New Jersey Department of Environmental Protection
Baseline Studies

April – June 2008 Quarterly Report

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LIST OF ACRONYMS AND ABBREVIATIONS

%	Percent
µW	Microwatt(s)
ADCP	Acoustic Doppler Current Profiler
BSS	Beaufort Sea State
CDOM	Colored Dissolved Organic Matter
cm^2	Square Centimeter(s)
CTD	Conductivity-Temperature-Depth
ft	Foot(Feet)
GB	Gigabyte(s)
GMI	Geo-Marine, Inc.
hr	Hour
kHz	Kilohertz
km	Kilometer(s)
kt	Knot(s)
lon-lat	Longitude-Latitude
mbar	Millibar(s)
mg/L	Milligram(s) per Liter
mi	Mile(s)
min	Minute(s)
NJDEP	New Jersey Department of Environmental Protection
nm	Nanometer(s)
NM	Nautical Mile(s)
^oC	Degree(s) Celsius
PAR	Photosynthetically Active Radiation
PSU	Practical Salinity Unit(s)
QAQC	Quality Assurance/Quality Control
QAWP	Quality Assurance Work Plan
s	Second(s)
SMS	Surface Mapping System
SST	Sea Surface Temperature
TI-VPR	Thermal Imaging-Vertically Pointing Radar

INTRODUCTION

This quarterly progress report provides an overview of avian, marine mammal, sea turtle, and pinniped studies conducted for the New Jersey Department of Environmental Protection (NJDEP) Baseline Studies Project from April through June 2008. Survey effort and a brief overview of survey results are presented for avian, marine mammals, sea turtles, and pinnipeds. We also discuss the acoustic monitoring task. Dates for the occurrence of each field task are presented in **Table 1.1**.

Table 1-1
Dates and Status of Tasks Conducted during this Reporting Period

Task	April	May	June
Ship Offshore Avian Survey	09-10/12-14	07-08/10-11	13-16
Ship Offshore Mammal Survey	09-10/12-14	07-08/10-11	13-16
Aerial Avian Survey	16	Not Scheduled	Not Scheduled
Aerial Mammal Survey	17	15 (Incomplete)*	Not Conducted
Coastal Avian Survey	18	23	20
Radar Sites	Weather Delay #13: 03-13 #19: 13-19 Weather Delay #26: 24-30 #23: 01-x	#23: 01-07 #17: 07-11; left early due to weather	No data collection was scheduled for June
Thermal Sites	#13: 26.5 hrs #19: 36 hrs #26: 28 hrs Several hours of fog/rain delay	#23: 51 hrs #17: 21.5 hrs Several hours of fog/rain delay	No data collection was scheduled for June
Acoustic Surveys	Buoys collecting data	Buoys collecting data	17 – recovered 4 pop-up buoys 24 – redeployment of 4 pop-up buoys
Oceanographic Surveys	09-10/12-14	07-08/10-11	12-17

* Airplane crashed during survey

1.0 QUALITY ASSURANCE WORK PLAN

The draft Quality Assurance Work Plan (QAWP) was submitted on October 24, 2007. NJDEP comments on the draft were addressed and a revised QAWP submitted on January 04, 2008 prior to the initiation of field work. Additional comments were addressed and a revised QAWP submitted on February 08, 2008 and then again on June 16, 2008 after secondary revisions. Changes and comments resulting from the additional funding received will be addressed and a revised QAWP submitted in the next quarter.

2.0 LITERATURE REVIEW

We pulled all of the literature within the Geo-Marine, Inc. (GMI) library that pertains to marine mammals, sea turtles, fisheries, habitats, oceanography and other marine resources for the northeast Atlantic and are currently evaluating all the literature for specific application to New Jersey (Refer to **Table 2.1** for literature totals as of June 27, 2008). Searches for additional relevant scientific literature and data will be conducted during the next quarter. As literature and data are identified, documents are obtained in hard or electronic format and reviewed, key-worded, and catalogued in EndNote. The compiled list of literature reviewed to date can be found in **Appendix A**. This is an on going process and will continue throughout the project.

Table 2-1
New Jersey Literature Review (as of June 27, 2008)

Categories	Number of References	Appendix
Fishes	146	A-1
Marine Birds	35	A-2
Marine Mammals	133	A-3
Offshore Wind Farms	43	A-4
Sea Turtles	51	A-5
Total (June 27, 2008)	**408**	

3.0 DIGITAL DATA COMPILATION

The Principal Investigator for this task, Peter Gehring, is compiling digital data from GMI data banks and geospatial data from numerous sources. These data are currently under review for applicability for this project. We will provide a list of data and geospatial data that we have obtained in the next quarterly report.

4.0 AVIAN PREDICTIVE/PROBABILITY MODEL

No work has been conducted on the task.

5.0 BASELINE SURVEYS

5.1 SHIPBOARD OFFSHORE SURVEYS

5.1.1 Avian

5.1.1.1 Survey Effort

Shipboard avian survey lines for the April, May, and June surveys were conducted along the same transect lines as the marine mammal/sea turtle lines but may differ due to varying sea state conditions/requirements.

5.1.1.1.1 April 2008

Ship avian surveys were initiated on 09 April. There were four hour reductions to the potential survey efforts on 09 and 10 April because of poor visibility due to dense fog. The ship survey was cancelled on 11 April because of visibility due to fog. The surveys resumed on 12 April and were completed on 14 April. The ship transects covered 428 nautical miles (NM) (792 kilometers [km]; **Figure 5.1-1**). On-effort survey time totaled 46.32 hours (hrs).

5.1.1.1.2 May 2008

Ship avian surveys were started on 07 May. There were four hour reductions to the potential survey efforts on 07 and 08 May and no efforts attempted on 09 May due to gale force winds (>20 knots [kt]) and high sea states (Beaufort Sea State [BSS] ≥6). Shipboard surveys resumed on 10 May and concluded 11 May. The ship transects covered 346 NM (641 km; **Figure 5.1-2**). On-effort survey time totaled 38 hrs.

5.1.1.1.3 June 2008

Ship avian surveys commenced on 13 June and were completed on 16 June. Survey efforts on 14 June ended early because of poor visibility due to smoke and haze that drifted on southerly winds from forest fires in North Carolina. The ship transects covered 491 NM (910 km; **Figure 5.1-3**). On-effort survey time totaled 53.53 hrs.

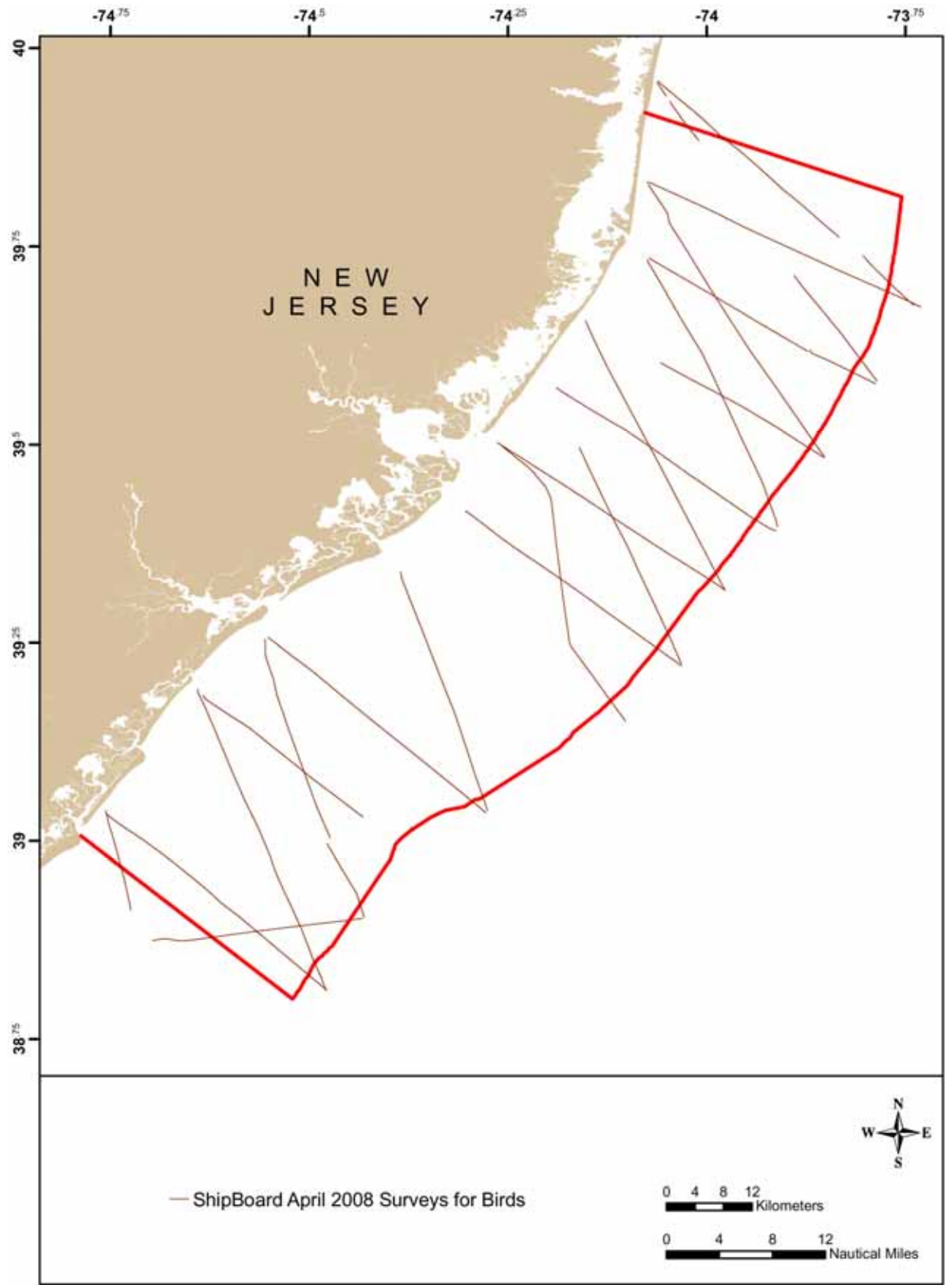

Figure 5.1-1. Shipboard Avian Survey Tracklines for April 2008.

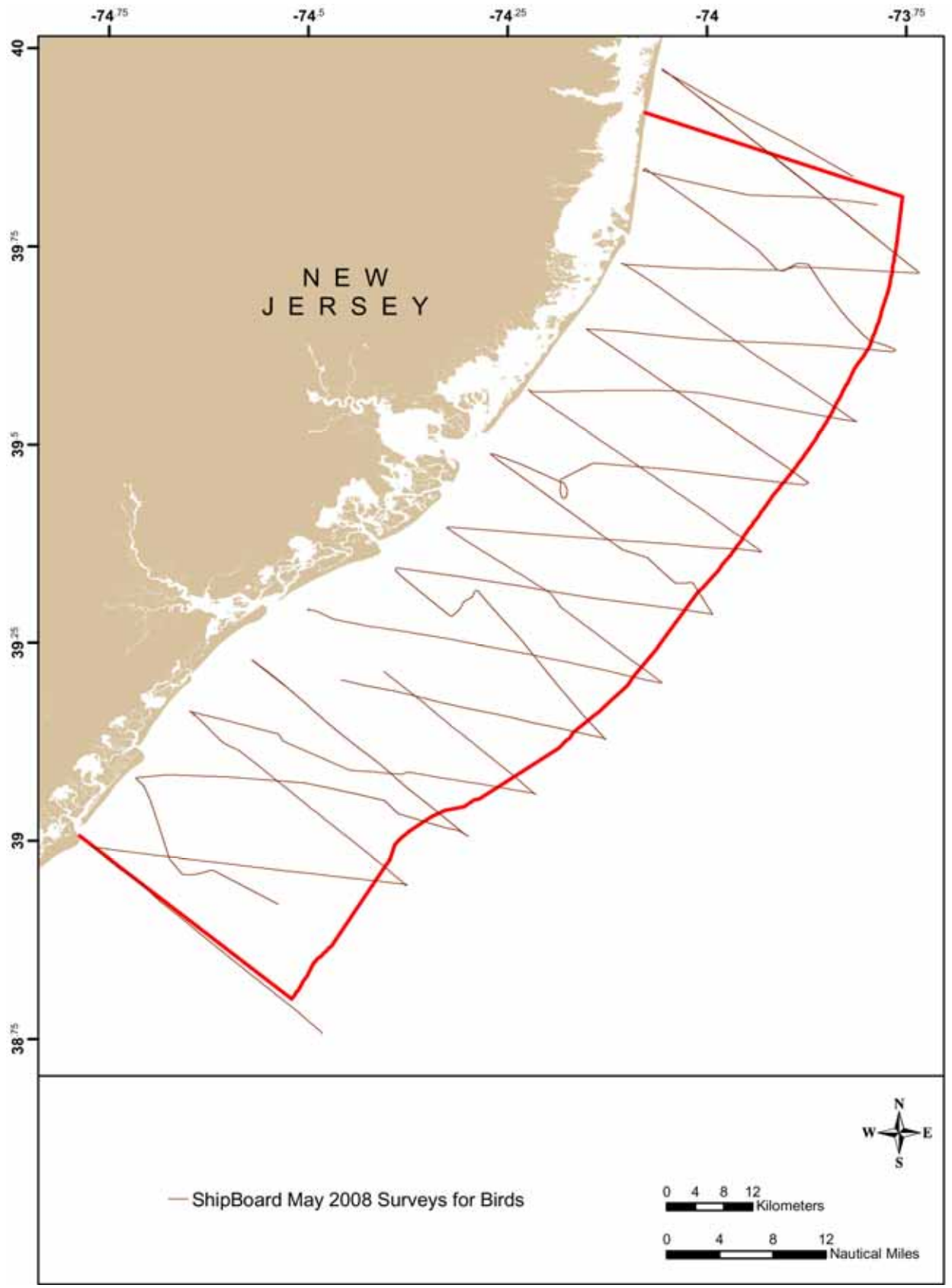

Figure 5.1-2. Shipboard Avian Survey Tracklines for May 2008.

