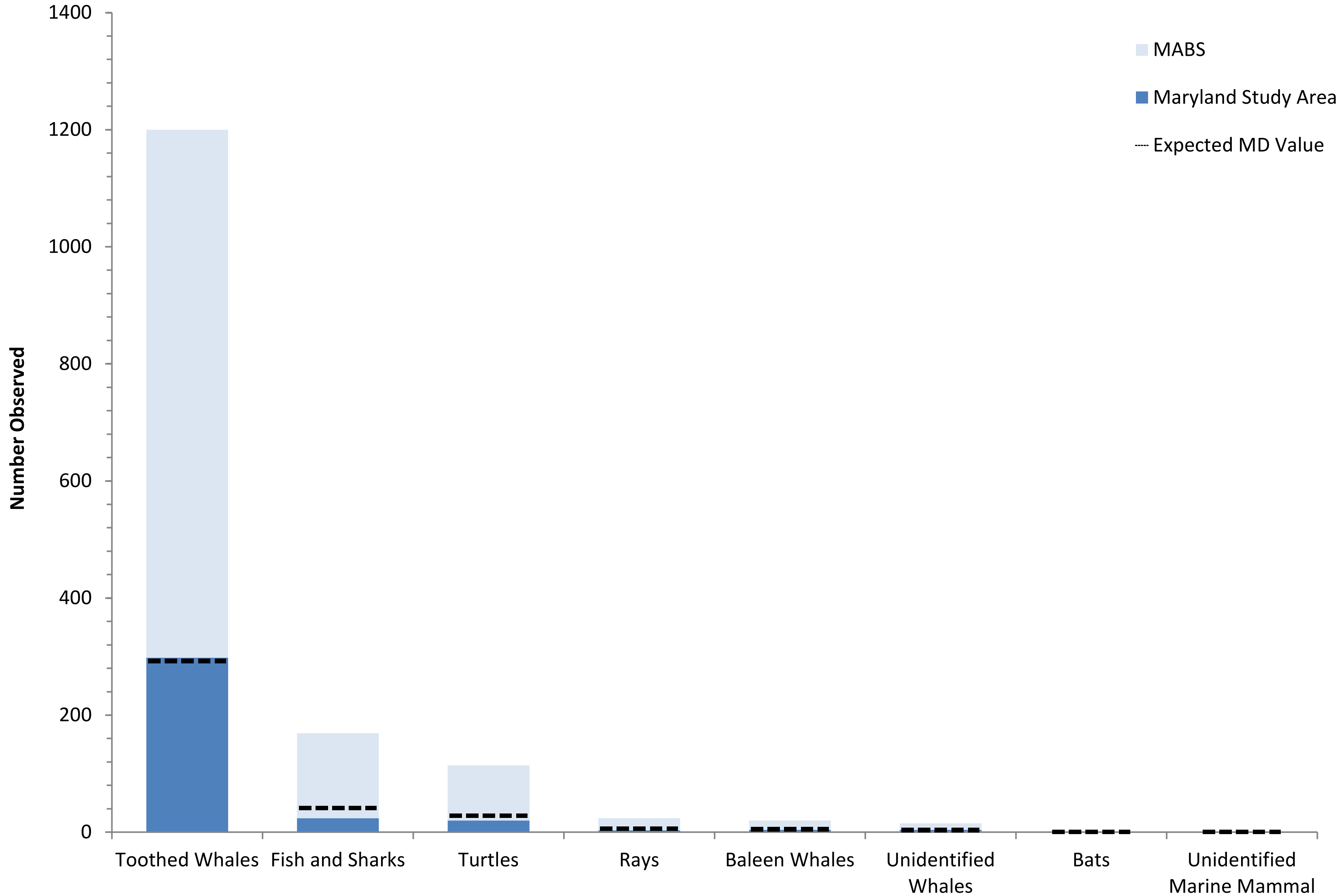

Figure 7-5. Aquatic animals observed in the Maryland study area and the Mid-Atlantic Baseline Studies project area (Figure 7-1). The expected number of animals given the proportion of the study area covered in the Maryland project area (24%) is shown for each group using a dashed line.

