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

Summer 2017 Taxonomic Analysis Summary Report

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APEM

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Introduction

The second summer survey for the NYSERDA offshore planning area (OPA) was started on 6 August 2017 and completed on 21 August 2017. Delay in completion was caused by erratic weather conditions and the survey window spanned 2 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 3,133.5 km^2 area of the OPA and 300-m buffer using a transect (Table 1), which amounts to 318,741 images. Of the 318,741 images analyzed, 311,832 were blank (Table 2). The target extraction identified 15,961 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), fixed structures, and vessels (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	Total Number of Images Collected	km² of Analyzed Images within the Survey Area	Percent Coverage	Survey Area (km²)
OPA	318,741	3,133.5	7.16	43,745.20

Table 2. Blank Images Detected

		Blank Images			
Area	Total Images Analyzed	Number Detected	Number Sent for QA	Total Percent QA	Total Percent Blank
OPA	318,741	311,832	31,271	10.03	97.83

Table 3. Targets Sent for Identification

Group	# Individuals
Avian	2,964
Marine Mammal species	1,446
Turtle species	711

Group	# Individuals
Shark species	1,386
Ray species	7,622
Fish species	1,792
Vessel	39
Fixed Structure	1
TOTAL	**15,961**

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). In this latter category although "Sterna tern (unid)" are categorized as endangered, only birds identified as roseate tern go through 100% QC. All other Sterna terns receive a 20% review. 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 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.

Quality Control Results (Summer 2017)

Table 4.   Quality Control Results, All Groups

Group	Number of Images	Number of Images for QC	% Agreement
Avian	2,964	618	99
Marine Mammals	1,446	286	100
Turtles	711	711	100
Rays	7,623	1,576	100
Sharks	1,382	623	98
Total	**14,126**	**3,814**	**100**

Table 5. Quality Control Results, Endangered Species Only

Group	Number of Images	% Agreement
Avian	13	100
Marine Mammals	8	100
Turtles	711	100
Sharks	445	100
Total	**1,177**	**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 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 groups depending on size, coloration and flight activity. Birds that are both small and sitting on the water are generally more difficult to identify, and in this survey a large number of phalaropes and storm-petrels were encountered (Table 6). Both of these groups contain multiple species that are morphologically similar and difficult to distinguish, more than one of which could be expected in the study area. 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
Loons	5	60	100
Petrels	3	100	0
Shearwaters	576	74	61
Storm-petrels	2,080	16	2
Gannets	4	100	100
Shorebirds	29	12	0
Phalaropes	138	1	45
Auks	4	0	100
Gulls	109	69	79
Terns not including *Sterna*	2	50	0
Raptors/Falcons	1	100	0
		Average Success	**Average Sitting**
Total Individuals	**2,964**	**59%**	**44%**

Table 7. Avian Species Identified and Number Flying

Species	# Individuals in Group	# Individuals by Species	# Flying	% of Total
Loon	**5**		**0**	**0**
Common Loon		3	0	0
species unknown		2	0	0
Petrel	**3**		**3**	**100**
Black-capped Petrel		3	3	100
Shearwater	**576**		**225**	**39**
Cory's Shearwater		90	62	69
Great Shearwater		337	146	43
Sooty Shearwater		1	1	100
species unknown-Large		108	13	12
species unknown-Small		40	3	8
Storm-petrel	**2,080**		**2,039**	**98**
Wilson's Storm-Petrel		339	338	100
Leach's Storm-Petrel		2	2	100
species unknown		1,739	1,699	98
Gannet	**4**		**0**	**0**
Northern Gannet		4	0	0
Shorebird	**29**		**29**	**100**
Semipalmated Plover		3	3	100
species unknown		26	26	100
Phalarope	**138**		**75**	**54**
Red-necked Phalarope		1	0	0
Red/Red-necked Phalarope		121	63	52
species unknown		16	12	75
Auk	**4**			**0**
Murre/Razorbill		2	0	0
species unknown		2	0	0
Gull	**109**		**23**	**21**
Laughing Gull		13	5	38
Ring-billed Gull		2	1	50
Herring Gull		33	7	21
Lesser Black-backed Gull		2	1	50
Great Black-backed Gull		25	5	20
species unknown - Large		3	2	67
species unknown - Small		31	2	6

Species	# Individuals in Group	# Individuals by Species	# Flying	% of Total
Tern	**2**		**1**	**50**
Black Tern[a]		1	0	0
species unknown		1	1	100
Sterna Tern	**13**		**13**	**100**
species unknown		13	13	100
Raptors/Falcons	**1**		**1**	**100**
Common Nighthawk		1	1	100
Total	**2,964**			

a Listed as threatened or endangered by NYSDEC

Marine Mammal Identification Success

The summer survey recorded 1,446 marine mammals (Table 8).

Of the 1,392 dolphins, 127 (9%) were classed as "species unknown." Of these, 103 (81%) were significantly submerged (Table 8).

Two seals were recorded but neither could be identified to species. One of these (50%) was significantly submerged.

The presence of seals and dolphins in the area, and some very submerged individuals of both meant that we had 41 mammals that could not be classed as dolphin or seal. Of these, 33 (80%) were significantly submerged.

There were 11 whales recorded, one (9%) of which remained unidentified. This individual was significantly submerged.

Table 8. Marine Mammal Species Identified*

Species	# Individuals Group	# Individuals Species	Significantly Submerged	Percent of Total
Seal	**2**			
species unknown		2	1	50
Whale	**11**			
Fin Whale		4	0	0
Sei Whale		1	0	0
Dwarf Sperm Whale		2	0	0
Sperm Whale		3	1	33
species unknown		1	1	100
Dolphin	**1,392**			
Common Dolphin		853	552	65
Pilot Whale (unid.)		52	22	42

Species	# Individuals		Significantly Submerged	Percent of Total
	Group	Species		
Short-finned Pilot Whale		24	8	33
Risso's Dolphin		140	64	46
Rough-toothed dolphin		15	9	60
Striped Dolphin		6	5	83
Common Bottlenose Dolphin		175	91	52
species unknown		127	103	81
Unid. Mammal	**41**			
species unknown		41	33	80
Total Mammals	**1,446**		**890**	**62**

*Highlighted species are classified as endangered

ᵃ Listed as threatened or endangered by NYSDEC

Turtle Identification Success

A total of 711 turtles were found in the summer 2017 survey, of which 20 (3%) were identified as loggerhead/Kemp's Ridley and 13 (2%) were unidentified to any species. Of the 20 loggerhead/Kemp's Ridley turtles, three were significantly submerged (15%). Of the 13 unidentified turtles, 7 (54%) were significantly submerged. The remaining 678 (95%) 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	5	1	20
Loggerhead Turtle	649	96	15
Loggerhead/Kemp's Turtle	20	3	15
Kemp's Ridley Turtle	24	1	4
species unknown	13	7	54
Total	**711**	**108**	**15**

Shark Identification Success

Of the 1,382 sharks recorded, 342 (25%) were not identified to group or species, 335 (98%) of which were ranked as significantly submerged (Table 10).

