Digital Aerial Baseline Survey of Marine Wildlife in Support of Offshore Wind Energy

Fall 2017 Taxonomic Analysis Summary Report

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Prepared for

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Development Authority
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Introduction

The second Fall survey for the NYSERDA offshore planning area (OPA) was started on 9 November 2018 and completed on 27 November 2018. Delay in completion was caused by weather conditions and aircraft maintenance, and the survey window spanned 2.5 weeks. Data users should bear this in mind when evaluating seasonal patterns. These surveys are designed to characterize the usage of the area by marine fauna to aid in the planning for offshore wind.

Methods

Data were collected for the OPA including a 300-m buffer. The survey collected imagery covering a 3,168.68 km^2 area of the OPA and 300-m buffer using a transect (Table 1), which amounts to 323,554 images. Of the 323,554 images analyzed, 319,811 were blank (Table 2). The target extraction identified 10,734 objects within imagery collected in the OPA and 300-m buffer survey area. These targets were categorized into seven groups representing avian (birds), marine mammals, turtles, sharks, rays, large bony fish individuals (excluding fish shoals), vessels, and fixed structures (Table 3) and assigned to taxonomic experts for identification. Targets extracted that were later identified as trash or other floating debris were removed from the dataset. No bats were found in imagery. Species listed as "Endangered" on the state threatened and endangered list and those listed as "Endangered" or "Threatened" under the federal Endangered Species Act were flagged for review.

Table 1. Total Images and Area Surveyed

Area	# of Images Collected	km^2 of Analyzed Images within the Survey Area	Percent Coverage	Survey Area (km^2)
OPA	323,554	3,168.68	7.24	43,745.20

Table 2. Blank Images Detected

Area	# Images Analyzed	Blank Images			
		# Detected	# Sent for QA	Total Percent QA	Total Percent Blank
OPA	323,554	319,811	31,985	10.00	98.84

Table 3. Targets Sent for Identification

Group	# Individuals
Avian	9,337
Marine Mammals	1,243
Turtles	13

Group	# Individuals
Sharks	13
Rays	2
Large Bony Fish	118
Vessels	4
Fixed Structures	4
Total	**10,734**

Quality Control

All identifications were made by biologists highly experienced in their species group. A minimum of 20% of all avian, turtle, marine mammal, and shark images identified were reviewed by a taxonomic expert and taxonomic agreement had to meet a minimum of 90% concurrence (Table 4). Failure to do so would trigger a review of 100% of identifications made by the individual concerned. The 20% review included quality control review of 100% of ESA-listed species and for endangered species a 100% agreement had to be reached on identifications (Table 5). Additional experts in the species concerned were called in to arbitrate identifications when concurrence could not be reached.

Results

All target extraction and quality control of target extraction was completed in early February 2018. All animals were identified and all identifications reached quality control standards. Animals were also fully georeferenced with exact locations of individuals available for review on the data portal.

Quality Control Results (Fall 2017)

Table 4. Quality Control Results, All Groups

Group	# Images	# Images for QC	% Agreement
Avian	9,337	1,981	98
Marine Mammals	1,243	294	100
Turtles	13	13	100
Sharks	13	6	100
Total	**10,606**	**2,294**	**99**

Table 5. Quality Control Results, Endangered Species Only

Group	# Images	% Agreement
Marine Mammals	7	100
Turtles	13	100
Sharks	3	100
Total	**23**	**100**

Identification Success

Identification success varied by species group and by depth of subsurface animals. All identifications had a level of certainty ascribed to them (e.g., possible, probable, and definite), and subsurface animals were also ranked as "breaching," "near surface," and "significantly submerged." The reason for this was to be able to evaluate whether the inability to identify animals to species stemmed from image quality, angle of the animal at point of capture, or from depth in the water. Digital imagery captured from downward rather than angled sensors "sees" through the water column more effectively, and more animals are "observed." Visual surveyors from boats and digital imagery captured by angled lenses will "see" fewer animals to a greater or lesser degree because subsurface animals are hidden by the water column. However, this improvement in reporting animal presence by downward facing lenses sometimes is at a cost of species identification because of the depth of the animal.

Avian Identification Success

Avian species-level identifications varied by species group depending on size, coloration, and flight activity. Birds that are small and belong to groups that contain multiple species that are morphologically similar and difficult to distinguish are generally more difficult to identify. In this survey a large number of storm-petrels, phalaropes, and auks were encountered (Table 6). These groups contains multiple species, more than one of which could be expected in the study area. Although identification success appeared low for these groups, this included species blends of murre/razorbill and red/red-necked phalarope. All bird identifications were classified to species or species group (Table 7).

Table 6. Avian Groups Identified, Percent ID Success, and Percent Sitting

Group	# Individuals	% ID Success	% Sitting
Goose	2	100	0
Duck	282	66	43
Loon	315	96	35
Fulmar	60	100	40
Shearwater	43	70	21
Storm-petrel	111	2	0
Gannet	757	100	71
Cormorant	110	0	3
Ardeidae	1	100	0
Shorebird	1,993	98	99
Phalarope	3,017	59	61
Skua	1	100	0
Auk	109	9	96
Gull	2,526	95	41
Sterna Tern	3	67	0
Passerine	7	100	0
		Average Success (%)	**Average % Sitting**
Total Individuals	**9,337**	**80**	**62**

Table 7. Avian Species Identified and Number Flying

Species	# Individuals in Group	# Individuals by Species	# Flying	% of Total
Goose	2			
Canada Goose		2	2	100
Duck	282			
Common Eider		4	0	0
Surf Scoter		39	34	87
White-winged Scoter		1	0	0
Black Scoter		127	122	96
Scoter unid.		94	0	0
Long-tailed Duck		14	3	21
Red-breasted Merganser		2	0	0
species unknown		1	1	100
Loon	315			
Red-throated Loon		161	143	89
Common Loon		140	59	42
species unknown		14	3	21
Fulmar	60			
Northern Fulmar		60	36	60
Shearwater	43			
Cory's Shearwater		2	2	100
Great Shearwater		12	11	92
Manx Shearwater		16	13	81
species unknown-Large		8	3	38
species unknown-Small		5	5	100
Storm-petrel	111			
Leach's Storm-Petrel		2	2	100
species unknown		109	109	100
Gannet	757			
Northern Gannet		757	220	29
Cormorant	110			
species unknown		110	107	97
Ardeidae	1			
Great Blue Heron		1	1	100
Shorebird	1,993			
Ruddy Turnstone		133	0	0
Sanderling		117	0	0
Dunlin		1,703	3	0
species unknown		40	14	35

Species	# Individuals in Group	# Individuals by Species	# Flying	% of Total
Phalarope	3,017			
Red Phalarope		1,774	747	42
Red/Red-necked Phalarope		1,238	424	34
species unknown		5	4	80
Skua	1			
Parasitic Jaeger		1	1	100
Auk	109			
Razorbill		2	0	0
Murre/Razorbill		96	4	4
Atlantic Puffin		8	0	0
species unknown		3	0	0
Gull	2,526			
Black-legged Kittiwake		371	302	81
Bonaparte's Gull		711	651	92
Laughing Gull		79	72	91
Ring-billed Gull		96	50	52
Herring Gull		929	300	32
Iceland Gull		1	0	0
Lesser Black-backed Gull		15	3	20
Great Black-backed Gull		186	70	38
species unknown - Large		38	3	8
species unknown - Small		96	37	39
species unknown		4	0	0
Sterna Tern	3			
Forster's Tern		2	2	100
species unknown		1	1	100
Passerine	7			
Snow Bunting		7	7	100
Total	**9,337**	**9,337**	**3,571**	**62**

Marine Mammal Identification Success

The Fall survey recorded 1,243 marine mammals (Table 8).

