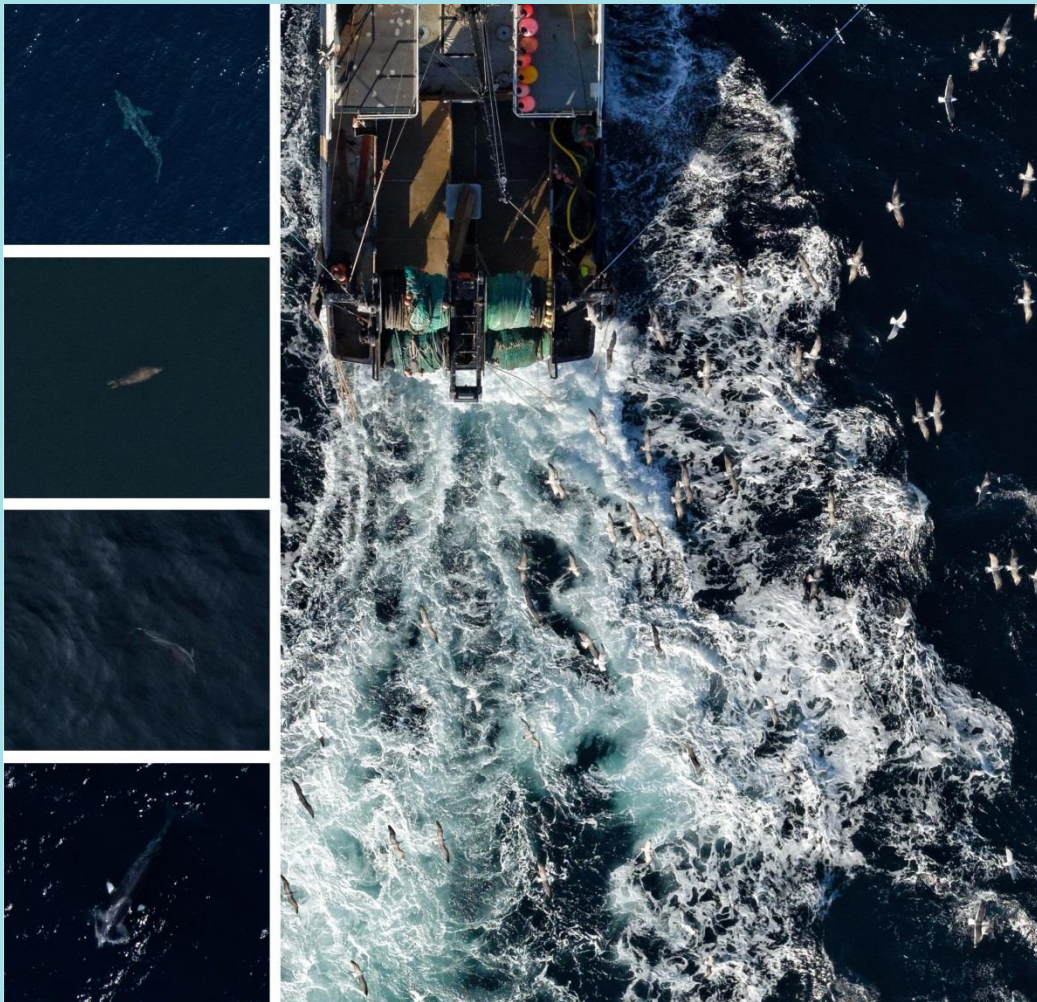


Digital Aerial Baseline Survey of Marine Wildlife in Support of Offshore Wind Energy

Spring 2017 Taxonomic Analysis Summary Report



NYSERDA



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Spring 2017 Taxonomic Analysis Summary Report

Prepared for

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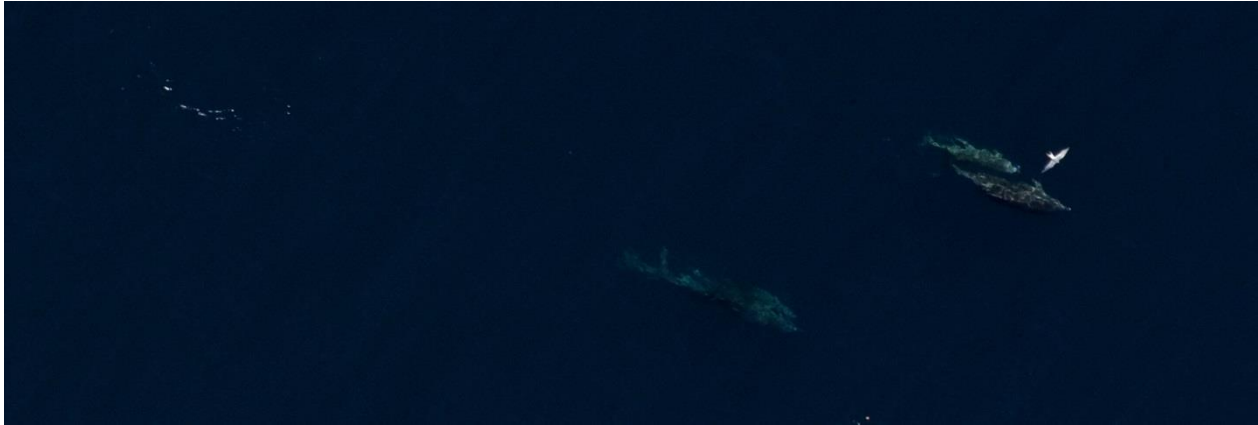