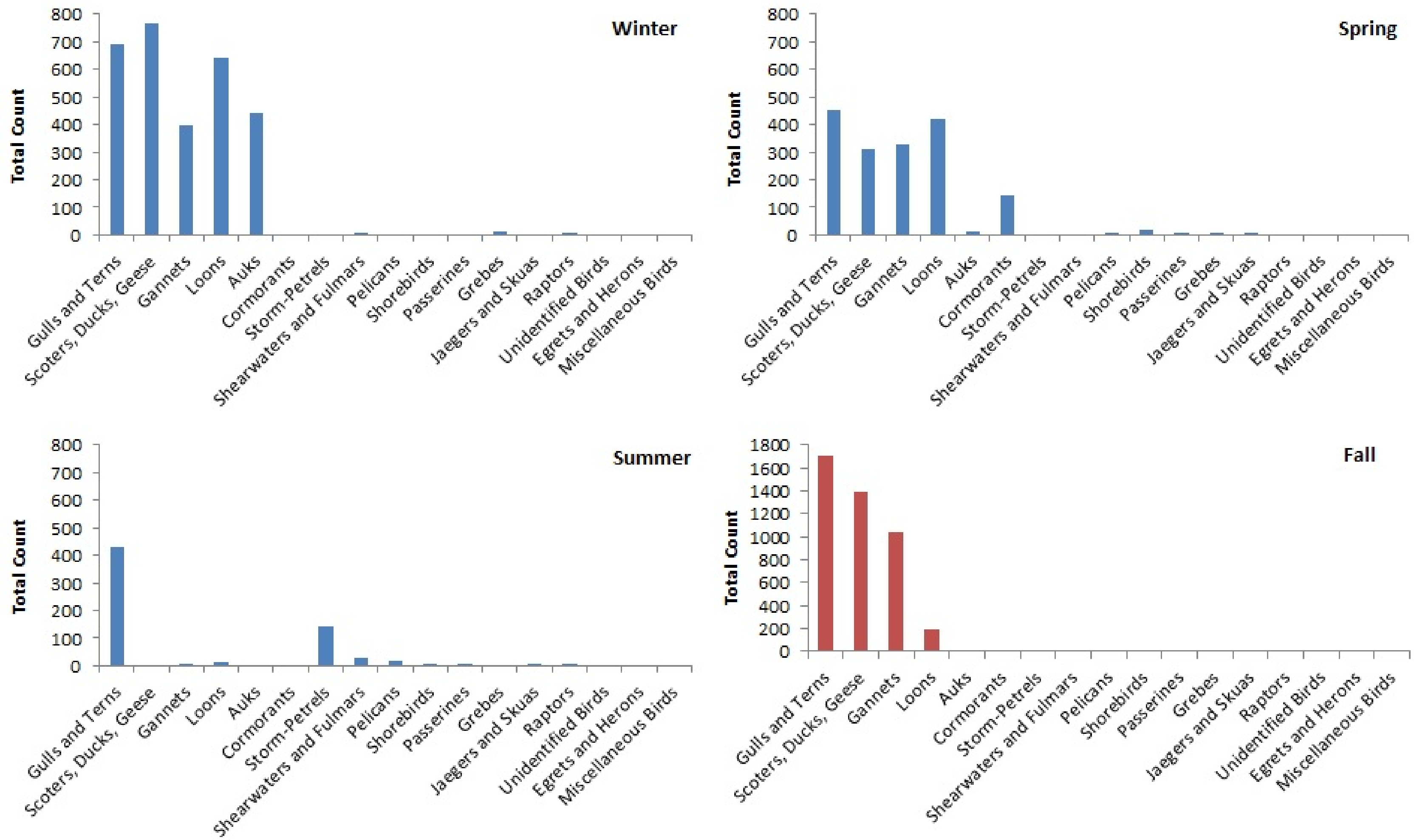

Figure 7-6. Abundance of birds by family or group in boat surveys in winter (December, January, February), spring (March, April, May), summer (June, July, August), and fall (September, October, November) within the Maryland study area. Note different y-axis between the first three graphs the last. X-axes are in order of overall abundance by family or group across all surveys.

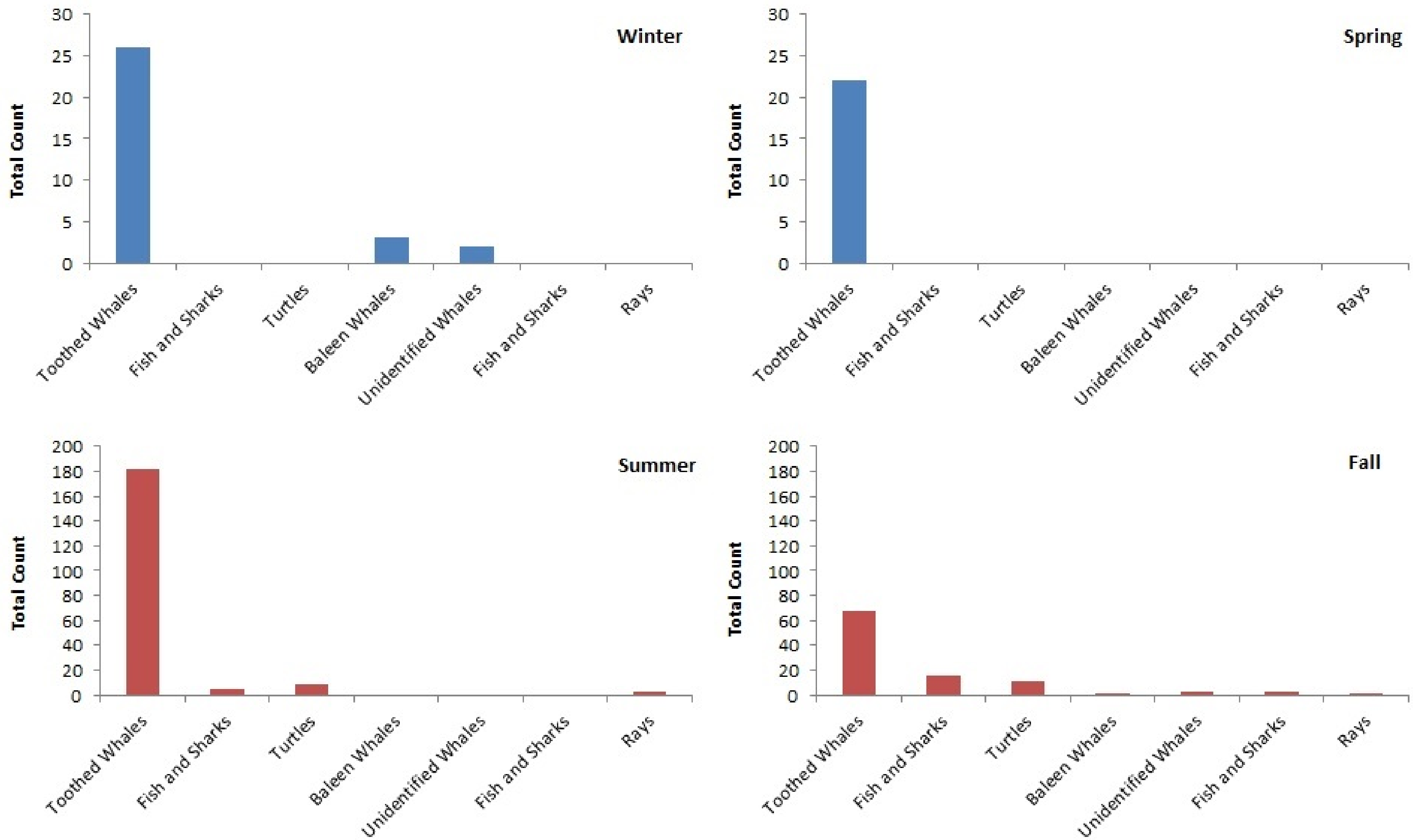

Figure 7-7. Abundance of non-avian animals by family or group in boat surveys in winter (December, January, February), spring (March, April, May), summer (June, July, August), and fall (September, October, November) within the Maryland study area. Note different y-axis between the top and bottom graphs. X-axes are in order of overall abundance by family or group across all surveys.