Table 10. Shark Species Identified*

Species	# Individuals	# Significantly Submerged	Percent of Total
Whale Shark	11	5	45
Sand Tiger Shark	1	0	0
Thresher Shark	5	4	80

Species	# Individuals	# Significantly Submerged	Percent of Total
Basking Shark	132	124	94
Great White Shark	13	5	38
Shortfin Mako	4	0	0
Blue Shark	21	9	43
Tiger Shark	8	0	0
Sandbar Shark	21	2	10
Carcharhinidae (unid.)	320	255	80
Dusky Shark	2	0	0
Hammerhead (unid.)	232	174	75
Scalloped Hammerhead	213	70	33
Great Hammerhead	1	1	100
Smooth Hammerhead	56	11	20
species unknown	342	335	98
Total	**1,382**	**995**	**72**

* Highlighted species are classified as endangered

Ray Identification Success

There were 7,623 rays recorded during the summer 2017 survey. Of these, 1,209 (16%) could not be identified to any species, and 1,975 (26%) were identified as cownose/bullnose. Of the 1,209 unidentified, 1,208 (100%) were significantly submerged, and of the 1,975 identified as cownose/bullnose, 1,891 (96%) were significantly submerged (Table 11).

Table 11. Ray Species Identified

Species	# Individuals	# Significantly Submerged	Percent of Total
Giant Manta Ray	123	72	59
Bullnose Ray	87	14	16
Cownose/Bullnose Ray	1,975	1,756	89
Cownose Ray	4,229	1,180	28
species unknown	1,209	1,207	100
Total	**7,623**	**4,229**	

Large Bony Fish Identification Success

Large bony fish identification has not been undertaken for the summer 2017 survey.

Species Presence

Avian

This season had moderate bird activity with 2,964 individuals recorded representing 18 species (see Table 7). Storm-petrels (n=2,080) and shearwaters (n=576) were the most numerous groups present, followed by phalaropes (n=138) and gulls (n=109). Other species encountered were shorebirds (n=29), terns

including *Sterna* terns (n=15), loons (n=5), gannets (n=4), auks (n=4), black-capped petrel (n=3), and a single common nighthawk.

Marine Mammals

Large numbers of marine mammals were encountered (n=1,446; see Table 8). Most of these were dolphins (n=1,392) consisting of 7 identified species or group, as follows:

- Common dolphin (n=853)
- Common bottlenose dolphin (n=175)
- Risso's dolphin (n=140)
- Pilot whale unid. (n=52)
- Short-finned pilot whale (n=24)
- Rough-toothed dolphin (n=15)
- Striped dolphin (n=6)
- Species unknown (n=127)

Two seals were encountered but neither were identified to species, and 41 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 11 whales, fin whales (n=4), sperm whales (n=3), dwarf sperm whales (n=2), and sei whale (n=1) were identified, and one deeply submerged animal could not be identified (see Table 8).

Turtles

The most numerous turtle encountered was loggerhead (n=649), followed by Kemp's Ridley turtle (n=24) and 20 individuals that could either have been Kemp's Ridley or loggerhead (see Table 9). Five leatherbacks were also encountered and 13 animals that could not be identified, giving a total of 711 turtles encountered in the summer 2017 survey. Carapace lengths were recorded for this survey, a review of which will be presented in the annual report.

Sharks

Of the 1,382 sharks seen, 213 were scalloped hammerhead and 232 unidentified hammerhead potentially representing scalloped hammerhead which is an endangered species. Two other hammerhead species were encountered; smooth hammerhead (n=56) and great hammerhead (n=1). There were 132 basking sharks encountered and 11 whale sharks, along with 13 great white sharks, sandbar sharks (n=21), blue sharks (n=21), tiger sharks (n=8), thresher sharks (n=5), shortfin mako sharks (n=4), dusky sharks (n=2), and an individual sand tiger shark (see Table 10).

Rays

There were 7,623 rays found in the survey area representing three species. The most common species was cownose ray (n=4,229), followed by giant manta ray (n=123) and bullnose ray (n=87), although a further 1,975 individuals were recorded as cownose/bullnose ray (see Table 11).

Large Bony Fish

There were 1,792 large bony fish recorded during the summer 2017 survey. Of these only 394 sunfish species were identified. All other large bony fish remain requiring identification.

Fish Shoals

740 Fish Shoals were recorded in the summer 2017 survey.

Endangered Species

There were potentially 1,177 animals representing state or federally threatened or endangered species recorded (Table 12). The conservative approach to identifications of *Sterna* tern (n=13) possibly representing roseate tern, and hammerhead unid (n= 232) possibly representing scalloped hammerhead may inflate the number of endangered species actually found in the area. Individuals positively identified as endangered species were fin whale (n=4), sei whale (n=1), scalloped hammerhead shark (n=213), and all of the turtle species present (see Tables 8, 9, and 10).

Table 12. Threatened and Endangered Species Identified

Species	# Individuals
Sterna Tern	
species unknown	13
Black Tern (state listed)	1
Whale	
Fin Whale	4
Sei Whale	1
Sperm Whale	3
Turtle	
Leatherback Turtle	5
Loggerhead Turtle	649
Loggerhead/Kemp's Turtle	20
Kemp's Ridley Turtle	24
species unknown	13
Shark	
Whale Shark	11
Hammerhead (unid.)	232
Scalloped Hammerhead	213
Total	**1,189**

Flight Activity

Avian fight height data will be presented in detail in the annual report. However, here we present a brief overview of flight altitude assessment success. The number of flying individuals by group and by species is presented in Table 7. Of these, we were able to calculate flight heights for

- 1 (100%) of 1 flying lesser black-backed gull
- 3 (100%) of 3 flying semipalmated plover
- 1 (50%) of 2 flying gull species unknown-large
- 70 (48%) of 146 flying great shearwater
- 163 (48%) of 338 flying Wilson's storm-petrels
- 28 (45%) of 62 flying Cory's shearwater
- 1 (33%) of 3 flying shearwater species unknown-small
- 2 (15%) of 13 flying shearwater species unknown-large
- 2 (3%) of 63 flying red/red-necked phalaropes

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 summer 2017 survey.