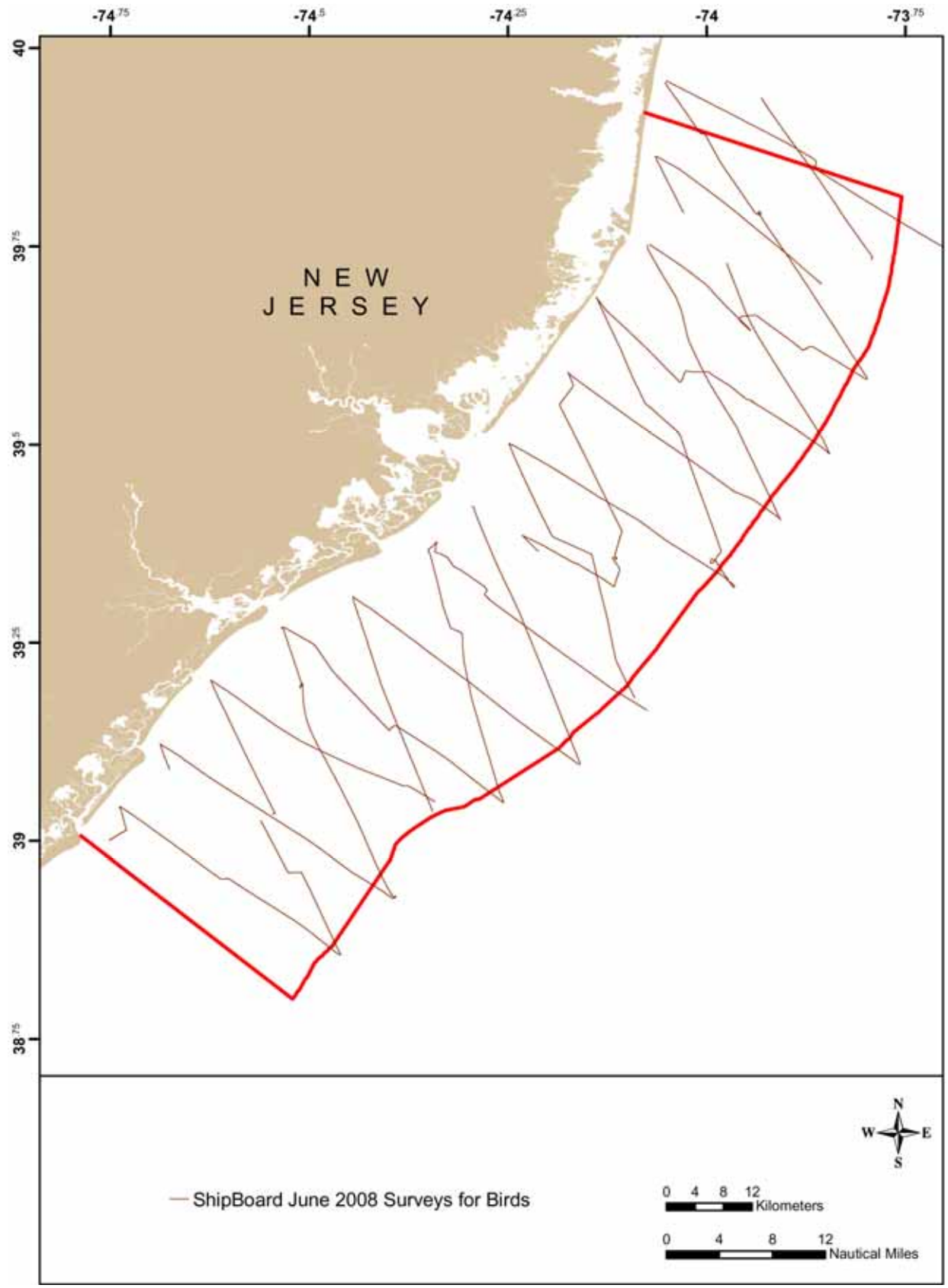

Figure 5.1-3. Shipboard Avian Survey Tracklines for June 2008.

5.1.1.2 Survey Results

5.1.1.2.1 Avian species occurrence

All survey data that were collected are presented in (**Table 5.1-1**). Thirty-eight species were observed during April, twenty-two during May, and seventeen during June. Birds that were not identifiable due to weather/sea state conditions, behavior, or distance were identified to the lowest identifiable form or taxon (genus, family, or unknown). Several species (e.g., Turkey Vulture and various passerines) were only observed on or over land when the ship was nearshore. Two state listed avian species (Royal Tern and Least Tern) were observed during the surveys.

5.1.1.2.2 Avian abundance and composition

The total monthly number of individuals observed decreased from April (11,612), to May (2,660), and to June (1,367; **Table 5.1-2**). This decrease is probably due to the departure of winter visitors and the completion of spring migration. The number of individuals during April (11,612) was greater than in March (9,265); this further indicates the effect of spring migration, which peaks for water birds during early April in New Jersey; loons, gannets, scoters, and large gulls comprised the majority of the decrease in numbers from April to June.

Northern gannet was the most abundant species observed during April and May (24.05 percent [%] and 31.09% of the total species composition of the two months respectively); Wilson's Storm-Petrel was the most numerous species in June (see **Table 5.1-2**). Scoters made up 51.39% (5,967) of the total birds counted during April. Double-crested Cormorant, Herring Gull, Common Loon, and Common Tern were the 2nd to 5th most abundant species during May. Common Tern, Northern Gannet, Laughing Gull, and Cory's Shearwater were the 2nd to 5th most abundant species during June (see **Table 5.1-2**).

Table 5.1-1
Avian Species* Observed during April through June 2008 Shipboard Surveys

Family Common Name, *Scientific name*	**April**	**May**	**June**
Gaviidae (loons)			
Red-throated Loon, *Gavia stellata*	X	X	
Common Loon, *Gavia immer*	X	X	X
Podicipedidae (grebes)			
Horned Grebe, *Podiceps auritus*	X		
Procellariidae (petrels and shearwaters)			
Cory's Shearwater, *Calonectris diomedea*			X
Greater Shearwater, *Puffinus gravis*			X
Sooty Shearwater, *Puffinus griseus*			X
Manx Shearwater, *Puffinus puffinus*		X	
Hydrobatidae (storm-petrels)			
Wilson's Storm-Petrel, *Oceanites oceanicus*			X
Phalacrocoracidae (cormorants)			
Double-crested Cormorant, *Phalacrocorax auritus*	X	X	X
Sulidae (gannets)			
Northern Gannet, *Morus bassanus*	X	X	X
Ardeidae (bitterns, egrets, and herons)			
Great Blue Heron, *Ardea herodias*	X		
Anatidae (geese, ducks)			
(Atlantic) Brant, *Branta bernicla*	X		
Canada Goose, *Branta canadensis*	X		
Snow Goose, *Chen caerulescens*	X		
American black duck, *Anas rubripes*	X		
Gadwall, *Anas strepera*	X		
Northern Pintail, *Anas acuta*	X		
Green-winged Teal, *Anas crecca*	X		
Scaup (unknown), Lesser Scaup, *Aythya marila*/Greater Scaup, *A. affinis*	X		
Surf Scoter, *Melanitta perspicillata*	X		X
Black Scoter, *Melanitta nigra*	X	X	
White-winged Scoter, *Melanitta fusca*	X		
Long-tailed Duck, *Clangula hyemalis*	X		
Bufflehead, *Bucephala albeola*	X		
Red-breasted Merganser, *Mergus serrator*	X	X	
Accipitridae (harriers, eagles, kites, hawks, and osprey)			
Osprey, *Pandion haliaetus*	X	X	
Northern Harrier, *Circus cyaneus*		X	
Scolopacidae (sandpipers)			
Least Sandpiper, *Calidris minutilla*		X	
Laridae (gulls)			
Parasitic Jaeger, *Stercorarius parasiticus*			X
Little Gull, *Larus minutus*	X		
Bonaparte's Gull, *Larus philadelphia*	X		
Laughing Gull, *Larus atricilla*	X	X	X
Ring-billed Gull, *Larus delawarensis*			
Herring Gull, *Larus argentatus*	X	X	X
Lesser Black-backed Gull, *Larus fuscus*	X	X	
Great black-backed Gull, *Larus marinus*	X	X	X
Royal Tern, *Sterna maxima*	X	X	X
Common Tern, *Sterna hirundo*	X	X	X
Forster's Tern, *Sterna forsteri*	X	X	X
Least Tern, *Sterna antillarum*		X	
Alcidae (alcids)			
Dovekie, *Alle alle*	X		
Razorbill, *Alca torda*	X		

* All water birds identified to species during shipboard surveys were included

Table 5.1-2
Abundance and Percent Composition* of Avian Species Observed during April through June 2008 Shipboard Surveys

Family	April		May		June	
Common Name, *Scientific name*	Number	% Composition	Number	% Composition	Number	% Composition
Gaviidae (loons)						
Red-throated Loon, *Gavia stellata*	564	4.9%	40	1.5%		
Common Loon, *Gavia immer*	271	2.3%	252	9.5%	3	0.2%
Loon (unknown), *Gavia spp.*	20	0.2%				
Podicipedidae (grebes)						
Horned Grebe, *Podiceps auritus*	2	<0.1%				
Procellariidae (petrels and shearwaters)						
Cory's Shearwater, *Calonectris diomedea*					72	5.3%
Greater Shearwater, *Puffinus gravis*					1	0.1%
Sooty Shearwater, *Puffinus griseus*					5	0.4%
Manx Shearwater, *Puffinus puffinus*			2	0.1%		
Hydrobatidae (storm-petrels)						
Wilson's Storm-Petrel, *Oceanites oceanicus*					400	29.3%
Storm-petrel (unknown)					2	0.1%
Phalacrocoracidae (cormorants)						
Double-crested Cormorant, *Phalacrocorax auritus*	296	2.5%	480	18.0%	1	0.1%
Sulidae (gannets and boobies)						
Northern Gannet, *Morus bassanus*	2793	24.1%	827	31.1%	245	17.9%
Ardeidae (bitterns, egrets, and herons)						
Great Blue Heron, *Ardea herodias*	18	0.2%				
Anatidae (swans,geese, and ducks)						
(Atlantic) Brant, *Branta bernicla*	54	0.5%				
Canada Goose, *Branta canadensis*	4	<0.1%				
Snow Goose, *Chen caerulescens*	10	0.1%				
American Black Duck, *Anas rubripes*	96	0.8%				
Gadwall, *Anas strepera*	1	<0.1%				
Northern Pintail, *Anas acuta*	25	0.2%				
Green-winged Teal, *Anas crecca*	1	<0.1%				
Duck (dabbling), *Anas spp.*	34	0.3%				
Scaup (unknown), Lesser Scaup, *Aythya marila*/Greater Scaup, *A. affinis*	4	<0.1%				
Duck (diving)	6	0.1%				
Surf Scoter, *Melanitta perspicillata*	2408	20.7%			1	0.1%
Black Scoter, *Melanitta nigra*	484	4.2%	141	5.3%		
White-winged Scoter, *Melanitta fusca*	8	0.1%				
Scoter (dark-winged), *Melanitta spp.*	1650	14.2%				
Scoter (unknown), *Melanitta spp.*	1425	12.3%				
Long-tailed Duck, *Clangula hyemalis*	3	<0.1%				

Table 5.1-2 (*continued*)
Abundance and Percent Composition* of Avian Species Observed during April through June 2008 Shipboard Surveys

Family	April		May		June	
Common Name, *Scientific name*	Number	% Composition	Number	% Composition	Number	% Composition
Anatidae (swans,geese, and ducks)						
Bufflehead, *Bucephala albeola*	2	<0.1%				
Red-breasted Merganser, *Mergus serrator*	19	0.2%	2	0.1%		
Duck (unknown)	102	0.9%				
Accipitridae (harriers, eagles, kites, hawks, and osprey)						
Osprey, *Pandion haliaetus*	3	<0.1%	2	0.1%		
Northern Harrier, *Circus cyaneus*			1	0.0%		
Scolopacidae (sandpipers)						
Least Sandpiper, *Calidris minutilla*			6	0.2%		
Shorebird (small)			5	0.2%		
Laridae (skuas, jaegers, gulls, terns, and skimmers)						
Parasitic Jaeger, *Stercorarius parasiticus*					3	0.2%
Little Gull, *Larus minutus*	1	<0.1%				
Bonaparte's Gull, *Larus philadelphia*	391	3.4%				
Laughing Gull, *Larus atricilla*	74	0.6%	152	5.7%	228	16.7%
Ring-billed Gull, *Larus delawarensis*	5	<0.1%				
Herring Gull, *Larus argentatus*	386	3.3%	257	9.7%	41	3.0%
Lesser Black-backed Gull, *Larus fuscus*	1	<0.1%	1	<0.1%		
Great black-backed Gull, *Larus marinus*	100	0.9%	124	4.7%	51	3.7%
Gull (large), *Larus spp.*	179	1.5%	30	1.1%	10	0.7%
Royal Tern, *Sterna maxima*	1	<0.1%	6	0.2%	2	0.1%
Common Tern, *Sterna hirundo*	2	<0.1%	185	7.0%	288	21.1%
Forster's Tern, *Sterna forsteri*	108	0.9%	56	2.1%	2	0.1%
Least Tern, *Sterna antillarum*			1	<0.1%		
Tern (small), *Sterna spp.*	3	<0.1%	64	2.4%	8	0.6%
Gull (small)/tern (unknown)	33	0.3%				
Alcidae (alcids)						
Dovekie, *Alle alle*	2	<0.1%				
Razorbill, *Alca torda*	4	<0.1%				
Other						
Non-passerine[1]	14	0.1%	4	0.2%	1	0.1%
Passerine[2]	5	<0.1%	20	0.8%	3	0.2%
Unknown			2	0.1%		
TOTAL	**11612**		**2660**		**1367**	

* All avian data recorded during the offshore surveys was used to calculate percent composition
[1] Represents vultures and other non-water bird, non-passerine spp.
[2] Represents passerine spp. recorded over land, on shore, offshore, and/or on the survey vessel

5.1.2 Marine Mammals and Sea Turtles

5.1.2.1 Survey Effort

Shipboard marine mammal/sea turtle survey lines for the April, May, and June surveys differ from avian lines due to varying sea state conditions/requirements.