Of the 1,221 dolphins, 533 (44%) were classed as "species unknown." Of these, 487 (91%) were significantly submerged (Table 8).

One seal was recorded but could not be identified to species. This individual was not significantly submerged, but characters required for identification were obscured.

The presence of seals and dolphins in the area meant that we had 5 mammals that could not be classed as dolphin or seal. Of these, 4 (80%) were significantly submerged.

There were 16 whales recorded, six (38%) of which remained unidentified. Five (83%) of these were significantly submerged.

Table 8. Marine Mammal Species Identified*

Species	# Individuals		Significantly Submerged	Percent of Total
	Group	Species		
Dolphin	1,221			
Common Dolphin		563	440	78
Pilot Whale (unid.)		20	12	60
Risso's Dolphin		37	22	59
Common Bottlenose Dolphin		68	38	56
species unknown		533	487	91
Seal	1			
species unknown		1	0	0
Unid. Mammal	5			
species unknown		5	4	80
Whale	16			
Common Minke Whale		1	0	0
Fin Whale ᵃ		4	3	75
Humpback Whale ᵃ		3	2	67
Pygmy Sperm Whale		2	0	0
species unknown		6	5	83
Total Mammals	**1,243**		**1,013**	**81**

*Highlighted species are classified as endangered
ᵃ Listed as threatened or endangered by NYSDEC

Turtle Identification Success

A total of 13 turtles were found in the Fall 2017 survey, of which one (8%) was identified as loggerhead/Kemp's Ridley and was significantly submerged (100%). The remaining 12 (92%) were identified to species (Table 9). All turtles are Endangered species and receive 100% QC.

Table 9. Turtle Species Identified

Species	# Individuals	# Significantly Submerged	Percent of Total
Leatherback Turtle	2	0	0
Loggerhead/Kemp's Turtle	1	1	100
Loggerhead Turtle	5	1	20
Kemp's Ridley Turtle	5	2	40
Total	**13**	**4**	**31**

Shark Identification Success

Of the 13 sharks recorded, one (8%) was not identified to group or species and was ranked as significantly submerged (Table 10).

Table 10. Shark Species Identified*

Species	# Individuals	# Significantly Submerged	Percent of Total
Basking Shark	1	0	0
Great White Shark	1	0	0
Carcharhinidae (unid.)	2	0	0
Tiger Shark	1	0	0
Blue Shark	3	1	33
Scalloped Hammerhead	2	0	0
Smooth Hammerhead	1	0	0
Hammerhead (unid.)	1	0	0
species unknown	1	1	100
Total	**13**	**2**	**15**

* Highlighted species are classified as endangered

Ray Identification Success

There were two rays recorded during the Fall 2017 survey, one of which could not be identified to species and was significantly submerged (Table 11).

Table 11. Ray Species Identified

Species	# Individuals	# Significantly Submerged	Percent of Total
Giant Manta Ray	1	0	0
species unknown	1	1	100
Total	**2**	**1**	**50**

Large Bony Fish Identification Success

Large bony fish identification has not been formally undertaken for the Fall 2017 survey. However, while looking at sunfish images, mahi-mahi and tuna species were also found (Table 12).

Table 12. Large Bony Fish Species Identified

Species	# Individuals in Group	# Individuals	# Significantly Submerged	Percent of Total
Mahi-Mahi	9			
Mahi-Mahi		9	0	0
Tuna	1			
species unknown		1	0	0
Sunfish	105			
Ocean Sunfish		80	47	59
Sharptail Sunfish		12	9	75
species unknown		13	10	77
Not identified	3			
Total	**118**		**66**	**57**

Species Presence

Avian

This season had moderate bird activity with 9,337 individuals recorded representing 30 species (see Table 7). Phalaropes (n=3,017), gulls (n=2,527) and shorebirds (n=1,993) were the most numerous groups present, followed by gannets (n=758), loons (n=314), and ducks (n=282). Other species encountered were cormorants (n=110), storm-petrels (n=109), auks (n=109), fulmars (n=60), shearwaters (n=45), passerines (n=7), Forster's terns (n=2), Canada geese (n=2), and singles of great blue heron and parasitic jaeger.

Marine Mammals

Large numbers of marine mammals were encountered (n=1,243; see Table 8). Most of these were dolphins (n=1,221) consisting of 4 identified species or group, as follows:

- Common dolphin (n=563)
- Common bottlenose dolphin (n=68)
- Risso's dolphin (n=37)
- Pilot whale unid. (n=20)

One seal was encountered but not identified to species, and 5 animals were also recorded that could have been seals or dolphins but depth in the water column or angle of the animal at the moment of image capture obscured features needed for identification (see Table 8).

Of 16 whales, fin whales (n=4), humpback whales (n=3), pygmy sperm whales (n=2), and a common minke whale (n=1) were identified; six animals could not be identified (see Table 8).

Turtles

Loggerhead and Kemp's Ridley turtles were present in small but equal numbers (n=5 each), and one further individual was classed as loggerhead/Kemp's. Two leatherback turtles were also encountered

(Table 9 and Table 13). Carapace lengths were recorded for this survey, a review of which will be presented in the annual report.

Sharks

Of the 13 sharks seen, two were scalloped hammerhead and one unidentified hammerhead potentially representing scalloped hammerhead, which is an endangered species. One other hammerhead species was encountered; smooth hammerhead (n=1). There was one basking shark encountered along with individuals of great white shark, blue shark, and tiger shark (see Table 10).

Rays

A solitary giant manta ray was recorded in this survey.

Large Bony Fish

There were 118 large bony fish recorded during the Fall 2017 survey. Of these only 105 were sunfish species formally identified, although incidental identifications of mahi-mahi and tuna were also made. All other large bony fish remain requiring identification (Table 12).

Fish Shoals

Two fish shoals were recorded in the survey.

Endangered Species

There were 23 animals representing state or federally threatened or endangered species recorded (Table 13). We take a conservative approach to identifications of hammerhead unid (n= 1) and accept that it possibly represents scalloped hammerhead. Individuals positively identified as endangered species were fin whale (n=4), humpback whale (n=3), scalloped hammerhead shark (n=2), and all of the turtle species present (see Table 9 and Table 13).