Figure 1. *Sterna* Tern distribution during the 2017 Summer survey.
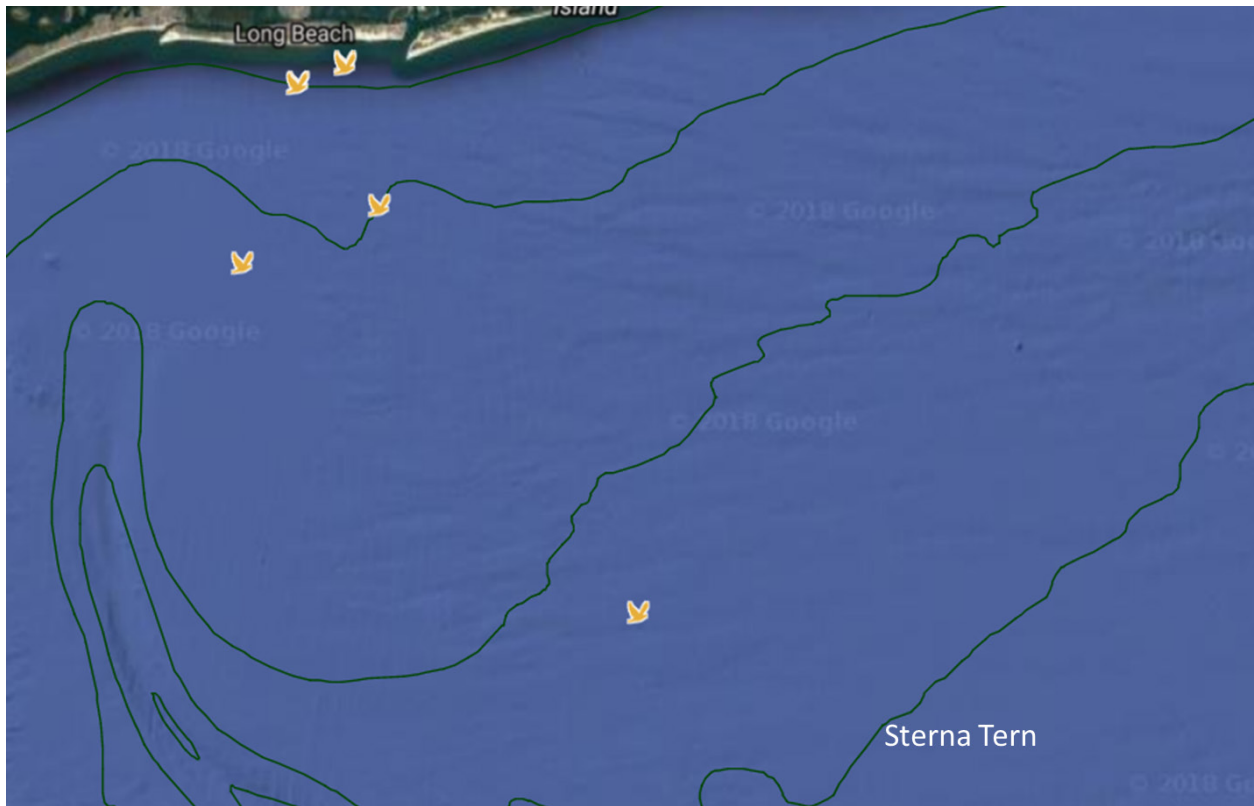
Figure 2. Fin Whale and Sei Whale distribution during the 2017 Summer survey.