5.1.2.1.1 April 2008

Marine mammal/sea turtle shipboard surveys were initiated on 09 April and concluded on 14 April. The survey was delayed on 11 April due to fog and the vessel remained on station for that day. The survey covered 547 km of on-effort trackline (**Figure 5.1-4)**.

5.1.2.1.2 May 2008

Marine mammal/sea turtle shipboard surveys were initiated on 07 May and suspended on the next day due to gale force winds and high sea states. The survey was continued on the morning of the 10th and completed on 11 May. The survey covered ~500 km of on-effort trackline (**Figure 5.1-5**).

5.1.2.1.3 June 2008

Marine mammal/sea turtle shipboard surveys were initiated on 13 June and concluded on the 16 June. A temporary delay was experienced due to smoke coverage in the study area from the forest fires in the North Carolina. The survey covered 602 km of on-effort trackline (**Figure 5.1-6**).

5.1.2.2 Survey Results

Six species were observed during the second quarter of the ship surveys along with other cetaceans (whales, dolphins, and porpoises) and hardshell turtles which could not be identified to species. All marine mammal and sea turtle species sighted during the second quarter are summarized in **Table 5.1.3**.

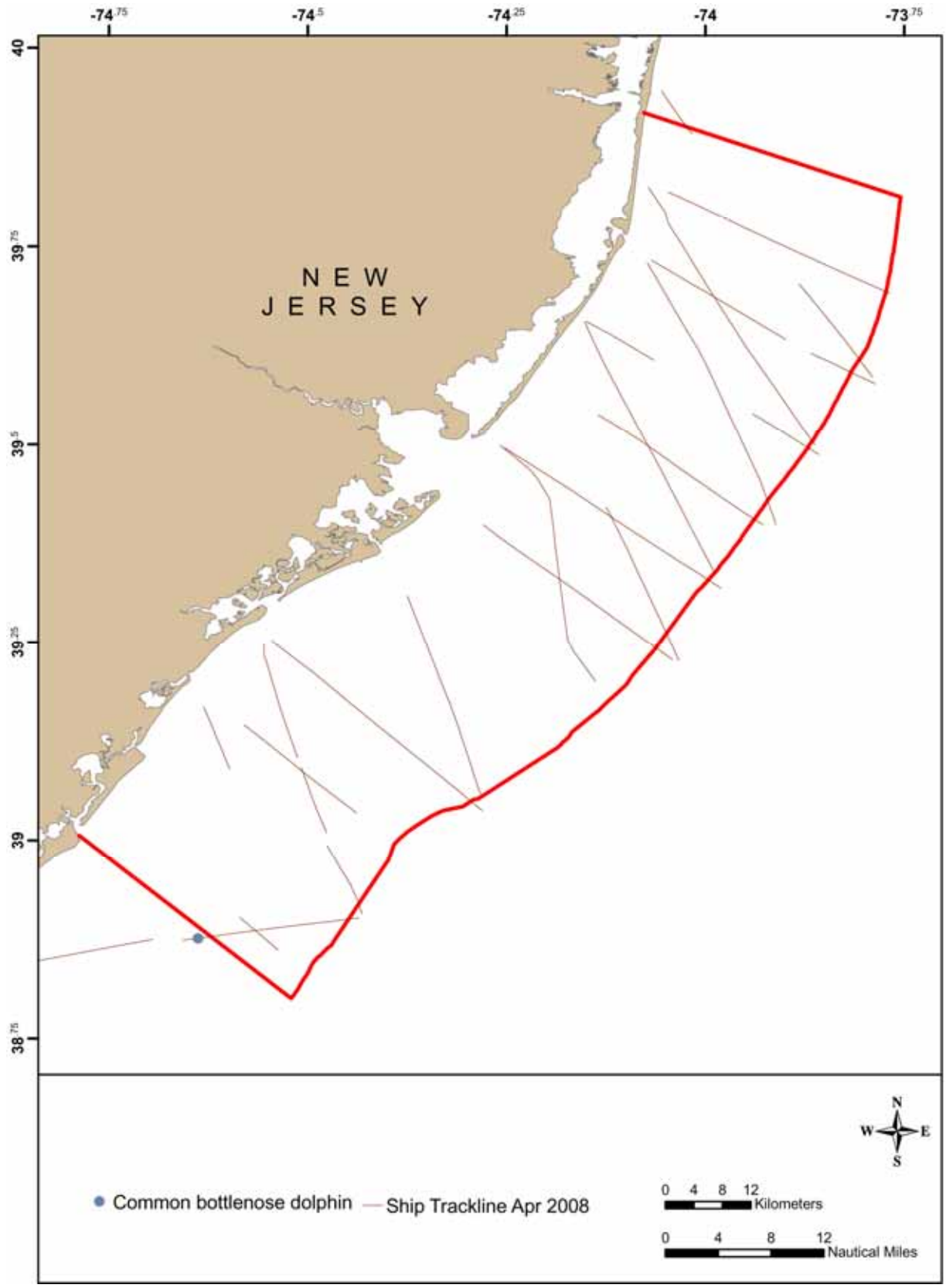

Figure 5.1-4. Shipboard Marine Mammal/Sea Turtle Survey for April 2008.

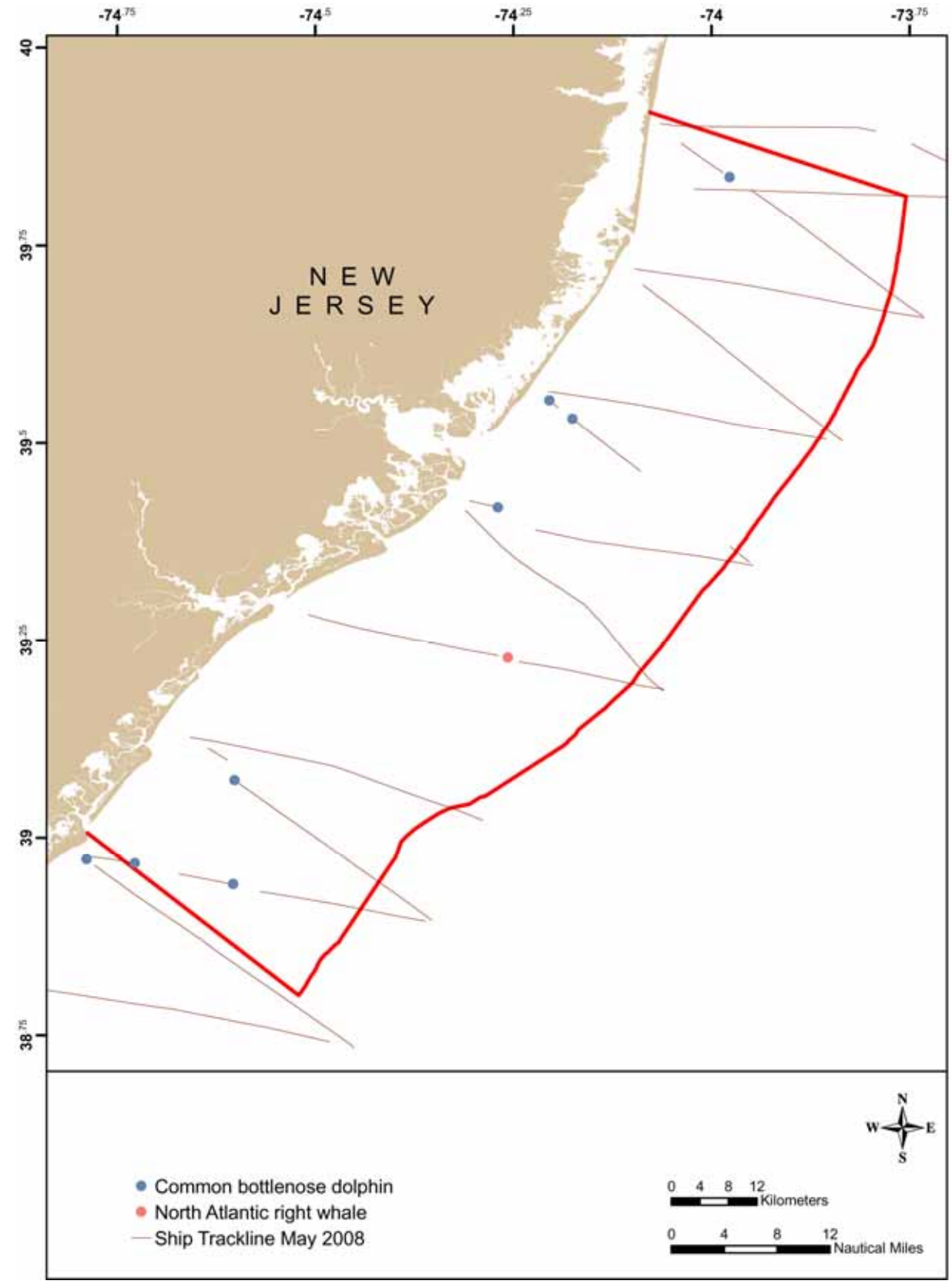

Figure 5.1-5. Shipboard Marine Mammal/Sea Turtle Survey for May 2008.

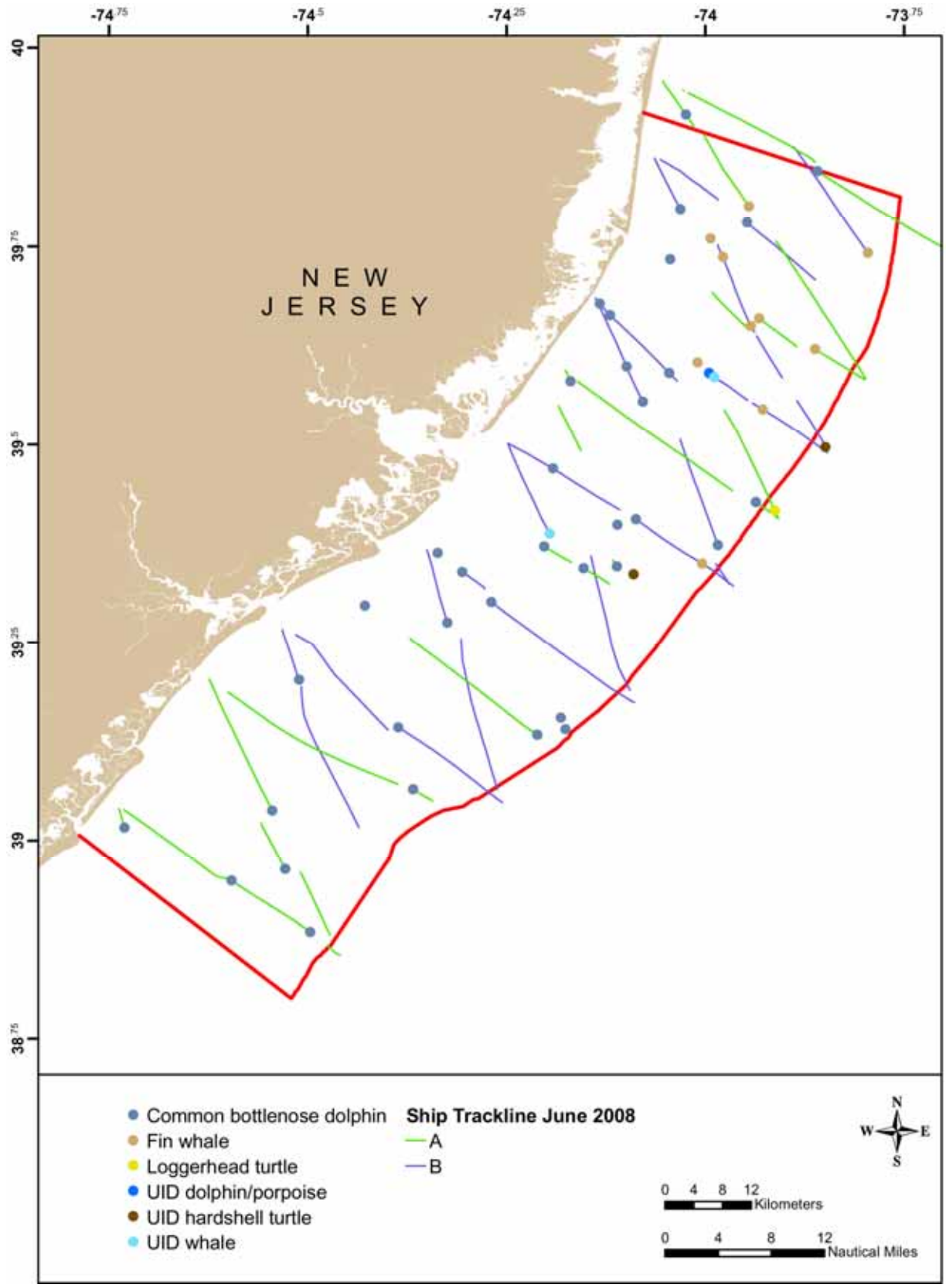

Figure 5.1-6. Shipboard Marine Mammal/Sea Turtle Survey for June 2008.