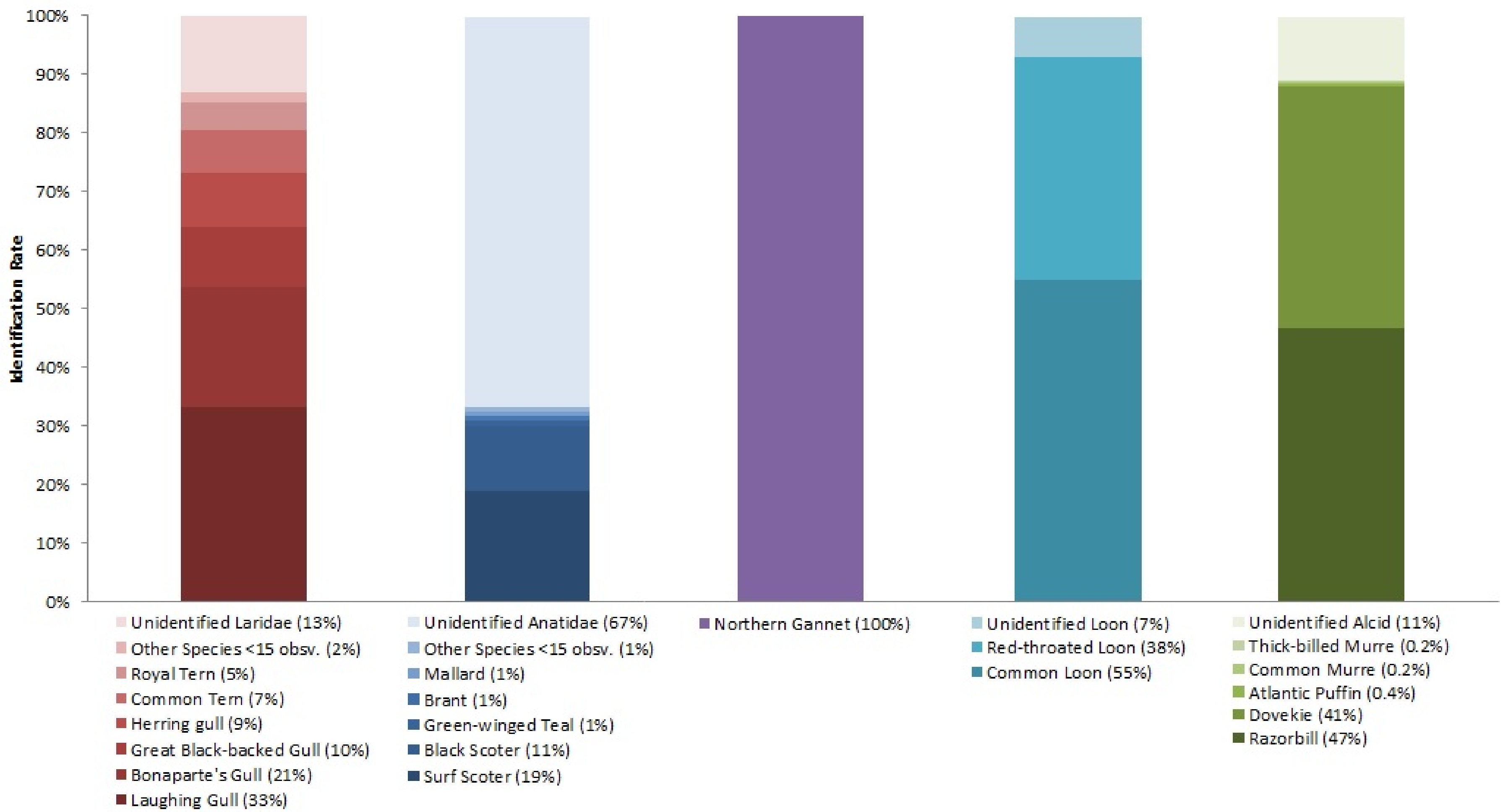

Figure 7-8. Identification rates of the most common bird groups observed in the Maryland study area boat survey data. “Other species” in the Laridae (red, n=3281) and Anatidate (blue, n=2476) can be found in Appendix 7A. Sample sizes for gannets, loons, and auks are 1767, 1272, and 454 respectively.