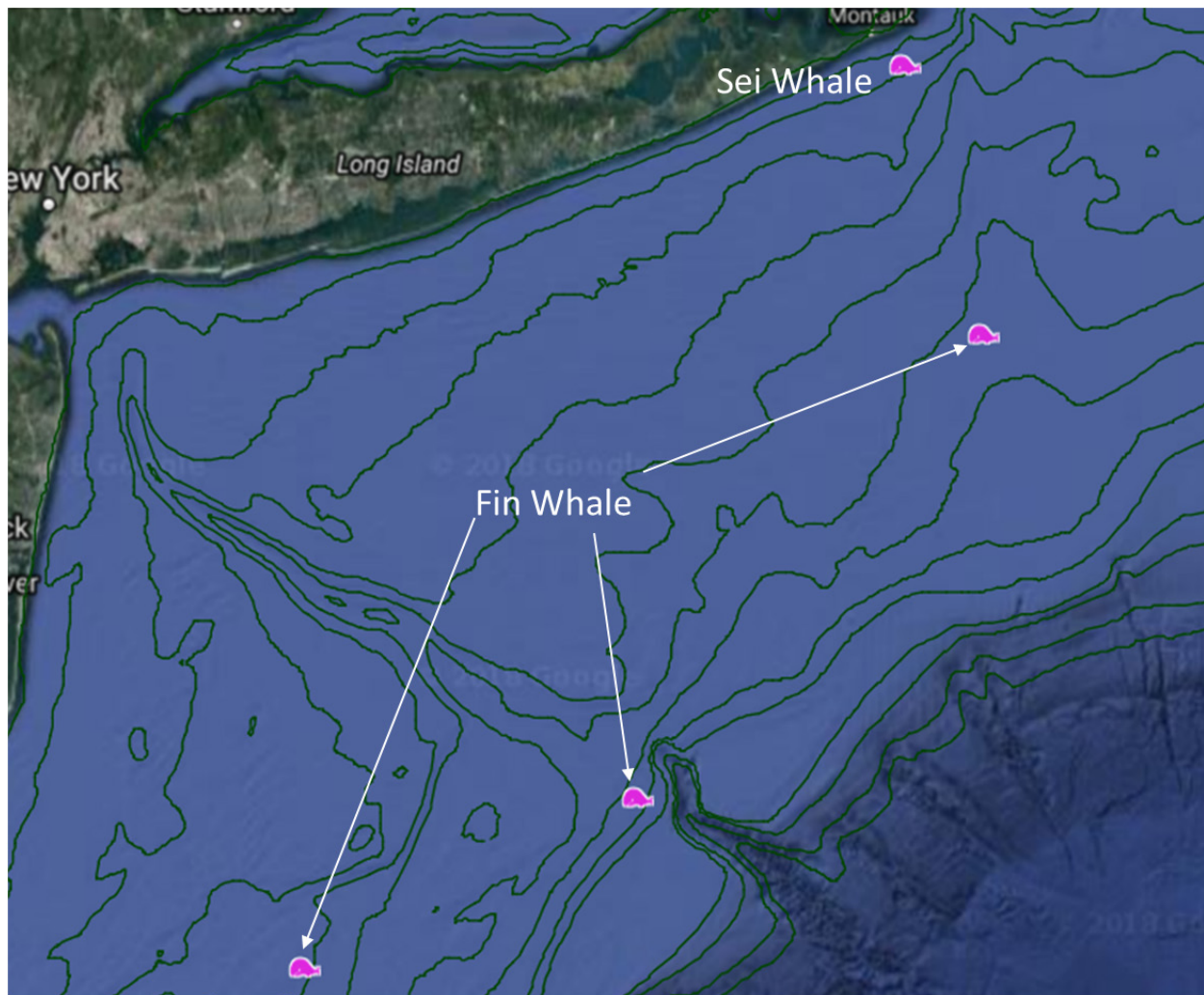
Figure 3. Sperm Whale distribution during the 2017 Summer survey.
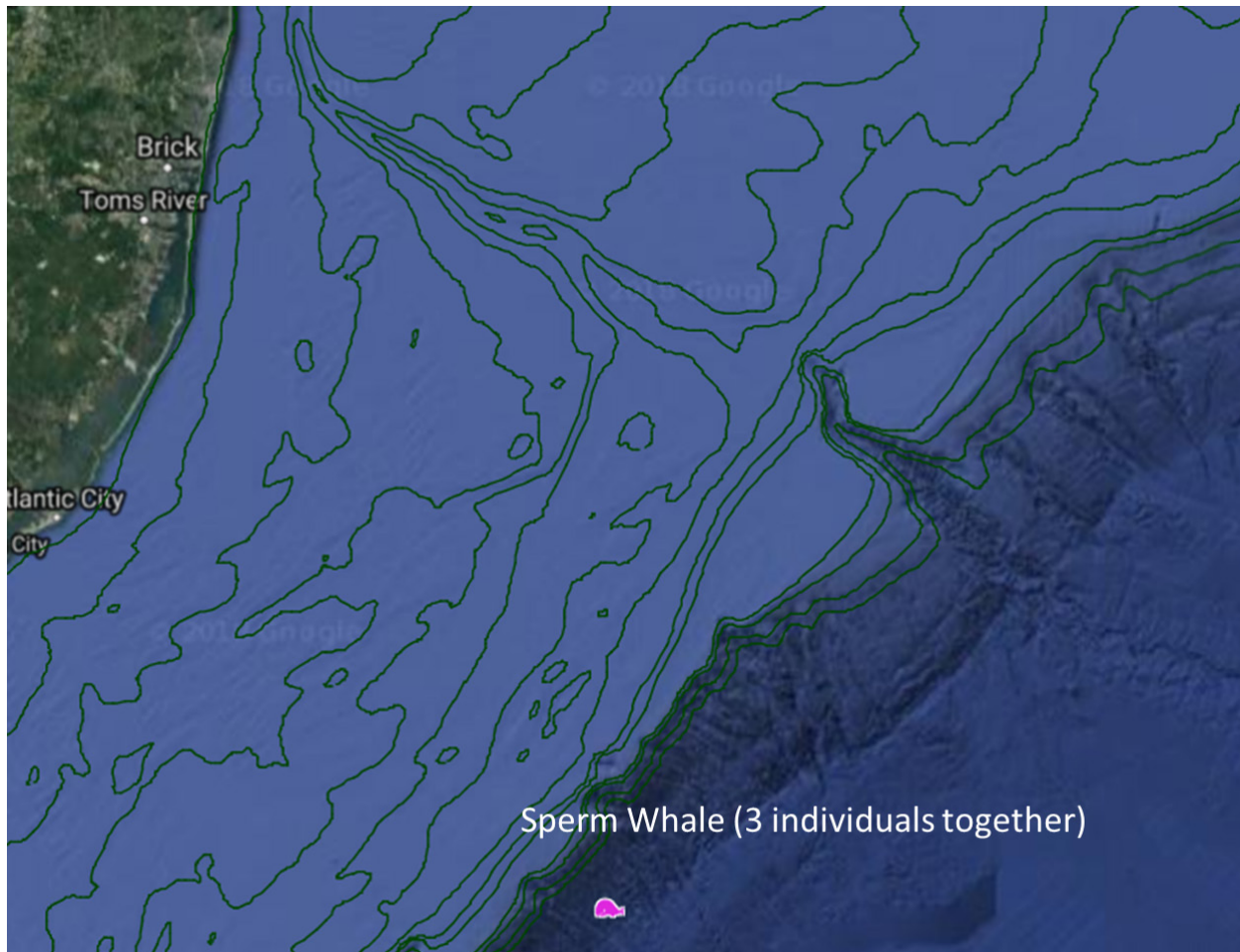
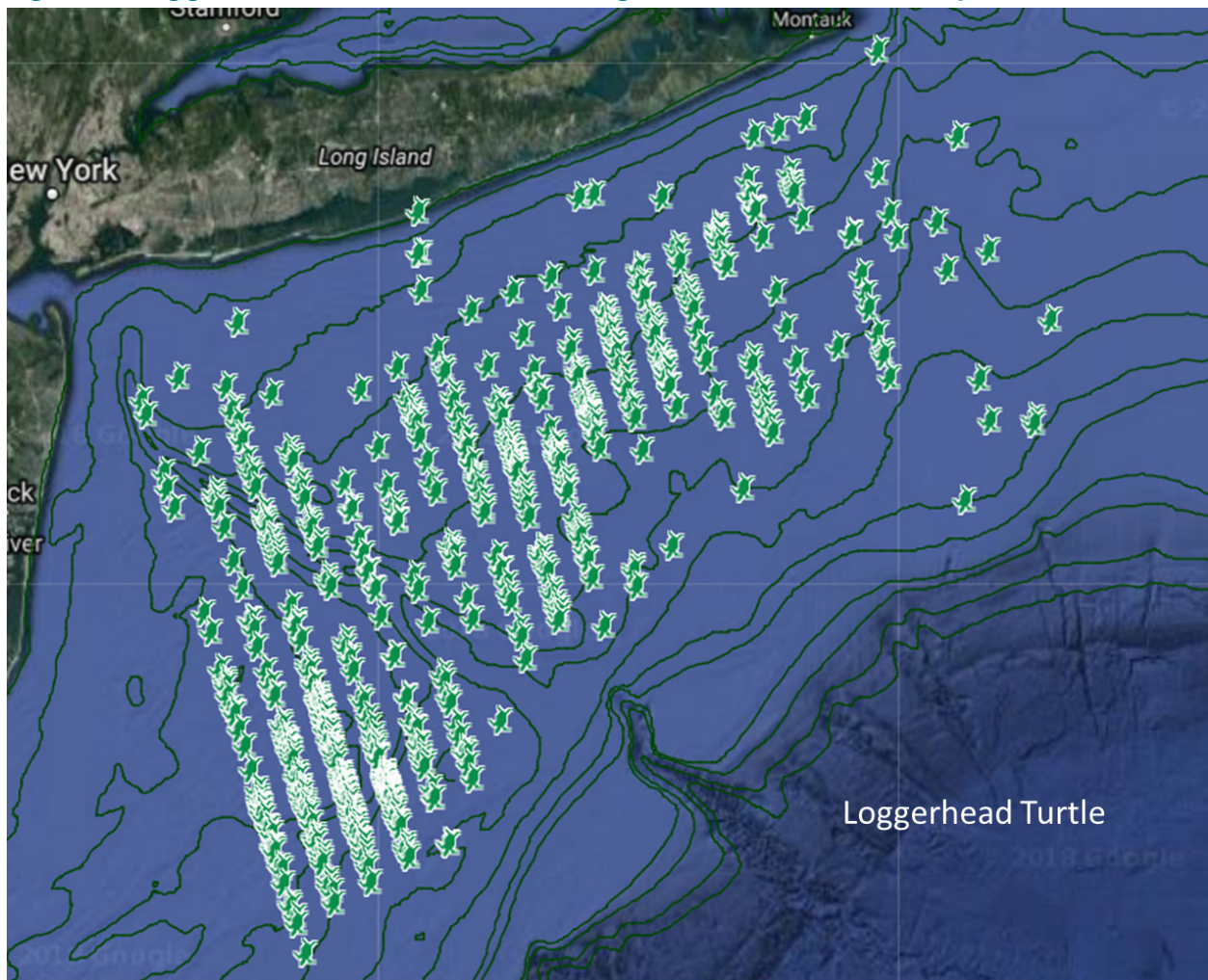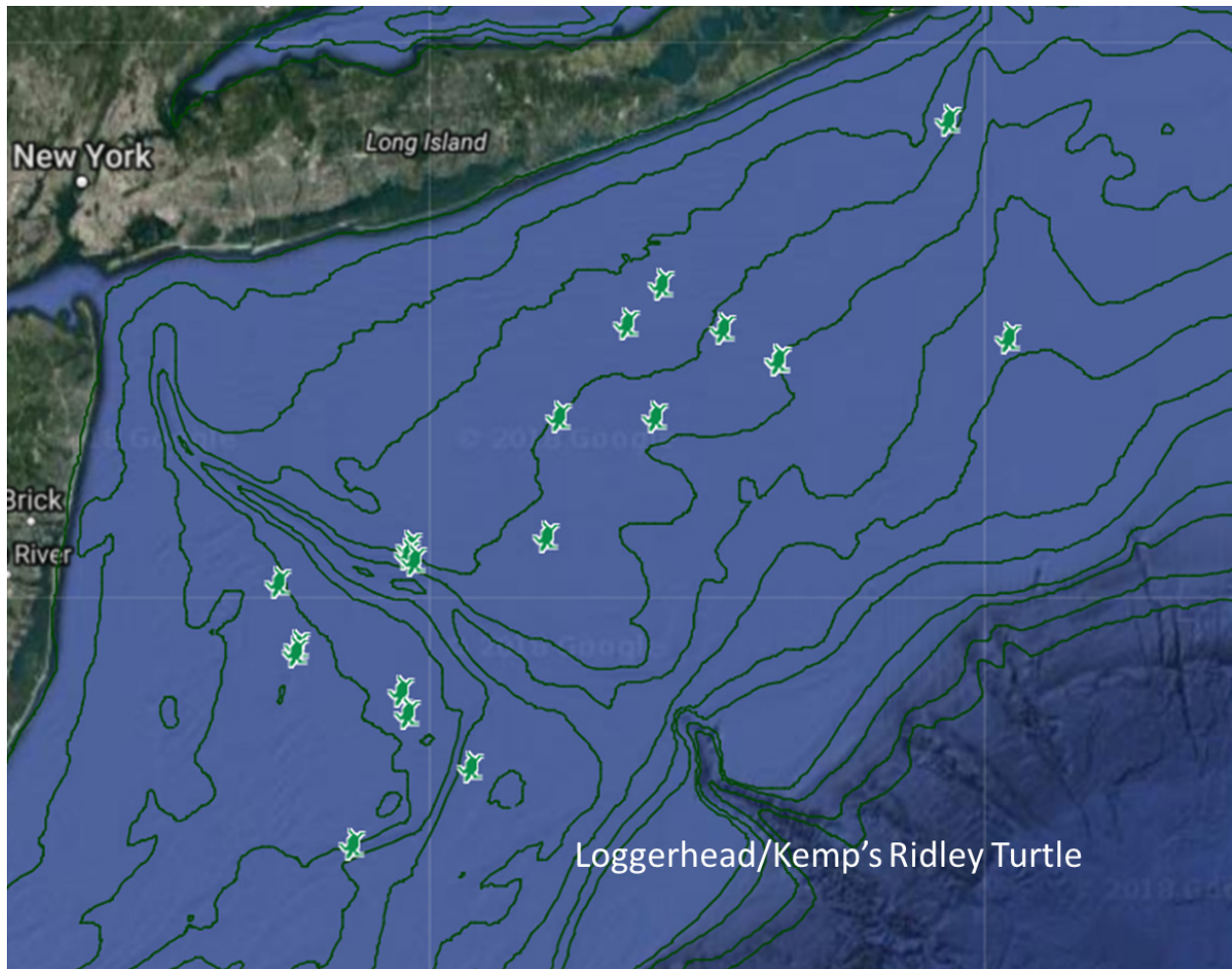**Figure 