Table 13. Threatened and Endangered Species Identified

Species	# Individuals
Whale	
Fin Whale*	4
Humpback Whale ͣ	3
Turtle	
Leatherback Turtle*	2
Loggerhead/Kemp's Turtle*	1
Loggerhead Turtle*	5
Kemp's Ridley Turtle*	5
Shark	
Scalloped Hammerhead*	2
Hammerhead (unid.)	1
Total	**23**

*Classed as endangered
ͣ listed as threatened or endangered by NYSDEC

Flight Activity

Avian fight height data will be presented in detail in the annual report. Table 14 presents an overview of flight activity and flight height assessment success. The number of flying individuals by group and by

species is presented in Table 7. Of the 3,571 flying individuals, we were able to calculate flight heights for 2,220 (62%) individuals (Table 15). Table 16 shows the maximum, minimum, and average flight heights by species.

Table 14. Number of Individuals Flying and Sitting within Avian Group

Group	# Individuals	# Flying Individuals		# Sitting
		Known Height	Unknown Height	
Goose	2	0	2	0
Duck	282	22	138	122
Loon	315	171	34	110
Fulmar	60	18	18	24
Shearwater	43	34	0	9
Storm-petrel	111	110	1	0
Gannet	757	115	105	537
Cormorant	110	105	2	3
Ardeidae	1	1	0	0
Shorebird	1,993	14	3	1,976
Phalarope	3,017	932	243	1,842
Skua	1	1	0	0
Auk	109	4	0	105
Gull	2,526	685	803	1,038
Sterna Tern	3	1	2	0
Passerine	7	7	0	0
All Avian	**9,337**	**2,220**	**1,351**	**5,766**

Table 15. Number of Flying Individuals with Calculated Flight Heights

Species	# Flying Individuals	# Flying Individuals with Calculated Flight Heights	% of Total
Cory's Shearwater	2	2	100%
Dunlin	3	3	100%
Great Blue Heron	1	1	100%
Great Shearwater	11	11	100%
Leach's Storm-Petrel	2	2	100%
Manx Shearwater	13	13	100%
Murre/Razorbill	4	4	100%
Parasitic Jaeger	1	1	100%
Shearwater-species unknown-Large	3	3	100%
Shearwater-species unknown-Small	5	5	100%
Snow Bunting	7	7	100%

Species	# Flying Individuals	# Flying Individuals with Calculated Flight Heights	% of Total
Sterna Tern-species unknown	1	1	100%
Storm-petrel-species unknown	109	108	99%
Cormorant-species unknown	107	105	98%
Common Loon	59	54	92%
Red Phalarope	747	635	85%
Red-throated Loon	143	117	82%
Shorebird-species unknown	14	11	79%
Phalarope-species unknown	4	3	75%
Red/Red-necked Phalarope	424	294	69%
Lesser Black-backed Gull	3	2	67%
Surf Scoter	34	19	56%
Bonaparte's Gull	651	351	54%
Northern Gannet	220	115	52%
Northern Fulmar	36	18	50%
Great Black-backed Gull	70	34	49%
Herring Gull	300	139	46%
Ring-billed Gull	50	20	40%
Laughing Gull	72	28	39%
Black-legged Kittiwake	302	111	37%
Black Scoter	122	3	2%
Canada Goose	2	0	0%
Duck-species unknown	1	0	0%
Forster's Tern	2	0	0%
Gull-species unknown - Large	3	0	0%
Gull-species unknown - Small	37	0	0%
Long-tailed Duck	3	0	0%
Loon-species unknown	3	0	0%
Grand Total	**3,571**	**2,220**	**62%**

Table 16. Maximum, Minimum, and Average Altitude of Flying Birds by Species

Species	Flight Height (m)		
	Maximum	Minimum	Average
Surf Scoter	21	3	7
Black Scoter	3	2	2
Red-throated Loon	184	2	44
Common Loon	149	2	55

Species	Flight Height (m)		
	Maximum	Minimum	Average
Northern Fulmar	37	1	7
Cory's Shearwater	2	1	2
Great Shearwater	4	0	2
Manx Shearwater	2	1	2
Shearwater-species unknown-Large	1	1	1
Shearwater-species unknown-Small	2	0	1
Leach's Storm-Petrel	2	2	2
Storm-petrel-species unknown	2	0	1
Northern Gannet	115	1	32
Cormorant-species unknown	16	2	13
Great Blue Heron	18	18	18
Dunlin	0	0	0
Shorebird-species unknown	2	1	1
Red Phalarope	3	0	1
Red/Red-necked Phalarope	3	0	1
Phalarope-species unknown	2	1	2
Parasitic Jaeger	44	44	44
Murre/Razorbill	1	1	1
Black-legged Kittiwake	170	1	42
Bonaparte's Gull	132	1	43
Laughing Gull	140	9	50
Ring-billed Gull	157	1	32
Herring Gull	293	1	70
Lesser Black-backed Gull	81	5	43
Great Black-backed Gull	224	2	60
Sterna Tern-species unknown	5	5	5
Snow Bunting	3	2	2

Spatial Distribution of Animals Treated as Threatened or Endangered

All animals have had their location mapped, and we have very precise location data. Presenting locations of animals spread over such a broad area is difficult as the size of the icon representing the animal suggests a greater spatial use than is real. A better idea of spatial use can be obtained by using the map tool in ReMOTe (remote.normandeau.com), which allows for zoom.

The following images show the locations of the federally listed endangered species encountered in the Fall 2017 survey.