with

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Introduction

The first spring survey for the Digital Aerial Baseline Survey of Marine Wildlife in Support of Offshore Wind Energy for the New York Offshore Planning Area (OPA) and Wind Energy Area (WEA) began on May 4, 2017, and finished May 21, 2017. All target extraction and quality control of target extraction was completed in early November 2017. 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.

Methods

Data were collected for the OPA including a 300-m buffer and the WEA including a 4-km buffer. As the camera array width is large, additional data has been collected around the OPA to ensure complete coverage to the boundary of the OPA. The survey collected imagery covering a 3,293.25 km² area of the OPA and 300-m buffer using a transect pattern and 133.54 km² of the WEA with a 4-km buffer using a grid pattern (Table 1), which amounts to 350,824 images. Of the 350,824 images analyzed, 346,632 were blank (Table 2). The target extraction identified 6,356 objects: 6,205 (97.6%) within imagery collected in the OPA and 300-m buffer survey area and 151 objects within imagery exclusively covering the WEA and 4-km buffer area. These targets were categorized into seven groups representing avian (birds), turtles, marine mammals, sharks, large bony fish individuals (excluding fish shoals), fixed structures, and vessels (Table 3) and assigned to taxonomic experts for identification. No bats or rays were found in imagery. Species listed 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 4); 756 individuals were categorized into this group. This categorization was conservative. For example, it is possible that “*Sterna tern*” could represent roseate tern, and so this identification was placed into the “Endangered” category.

Collection of images for the spring 2017 survey occurred over a 2.5-week period (May 4 through May 21) because of erratic weather conditions after May 11. Data users should bear this in mind when evaluating seasonal patterns.

Table 1. Total Images and Area Surveyed

Area	Total Number of Images Collected	Area (km ²) of Analyzed Images within the Survey Area	Percent Coverage	Survey Area (km ²)
WEA ^a	12,683	133.54	15.69	850.92
OPA ^b	338,141	3,293.25	7.53	43,745.20
Total	350,824	3,426.77	7.68	44,596.12

^a This table only represents the imagery that was processed and analysed per the scope of work. An additional 10% coverage was collected for the WEA but is being stored if needed for future processing and analysis.

^b Percent coverage of the entire OPA including where the survey crosses the WEA.

Table 2. Blank Images Detected

Area	Total Images Analyzed	Blank Images			
		Number Detected	Number Sent for QA	Total Percent QA	Total Percent Blank
WEA	12,683	12,582	1,258	10.00	99.2
OPA	338,141	334,050	33,427	10.01	98.79
Total	350,824	346,632	34,685	10.01	98.81

Table 3. Targets Identified

Group	Total (OPA and WEA)	OPA	WEA
Avian	3,807	3,668	139
Fish species	645	642	3
Fixed Structure	3	3	0
Marine Mammal species	1,694	1,687	7
Shark species	182	180	2
Turtle species	10	10	0
Vessel	15	15	0

Table 4. Endangered Species Act Listed Species Identified

Group	Total (OPA and WEA)	OPA	WEA
Avian	738	721	17
Turtles	10	10	0
Marine Mammals	8	8	0
TOTAL	756	739	17

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 5). 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 6). In this latter category all “*Sterna tern* (unid)” are categorized as endangered, and those as well as birds identified as roseate tern go through 100% QC (see Appendix for full list of species and scientific names for all taxa). All other terns receive a 20% review. Additional experts in the species concerned were called in to arbitrate identifications when concurrence could not be reached.

Results

Quality Control Results (Spring 2017)

Table 5. All Species

Taxonomic Group	Number of Images	Number of Images for QC	% Agreement Reached
Avian	3,807	1,351	99
Marine Mammals	1,694	343	98
Sharks	182	34	100
Turtles	10	10	100
TOTAL	5,693	1,738	99

Table 6. Endangered Species Only

Taxonomic Group	Number of Images	% Agreement Reached
Avian	738	100
Turtles	10	100
Marine Mammals	8	100
TOTAL	756	100

Identification Success

Identification success varied by species groups 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-pointing sensors “sees” through the water column more effectively than angled sensors, 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 -quantifying animal presence by downward facing lenses sometimes is at a cost of species identification because of the depth of the animal.