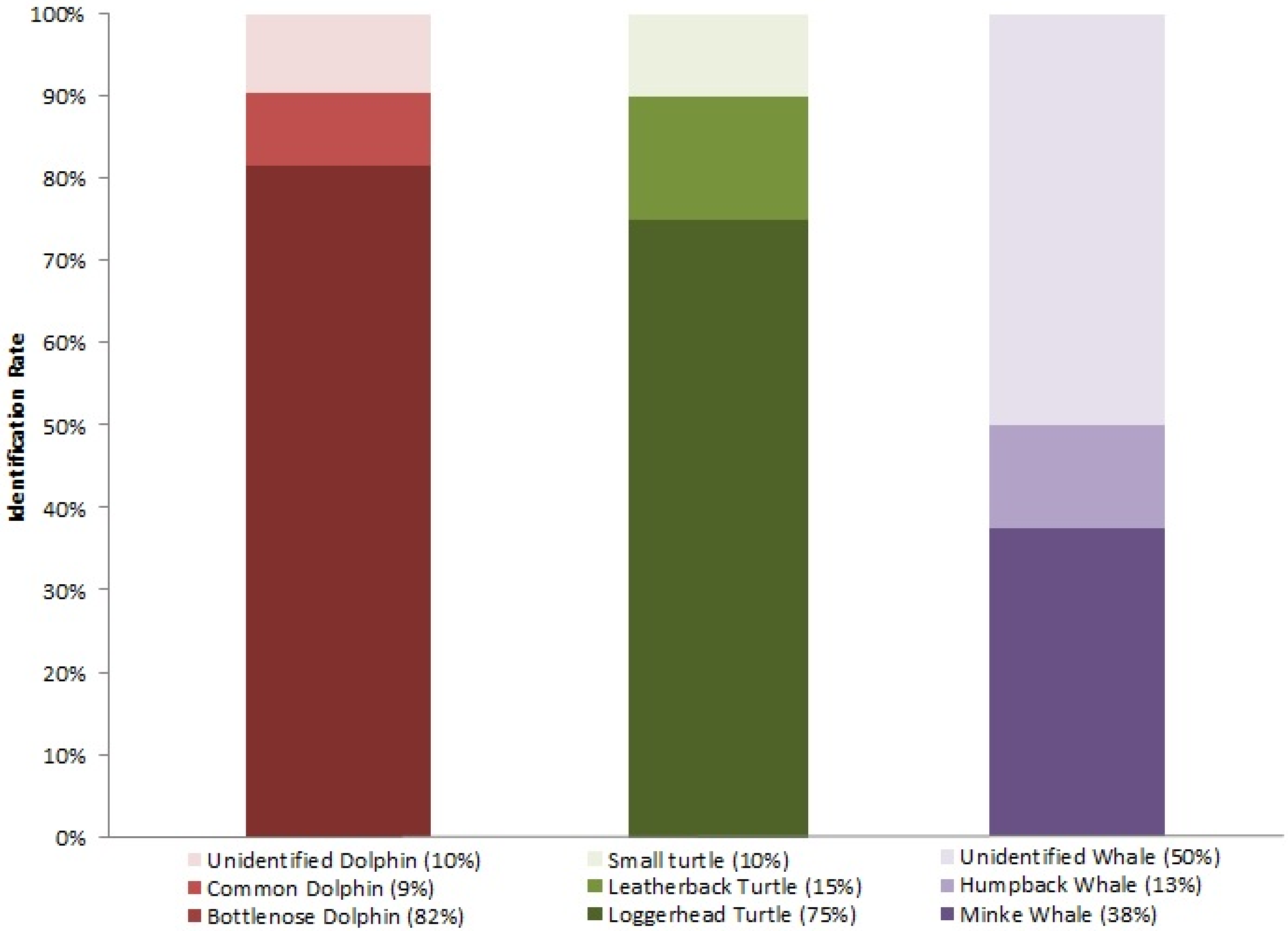

Figure 7-9. Identification rate of aquatic animal groups observed in the Maryland study area boat study data. Sample sizes for dolphins, turtles, and whales are 298, 20, and 8 respectively.