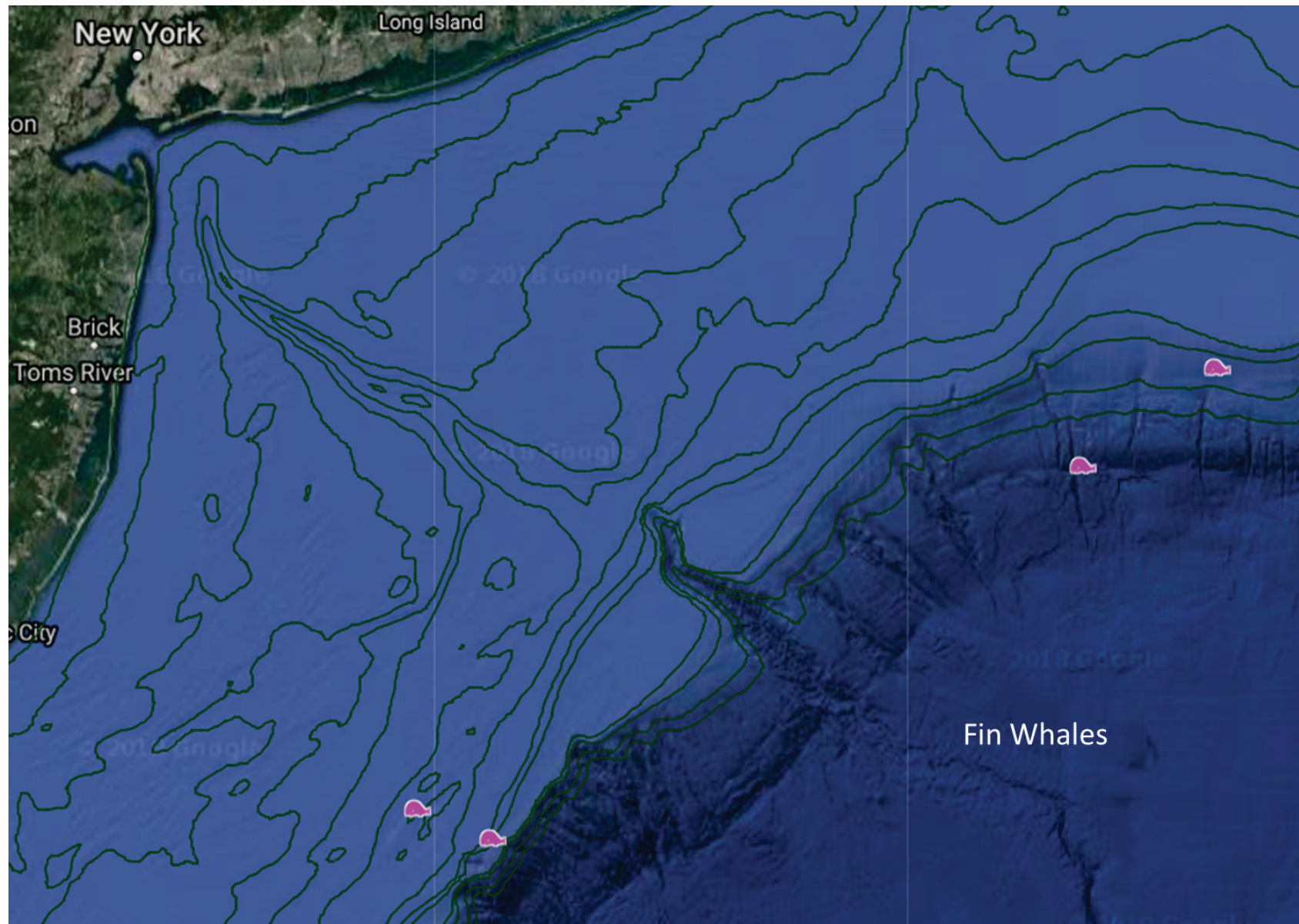**Figure 1. Fin Whale distribution during the 2017 Fall survey.**

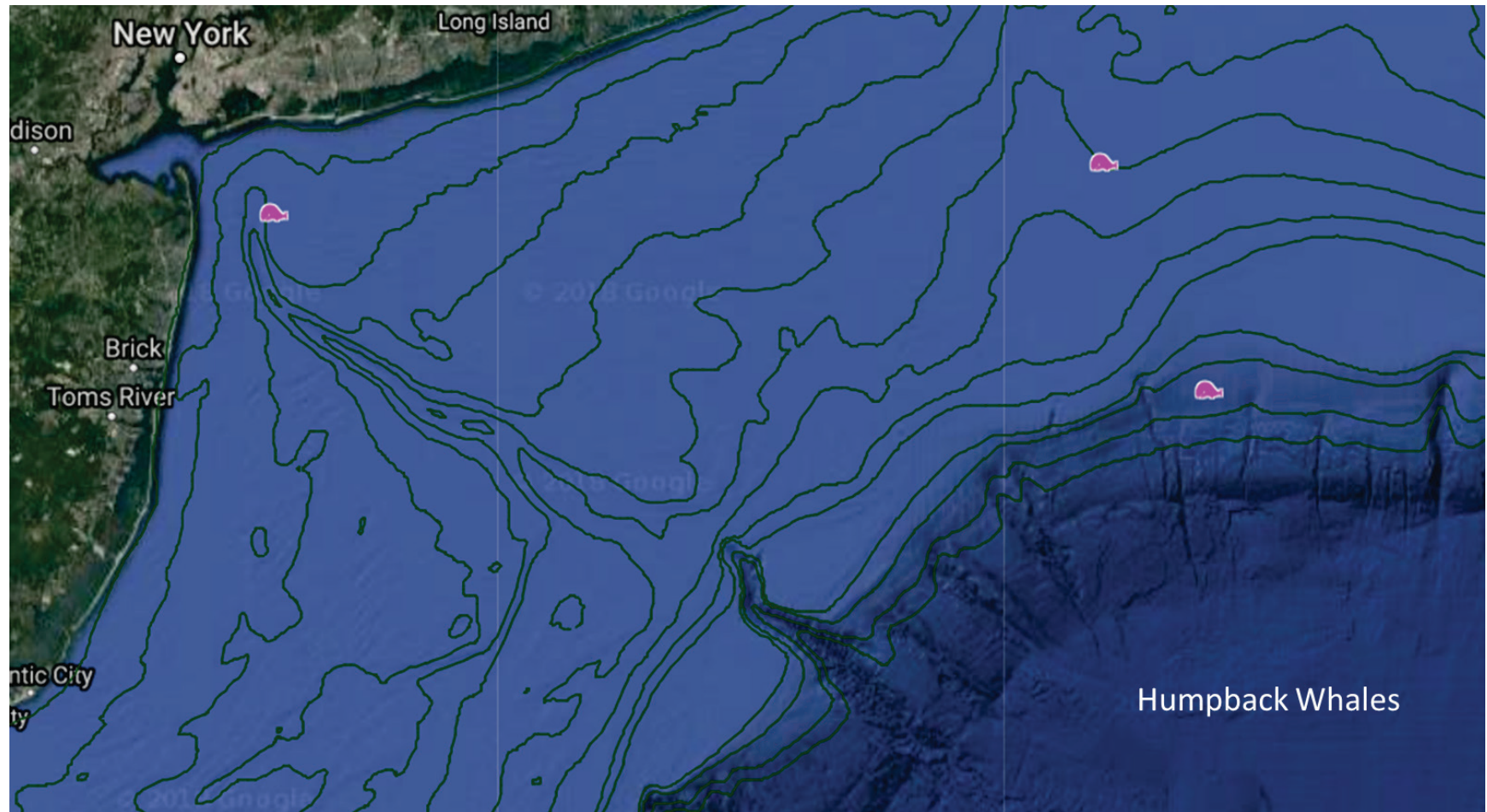**Figure 2. Humpback Whale distribution during the 2017 Fall survey.**