Avian species-level identifications varied by species groups depending on size and coloration. All bird identifications were classified to species or species group (Table 7) with a species identification success of over 90%. Avian species groups consisting of cormorant, fulmar, gannet, merganser, skua and small terns which excludes *Sterna* tern achieved 100% identification success rates. Success rate for each group was:

- 100% cormorant (n= 16)
- 100% fulmar (n=50)
- 100% gannet (n=213)
- 100% skua (n= 4)
- 100% merganser (n=7)
- 100% small terns (n=55)
- 99% loons (n=269)
- 97% gulls (n=890)
- 95% storm-petrels (n=97)
- 75% alcids (n=106)
- 74% shearwaters (n=125)
- 50% petrels (n=2)
- 47% *Sterna* terns (n=1,363)
- 14% ducks (n=59) (84% = scoter unid (n=50))
- 3% phalaropes (n=551)

Table 7. Avian Species Identified (3,668 in OPA, 139 in WEA)

Species	OPA		WEA	
	Number of Individuals	Number of Individuals by Species	Number of Individuals	Number of Individuals by Species
Auk	106		0	
Atlantic Puffin		45		0
Murre/Razorbill		30		0
Razorbill		4		0
species unknown		27		0
Cormorant	16		0	
Double-crested Cormorant		16		0
Duck	59		0	
Black Scoter		3		0
Lesser Scaup		2		0
Long-tailed Duck		2		0
Scoter unid.		50		0
species unknown		1		0
White-winged Scoter		1		0

Species	OPA		WEA	
	Number of Individuals	Number of Individuals by Species	Number of Individuals	Number of Individuals by Species
Fulmar	50		0	
Northern Fulmar		50		0
Gannet	207		6	
Northern Gannet		207		6
Gull	889		1	
Great Black-backed Gull		257		0
Herring Gull		554		1
Iceland Gull		1		0
Laughing Gull		35		0
Lesser Black-backed Gull		11		0
Ring-billed Gull		1		0
species unknown - Large		1		0
species unknown - Small		29		0
Loon	240		29	
Common Loon		213		29
Red-throated Loon		24		0
species unknown		3		0
Merganser	7		0	
Red-breasted Merganser		7		0
Petrel	2		0	
species unknown		1		0
Trindade Petrel		1		0
Phalarope	549		2	
Red Phalarope		1		0
Red-necked Phalarope		17		0
Red/Red-necked Phalarope		531		2
Shearwater	125		0	
Cory's Shearwater		9		0
Great Shearwater		2		0
Sooty Shearwater		81		0
species unknown-Large		15		0
species unknown-Small		18		0
Skua	4		0	
Parasitic Jaeger		2		0
Pomarine Jaeger		1		0

Species	OPA		WEA	
	Number of Individuals	Number of Individuals by Species	Number of Individuals	Number of Individuals by Species
South Polar Skua		1		0
<i>Sterna</i> Tern	1267		96	
Common Tern		546		79
Roseate Tern		15		0
species unknown		706		17
Storm-petrel	96		1	
Band-rumped Storm-Petrel		1		0
Leach's Storm-Petrel		1		0
species unknown		4		1
Wilson's Storm-Petrel		90		0
Tern	51		4	
Black Tern		2		0
Least Tern		49		4
TOTAL	3668		139	

Ten turtles were observed in the OPA and none in the WEA (Table 8).

Table 8. Turtle Species Identified (10 in OPA). All are classed as endangered.

Species	Number of Individuals OPA	Number of Individuals by Species OPA
Turtle	10	
Kemp's Ridley Turtle		1
Loggerhead Turtle		5
Loggerhead/Kemp's Turtle		2
species unknown		2

The fall survey recorded 1,694 marine mammals (Table 9), of which seven were recorded in the WEA.

- Of the 1,565 dolphins, 356 (23%) were classed as “species unknown.” Of these, 294 (83%) were ranked as significantly submerged.
- One seal was recorded and clearly identifiable.
- There were 111 unidentified mammals that were not ascribed to species group, 90 (81%) of which were ranked as significantly submerged.
- There were three whales not ascribed to species or species group, all (100%) of which were ranked as significantly submerged.