4. Kemp's Ridley Turtle distribution during the 2017 Summer survey.**
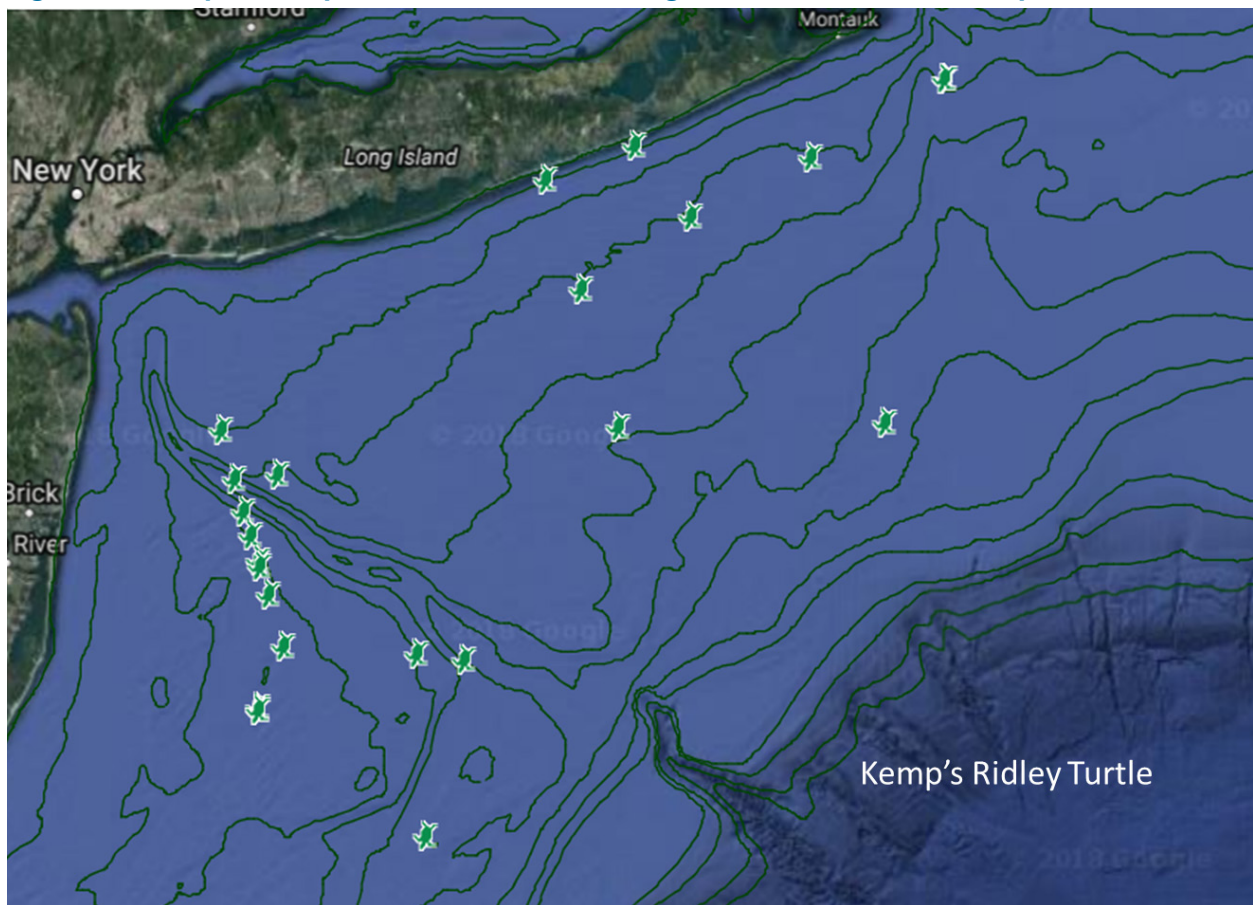
Figure 5. Loggerhead Turtle distribution during the 2017 Summer survey.