Figure 3. Kemp's Ridley Turtle distribution during the 2017 Fall survey.
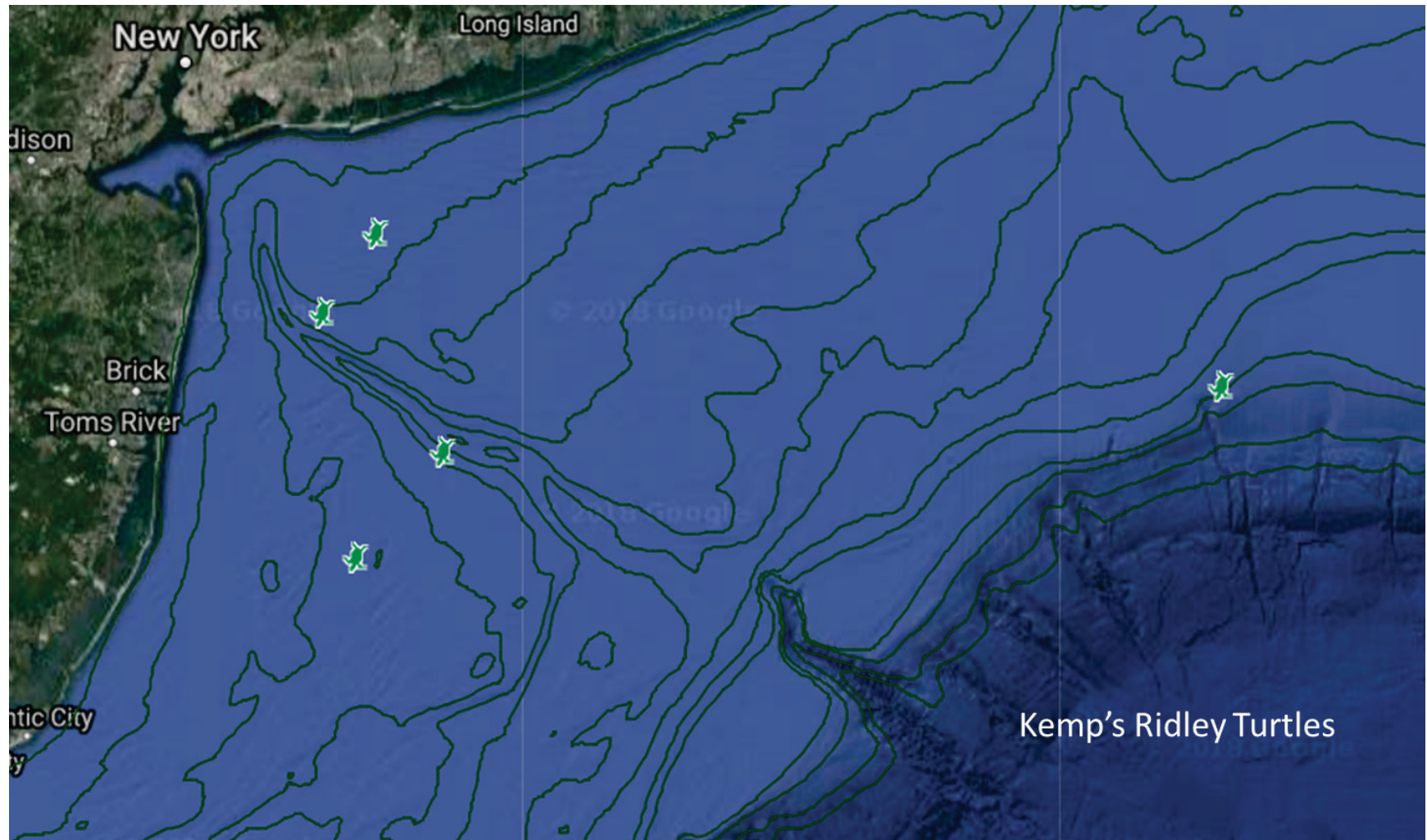
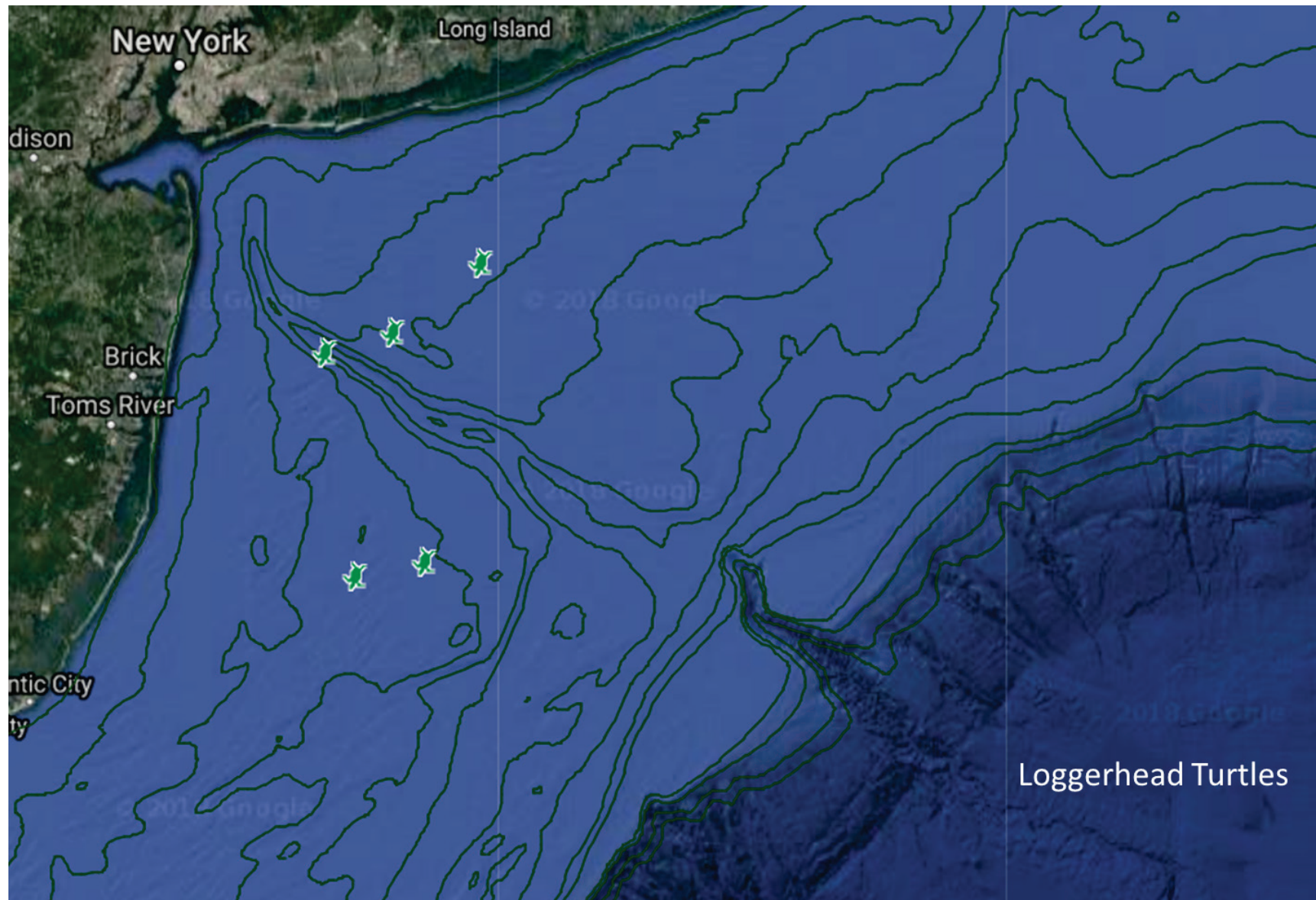**Figure 4. Loggerhead Turtle distribution during the 2017 Fall survey.**