Table 5.1-3
Summary of Marine Mammal/Sea Turtle Sightings from the Shipboard Surveys from April through June 2008

Common Name, *Scientific Name*	Sightings by Month		
	April	May	June
Humpback whale, *Megaptera novaeangliae**	0	0	0
Fin whale, *Balaenoptera physalus**	0	0	10
North Atlantic right whale, *Eubalaena glacialis**	0	1	0
Minke whale, *Balaenoptera acutorostrata*	0	0	0
Common dolphin, *Delphinus delphis*	0	0	0
Common Bottlenose dolphin, *Tursiops truncatus*	1	10	35
Harbor porpoise, *Phocoena phocoena*	0	0	0
Balaenoptera spp.	0	0	0
unidentified cetacean	0	0	0
unidentified dolphin	0	0	1
unidentified small delphinid	0	0	0
unidentified small whale	0	0	0
unidentified large whale	0	0	1
Harbor seal, *Phoca vitulina*	0	0	1
Loggerhead sea turtle, *Caretta caretta**	0	0	1
unidentified hardshell turtle	0	0	2

* ESA species
April Weather Delays: fog made visibility zero for one day
May Weather Delays: Seas exceeded BSS = 6 and winds >20 kt
June Weather Delays: North Carolina forest fire smoke diminished visibility for ½ day

5.2 AERIAL SURVEYS

5.2.1 Avian

April 2008

Aerial avian survey lines for the April survey differ from marine mammal/sea turtle lines due to varying sea state condition and flight altitude/protocol requirements.

Avian aerial surveys were initially scheduled for 15-17 April. Weather conditions on 15 April did not meet the survey protocols; however, conditions on 16 April were ideal and all survey transect lines were completed on that date.

Transcription from a digital audio recorder of the 16 April data is ongoing and preliminary results will be compiled by July 31, 2008.

5.2.2 Marine Mammals and Sea Turtles

5.2.2.1 April 2008

Marine mammal/sea turtle aerial surveys were flown on 17 April and completed on that same day (**Figure 5.2-1**). All marine mammal species sighted during the second quarter are summarized in **Table 5.2-1**

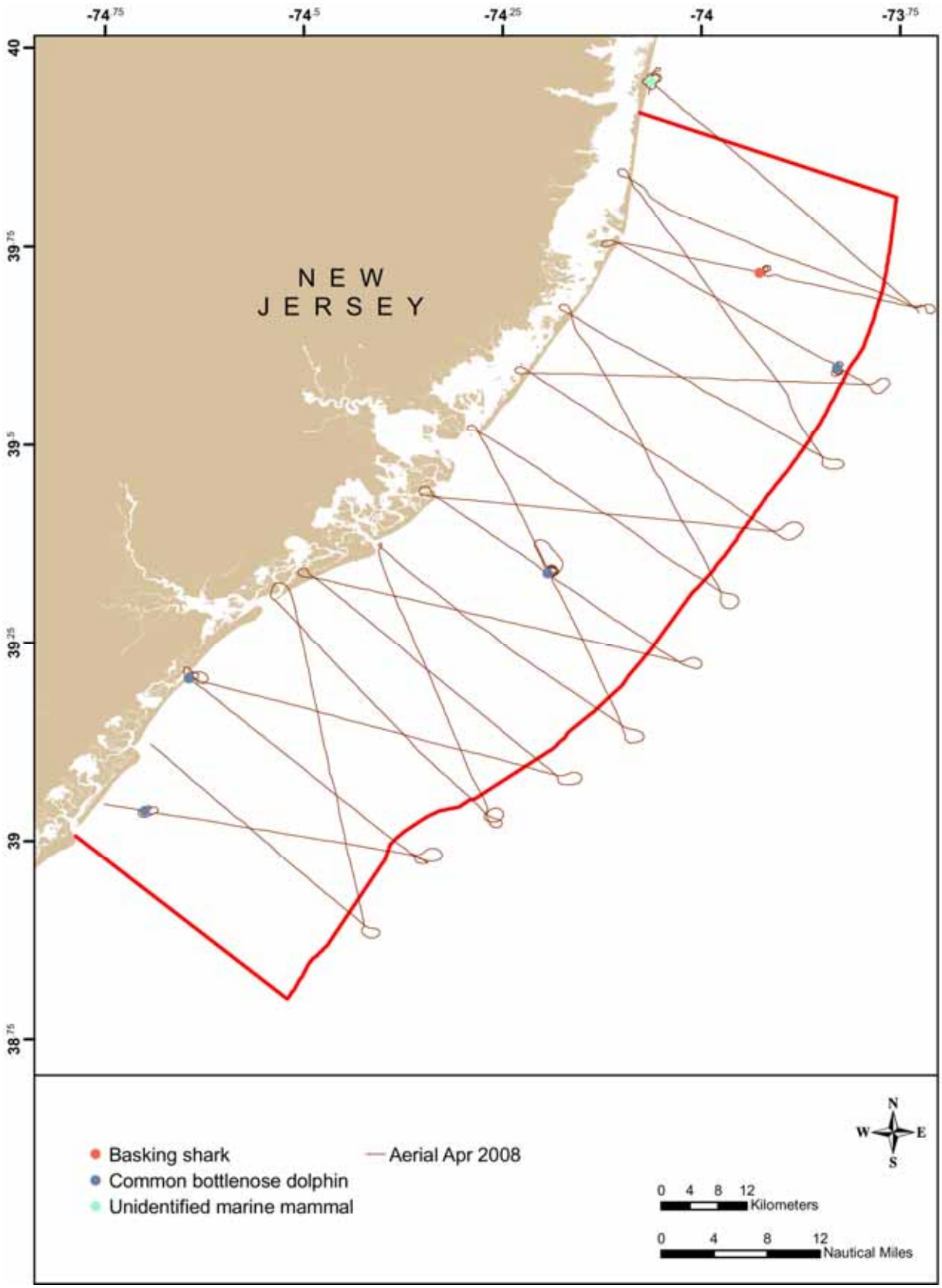

Figure 5.2-1. Aerial Marine Mammal/Sea Turtle Survey for April 2008.

5.2.2.2 May 2008

Marine mammal/sea turtle aerial surveys were flown on 15 May and completed on saw-tooth. The survey was not flown on the 16th due to high winds. The plane crashed on the 17th and surveys have not been flown since.

Table 5.2-1
Summary of Marine Mammal/Sea Turtle Sightings from the Aerial Surveys from April through June 2008

Common Name, *Scientific Name*	Sightings by Month		
	April	May	June
Humpback whale, *Megaptera novaeangliae**	0	0	N/A
Common dolphin, *Delphinus delphis*	0	0	N/A
Common Bottlenose dolphin, *Tursiops truncatus*	4	0	N/A
Harbor porpoise, *Phocoena phocoena*	0	0	N/A
unidentified cetacean	1	0	N/A
Loggerhead sea turtle, *Caretta caretta**	1	0	N/A
Harbor seal, *Phoca vitulina*	0	0	N/A

* ESA species
April Weather Delays: Seas exceeded BSS = 4 and winds >20 kt
May Weather Delays: Seas exceeded BSS = 4 and winds >20 kt
June: No survey flown

5.3 SMALL BOAT COASTAL SURVEYS

5.3.1 Survey Effort

5.3.1.1 April 2008

The small boat coastal survey was conducted on 18 April. The small boat transects covered 63 NM (116 km; **Figure 5.3-1**). Survey effort was continuous; the total daily effort was 6.11 hrs.

5.3.1.2 May 2008

The small boat coastal survey was conducted on 23 May. The small boat transects covered 62 NM (115 km; **Figure 5.3-2**). Survey effort was continuous; the total daily effort was 6.11 hrs.

5.3.1.3 June 2008

The small boat coastal survey was conducted on 20 June. The most northerly transects of the survey were not completed due to rain. The small boat transects covered 57 NM (105 km; **Figure 5.3-3**). Survey effort was continuous; the total daily effort was 6.11 hrs.

5.3.2 Survey Results

5.3.2.1 Avian Species Occurrence

A total of 24 species were sighted in April, 25 species in May, and 14 species in June (**Table 5.3-1**). Birds that were not identifiable due to weather/sea state conditions, behavior, or distance were identified to the lowest identifiable form or taxon (genus, family, or unknown). Two state-listed avian species (Royal Tern and Least Tern) were observed during the surveys.

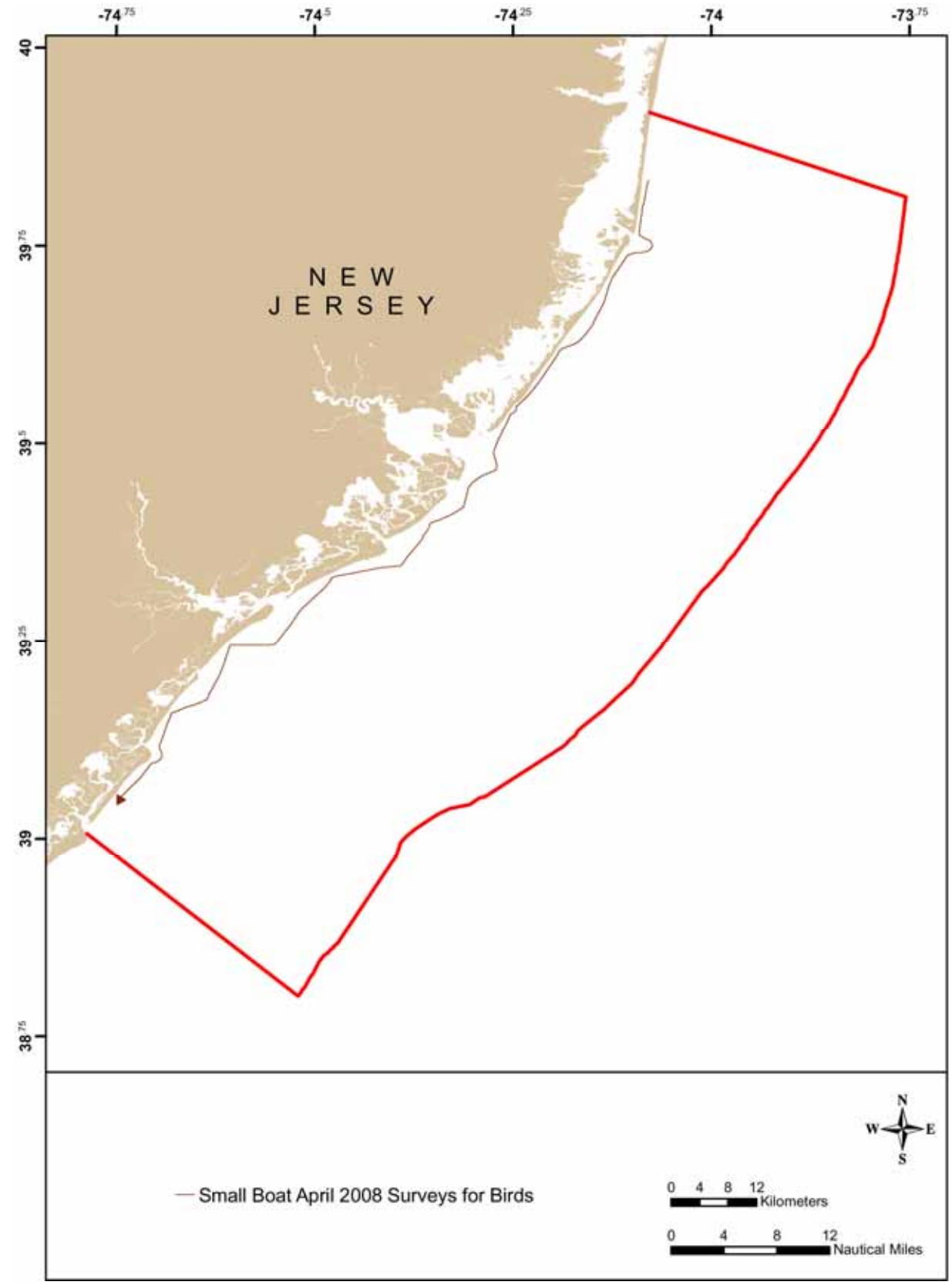

Figure 5.3-1. Small Boat Coastal Survey Tracklines for April 2008.