Figure 6. Loggerhead/Kemp's Ridley Turtle distribution during the 2017 Summer survey.

Loggerhead/Kemp's Ridley Turtle

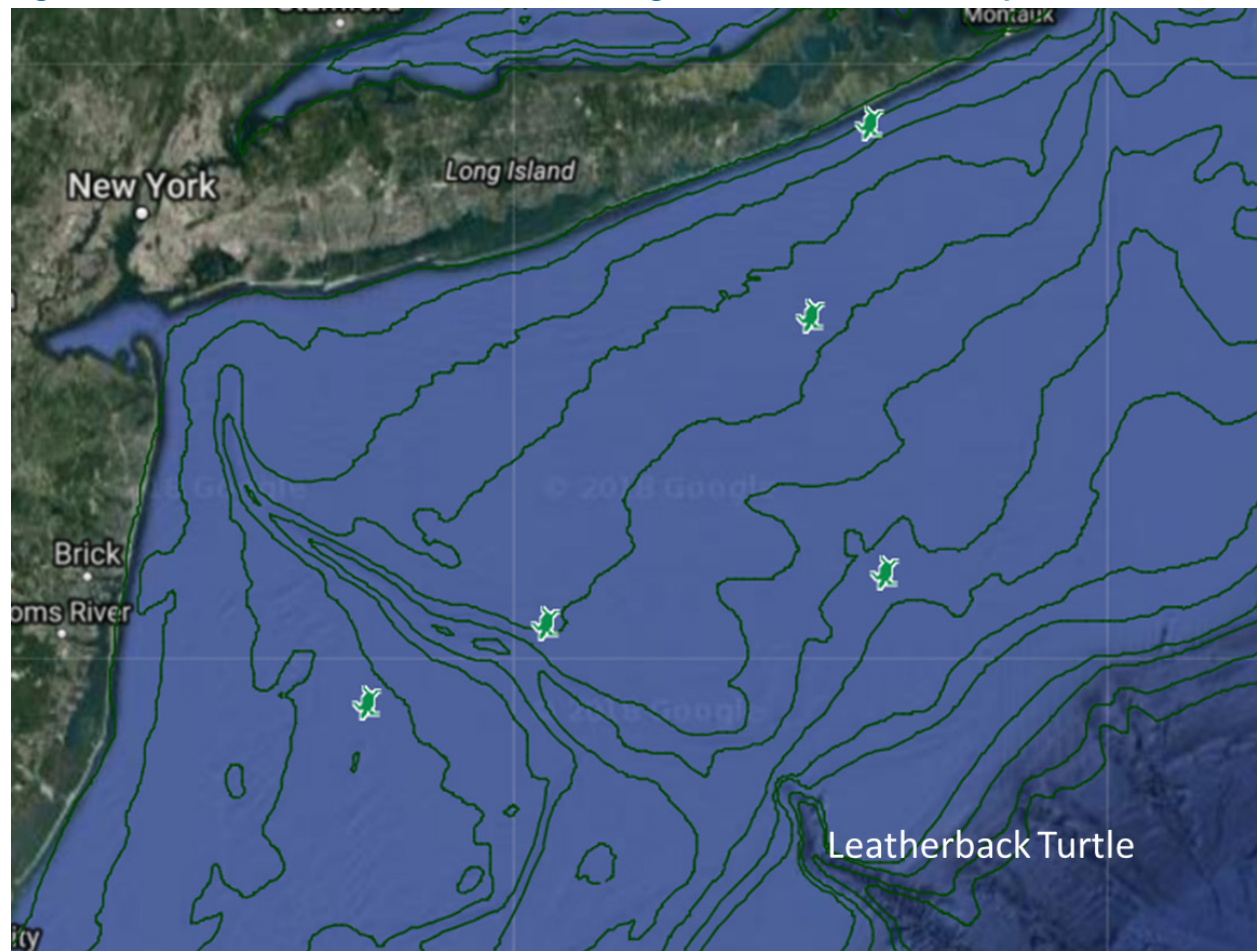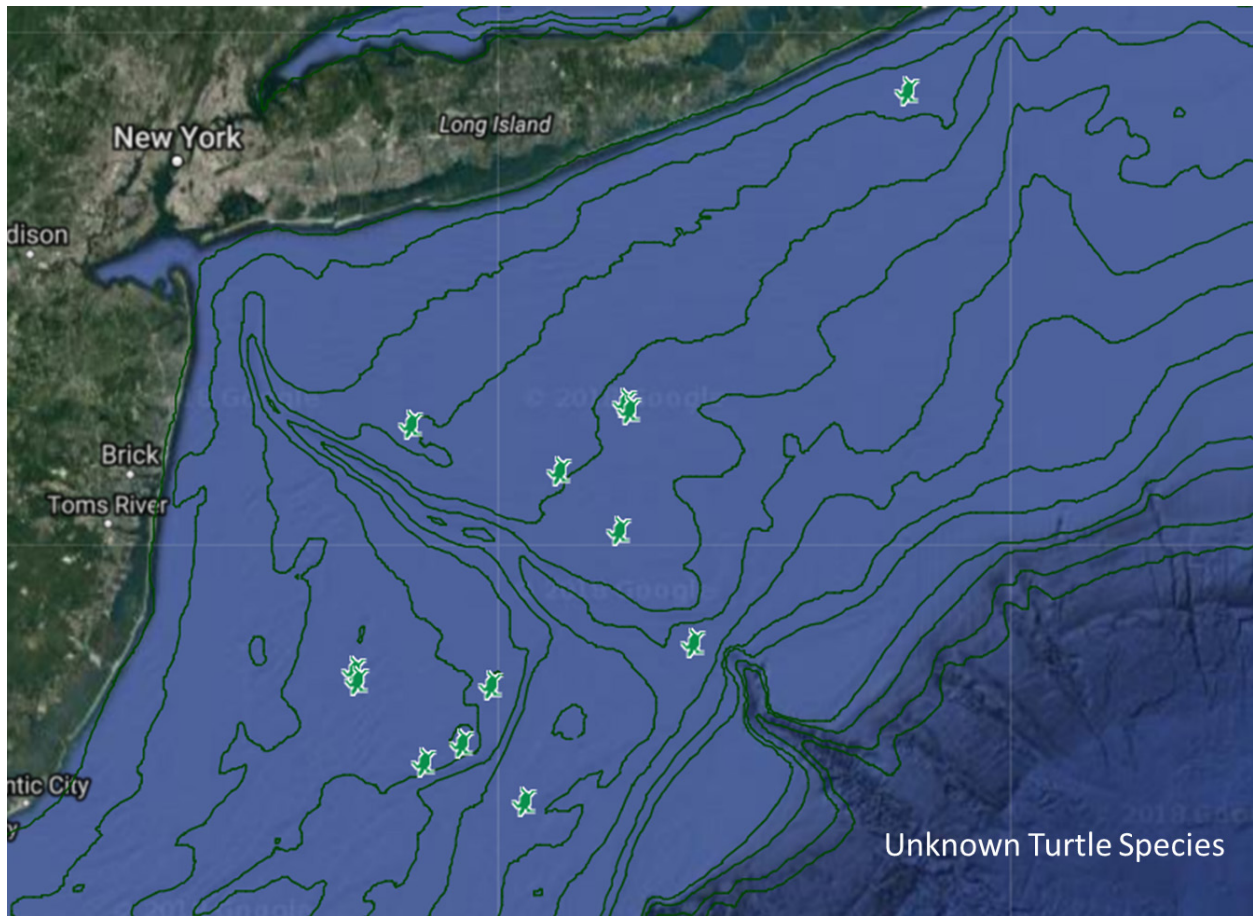**Figure 7. Leatherback