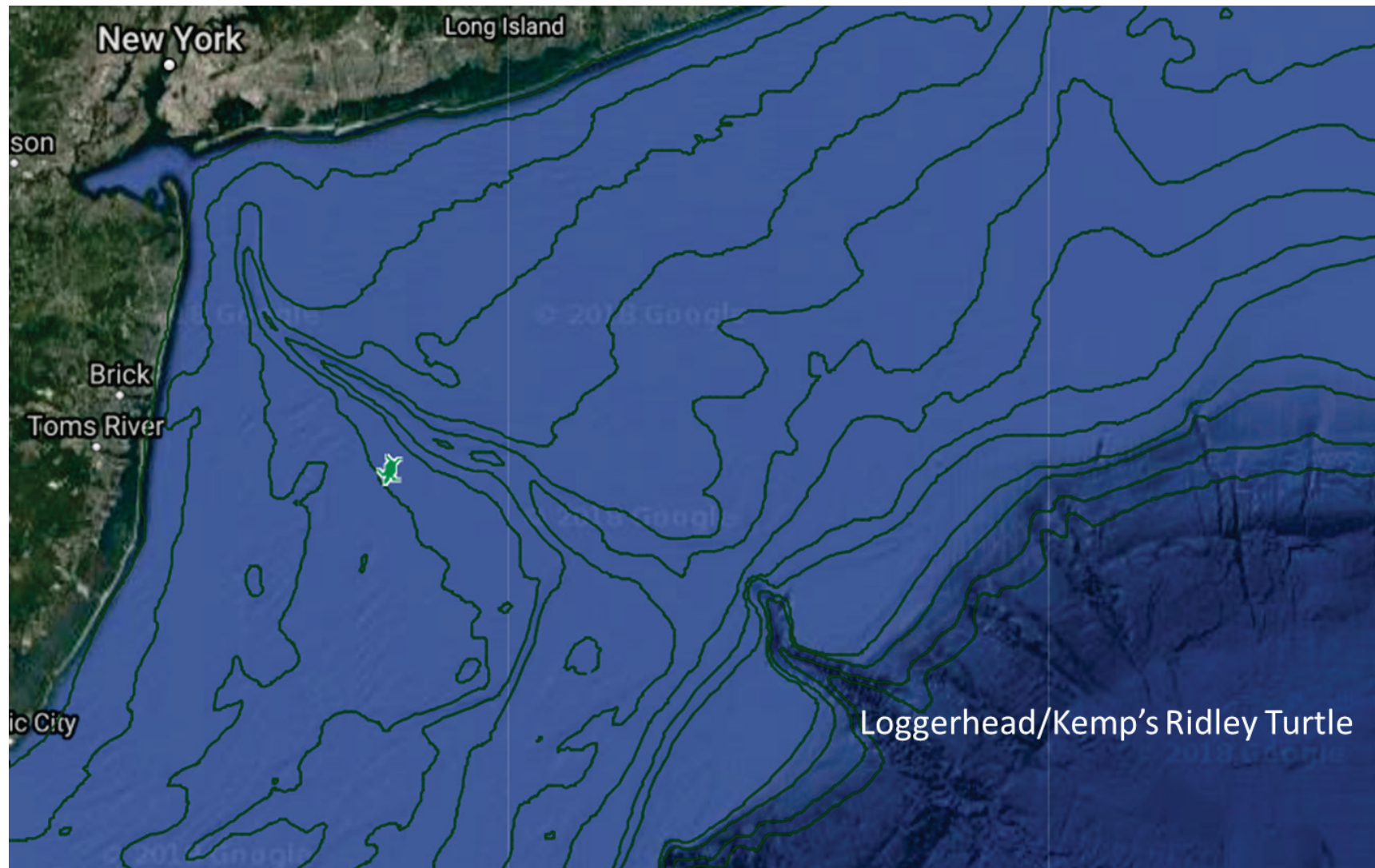**Figure 5. Loggerhead/Kemp's Ridley Turtle distribution during the 2017 Fall survey.**

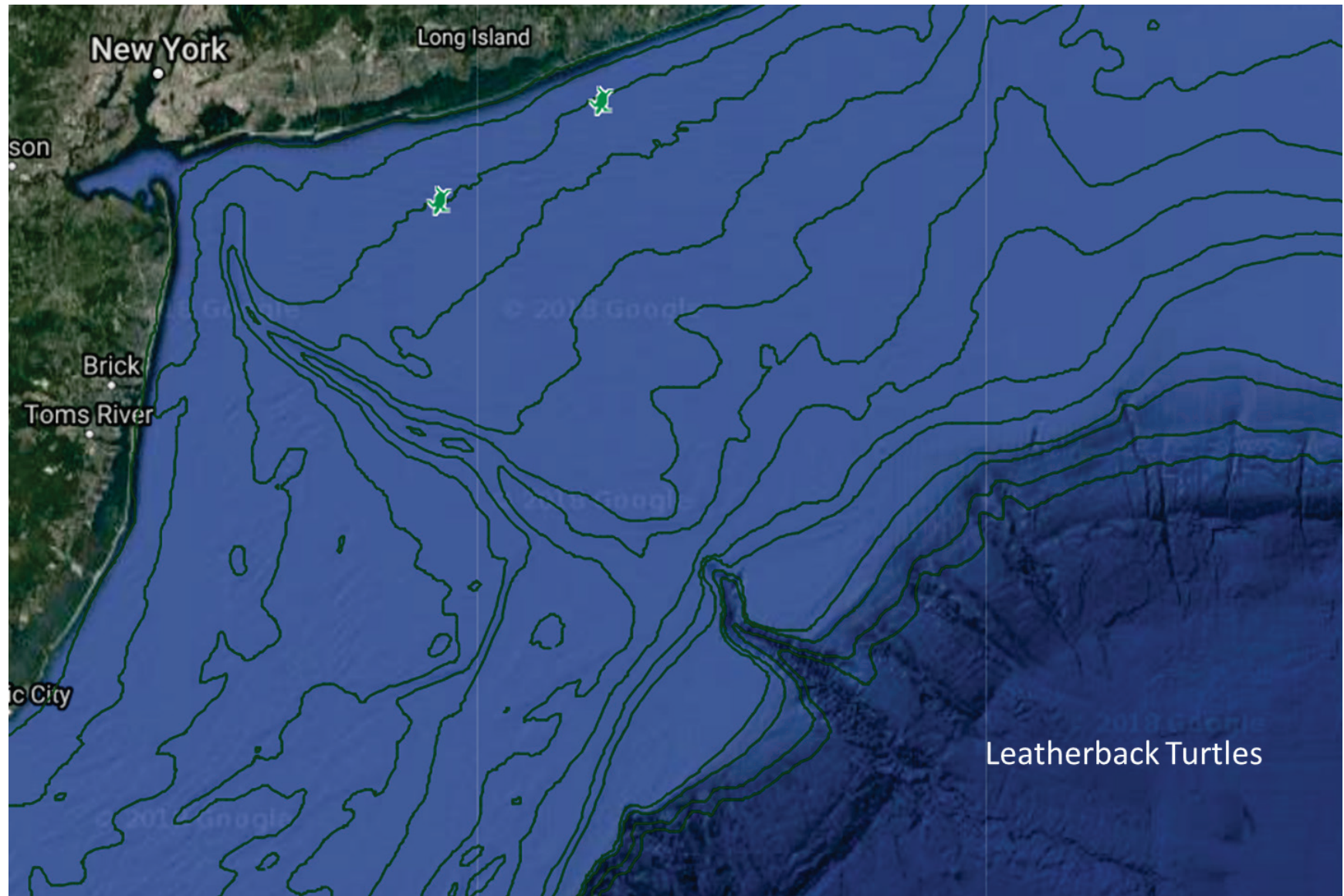**Figure 6. Leatherback Turtle distribution during the 2017 Fall survey**