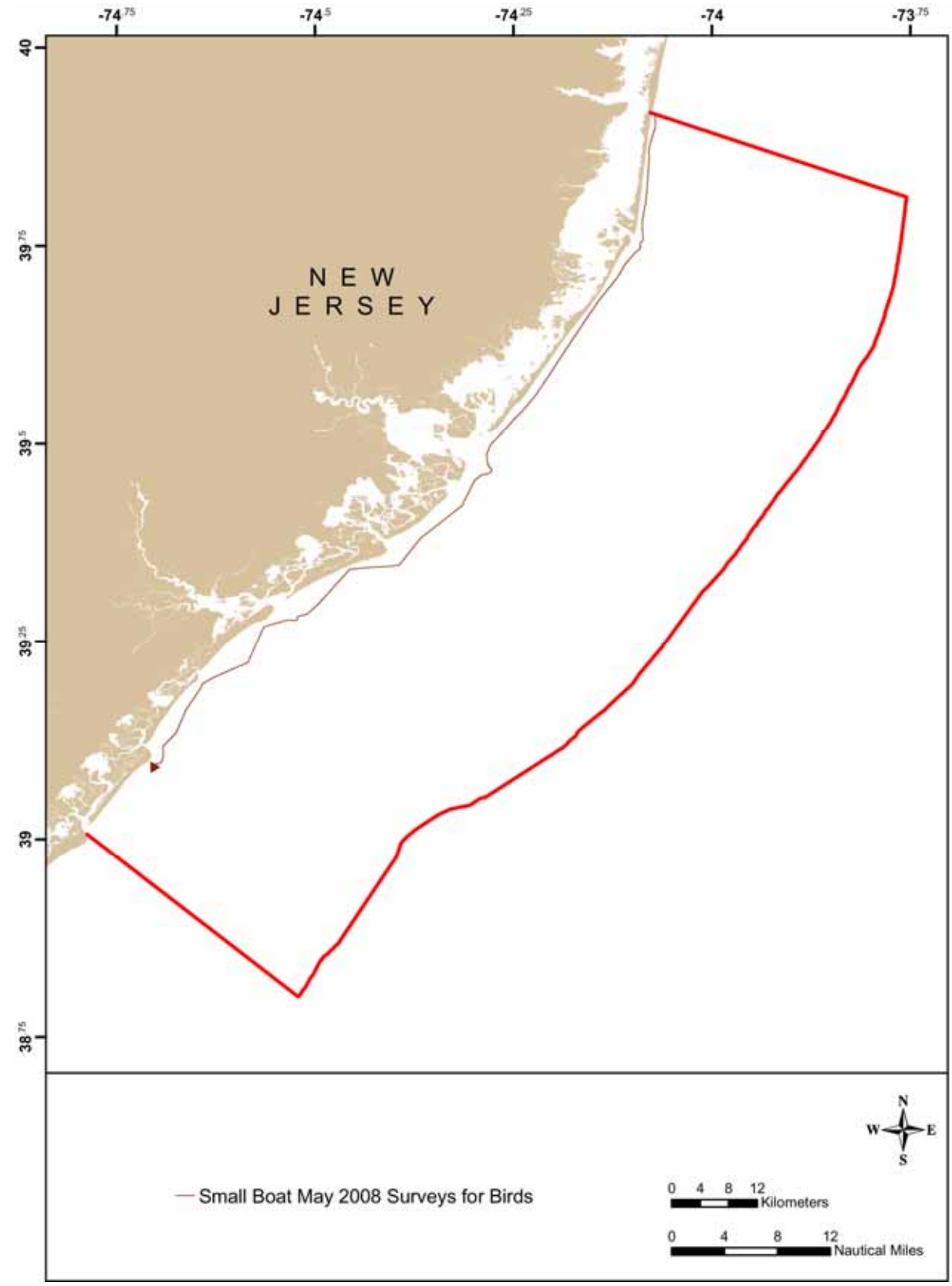

Figure 5.3-2. Small Boat Coastal Survey Tracklines for May 2008.

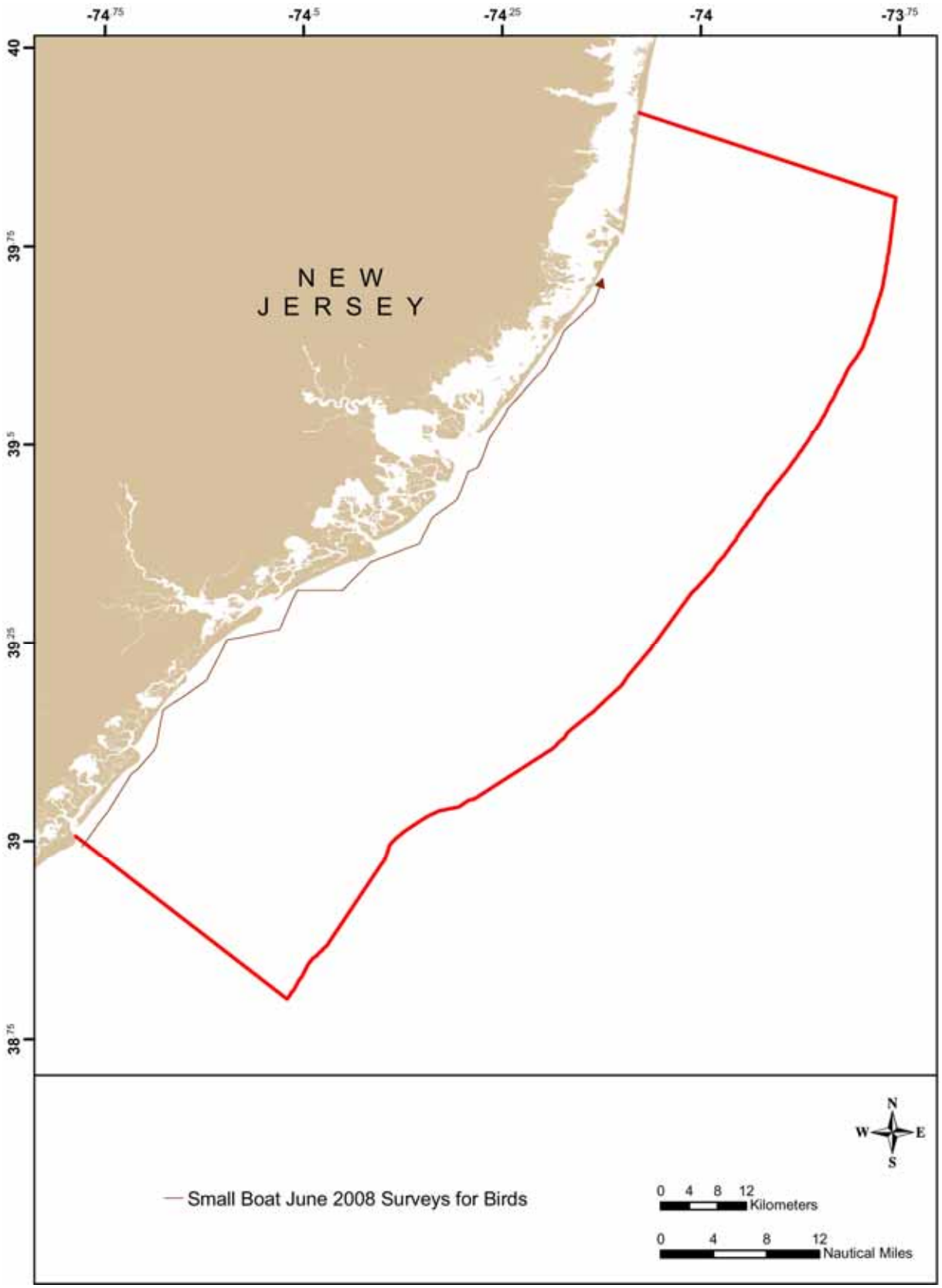

Figure 5.3-3. Small Boat Coastal Survey Tracklines for June 2008.

Table 5.3-1
Avian Species* Observed from April through June 2008 Coastal Boat Surveys

Family *Common Name, Scientific name*	April	May	June
Gaviidae (loons)			
Red-throated Loon, *Gavia stellata*	X	X	
Common Loon, *Gavia immer*	X	X	X
Great Blue Heron, *Ardea herodias*	X	X	
Great Egret, *Ardea alba*			X
Anatidae (geese, ducks)			
Mallard, *Anas platyrhynchos*		X	
American Black Duck, *Anas rubripes*	X		
Surf Scoter, *Melanitta perspicillata*	X	X	X
Black Scoter, *Melanitta nigra*	X		
White-winged Scoter, *Melanitta fusca*	X		
Accipitridae (eagles, hawks)			
Osprey, *Pandion haliaetus*	X	X	X
Northern Harrier, *Circus cyaneus*	X		
Haematopodidae (oystercatchers)			
American oystercatcher, *Haematopus palliatus*	X		
Scolopacidae (sandpipers)			
Ruddy Turnstone, *Arenaria interpres*		X	
Sanderling, *Calidris alba*	X	X	
Semipalmated Sandpiper, *Calidris pusilla*		X	
Laridae (gulls)			
Bonaparte's Gull, *Larus philadelphia*	X		
Laughing Gull, *Larus atricilla*	X	X	X
Ring-billed Gull, *Larus delawarensis*	X		
Herring Gull, *Larus argentatus*	X	X	X
Great black-backed Gull, *Larus marinus*	X	X	X
Royal Tern, *Sterna maxima*		X	X
Common Tern, *Sterna hirundo*		X	X
Forster's Tern, *Sterna forsteri*	X	X	X
Least Tern, *Sterna antillarum*		X	

* All water birds identified to species during coastal surveys were included

5.3.2.2 Avian Abundance and Percent Composition

Double-crested Cormorant, Surf Scoter, Northern Gannet, Herring Gull, and dark-winged scoter were the five most abundant species/identifiable groups during April; Laughing Gull, Herring Gull, Double-crested Cormorant, Great Black-backed Gull, various passerines, and Common Tern were the six most abundant species during May; Laughing Gull, Great Black-backed Gull, Common Tern, Forster's Tern, and Northern Gannet were the five most abundant species tallied in June (**Table 5.3-2**).

The total number of individuals decreased from April (4,012), to May (1,786), and to June (598; **Table 5.3-2**). The number of individuals in March (8,153) was greater than in April (4,012). The closer proximity of the tracklines to shore and the resulting higher counts of sitting gulls and shorebirds probably explains a significant proportion of the difference between these two totals. As discussed in **Section 5.1.1.2.2**, the numerical decrease through the spring season is probably the result of winter visitors and spring migrants departing from the Study Area.

Table 5.3-2
Abundance and Percent Composition* of Avian Species Observed during April through June 2008 Small Boat Coastal Surveys

Family Common Name, *Scientific name*	April		May		June	
	Number	% Composition	Number	% Composition	Number	% Composition
Gaviidae (loons)						
Red-throated Loon, *Gavia stellata*	36	0.9%	2	0.1%		
Common Loon, *Gavia immer*	63	1.6%	2	0.1%	1	0.2%
Phalacrocoracidae (cormorants)						
Great Cormorant, *Phalacrocorax carbo*	3	0.1%				
Double-crested Cormorant, *Phalacrocorax auritus*	1550	38.6%	237	13.3%	13	2.2%
Cormorant (unknown), *Phalacrocorax spp.*	1	<0.1%				
Pelecanidae (pelicans)						
Brown Pelican, *Pelecanus occidentalis*					3	0.5%
Sulidae (boobies, gannets)						
Northern Gannet, *Morus bassanus*	478	11.9%	31	1.7%	25	4.2%
Ardeidae (bitterns, egrets, and herons)						
Great Blue Heron, *Ardea herodias*	1	<0.1%	1	0.1%		
Great Egret, *Ardea alba*					1	0.2%
Anatidae (geese, ducks)						
Mallard, *Anas platyrhynchos*			3	0.2%		
American Black Duck, *Anas rubripes*	6	0.1%				
Duck (diving)	1	<0.1%				
Surf Scoter, *Melanitta perspicillata*	640	16.0%	1	0.1%	11	1.8%
Black Scoter, *Melanitta nigra*	83	2.1%				
White-winged Scoter, *Melanitta fusca*	38	0.9%				
Scoter (dark-winged), *Melanitta spp.*	235	5.9%				
Scoter (unknown), *Melanitta spp.*	182	4.5%				
Duck (unknown)	3	0.1%				
Accipitridae (eagles, hawks)						
Osprey, *Pandion haliaetus*	9	0.2%	25	1.4%	21	3.5%
Northern Harrier, *Circus cyaneus*	2	<0.1%				
Haematopodidae (oystercatchers)						
American Oystercatcher, *Haematopus palliatus*	1	<0.1%				
Scolopacidae (sandpipers)						
Ruddy Turnstone, *Arenaria interpres*			14	0.8%		
Sanderling, *Calidris alba*	35	0.9%	31	1.7%		
Semipalmated Sandpiper, *Calidris pusilla*			1	0.1%		
Shorebird (small)			40	2.2%		
Laridae (gulls)						
Bonaparte's Gull, *Larus philadelphia*	5	0.1%				
Laughing Gull, *Larus atricilla*	38	0.9%	560	31.4%	303	50.7%
Ring-billed Gull, *Larus delawarensis*	9	0.2%				
Herring Gull, *Larus argentatus*	288	7.2%	311	17.4%	20	3.3%
Great black-backed Gull, *Larus marinus*	119	3.0%	217	12.2%	78	13.0%

Table 5.3-2 (*continued*)
Abundance and Percent Composition* of Avian Species Observed during April through June 2008 Small Boat Coastal Surveys

Family	April		May		June	
Common Name, *Scientific name*	Number	% Composition	Number	% Composition	Number	% Composition
Laridae (gulls)						
Gull (small)	6	0.1%				
Gull (large), *Larus spp.*	105	2.6%	43	2.4%	23	3.8%
Royal Tern, *Sterna maxima*			2	0.1%	6	1.0%
Common Tern, *Sterna hirundo*			76	4.3%	51	8.5%
Forster's Tern, *Sterna forsteri*	19	0.5%	59	3.3%	32	5.4%
Least Tern, *Sterna antillarum*			1	0.1%		
Tern (small), *Sterna spp.*			19	1.1%	8	1.3%
Other						
Non-passerine[1]			3	0.2%		
Passerine[2]	48	1.2%	107	6.0%	2	0.3%
Unknown	8	0.2%				
TOTAL	4012		1786		598	

* All avian data recorded during the coastal surveys was used to calculate percent composition
[1] Represents vultures and other non-water bird, non-passerine spp.
[2] Represents passerine spp. recorded over land, on shore, offshore, and/or on the survey vessel

5.3.3 Discussion

Offshore bird abundance was greater than coastal bird abundance in April, May, and June. This seems predictable given the far greater on-effort hours of each of the off shore surveys compared to the coastal surveys. When birds per on-effort hours is considered (**Table 5.3-3)**, the coastal small boat surveys had greater values than the offshore surveys for each month. Species composition/diversity varied between coastal and offshore survey areas.