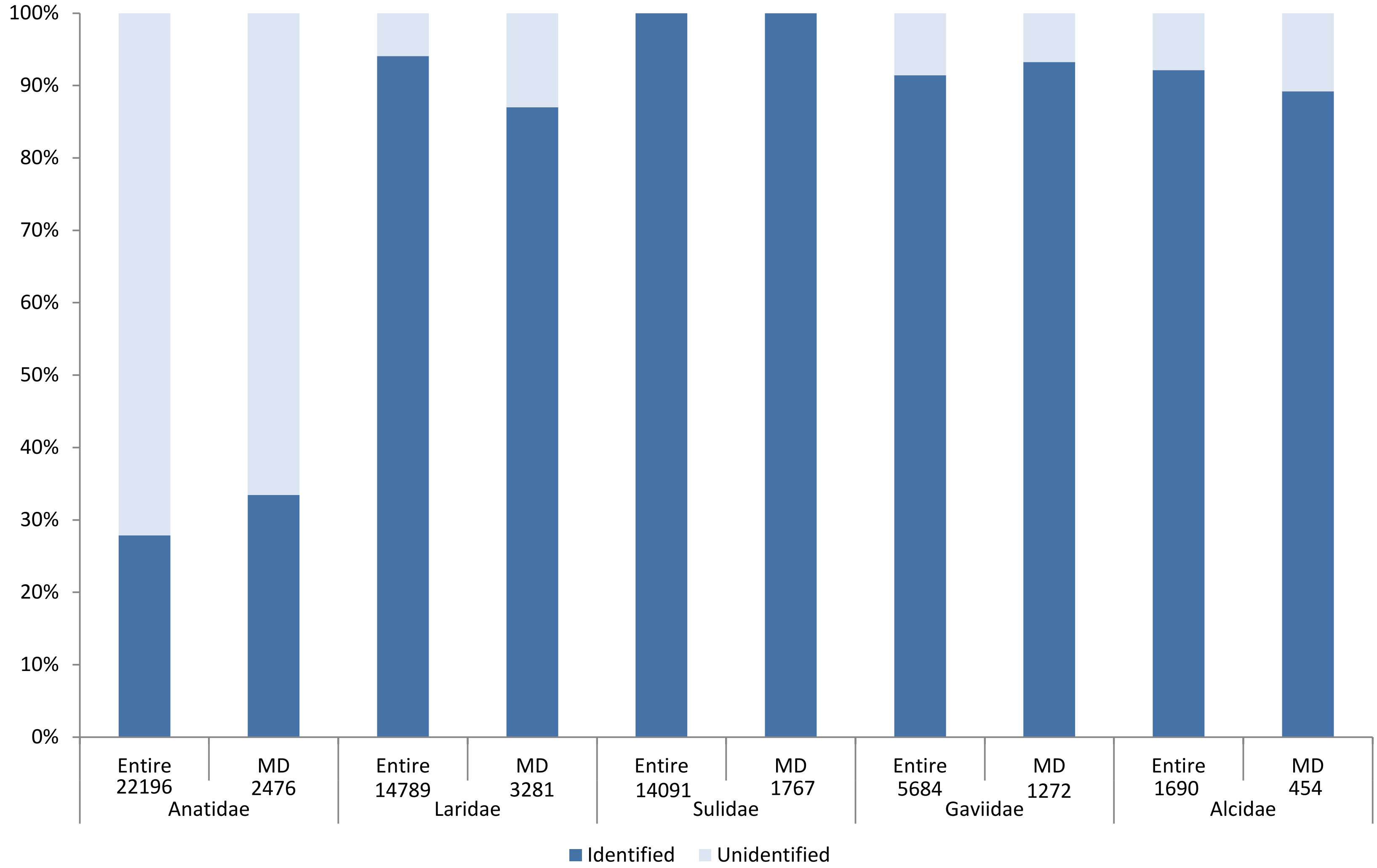

Figure 7-10. Rates birds were identified to the species level for the five most abundant avian groups from the Mid-Atlantic Baseline Studies and Maryland Projects (Entire) and the Maryland Study Area specifically (MD). The total number of birds in each category is given below the bar.

Table 7-1. Weeks in which boat surveys were completed during the Mid-Atlantic Baseline Studies and Maryland Projects. Each survey took from one to five days to complete, depending upon weather, ship availability, and other factors. Surveys colored in gray only included Mid-Atlantic Baseline Studies transects; surveys in blue also included Maryland Project transects.

	Jan.				Feb.				Mar.				Apr.				May				Jun.				Jul.				Aug.				Sep.				Oct.				Nov.				Dec.			
2012																Gray							Gray							Gray			Gray	Gray							Gray	Gray					Gray	
2013	Gray			Gray	Gray						Blue	Blue					Blue	Blue					Blue					Blue	Blue					Blue						Blue						Blue	Blue	
2014				Blue	Blue								Gray																																			

Table 7-2. Summary data for April 2012-April 2014 Maryland study area boat surveys (by species group). Data are presented in order of abundance based on the total counts from all Maryland surveys. Grey survey headings and totals include only the original MABS transect lines that fall within the Maryland study area, while surveys in blue include the Maryland Project transects in addition to the MABS transect lines.

Animal Group	Apr. 2012	Jun. 2012	Aug. 2012	Sep. 2012	Nov. 2012	Dec. 2012	Jan. 2013	Mar. 2013	May. 2013	Jun. 2013	Aug. 2013	Sep. 2013	Oct. 2013	Dec. 2013	Jan. 2014	Apr. 2014	Grand Total	% of Total
Gulls and Terns (Laridae)	76	75	79	112	509	56	44	61	249	101	176	230	855	529	64	65	3281	**32.56%**
Scoters, Ducks, Geese (Anatidae)	0	0	0	20	143	33	29	222	75	0	0	0	1235	97	608	14	2476	**24.57%**
Gannets (Sulidae)	48	1	0	0	509	34	176	107	15	0	0	0	528	83	107	159	1767	**17.53%**
Loons (Gaviidae)	81	4	0	0	181	23	56	63	102	9	0	0	18	175	389	171	1272	**12.62%**
Auks (Alcidae)	0	0	0	0	0	56	234	12	0	0	0	0	0	5	146	1	454	**4.50%**
Cormorants (Phalacrocoracidae)	0	0	0	0	0	0	0	0	142	0	0	0	7	0	0	0	149	**1.48%**
Storm-Petrels (Hydrobatidae)	0	26	53	2	0	0	0	0	0	33	33	0	0	0	0	0	147	**1.46%**
Shearwaters and Fulmars (Procellariidae)	0	2	0	0	1	0	0	0	0	26	2	0	6	0	6	0	43	**0.43%**
Pelicans (Pelecanidae)	0	5	0	6	0	0	0	0	1	2	13	4	6	0	0	0	37	**0.37%**
Shorebirds (Charadriiformes spp.)	1	0	1	5	0	0	0	0	18	0	4	2	0	0	0	0	31	**0.31%**
Grebes (Podicipedidae)	1	1	0	1	3	0	0	0	2	0	7	0	1	0	0	1	17	**0.17%**
Passerines (Passeriformes spp.)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	15	1	16	**0.16%**
Jaegers and Skuas (Stercorariidae)	5	0	0	0	2	0	0	0	1	2	0	0	3	0	0	0	13	**0.13%**
Raptors (Pandionidae, Falconidae, and	0	3	0	1	0	0	0	0	0	1	0	4	1	1	0	0	11	**0.11%**