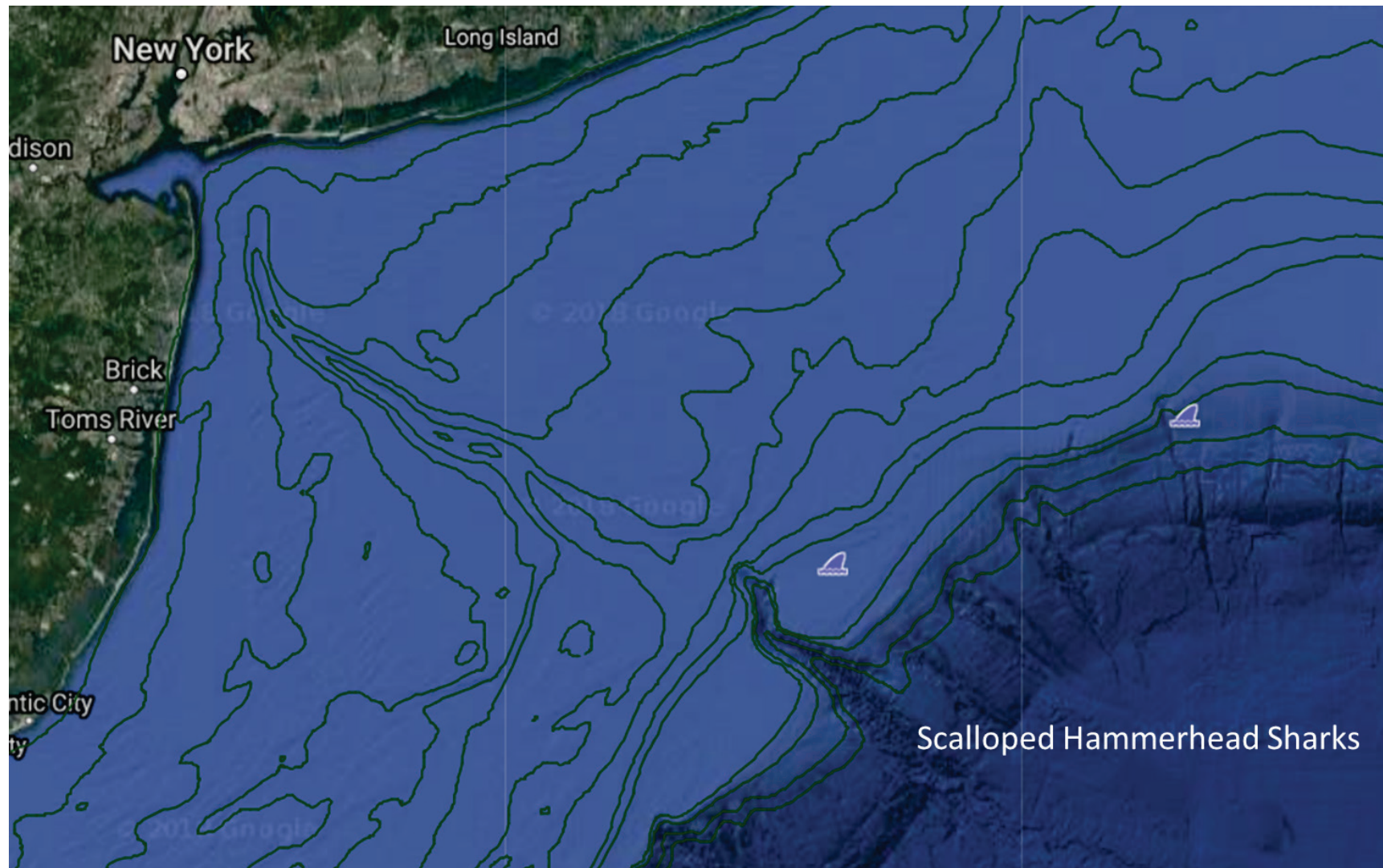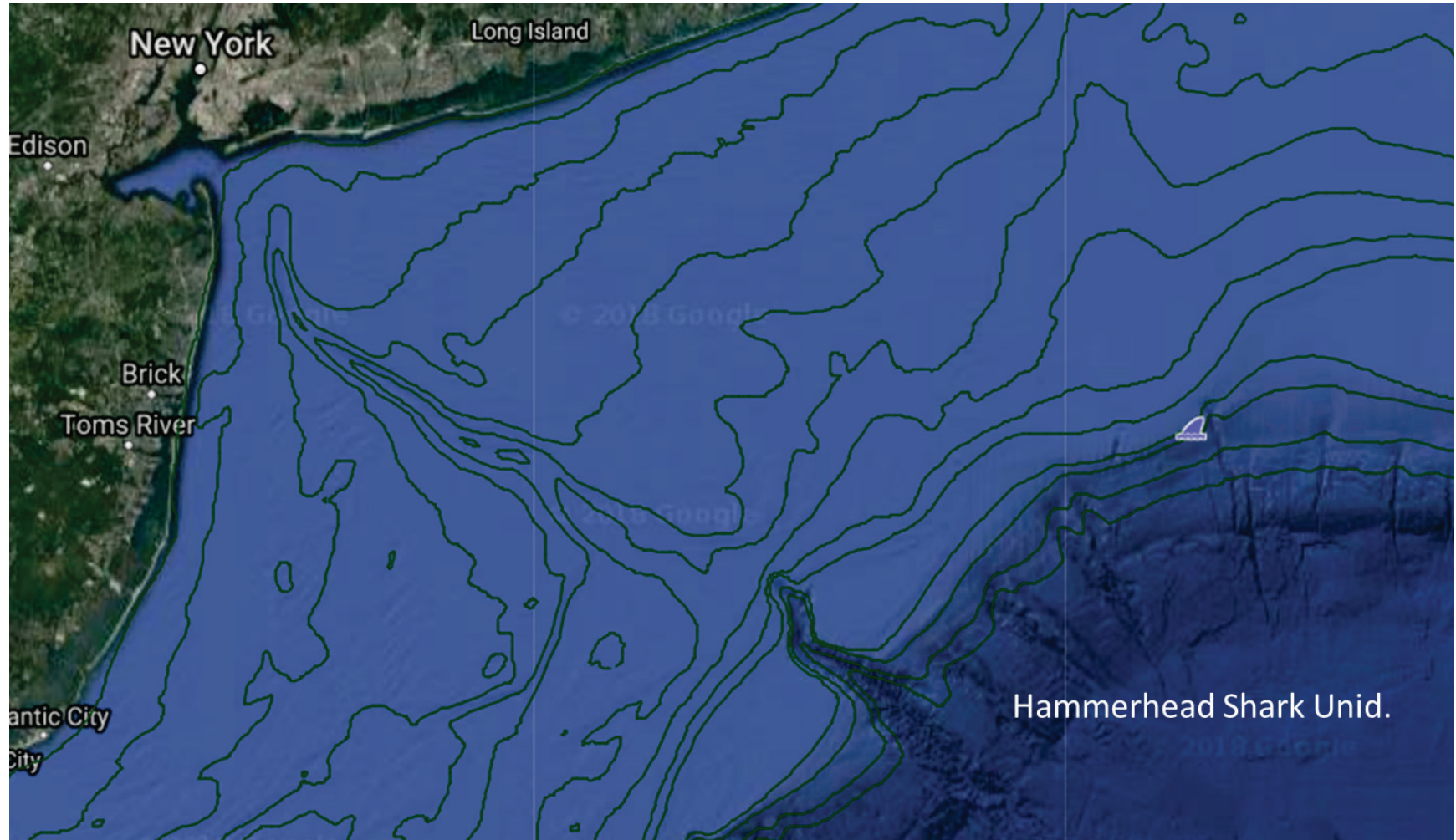**Figure 7. Scalloped Hammerhead Shark distribution during the 2017 Fall survey.**