Table 9. Marine Mammal Species Identified (1,687 in OPA, 7 in WEA)*

Species	OPA		WEA		Significantly Submerged	% of Total
	# of Individuals	# by Species	# of Individuals	# by Species		
Dolphin	1,558		7			
Atlantic Spotted Dolphin		3		0	2	67
Common Bottlenose Dolphin		173		0	112	65
Common Dolphin		852		0	557	65
Common/White-sided Dolphin		4		0		
Harbor Porpoise		17		0	15	88
Pilot Whale (unid.)		29		0	21	72
Risso's Dolphin		131		0	88	67
Species unknown		349		7	294	83
Seal	1		0			
Harp Seal		1		0		
Unid. Mammal	111		0			
Species unknown		111		0	90	81
Whale	17		0			
Beaked Whale (unid.)		1		0	1	100
Common Minke Whale		5		0	1	20
Fin Whale ^a		1		0	1	100
Humpback Whale ^a		5		0		
North Atlantic Right Whale ^a		2		0		
Species unknown		3		0	3	100
TOTAL	1,687		7			

*Highlight denotes classed as endangered

^a Listed as threatened or endangered by NYSDEC

No rays were recorded during the spring 2017 survey.

Of the 182 sharks recorded, 136 (74.7%) were identified to species. Of the remaining individuals, 35 were ranked as significantly submerged (Table 10).

Table 10. Shark Species Identified (180 in OPA, 2 in WEA)

Species	OPA-species	WEA-species	Significantly Submerged	Percent of Total
Basking Shark	99	1	68	68
Blue Shark	34	0	6	18
Carcharhinidae (unid.)	3	0	1	33
Great White Shark	2	0	2	100
Species unknown	42	1	34	79
TOTAL	180	2		

Out of the 645 large bony fish recorded, 54% were identified to species. 279 (43%) were identified as ocean sunfish with 62 (22%) being ranked as significantly submerged. Nineteen sunfish (6%) were not ascribed to species, 79% being significantly submerged. Three other species were identified (n= 7). Out of the remaining 340 individuals unidentified to species, 31 (9%) were rated as significantly submerged (Table 11).

Table 11. Large Bony Fish Species Identified (642 in OPA, 3 in WEA)

Species	OPA-species	WEA-species	Significantly Submerged	Percent of Total
Mahi-Mahi	2	0	1	50
Ocean Sunfish	279	0	62	22
Sharptail Sunfish	1	0		
Sunfish species unknown	19	0	15	79
Atlantic Bluefin Tuna	1	3		
Fish species unknown	340	0	31	9
TOTAL	642	3		

Species Presence

This season had 3,807 birds of 36 species (see Table 7). The survey was timed to provide as much information as possible on roseate terns and red phalaropes and was anticipated to coincide with loon and gull activity.

- As anticipated, large numbers of *Sterna* terns were reported into which group belongs roseate tern (n=1,363)
 - 1,200 were documented as flying
- Both red-throated and common loons were documented (n=266)
 - Of the 242 common loons, 19 were flying
 - Of the 24 red-throated loons, 4 were flying
- There were 59 sea ducks, with 4 different species identified
 - Most were unidentified scoters (n=50) and all 50 were sitting on the water
- There were 890 gulls identified in the imagery of 6 different species, of which 221 were reported as flying
 - 555 herring gulls
 - 257 great black-backed gulls
 - 1 Iceland gull
 - 35 laughing gulls
 - 11 lesser black-backed gulls
 - 1 ring-billed gull
 - 30 gulls unidentified
- There were 213 northern gannets identified in the imagery, of which 111 were flying
- There were 551 phalaropes identified in the imagery, of which 112 were flying
- Remaining species occurring in notable numbers include
 - 97 storm-petrels of 3 species; 88 were flying
 - 125 shearwaters of 3 species, of which 36 were flying

Ten turtles were recorded of which 5 were identified as loggerhead, 2 as Kemp's Ridley, 2 as Loggerhead/Kemp's Ridley and 2 remained unknown.

Large numbers of marine mammals were encountered (n=1,694; see Table 9). Most of these were dolphins (n=1,565) consisting of 8 identified species or species group, as follows:

- Atlantic White-sided dolphin (n=3)
- Common Bottlenose dolphin (n=173)
- Common dolphin (n=852)
- Common/White-sided dolphin (4)
- Harbor porpoise (n=17)
- Risso's dolphin (n=131)
- Pilot whale (unid.) (n=29)
- Species unknown (n=356)

Of whales (n=17), common minke whales (n=5), humpback whales (n=5), and North Atlantic right whales (n=2) were the only species with more than one encounter (see Table 9).

Of the 182 sharks seen, 100 (55%) were basking sharks and 34 (19%) were blue sharks (see Table 10). Of the 43 sharks unidentified to species, 34 were ranked as significantly submerged.

Of 645 large bony fish species, 279 were identified as ocean sunfish, four as Atlantic bluefin tuna (see Table 11). Of the 340 unidentified to species or species group, 31 were ranked as significantly submerged.

There were 756 animals that we classified listed as state or federally threatened or endangered species. Most (n=739) were recorded in the OPA and 17 in the WEA (Table 12). *Sterna* terns (species unknown) represented 723 of these, with only 15 positively identified roseate terns. The 10 turtles encountered in the spring survey are all classified as threatened (Figure 1). In addition, there were 8 listed marine mammals. These were fin whale (n=1), humpback whale (n=5), and North Atlantic right whale (n=2) (Figure 2).