Animal Group	Apr. 2012	Jun. 2012	Aug. 2012	Sep. 2012	Nov. 2012	Dec. 2012	Jan. 2013	Mar. 2013	May. 2013	Jun. 2013	Aug. 2013	Sep. 2013	Oct. 2013	Dec. 2013	Jan. 2014	Apr. 2014	Grand Total	% of Total
Accipitridae)																		
Unidentified Birds (Aves spp.)	0	0	0	6	0	0	0	0	0	0	0	0	0	0	0	0	6	**0.06%**
Egrets and Herons (Ardeidae)	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	3	**0.03%**
Miscellaneous Birds	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	2	**0.02%**
Total Birds	**212**	**117**	**133**	**153**	**1349**	**202**	**539**	**465**	**605**	**174**	**235**	**240**	**2664**	**890**	**1335**	**412**	**9725**	**96.50%**
Toothed Whales	19	93	15	15	0	8	6	2	1	9	65	1	52	0	12	0	298	**2.96%**
Fish and Sharks	0	5	0	0	1	0	0	0	0	0	0	0	18	0	0	0	24	**0.24%**
Turtles (Testudines)	0	1	2	2	2	0	0	0	0	4	2	1	6	0	0	0	20	**0.20%**
Unidentified Whale (Cetacea)	0	0	0	0	2	1	1	0	0	0	0	0	0	0	0	0	4	**0.04%**
Baleen Whales (Mysticeti)	0	0	0	0	1	0	2	0	0	0	0	0	0	1	0	0	4	**0.04%**
Rays (Batoidea)	0	2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	3	**0.03%**
Non-Avian Total	**19**	**101**	**17**	**18**	**6**	**9**	**9**	**2**	**1**	**13**	**67**	**2**	**76**	**1**	**12**	**0**	**353**	**3.50%**
Grand Total	**231**	**218**	**150**	**171**	**1355**	**211**	**548**	**467**	**606**	**187**	**302**	**242**	**2740**	**891**	**1347**	**412**	**10078**	**100.00%**

Supplementary material

Appendix 7A. Animals observed during the Maryland study area boat surveys.

Table 7A-1. Animals observed during the Maryland study area boat surveys. Data are presented in order of abundance by family, based on the total count from all surveys, with avian species first. Grey survey headings and totals include only the original MABS transect lines that fall within the study area, while surveys in blue include the Maryland Project transects in addition to the MABS transect lines.

Animal Group	Apr. 2012	Jun. 2012	Aug. 2012	Sep. 2012	Nov. 2012	Dec. 2012	Jan. 2013	Mar. 2013	May. 2013	Jun. 2013	Aug. 2013	Sep. 2013	Oct. 2013	Dec. 2013	Jan. 2014	Apr. 2014	Grand Total	% of Total
Laughing Gull	22	40	61	32	100	0	0	2	13	51	115	90	558	3	0	1	1088	**10.80%**
Bonaparte's Gull	5	0	0	0	318	13	0	1	1	0	0	0	0	292	12	34	676	**6.71%**
Great Black-backed Gull	0	14	0	2	27	28	33	29	16	3	15	17	113	18	17	2	334	**3.31%**
Unidentified Gull	0	0	0	26	15	4	0	4	73	1	0	1	5	193	6	2	330	**3.27%**
Herring gull	17	1	0	3	32	9	10	25	21	5	0	2	114	16	19	24	298	**2.96%**
Common Tern	19	13	4	15	8	0	0	0	107	18	12	47	0	0	0	0	243	**2.41%**
Royal Tern	9	3	12	23	0	0	0	0	2	19	34	47	4	0	0	0	153	**1.52%**
Unidentified Tern	2	4	0	5	3	0	0	0	9	0	0	19	55	0	0	0	97	**0.96%**
Black-legged Kittiwake	0	0	0	0	2	1	1	0	0	0	0	0	1	2	5	0	12	**0.12%**
Ring-billed Gull	0	0	0	0	2	1	0	0	0	0	0	0	5	1	4	0	13	**0.13%**
Forster's Tern	0	0	0	1	0	0	0	0	0	0	0	4	0	4	0	2	11	**0.11%**
Least Tern	0	0	0	0	0	0	0	0	5	4	0	0	0	0	0	0	9	**0.09%**
Lesser Black-backed Gull	2	0	0	0	2	0	0	0	0	0	0	0	0	0	1	0	5	**0.05%**
Black Tern	0	0	2	4	0	0	0	0	0	0	0	0	0	0	0	0	6	**0.06%**
Roseate Tern	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	2	**0.02%**
Caspian Tern	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	2	**0.02%**
Glaucous Gull	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	**0.01%**
Sabine's Gull	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	**0.01%**
Gulls and Terns (Laridae) Total	**76**	**75**	**79**	**112**	**509**	**56**	**44**	**61**	**249**	**101**	**176**	**230**	**855**	**529**	**64**	**65**	**3281**	**32.56%**