Figure 8. Hammerhead Shark Unid. distribution during the 2017 Fall survey.

APPENDIX: List of Species Found in Imagery during the 2017 Fall Survey in Taxonomic Order

Common Name	Scientific Name	Class	Family
Canada Goose	*Branta canadensis*	Aves	Anatidae
Common Eider	*Somateria mollissima*	Aves	Anatidae
Surf Scoter	*Melanitta perspicillata*	Aves	Anatidae
White-winged Scoter	*Melanitta fusca*	Aves	Anatidae
Black Scoter	*Melanitta americana*	Aves	Anatidae
Long-tailed Duck	*Clangula hyemalis*	Aves	Anatidae
Red-breasted Merganser	*Mergus serrator*	Aves	Anatidae
Red-throated Loon	*Gavia stellata*	Aves	Gaviidae
Common Loon	*Gavia immer*	Aves	Gaviidae
Northern Fulmar	*Fulmarus glacialis*	Aves	Procellariidae
Cory's Shearwater	*Calonectris diomedea*	Aves	Procellariidae
Great Shearwater	*Ardenna gravis*	Aves	Procellariidae
Manx Shearwater	*Puffinus puffinus*	Aves	Procellariidae
Leach's Storm-Petrel	*Oceanodroma leucorhoa*	Aves	Hydrobatidae
Northern Gannet	*Morus bassanus*	Aves	Sulidae
Great Blue Heron	*Ardea herodias*	Aves	Ardeidae
Ruddy Turnstone	*Arenaria interpres*	Aves	Scolopacidae
Sanderling	*Calidris alba*	Aves	Scolopacidae
Dunlin	*Calidris alpina*	Aves	Scolopacidae
Red Phalarope	*Phalaropus fulicarius*	Aves	Scolopacidae
Parasitic Jaeger	*Stercorarius parasiticus*	Aves	Stercorariidae
Razorbill	*Alca torda*	Aves	Alcidae
Atlantic Puffin	*Fratercula arctica*	Aves	Alcidae
Black-legged Kittiwake	*Rissa tridactyla*	Aves	Laridae
Bonaparte's Gull	*Chroicocephalus philadelphia*	Aves	Laridae
Laughing Gull	*Leucophaeus atricilla*	Aves	Laridae
Ring-billed Gull	*Larus delawarensis*	Aves	Laridae
Herring Gull	*Larus argentatus*	Aves	Laridae
Iceland Gull	*Larus glaucoides*	Aves	Laridae
Lesser Black-backed Gull	*Larus fuscus*	Aves	Laridae
Great Black-backed Gull	*Larus marinus*	Aves	Laridae
Forster's Tern	*Sterna forsteri*	Aves	Laridae
Snow Bunting	*Plectrophenax nivalis*	Aves	Calcariidae
Common Minke Whale	*Balaenoptera acutorostrata*	Mammalia	Balaenopteridae
Fin Whale	*Balaenoptera physalus*	Mammalia	Balaenopteridae
Humpback Whale	*Megaptera novaeangliae*	Mammalia	Balaenopteridae
Pygmy Sperm Whale	*Kogia breviceps*	Mammalia	Physeteridae
Common Dolphin	*Delphinus delphis*	Mammalia	Delphinidae

Common Name	Scientific Name	Class	Family
Risso's Dolphin	*Grampus griseus*	Mammalia	Delphinidae
Common Bottlenose Dolphin	*Tursiops truncatus*	Mammalia	Delphinidae
Leatherback Turtle	*Dermochelys coriacea*	Reptilia	Dermochelyidae
Loggerhead Turtle	*Caretta caretta*	Reptilia	Cheloniidae
Kemp's Ridley Turtle	*Lepidochelys kempii*	Reptilia	Cheloniidae
Basking Shark	*Cetorhinus maximus*	Chondrichthyes	Cetorhinidae
Great White Shark	*Carcharodon carcharias*	Chondrichthyes	Lamnidae
Blue Shark	*Prionace glauca*	Chondrichthyes	Carcharhinidae
Tiger Shark	*Galeocerdo cuvier*	Chondrichthyes	Carcharhinidae
Smooth Hammerhead	*Sphyrna zygaena*	Chondrichthyes	Sphyrnidae
Scalloped Hammerhead	*Sphyrna lewini*	Chondrichthyes	Sphyrnidae
Giant Manta Ray	*Manta birostris*	Chondrichthyes	Mobulidae
Mahi-Mahi	*Coryphaena hippurus*	Actinopterygii	Coryphaenidae
Ocean Sunfish	*Mola Mola*	Actinopterygii	Molidae
Sharptail Sunfish	*Masturus lanceolatus*	Actinopterygii	Molidae