Table 12. Threatened and Endangered Species Identified*

Species	TOTAL (OPA & WEA)	OPA	WEA
Avian			
Roseate Tern	15	15	0
<i>Sterna</i> Tern species unknown	723	706	17
Turtles			
Kemp's Ridley Turtle	1	1	0
Loggerhead Turtle ^a	5	5	0
Loggerhead/Kemp's Turtle	2	2	0
Species unknown	2	2	0
Marine Mammals			
Fin Whale ^a	1	1	0
Humpback Whale ^a	5	5	0
North Atlantic Right Whale ^a	2	2	0

*Highlight denotes classed as endangered

^a listed as threatened or endangered by NYSDEC

Flight Height

Out of the 3,807 birds recorded, 2,004 birds were sitting on the water and 1,803 birds were flying. Flight height data will be presented in detail in the semi-annual report. However, here we present a brief overview of flight altitude assessment success. We were able to calculate flight heights for 969 of the flying birds (54%). Of the birds without flight height calculations, 506 (61%) were unidentified to species.

- 543 (89%) of 610 flying common terns
- 10 (63%) of 16 flying common loons
- 41 (72%) of 57 flying great black-backed gulls
- 98 (73%) of 135 flying herring gulls
- 14 (26%) of 53 flying least terns
- 30 (86%) of 35 flying northern fulmar
- 5 (83%) of 6 flying lesser black-backed gulls
- 63 (62%) of 102 flying northern gannet
- 13 (54%) of 24 flying sooty shearwaters
- 96 (18%) of 535 flying unidentified *Sterna* terns
- 11 (13%) of 85 flying Wilson's storm-petrels

Spatial Distribution of Animals Classed 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 endangered species encountered in the Spring 2017 survey.