During the April offshore shipboard survey, the average daily number of birds observed was 2,322; 4,012 birds were sighted on the one day coastal survey (**Table 5.3-4**).

During the May offshore shipboard survey, an average of 665 birds was sighted daily; 1,786 birds were recorded during the one day coastal survey (**Table 5.3-5**).

During the June offshore shipboard survey, an average of 342 birds was sighted daily; 598 birds were recorded during the one day coastal survey (**Table 5.3-6**).

Table 5.3-3
Birds per On-effort Hours

	Coastal	Offshore
April	657.00	250.70
May	292.31	70.00
June	97.90	25.54

Table 5.3-4
Abundance and Percent Composition of Avian Species Observed during April Coastal and Offshore Surveys

Family	Coastal		Offshore	
Common Name*, Scientific name*	Number	% Composition	Number	% Composition
Gaviidae (loons)				
Red-throated Loon, *Gavia stellata*	36	0.9%	564	4.9%
Common Loon, *Gavia immer*	63	1.6%	271	2.3%
Loon (unknown), *Gavia spp.*			20	0.2%
Podicipedidae (grebes)				
Horned Grebe, *Podiceps auritus*			2	<0.1%
Phalacrocoracidae (cormorants)				
Great Cormorant, *Phalacrocorax carbo*	3	0.1%		
Double-crested Cormorant, *Phalacrocorax auritus*	1550	38.6%	296	2.5%
Cormorant (unknown), *Phalacrocorax spp.*	1	<0.1%		
Sulidae (boobies, gannets)				
Northern Gannet, *Morus bassanus*	478	11.9%	2793	24.1%
Ardeidae (bitterns, egrets, and herons)				
Great Blue Heron, *Ardea herodias*	1	<0.1%	18	0.2%
Anatidae (geese, ducks)				
(Atlantic) Brant, *Branta bernicla*			54	0.5%
Canada Goose, *Branta canadensis*			4	<0.1%
Snow Goose, *Chen caerulescens*			10	0.1%
American Black Duck, *Anas rubripes*	6	0.1%	96	0.8%
Gadwall, *Anas strepera*			1	<0.1%
Northern Pintail, *Anas acuta*			25	0.2%
Green-winged Teal, *Anas crecca*			1	<0.1%
Duck (dabbling), *Anas spp.*			34	0.3%

Table 5.3-4
Abundance and Percent Composition of Avian Species Observed during April Coastal and Offshore Surveys

Family	Coastal		Offshore	
Common Name, *Scientific name*	**Number**	**% Composition**	**Number**	**% Composition**
Anatidae (geese, ducks)				
Scaup (unknown): Lesser Scaup, *Aythya marila*/Greater Scaup, *A. affinis*			4	<0.1%
Duck (diving)	1	<0.1%	6	0.1%
Surf Scoter, *Melanitta perspicillata*	640	16.0%	2408	20.7%
Black Scoter, *Melanitta nigra*	83	2.1%	484	4.2%
White-winged Scoter, *Melanitta fusca*	38	0.9%	8	0.1%
Scoter (dark-winged), *Melanitta spp.*	235	5.9%	1650	14.2%
Scoter (unknown), *Melanitta spp.*	182	4.5%	1425	12.3%
Long-tailed Duck, *Clangula hyemalis*			3	<0.1%
Bufflehead, *Bucephala albeola*			2	<0.1%
Red-breasted Merganser, *Mergus serrator*			19	0.2%
Duck (unknown)	3	0.1%	102	0.9%
Accipitridae (eagles, hawks)				
Osprey, *Pandion haliaetus*	9	0.2%	3	<0.1%
Northern Harrier, *Circus cyaneus*	2	<0.1%		
Haematopodidae (oystercatchers)				
American oystercatcher, *Haematopus palliatus*	1	<0.1%		
Scolopacidae (sandpipers)				
Sanderling, *Calidris alba*	35	0.9%		
Laridae (gulls)				
Little Gull, *Larus minutus*			1	<0.1%
Bonaparte's Gull, *Larus philadelphia*	5	0.1%	391	3.4%
Laughing Gull, *Larus atricilla*	38	0.9%	74	0.6%
Ring-billed Gull, *Larus delawarensis*	9	0.2%	5	<0.1%
Herring Gull, *Larus argentatus*	288	7.2%	386	3.3%
Lesser Black-backed Gull, *Larus fuscus*			1	<0.1%
Great black-backed Gull, *Larus marinus*	119	3.0%	100	0.9%
Gull (small)	6	0.1%		
Gull (large), *Larus spp.*	105	2.6%	179	1.5%
Royal Tern, *Sterna maxima*			1	<0.1%
Common Tern, *Sterna hirundo*			2	<0.1%
Forster's Tern, *Sterna forsteri*	19	0.5%	108	0.9%
Tern (small), *Sterna spp.*			3	<0.1%
Gull (small)/tern (unknown)			33	0.3%
Alcidae (alcids)				
Dovekie, *Alle alle*			2	<0.1%
Razorbill, *Alca torda*			4	<0.1%
Other				
Non-passerine[1]			14	0.1%
Passerine[2]	48	1.2%	5	<0.1%
Unknown	8	0.2%		
TOTAL	**4012**		**11612**	

* All avian data recorded during the coastal and offshore surveys was used to calculate percent composition
[1] Represents vultures and other non-water bird, non-passerine spp.
[2] Represents passerine spp. recorded over land, on shore, offshore, and/or on the survey vessel

Table 5.3-5
Abundance and Percent Composition of Avian Species Observed during May Coastal and Offshore Surveys

Family	Coastal		Offshore	
Common Name, *Scientific name*	**Number**	**% Composition**	**Number**	**% Composition**
Gaviidae (loons)				
Red-throated Loon, *Gavia stellata*	2	0.1%	40	1.5%
Common Loon, *Gavia immer*	2	0.1%	252	9.5%
Procellariidae (petrels and shearwaters)				
Manx Shearwater, *Puffinus puffinus*			2	0.1%
Phalacrocoracidae (cormorants)				
Double-crested Cormorant, *Phalacrocorax auritus*	237	13.3%	480	18.0%
Sulidae (boobies, gannets)				
Northern Gannet, *Morus bassanus*	31	1.7%	827	31.1%
Ardeidae (bitterns, egrets, and herons)				
Great Blue Heron, *Ardea herodias*	1	0.1%		
Anatidae (geese, ducks)				
Mallard, *Anas platyrhynchos*	3	0.2%		
Surf Scoter, *Melanitta perspicillata*	1	0.1%		
Black Scoter, *Melanitta nigra*			141	5.3%
Red-breasted Merganser, *Mergus serrator*			2	0.1%
Accipitridae (eagles, hawks)				
Osprey, *Pandion haliaetus*	25	1.4%	2	0.1%
Northern Harrier, *Circus cyaneus*			1	<0.1%
Scolopacidae (sandpipers)				
Ruddy Turnstone, *Arenaria interpres*	14	0.8%		
Sanderling, *Calidris alba*	31	1.7%		
Semipalmated Sandpiper, *Calidris pusilla*	1	0.1%		
Least Sandpiper, *Calidris minutilla*			6	0.2%
Shorebird (small)	40	2.2%	5	0.2%
Laridae (gulls)				
Laughing Gull, *Larus atricilla*	560	31.4%	152	5.7%
Herring Gull, *Larus argentatus*	311	17.4%	257	9.7%
Lesser Black-backed Gull, *Larus fuscus*			1	<0.1%
Great black-backed Gull, *Larus marinus*	217	12.2%	124	4.7%
Gull (large), *Larus spp.*	43	2.4%	30	1.1%
Royal Tern, *Sterna maxima*	2	0.1%	6	0.2%
Common Tern, *Sterna hirundo*	76	4.3%	185	7.0%
Forster's Tern, *Sterna forsteri*	59	3.3%	56	2.1%
Least Tern, *Sterna antillarum*	1	0.1%	1	<0.1%
Tern (small), *Sterna spp.*	19	1.1%	64	2.4%
Other				
Non-passerine[1]	3	0.2%	4	0.2%
Passerine[2]	107	6.0%	20	0.8%
Unknown			2	0.1%
TOTAL	1786		2660	

* All avian data recorded during the coastal and offshore surveys was used to calculate percent composition
[1] Represents vultures and other non-water bird, non-passerine spp.
[2] Represents passerine spp. recorded over land, on shore, offshore, and/or on the survey vessel

Table 5.3-6
Abundance and Percent Composition of Avian Species Observed during June Coastal and Offshore Surveys

Family	Coastal		Offshore	
Common Name, *Scientific name*	**Number**	**% Composition**	**Number**	**% Composition**
Gaviidae (loons)				
Common Loon, *Gavia immer*	1	0.2%	3	0.2%
Procellariidae (petrels and shearwaters)				
Cory's Shearwater, *Calonectris diomedea*			72	5.3%
Greater Shearwater, *Puffinus gravis*			1	0.1%
Sooty Shearwater, *Puffinus griseus*			5	0.4%
Hydrobatidae (storm-petrels)				
Wilson's Storm-Petrel, *Oceanites oceanicus*			400	29.3%
Storm-petrel (unknown)			2	0.1%
Phalacrocoracidae (cormorants)				
Double-crested Cormorant, *Phalacrocorax auritus*	13	2.2%	1	0.1%
Pelecanidae (pelicans)				
Brown Pelican, *Pelecanus occidentalis*	3	0.5%		
Sulidae (boobies, gannets)				
Northern gannet, *Morus bassanus*	25	4.2%	245	17.9%
Ardeidae (bitterns, egrets, and herons)				
Great Egret, *Ardea alba*	1	0.2%		
Anatidae (geese, ducks)				
Surf Scoter, *Melanitta perspicillata*	11	1.8%	1	0.1%
Accipitridae (harriers, eagles, kites, hawks, and osprey)				
Osprey, *Pandion haliaetus*	21	3.5%		
Laridae (gulls)				
Parasitic Jaeger, *Stercorarius parasiticus*			3	0.2%
Laughing Gull, *Larus atricilla*	303	50.7%	228	16.7%
Herring Gull, *Larus argentatus*	20	3.3%	41	3.0%
Great black-backed Gull, *Larus marinus*	78	13.0%	51	3.7%
Gull (large), *Larus spp.*	23	3.8%	10	0.7%
Royal Tern, *Sterna maxima*	6	1.0%	2	0.1%
Common Tern, *Sterna hirundo*	51	8.5%	288	21.1%
Forster's Tern, *Sterna forsteri*	32	5.4%	2	0.1%
Tern (small), *Sterna spp.*	8	1.3%	8	0.6%
Other				
Non-passerine[1]			1	0.1%
Passerine[2]	2	0.3%	3	0.2%
TOTAL	598		1367	

* All avian data recorded during the coastal and offshore surveys was used to calculate percent composition
[1] Represents vultures and other non-water bird, non-passerine spp.
[2] Represents passerine spp. recorded over land, on shore, offshore, and/or on the survey vessel

5.4 RADAR SURVEYS

5.4.1 Data Collection

The month of April began with the barge and avian radar system in port at Atlantic City due to bad weather. On 03 April, the barge was able to return to sea and the avian radar was on station and collecting data at Site 13 that afternoon. The avian radar remained at Site 13 until the morning of 13 April, at which time the barge moved to Site 19 (**Figure 5.4-1**).

The avian radar collected data at Site 19 from 13 April through 19 April. A groundtruthing survey was conducted on 19 April. After completion of the groundtruthing survey, the barge moved to Site 26.

The barge attempted to jack up on station at Site 26 on 19 April, but was prevented from doing so due to rough seas at the Site and had to take shelter at Cape May to await calmer seas. The barge remained at

Cape May until 24 April, when it was able to successfully jack up at Site 26. The avian radar system operated at Site 26 from 24 April 24 through 30 April.

On 30 April, the barge was moved to Site 23, and the radar began collecting data at the Site. The barge collected data at Site 23 from April 30 through 07 May. On 03 May a groundtruthing exercise was conducted. On 07 May the avian radar system was turned off and the barge moved to Site 17.

On 07 May, the barge and avian radar system was moved to Site 17 and began collecting data. The avian radar remained operational at Site 17 through 11 May, at which time the barge had to return to port in Atlantic City due to an approaching weather system. The barge had to remain in port at Atlantic City until the end of the spring survey period.

5.4.2 Data Analysis

The radar data collected during the spring radar study are being processed and analyzed at GMI's Plano, Texas, office. The nearly continuous high wind and high wave activity in the vicinity of the avian radar system has resulted in a portion of the TracScan® data being unsatisfactory for bird analysis purposes. While on station, the radar operator attempted to adjust the radar settings to filter out some of the wave clutter at closer distances, but this in turn reduced the ability to pick up birds at further distances.

Data processing is in the preliminary stages and is ongoing. Additional filtering, weather analysis, weather correlation, groundtruthing analysis, Quality Assurance/Quality Control (QAQC) checks, and results interpretation have yet to be completed. Currently, GMI has filtered out all TracScan® data from a distance of 0 to 1.5 miles (mi) from the radar site due to extensive wave clutter in this zone. GMI has further filtered out data from a distance of 3 to 4 mi from the radar site due to decreased sensitivity of the radar to detect birds in this zone. The remaining zone from 1.5 to 3 mi out was chosen for the initial data analysis. This process is still being analyzed to determine if any additional data which was collected can be reliably used to determine avian flight numbers and patterns.

Initial summary results for tracks and altitude distribution at each site are included in the tables and figures in **Appendix B**. A track is a correlated series of radar detections, and may include one or more birds per track. Horizontal track data (TracScan®) and altitude data (VerCat®) are included for both diurnal and nocturnal activity. The diurnal period runs from civil sunrise to civil sunset, while nocturnal runs from civil sunset to civil sunrise.