Animal Group	Apr. 2012	Jun. 2012	Aug. 2012	Sep. 2012	Nov. 2012	Dec. 2012	Jan. 2013	Mar. 2013	May. 2013	Jun. 2013	Aug. 2013	Sep. 2013	Oct. 2013	Dec. 2013	Jan. 2014	Apr. 2014	Grand Total	% of Total
Dark scoter - either black scoter or surf scoter	0	0	0	0	0	0	0	141	75	0	0	0	662	71	23	6	978	**9.70%**
Unidentified Scoter	0	0	0	0	54	7	19	0	0	0	0	0	0	9	566	0	655	**6.50%**
Surf Scoter	0	0	0	0	5	0	8	13	0	0	0	0	433	4	5	0	468	**4.64%**
Black Scoter	0	0	0	0	58	24	2	68	0	0	0	0	115	1	7	4	279	**2.77%**
Green-winged Teal	0	0	0	0	0	0	0	0	0	0	0	0	22	0	0	0	22	**0.22%**
Brant	0	0	0	0	20	0	0	0	0	0	0	0	0	0	0	0	20	**0.20%**
Mallard	0	0	0	20	0	0	0	0	0	0	0	0	0	0	0	0	20	**0.20%**
Unidentified Duck	0	0	0	0	1	2	0	0	0	0	0	0	0	9	0	3	15	**0.15%**
White-winged Scoter	0	0	0	0	0	0	0	0	0	0	0	0	3	2	7	0	12	**0.12%**
American Black Duck	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	5	**0.05%**
Red-breasted Merganser	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	**0.01%**
Long-tailed Duck	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	**0.01%**
Scoters, Ducks, Geese (Anatidae) Total	**0**	**0**	**0**	**20**	**143**	**33**	**29**	**222**	**75**	**0**	**0**	**0**	**1235**	**97**	**608**	**14**	**2476**	**24.57%**
Northern Gannet	48	1	0	0	509	34	176	107	15	0	0	0	528	83	107	159	1767	**17.53%**
Gannets (Sulidae) Total	**48**	**1**	**0**	**0**	**509**	**34**	**176**	**107**	**15**	**0**	**0**	**0**	**528**	**83**	**107**	**159**	**1767**	**17.53%**
Common Loon	75	4	0	0	150	17	38	8	25	9	0	0	13	76	226	59	700	**6.95%**
Red-throated Loon	6	0	0	0	28	6	12	45	20	0	0	0	5	97	155	112	486	**4.82%**
Unidentified Loon	0	0	0	0	3	0	6	10	57	0	0	0	0	2	8	0	86	**0.85%**
Loons (Gaviidae) Total	**81**	**4**	**0**	**0**	**181**	**23**	**56**	**63**	**102**	**9**	**0**	**0**	**18**	**175**	**389**	**171**	**1272**	**12.62%**
Razorbill	0	0	0	0	0	22	68	11	0	0	0	0	0	5	106	1	213	**2.11%**
Dovekie	0	0	0	0	0	31	154	1	0	0	0	0	0	0	2	0	188	**1.87%**
Unidentified Alcid	0	0	0	0	0	2	6	0	0	0	0	0	0	0	26	0	34	**0.34%**
Unidentified large	0	0	0	0	0	0	2	0	0	0	0	0	0	0	11	0	13	**0.13%**

Animal Group	Apr. 2012	Jun. 2012	Aug. 2012	Sep. 2012	Nov. 2012	Dec. 2012	Jan. 2013	Mar. 2013	May. 2013	Jun. 2013	Aug. 2013	Sep. 2013	Oct. 2013	Dec. 2013	Jan. 2014	Apr. 2014	Grand Total	% of Total
alcid (Razorbill or Murre)																		
Unidentified small alcid (Puffin/Dovekie)	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	2	**0.02%**
Atlantic Puffin	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	2	**0.02%**
Common Murre	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	**0.01%**
Thick-billed Murre	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	**0.01%**
Auks (Alcidae) Total	**0**	**0**	**0**	**0**	**0**	**56**	**234**	**12**	**0**	**0**	**0**	**0**	**0**	**5**	**146**	**1**	**454**	**4.50%**
Double-crested Cormorant	0	0	0	0	0	0	0	0	142	0	0	0	7	0	0	0	149	**1.48%**
Cormorants (Phalacrocoracidae) Total	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**142**	**0**	**0**	**0**	**7**	**0**	**0**	**0**	**149**	**1.48%**
Wilson's Storm-petrel	0	25	53	2	0	0	0	0	0	33	33	0	0	0	0	0	146	**1.45%**
Unidentified Storm-petrel	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	**0.01%**
Storm-Petrels (Hydrobatidae) Total	**0**	**26**	**53**	**2**	**0**	**0**	**0**	**0**	**0**	**33**	**33**	**0**	**0**	**0**	**0**	**0**	**147**	**1.46%**
Cory's Shearwater	0	1	0	0	0	0	0	0	0	12	2	0	2	0	0	0	17	**0.17%**
Great Shearwater	0	1	0	0	0	0	0	0	0	7	0	0	0	0	0	0	8	**0.08%**
Northern Fulmar	0	0	0	0	0	0	0	0	0	0	0	0	1	0	6	0	7	**0.07%**
Manx Shearwater	0	0	0	0	0	0	0	0	0	5	0	0	2	0	0	0	7	**0.07%**
Unidentified Shearwater	0	0	0	0	1	0	0	0	0	2	0	0	0	0	0	0	3	**0.03%**
Sooty Shearwater	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	**0.01%**
Shearwaters and Fulmars (Procellariidae) Total	**0**	**2**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**26**	**2**	**0**	**6**	**0**	**6**	**0**	**43**	**0.43%**
Brown Pelican	0	5	0	6	0	0	0	0	1	2	13	4	6	0	0	0	37	**0.37%**
Pelicans	**0**	**5**	**0**	**6**	**0**	**0**	**0**	**0**	**1**	**2**	**13**	**4**	**6**	**0**	**0**	**0**	**37**	**0.37%**

Animal Group	Apr. 2012	Jun. 2012	Aug. 2012	Sep. 2012	Nov. 2012	Dec. 2012	Jan. 2013	Mar. 2013	May. 2013	Jun. 2013	Aug. 2013	Sep. 2013	Oct. 2013	Dec. 2013	Jan. 2014	Apr. 2014	Grand Total	% of Total
(Pelecanidae) Total																		
Short-billed Dowitcher	0	0	0	0	0	0	0	0	7	0	0	0	0	0	0	0	7	**0.07%**
Willet	0	0	0	0	0	0	0	0	6	0	0	0	0	0	0	0	6	**0.06%**
Red-necked Phalarope	0	0	0	4	0	0	0	0	0	0	0	2	0	0	0	0	6	**0.06%**
Unidentified shorebird	0	0	0	1	0	0	0	0	1	0	4	0	0	0	0	0	6	**0.06%**
Whimbrel	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	2	**0.02%**
Semipalmated Sandpiper	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	2	**0.02%**
Red Phalarope	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	**0.01%**
Least Sandpiper	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	**0.01%**
Shorebirds (Charadriiformes spp.) Total	**1**	**0**	**1**	**5**	**0**	**0**	**0**	**0**	**18**	**0**	**4**	**2**	**0**	**0**	**0**	**0**	**31**	**0.31%**
Red-necked Grebe	0	0	0	0	0	0	0	0	0	0	0	0	0	0	12	1	13	**0.13%**
Horned Grebe	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	3	**0.03%**
Grebes (Podicipedidae) Total	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**15**	**1**	**16**	**0.16%**
Unidentified Swallow	0	0	0	0	0	0	0	0	0	0	6	0	0	0	0	0	6	**0.06%**
Myrtle Warbler	0	0	0	0	2	0	0	0	0	0	0	0	1	0	0	0	3	**0.03%**
Unidentified Passerine	0	0	0	0	1	0	0	0	2	0	0	0	0	0	0	0	3	**0.03%**
Barn Swallow	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	**0.02%**
Unidentified Warbler	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	**0.01%**
Unidentified sparrow	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	**0.01%**
Purple Martin	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	**0.01%**
Passerines (Passeriformes	**1**	**1**	**0**	**1**	**3**	**0**	**0**	**0**	**2**	**0**	**7**	**0**	**1**	**0**	**0**	**1**	**17**	**0.17%**