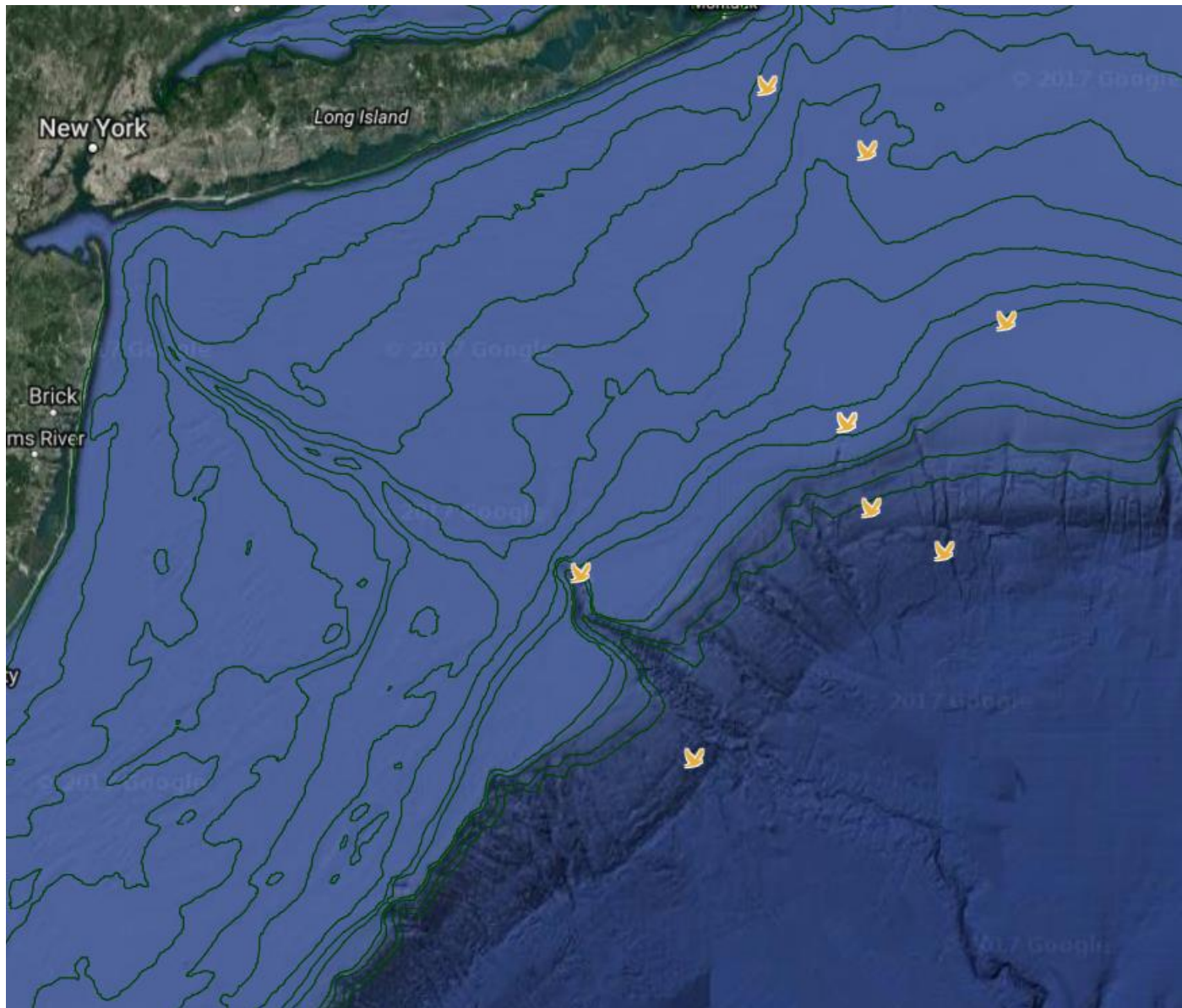


Figure 1. Roseate Tern distribution over the OPA during the 2017 Spring survey.

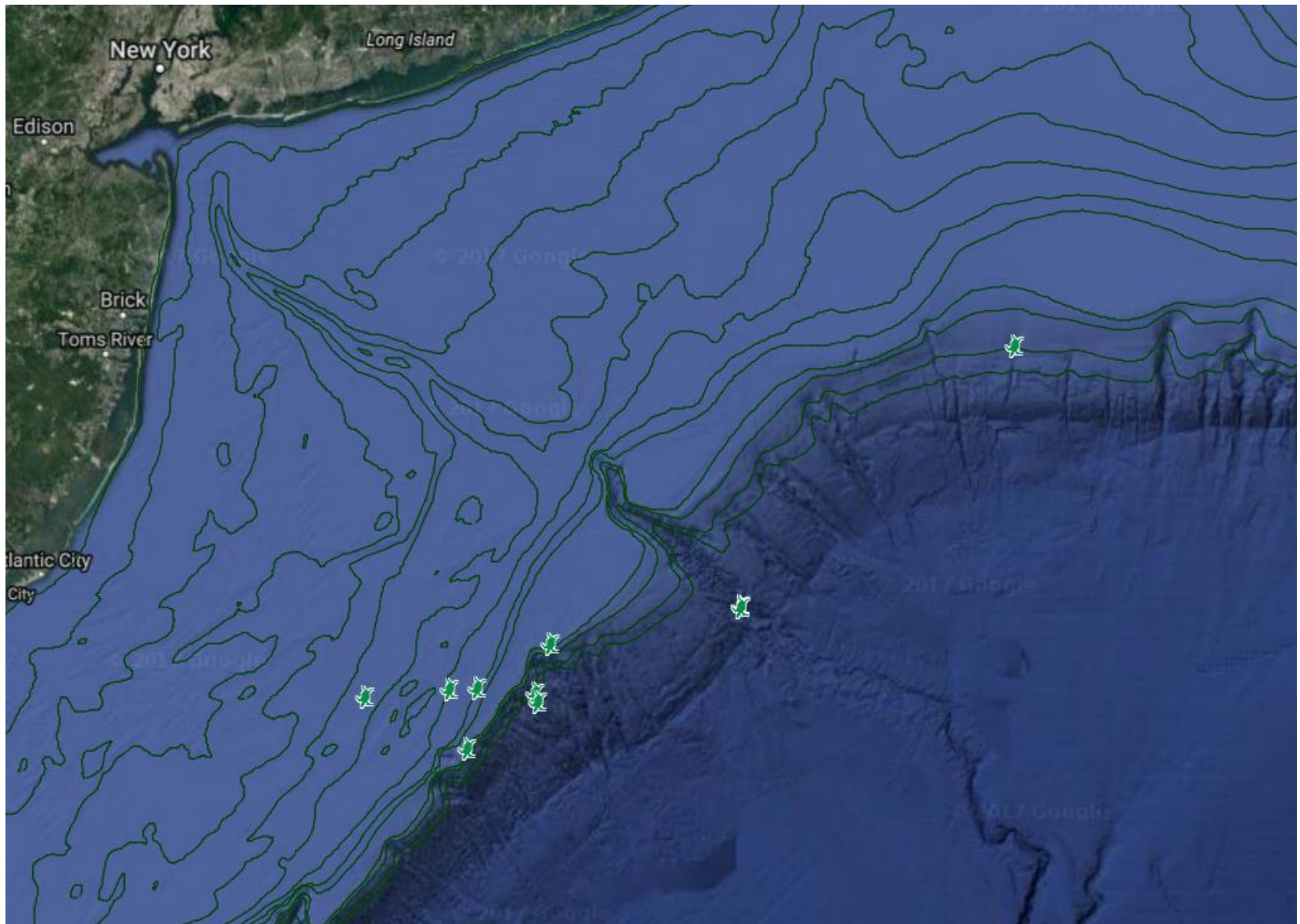


Figure 2. Turtle distribution over the OPA during the 2017 Spring survey.