Turtle distribution during the 2017 Summer survey**
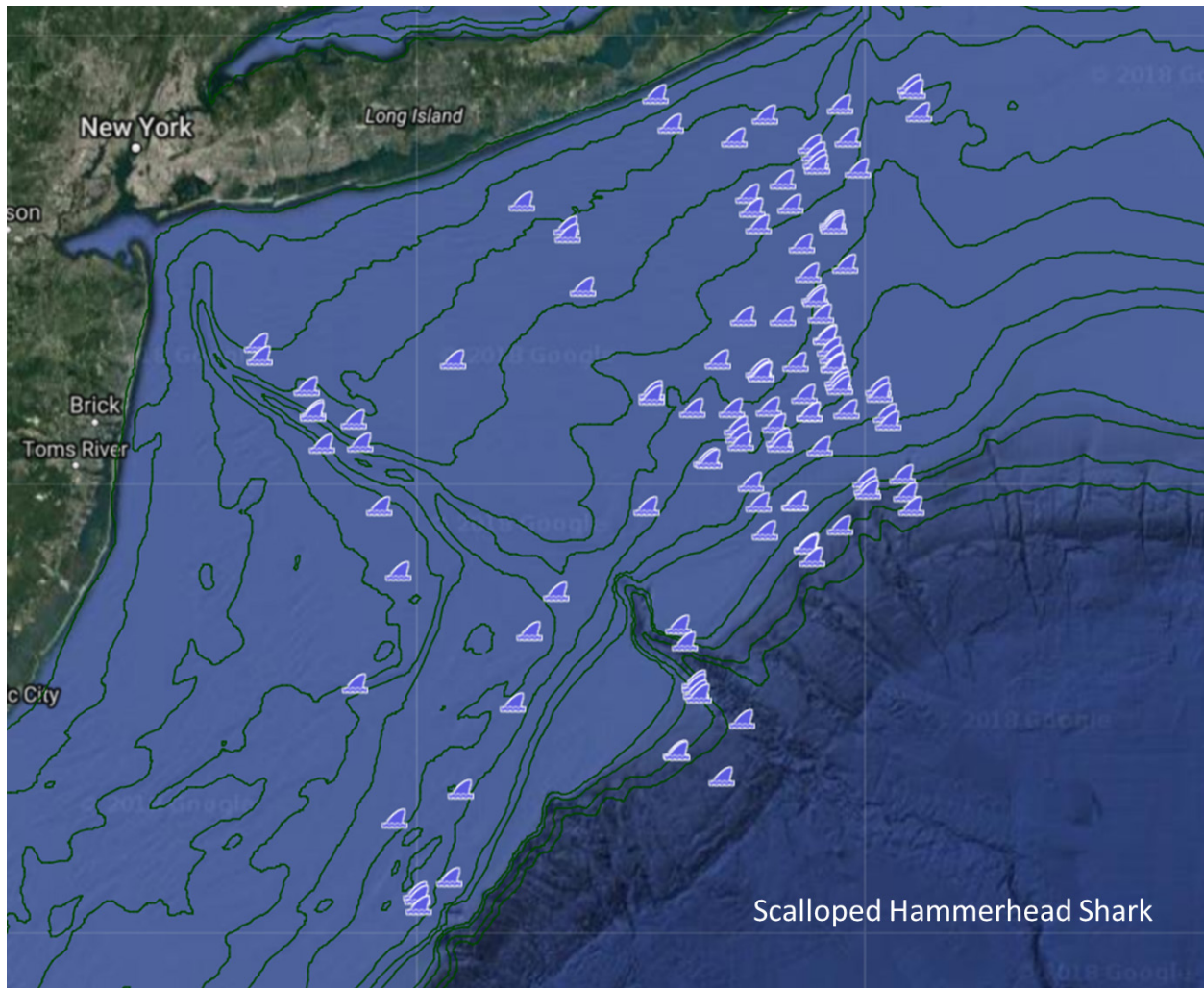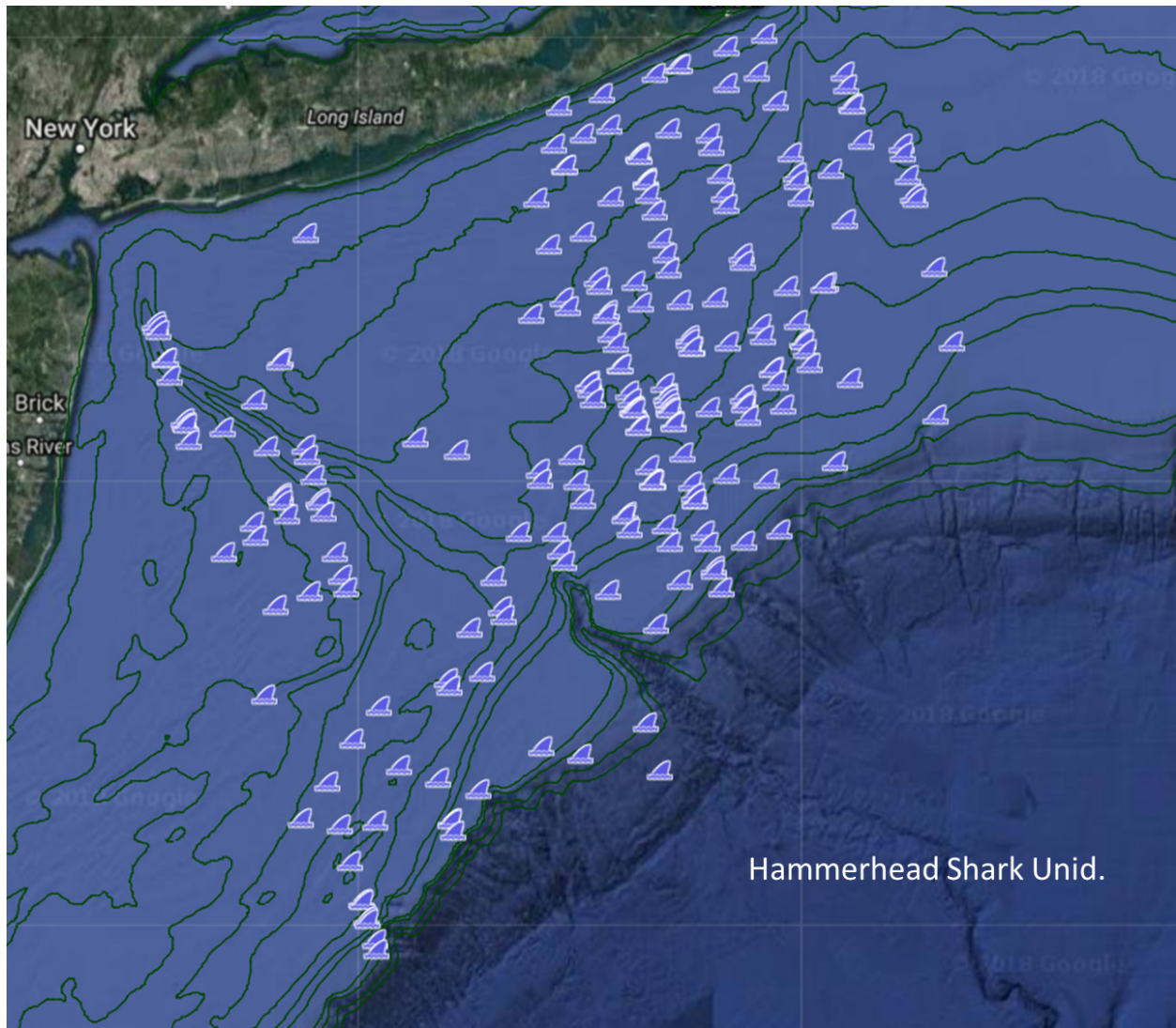
Figure 8. Turtle Unknown Species distribution during the 2017 Summer survey.