Animal Group	Apr. 2012	Jun. 2012	Aug. 2012	Sep. 2012	Nov. 2012	Dec. 2012	Jan. 2013	Mar. 2013	May. 2013	Jun. 2013	Aug. 2013	Sep. 2013	Oct. 2013	Dec. 2013	Jan. 2014	Apr. 2014	Grand Total	% of Total
spp.) Total																		
Parasitic Jaeger	5	0	0	0	2	0	0	0	1	0	0	0	2	0	0	0	10	**0.10%**
Unidentified Jaeger	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	2	**0.02%**
Pomarine Jaeger	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	**0.01%**
Jaegers and Skuas (Stercorariidae) Total	**5**	**0**	**0**	**0**	**2**	**0**	**0**	**0**	**1**	**2**	**0**	**0**	**3**	**0**	**0**	**0**	**13**	**0.13%**
Osprey	0	3	0	0	0	0	0	0	0	1	0	4	0	0	0	0	8	**0.08%**
Northern Harrier	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	**0.01%**
Bald Eagle	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	**0.01%**
Merlin	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	**0.01%**
Raptors (Pandionidae, Falconidae, and Accipitridae) Total	**0**	**3**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**4**	**1**	**1**	**0**	**0**	**11**	**0.11%**
Unidentified Bird	0	0	0	6	0	0	0	0	0	0	0	0	0	0	0	0	6	**0.06%**
Unidentified Birds (Aves spp.) Total	**0**	**0**	**0**	**6**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**6**	**0.06%**
Great Blue Heron	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	3	**0.03%**
Egrets and Herons (Ardeidae) Total	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**3**	**0**	**0**	**0**	**3**	**0.03%**
American Coot	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	2	**0.02%**
Miscellaneous Birds Total	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**2**	**0.02%**
Total Birds	**212**	**117**	**133**	**153**	**1349**	**202**	**539**	**465**	**605**	**174**	**235**	**240**	**2664**	**890**	**1335**	**412**	**9725**	**96.50%**
Bottlenose Dolphin	19	68	14	14	0	0	0	0	1	9	65	1	52	0	0	0	243	**2.41%**
Unidentified Dolphin	0	25	1	1	0	0	0	0	0	0	0	0	0	0	2	0	29	**0.29%**
Common Dolphin	0	0	0	0	0	8	6	2	0	0	0	0	0	0	10	0	26	**0.26%**
Toothed Whales (Odontoceti) Total	**19**	**93**	**15**	**15**	**0**	**8**	**6**	**2**	**1**	**9**	**65**	**1**	**52**	**0**	**12**	**0**	**298**	**2.96%**
Unidentified fish	0	5	0	0	1	0	0	0	0	0	0	0	15	0	0	0	21	**0.21%**

Animal Group	Apr. 2012	Jun. 2012	Aug. 2012	Sep. 2012	Nov. 2012	Dec. 2012	Jan. 2013	Mar. 2013	May. 2013	Jun. 2013	Aug. 2013	Sep. 2013	Oct. 2013	Dec. 2013	Jan. 2014	Apr. 2014	Grand Total	% of Total
Unidentified thresher shark	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	3	**0.03%**
Unidentified ray	0	2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	3	**0.03%**
Fish and Sharks Total	**0**	**7**	**0**	**1**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**18**	**0**	**0**	**0**	**27**	**0.27%**
Loggerhead Turtle	0	1	2	0	2	0	0	0	0	3	2	1	4	0	0	0	15	**0.15%**
Leatherback Turtle	0	0	0	1	0	0	0	0	0	0	0	0	2	0	0	0	3	**0.03%**
Small turtle - Loggerhead, Green, Hawksbill, or Kemp's Ridley	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	2	**0.02%**
Turtles (Testudines) Total	**0**	**1**	**2**	**2**	**2**	**0**	**0**	**0**	**0**	**4**	**2**	**1**	**6**	**0**	**0**	**0**	**20**	**0.20%**
Unidentified Whale	0	0	0	0	2	1	1	0	0	0	0	0	0	0	0	0	4	**0.04%**
Minke Whale	0	0	0	0	1	0	2	0	0	0	0	0	0	0	0	0	3	**0.03%**
Humpback Whale	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	**0.01%**
Whale (Cetacea) Total	**0**	**0**	**0**	**0**	**3**	**1**	**3**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**8**	**0.08%**
Non-Avian Animal Total	**19**	**101**	**17**	**18**	**6**	**9**	**9**	**2**	**1**	**13**	**67**	**2**	**76**	**1**	**12**	**0**	**353**	**3.50%**
Grand Total	**231**	**218**	**150**	**171**	**1355**	**211**	**548**	**467**	**606**	**187**	**302**	**242**	**2740**	**891**	**1347**	**412**	**10078**	**100.00%**