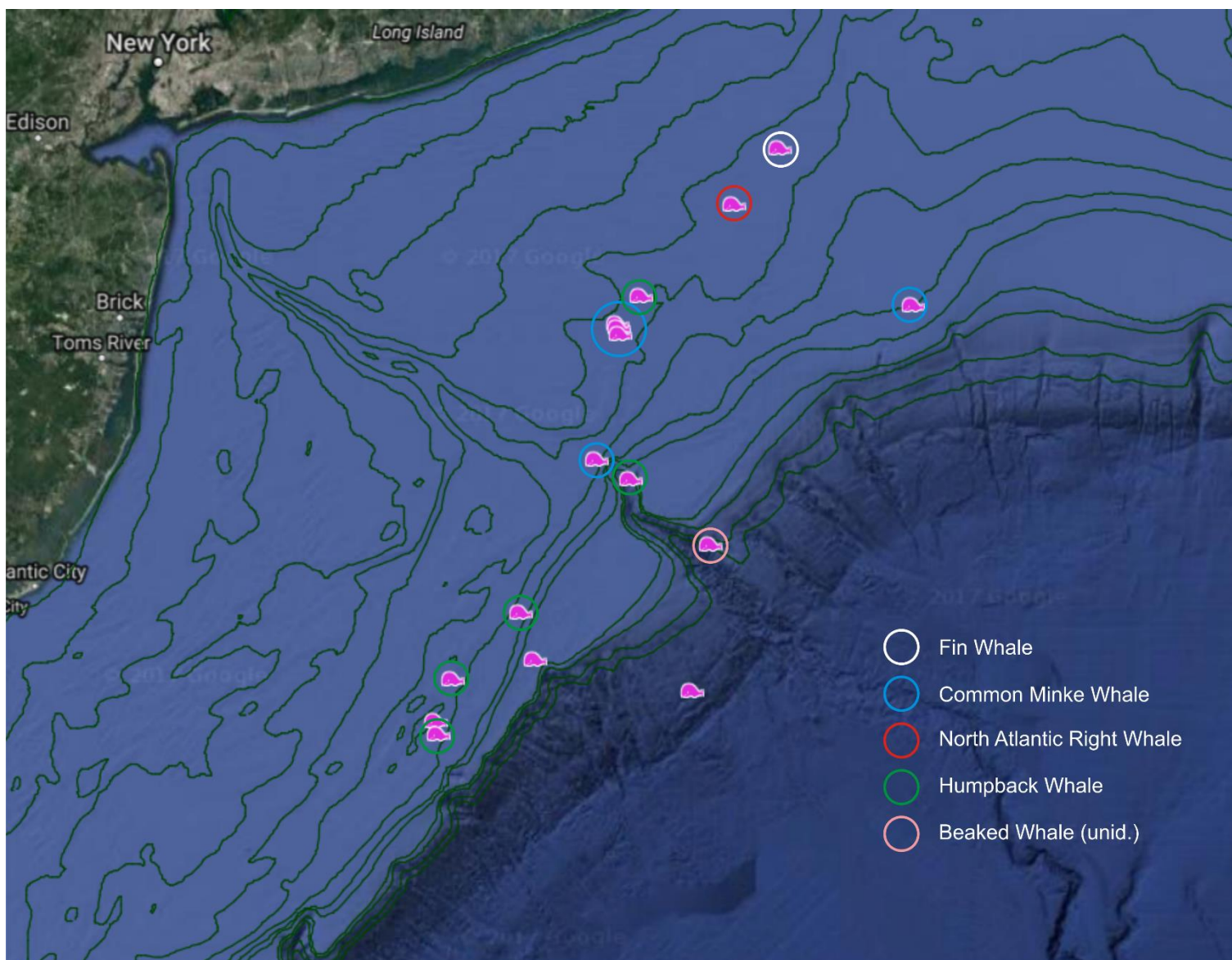


Figure 3. Whale distribution over the OPA during the 2017 Spring survey. Animals not labeled are unidentified species (n=3)

APPENDIX

List of Species Found in Imagery during the Spring 2017 Survey in Taxonomic Order