Figure 9. Scalloped Hammerhead Shark distribution during the 2017 Summer survey.

Figure 10.   Hammerhead Shark Unid. distribution during the 2017 Summer survey.

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

Common Name	Scientific Name	Class	Family
Common Loon	*Gavia immer*	Aves	Gaviidae
Black-capped Petrel	*Pterodroma hasitata*	Aves	Procellariidae
Cory's Shearwater	*Calonectris diomedea*	Aves	Procellariidae
Great Shearwater	*Ardenna gravis*	Aves	Procellariidae
Sooty Shearwater	*Ardenna grisea*	Aves	Procellariidae
Wilson's Storm-Petrel	*Oceanites oceanicus*	Aves	Hydrobatidae
Leach's Storm-Petrel	*Oceanodroma leucorhoa*	Aves	Hydrobatidae
Northern Gannet	*Morus bassanus*	Aves	Sulidae
Semipalmated Plover	*Charadrius semipalmatus*	Aves	Charadriidae
Red-necked Phalarope	*Phalaropus lobatus*	Aves	Scolopacidae
Red/Red-necked Phalarope	*Phalaropus unid.*	Aves	Scolopacidae
Murre/Razorbill	*Uria/Alca unid.*	Aves	Alcidae
Laughing Gull	*Leucophaeus atricilla*	Aves	Laridae
Ring-billed Gull	*Larus delawarensis*	Aves	Laridae
Herring Gull	*Larus argentatus*	Aves	Laridae
Lesser Black-backed Gull	*Larus fuscus*	Aves	Laridae
Great Black-backed Gull	*Larus marinus*	Aves	Laridae
Black Tern	*Chlidonias niger*	Aves	Laridae
Common Nighthawk	*Chordeiles minor*	Aves	Caprimulgidae
Fin Whale	*Balaenoptera physalus*	Mammalia	Balaenopteridae
Sei Whale	*Balaenoptera borealis*	Mammalia	Balaenopteridae
Dwarf Sperm Whale	*Kogia sima*	Mammalia	Physeteridae
Sperm Whale	*Physeter macrocephalus*	Mammalia	Physeteridae
Common Dolphin	*Delphinus delphis*	Mammalia	Delphinidae
Pilot Whale (unid.)	*Globicephala (unid.)*	Mammalia	Delphinidae
Short-finned Pilot Whale	*Globicephala macrorhynchus*	Mammalia	Delphinidae

Common Name	Scientific Name	Class	Family
Risso's Dolphin	*Grampus griseus*	Mammalia	Delphinidae
Rough-toothed dolphin	*Steno bredanensis*	Mammalia	Delphinidae
Striped Dolphin	*Stenella coeruleoalba*	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
Whale Shark	*Rhincodon typus*	Chondrichthyes	Rhincodontidae
Sand Tiger Shark	*Carcharias taurus*	Chondrichthyes	Odontaspididae
Thresher Shark	*Alopias vulpinus*	Chondrichthyes	Alopiidae
Basking Shark	*Cetorhinus maximus*	Chondrichthyes	Cetorhinidae
Great White Shark	*Carcharodon carcharias*	Chondrichthyes	Lamnidae
Shortfin Mako	*Isurus oxyrinchus*	Chondrichthyes	Lamnidae
Sandbar Shark	*Carcharhinus plumbeus*	Chondrichthyes	Carcharhinidae
Blue Shark	*Prionace glauca*	Chondrichthyes	Carcharhinidae
Tiger Shark	*Galeocerdo cuvier*	Chondrichthyes	Carcharhinidae
Dusky Shark	*Carcharhinus obscurus*	Chondrichthyes	Carcharhinidae
Smooth Hammerhead	*Sphyrna zygaena*	Chondrichthyes	Sphyrnidae
Great Hammerhead	*Sphyrna mokarran*	Chondrichthyes	Sphyrnidae
Scalloped Hammerhead	*Sphyrna lewini*	Chondrichthyes	Sphyrnidae
Giant Manta Ray	*Manta birostris*	Chondrichthyes	Mobulidae
Bullnose Ray	*Myliobatis freminvillii*	Chondrichthyes	Myliobatidae
Cownose Ray	*Rhinoptera bonasus*	Chondrichthyes	Rhinopteridae
Ocean Sunfish	*Mola Mola*	Actinopterygii	Molidae