The TracScan® results have been further broken out into weather periods of clear, fog, mist, and rain. TracScan® results are expressed as passage rates and density. Passage rates are the average number of targets per linear km of radar detection front per hour (i.e., a measure of the migratory activity for a given period of time). For this study, passage rates are the average number of targets per km per hour within a specified period (e.g., daytime, nighttime). Density is the number of tracks per hour per cubic kilometer of airspace.

All VerCat® data was processed. VerCat® results have been further broken out into small, medium, large, and flock, although this should not be strictly interpreted. For example:

- The "small" category is comprised entirely of a single bird or a few small birds up to the weight limit of the category.
- The "medium" category may contain single or multiple medium-sized birds or variable-size flocks of small sized birds up to the weight limit of the category.
- The "large" category may contain large flocks of small birds, variable-size flocks of medium sized birds, single or multiple large birds, or multiple medium birds up to the weight limit of the category.
- The "flock: category may contain one or multiple birds of a flock species, small to large numbers of large birds (e.g., eagle), and/or large numbers of medium birds.

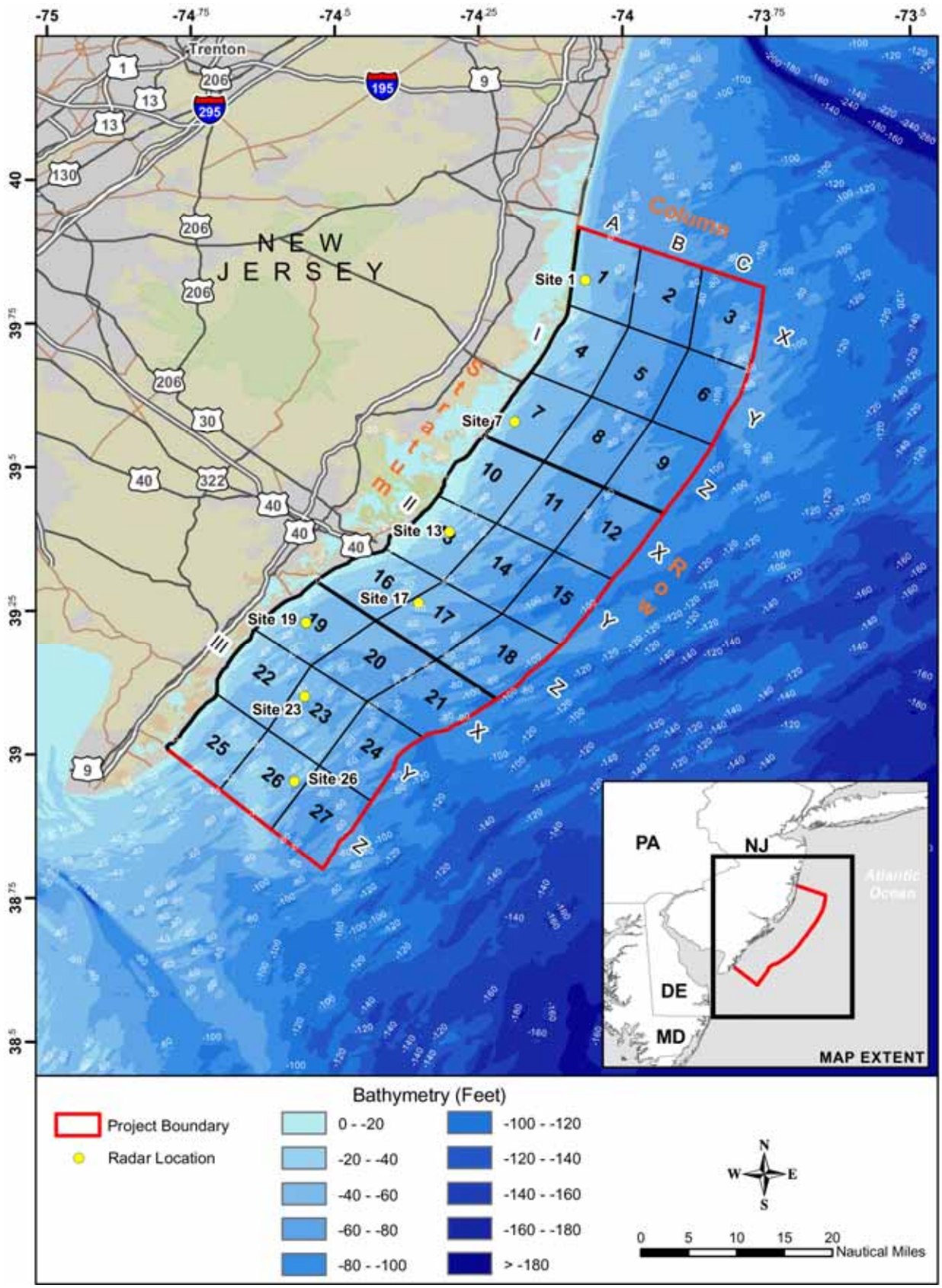

Figure 5.4-1. Radar Grid and Site Locations through May 2008.

5.5 THERMAL SURVEYS

The new multiplexer was installed near the end of March and full system functionality was restored. The offshore conditions during the months of April and May included large periods of heavy fog and/or rain at each site. This prevented following the proposed thermal imaging-vertically pointing radar (TI-VPR) recording schedule of 4 hrs recording, 4 hrs off, 4 hrs recording, 16 hrs off, and repeat.

During April, recording at site 13 was conducted for approximately 26.5 hrs, at site 19 for approximately 36 hrs, and at site 26 for approximately 28 hrs. In May, recording was conducted at site 23 for approximately 51 hrs and at site 17 for approximately 21.5 hrs.

Currently, data analysis has concentrated on radar data rather than TI-VPR data and there are no results to report at this time.

5.6 ACOUSTIC SURVEYS

The first set of five Marine Autonomous Recording Units (e.g., Pop-Ups) that were deployed in March 2008 were recovered, refurbished, and redeployed in June 2008.

5.6.1 Recovery

Four (PU063, PU081, PU086, PU134) of the five previously deployed Pop-Ups were successfully recovered on June 17, 2008. The southern-most station (#1, PU039) did not respond to acoustic signals and was not detected on sonar searches. The auto-burn was scheduled for 24 June; thus redeployment of the four recovered pop-ups was rescheduled for 24 June. A thorough sonar search suggested that the Pop-Up was no longer on site: the supposition is that it might have been moved after interaction with fishery gear.

5.6.2 Refurbishment

PU063, PU081, PU086, and PU134 were cleaned and refurbished between June 18 and June 23, 2008: their external hard hats and internal spheres were cleaned of marine growth; the internal power source components (i.e., batteries) were replaced. Each unit was equipped with a new radio frequency board and new hard drive. The pop-ups deployed at the southern- (S#1, PU063) and northern- (S#5, PU134) most points of our deployment configuration had the 2 kilohertz (kHz) sampling code reinstalled with continuous sampling during the ensuing 3-month deployment. These two units also had an 80-gigabyte (GB) storage hard drive installed. The center-line pop-ups (S#4, PU086 and S#2, PU081) were loaded with a 31.25 kHz sampling code with 5 min on and 25 min off sampling rates. These two units had 120 GB storage hard drives installed.

All four refurbished pop-ups responded successfully to electronic/computer communication during refurbishment. Each pop-up responded well to all acoustic hello and burn tests (direct, time and auto). The four refurbished pop-ups were turned on to record and synchronized on 23 June 2008 and were successfully redeployed on 24 June 2008.

5.6.3 Redeployment

The four refurbished pop-ups (PU063, PU081, PU086, and PU134) were successfully redeployed in a diamond configuration on 24 June 2008. Each responded well to their test hello signals at the surface and after deployment (i.e., from the bottom). Because only four pop-ups were redeployed, we deleted station #3 from the cross configuration during redeployment of the four pop-ups. The resulting diamond shape (**Figure 5.6-1**) will still provide data for us to address the research questions outlined in the proposal.

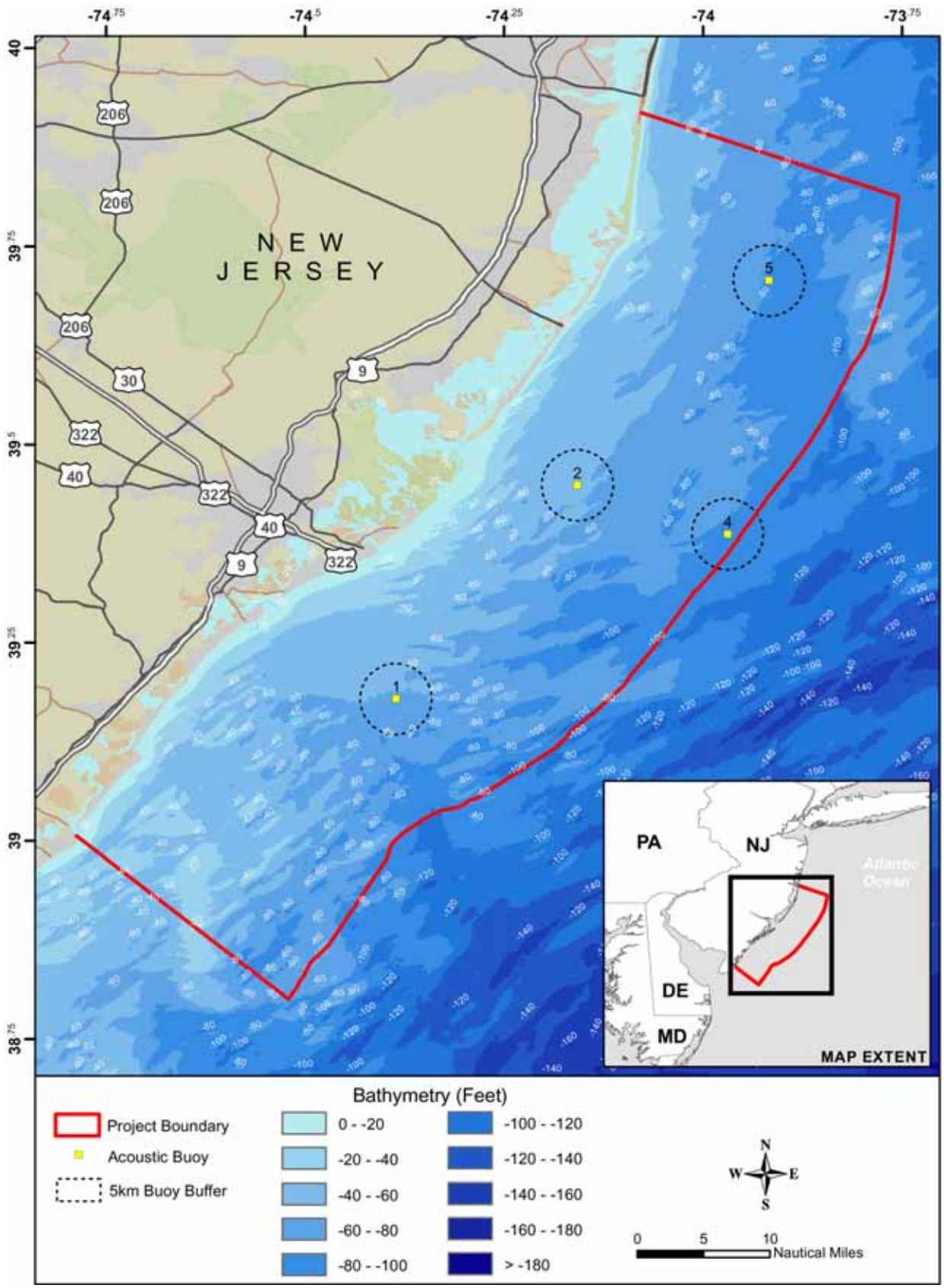

Figure 5.6-1. Deployment Sites for the Four Acoustic Pop Up Buoys off the Coast of New Jersey.

We were on station 15 min prior to the auto-burn for PU039 (the non-recovered pop-up). We searched via Radio Frequency, with binoculars and with 6 pairs of eyes for PU039 for 25 minutes. After re-deploying the refurbished unit to station #1, we spent another 15-20 min searching with eyes and radio frequency for the missing pop-up. The missing pop-up was not detected.

5.6.4 Data Analyses/Processing

The hard drives from the successfully recovered pop-up units will be processed during the next quarter with acoustic analyses ongoing for the presence/detection of marine mammals that might have been in the study area within range of the pop-up unit from late March to mid-June 2008. Each drive contains a 30 GB file with data continuously collected during the spring 2008 deployment that will need to be binned, compensated (i.e., synchronized across the four units) and made into an AIFF file format for processing with custom software in MATLAB and Raven software tools. Details on the sounds captured will be provided in monthly reports (beginning at the end of July) and in the third quarterly report.

5.7 OCEANOGRAPHIC SURVEYS

Surface Mapping System (SMS), Conductivity-Temperature-Depth (CTD), and Acoustic Doppler Current Profiler (ADCP) measurements were conducted at point locations in the NJDEP Study Area off the coast of New Jersey during the second quarter (April-June) of 2008.

5.7.1 Surface Mapping System (SMS)

For the SMS, measured static parameters include the measurement date and time, water depth (feet [ft] or m), and longitude-latitude (lon-lat) location. Measured climatic parameters include windspeed (knots), wind direction (deg), air temperature (degrees Celsius [^{o}C]), relative humidity (%), and atmospheric barometric pressure (millibars [mbar]). Measured dynamic oceanographic parameters include water temperature (sea surface temperature [SST], ^{o}C), salinity (practical salinity units [PSU]), fluorometric chlorophyll, colored dissolved organic matter (CDOM; Turner raw), and photosynthetically active radiation (PAR; quanta per second [s^{-1}]). Turner units are a spectral measurement of fluorescent material in the water at specific wavelengths. Chlorophyll has an absorption peak in the blue spectral region (440 nanometers [nm]) and a strong fluorescent peak at red wavelengths (670 nm), whereas CDOM absorbs strongly in the blue region (412 m) and has a broad fluorescent peak at green-yellow wavelengths (530 nm). The PAR is measured with a PRR-600 light meter (spectral photometer) and is calculated from the spectral integration of light intensity measured at the following wavelengths: 443, 490, 510, 555, and 656 nm (spectral units: microwatt [µW] per square centimeter [cm^{-2}] nm^{-1}).