Common Name	Scientific Name	Class	Family
Lesser Scaup	<i>Aythya affinis</i>	Aves	Anatidae
White-winged Scoter	<i>Melanitta fusca</i>	Aves	Anatidae
Black Scoter	<i>Melanitta americana</i>	Aves	Anatidae
Long-tailed Duck	<i>Clangula hyemalis</i>	Aves	Anatidae
Red-breasted Merganser	<i>Mergus serrator</i>	Aves	Anatidae
Red-throated Loon	<i>Gavia stellata</i>	Aves	Gaviidae
Common Loon	<i>Gavia immer</i>	Aves	Gaviidae
Northern Fulmar	<i>Fulmarus glacialis</i>	Aves	Procellariidae
Trindade Petrel	<i>Pterodroma arminjoniana</i>	Aves	Procellariidae
Cory's Shearwater	<i>Calonectris diomedea</i>	Aves	Procellariidae
Great Shearwater	<i>Ardenna gravis</i>	Aves	Procellariidae
Sooty Shearwater	<i>Ardenna grisea</i>	Aves	Procellariidae
Wilson's Storm-Petrel	<i>Oceanites oceanicus</i>	Aves	Hydrobatidae
Leach's Storm-Petrel	<i>Oceanodroma leucorhoa</i>	Aves	Hydrobatidae
Band-rumped Storm-Petrel	<i>Oceanodroma castro</i>	Aves	Hydrobatidae
Northern Gannet	<i>Morus bassanus</i>	Aves	Sulidae
Double-crested Cormorant	<i>Phalacrocorax auritus</i>	Aves	Phalacrocoracidae
Red-necked Phalarope	<i>Phalaropus lobatus</i>	Aves	Scolopacidae
Red Phalarope	<i>Phalaropus fulicarius</i>	Aves	Scolopacidae
South Polar Skua	<i>Stercorarius maccormicki</i>	Aves	Stercorariidae
Pomarine Jaeger	<i>Stercorarius pomarinus</i>	Aves	Stercorariidae
Parasitic Jaeger	<i>Stercorarius parasiticus</i>	Aves	Stercorariidae
Razorbill	<i>Alca torda</i>	Aves	Alcidae
Atlantic Puffin	<i>Fratercula arctica</i>	Aves	Alcidae
Laughing Gull	<i>Leucophaeus atricilla</i>	Aves	Laridae
Ring-billed Gull	<i>Larus delawarensis</i>	Aves	Laridae

Common Name	Scientific Name	Class	Family
Herring Gull	<i>Larus argentatus</i>	Aves	Laridae
Iceland Gull	<i>Larus glaucooides</i>	Aves	Laridae
Lesser Black-backed Gull	<i>Larus fuscus</i>	Aves	Laridae
Great Black-backed Gull	<i>Larus marinus</i>	Aves	Laridae
Least Tern	<i>Sternula antillarum</i>	Aves	Laridae
Black Tern	<i>Chlidonias niger</i>	Aves	Laridae
Roseate Tern	<i>Sterna dougallii</i>	Aves	Laridae
Common Tern	<i>Sterna hirundo</i>	Aves	Laridae
Kemp's Ridley Turtle	<i>Lepidochelys kempii</i>	Reptilia	Cheloniidae
Loggerhead Turtle	<i>Caretta caretta</i>	Reptilia	Cheloniidae
North Atlantic Right Whale	<i>Eubalaena glacialis</i>	Mammalia	Balaenidae
Common Minke Whale	<i>Balaenoptera acutorostrata</i>	Mammalia	Balaenopteridae
Fin Whale	<i>Balaenoptera physalus</i>	Mammalia	Balaenopteridae
Humpback Whale	<i>Megaptera novaeangliae</i>	Mammalia	Balaenopteridae
Atlantic Spotted Dolphin	<i>Stenella frontalis</i>	Mammalia	Delphinidae
Common Bottlenose Dolphin	<i>Tursiops truncatus</i>	Mammalia	Delphinidae
Common Dolphin	<i>Delphinus delphis</i>	Mammalia	Delphinidae
Pilot Whale (unid.)	<i>Globicephala</i> (unid.)	Mammalia	Delphinidae
Risso's Dolphin	<i>Grampus griseus</i>	Mammalia	Delphinidae
Harbor Porpoise	<i>Phocoena phocoena</i>	Mammalia	Phocoenidae
Harp Seal	<i>Pagophilus groenlandicus</i>	Mammalia	Phocidae
Blue Shark	<i>Prionace glauca</i>	Chondrichthyes	Carcharhinidae
Basking Shark	<i>Cetorhinus maximus</i>	Chondrichthyes	Cetorhinidae
Great White Shark	<i>Carcharodon carcharias</i>	Chondrichthyes	Lamnidae
Mahi-Mahi	<i>Coryphaena hippurus</i>	Actinopterygii	Coryphaenidae
Ocean Sunfish	<i>Mola mola</i>	Actinopterygii	Molidae
Sharptail Sunfish	<i>Masturus lanceolatus</i>	Actinopterygii	Molidae
Atlantic Bluefin Tuna	<i>Thunnus thynnus</i>	Actinopterygii	Scombridae