These SMS measurements were conducted (**Figures 5.7-1 through 5.7-3**) and recorded every 10 s on the following dates:

- April 2008: 4-9 through 4-14.
- May 2008: 5-7, 5-8, 5-10, and 5-11.
- June 2008: 6-12 through 6-17.

Data values of these parameters for each 10-s interval were written to text files ("yymmddhh.txt"), and separate text files were generated for each hour ("hh") of data collection. For example, data collected during the 13th hour on April 9, 2008 were recorded to the text file "08040913.txt".

5.7.2 Conductivity-Temperature-Depth (CTD) Measurements

In addition to water surface properties, water depth profiles were generated for water temperature (^{o}C), salinity (PSU), dissolved oxygen (milligram per liter [mg/L]), and conductivity (voltage) using CTD instruments. Depth profiles of these four parameters were combined into a single plot for each set of measurements (**Figure 5.7-4**). Graphical plots of these depth profiles were saved as Excel files.

The CTD measurements were conducted at 28 sites in April, 21 sites in May, and 31 sites in June. The enclosed map shows the lon-lat locations of the sites of the CTD casts at which data collection occurred.

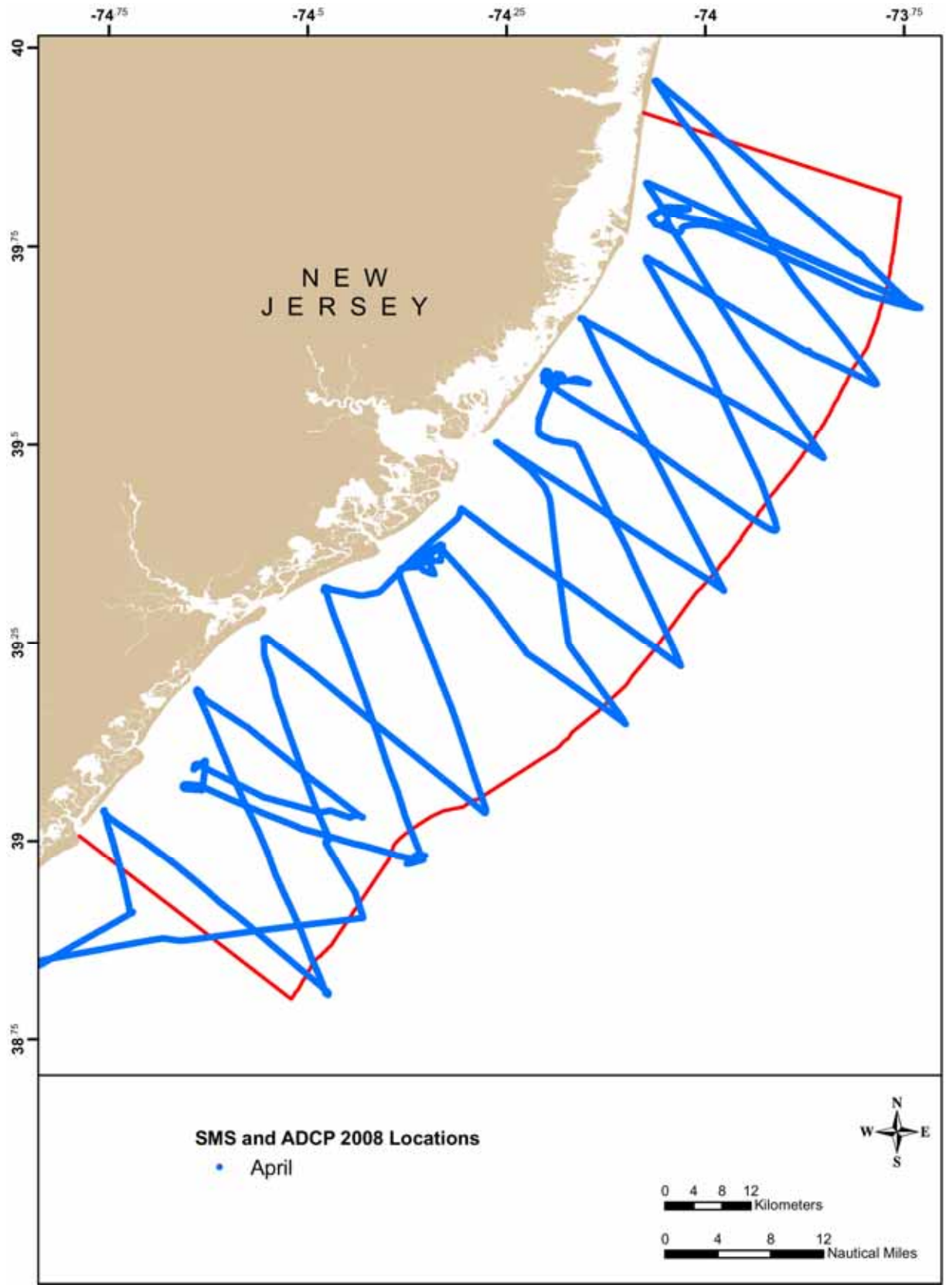

Figure 5.7-1. SMS and ADCP Measurements Conducted during Shipboard Surveys in the NJDEP Study Area off the Coast of New Jersey in April 2008.

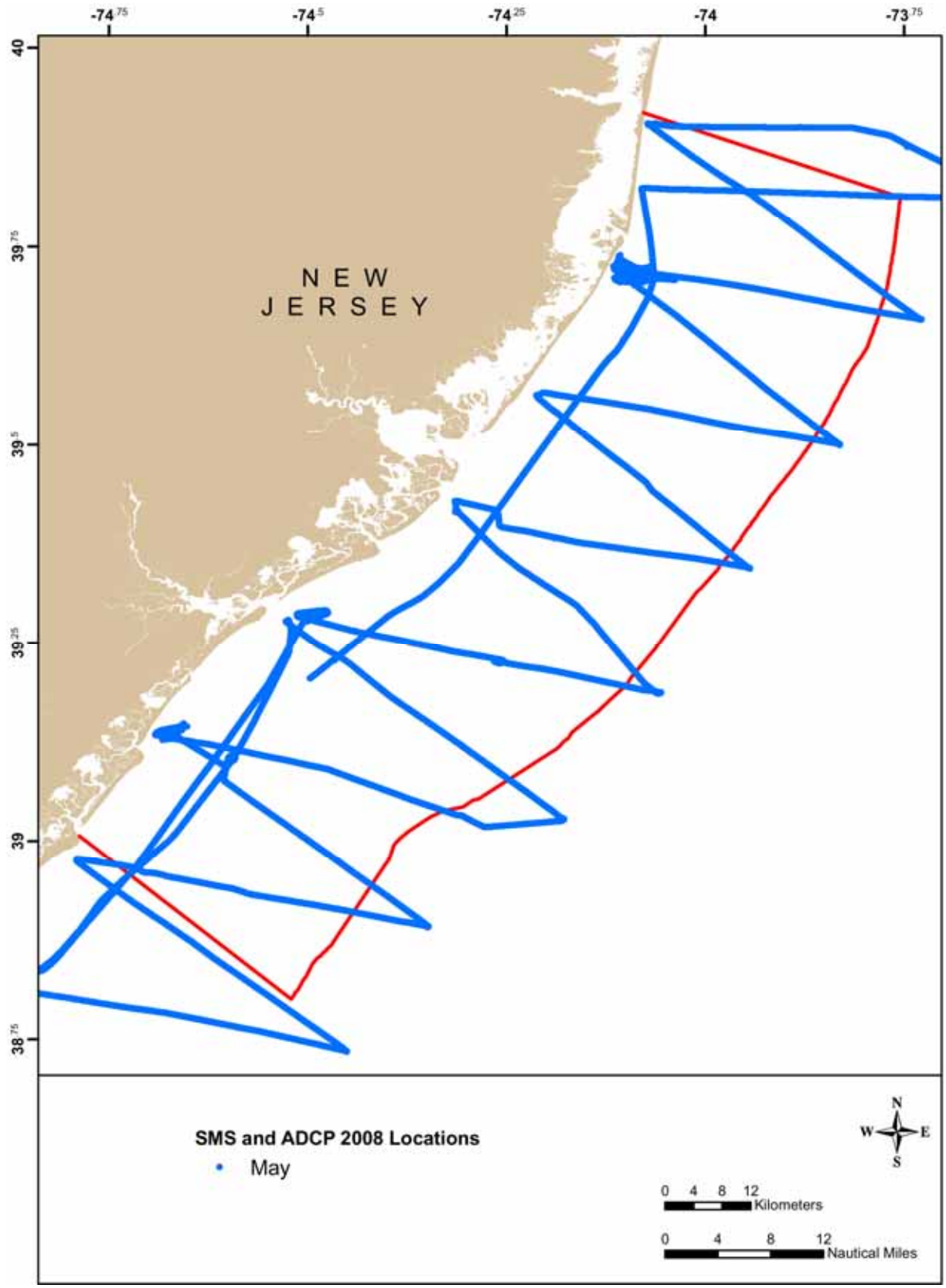

Figure 5.7-2. SMS and ADCP Measurements Conducted during Shipboard Surveys in the NJDEP Study Area off the Coast of New Jersey in May 2008.

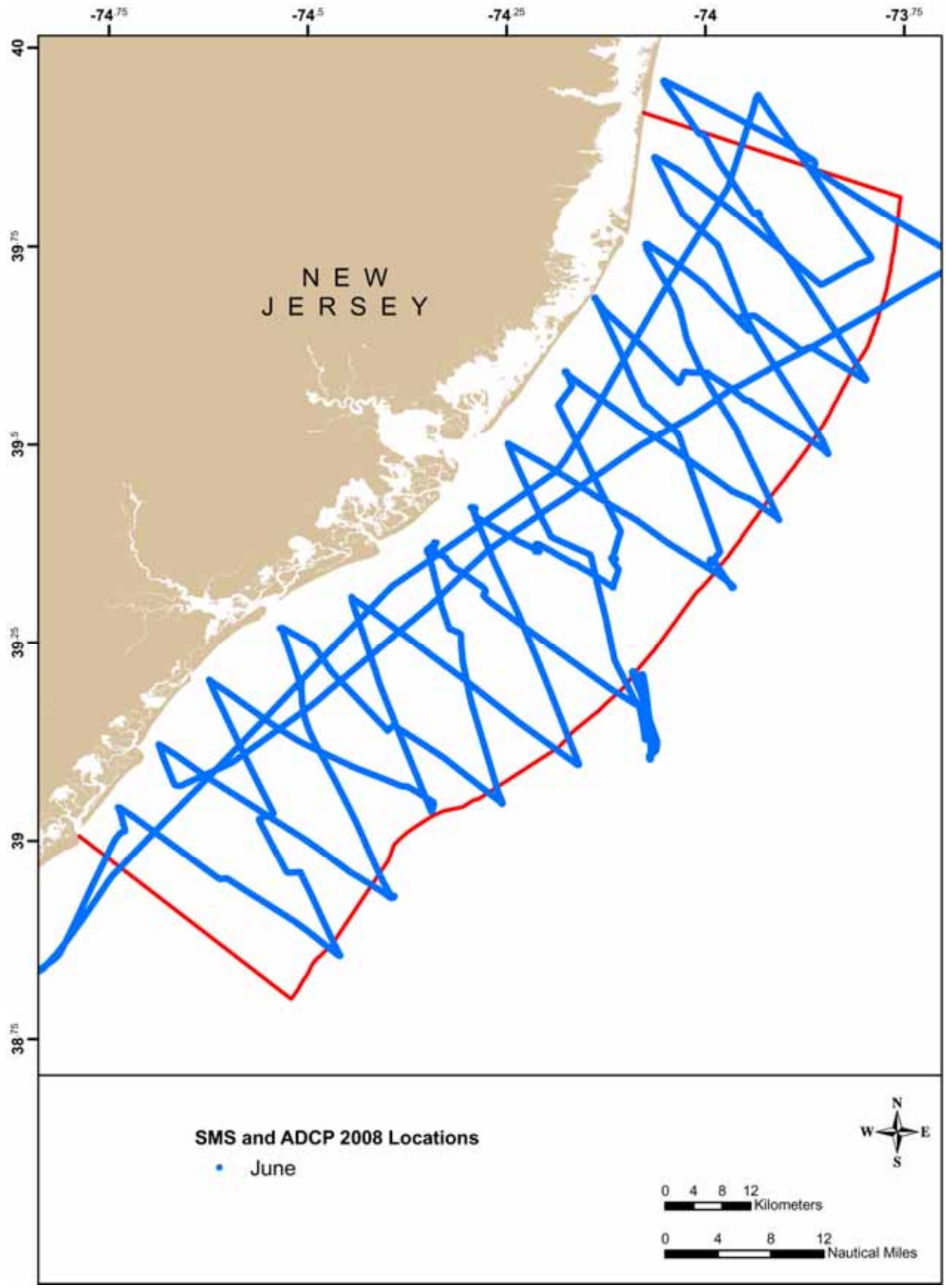

Figure 5.7-3. SMS and ADCP Measurements Conducted during Shipboard Surveys in the NJDEP Study Area off the Coast of New Jersey in June 2008.

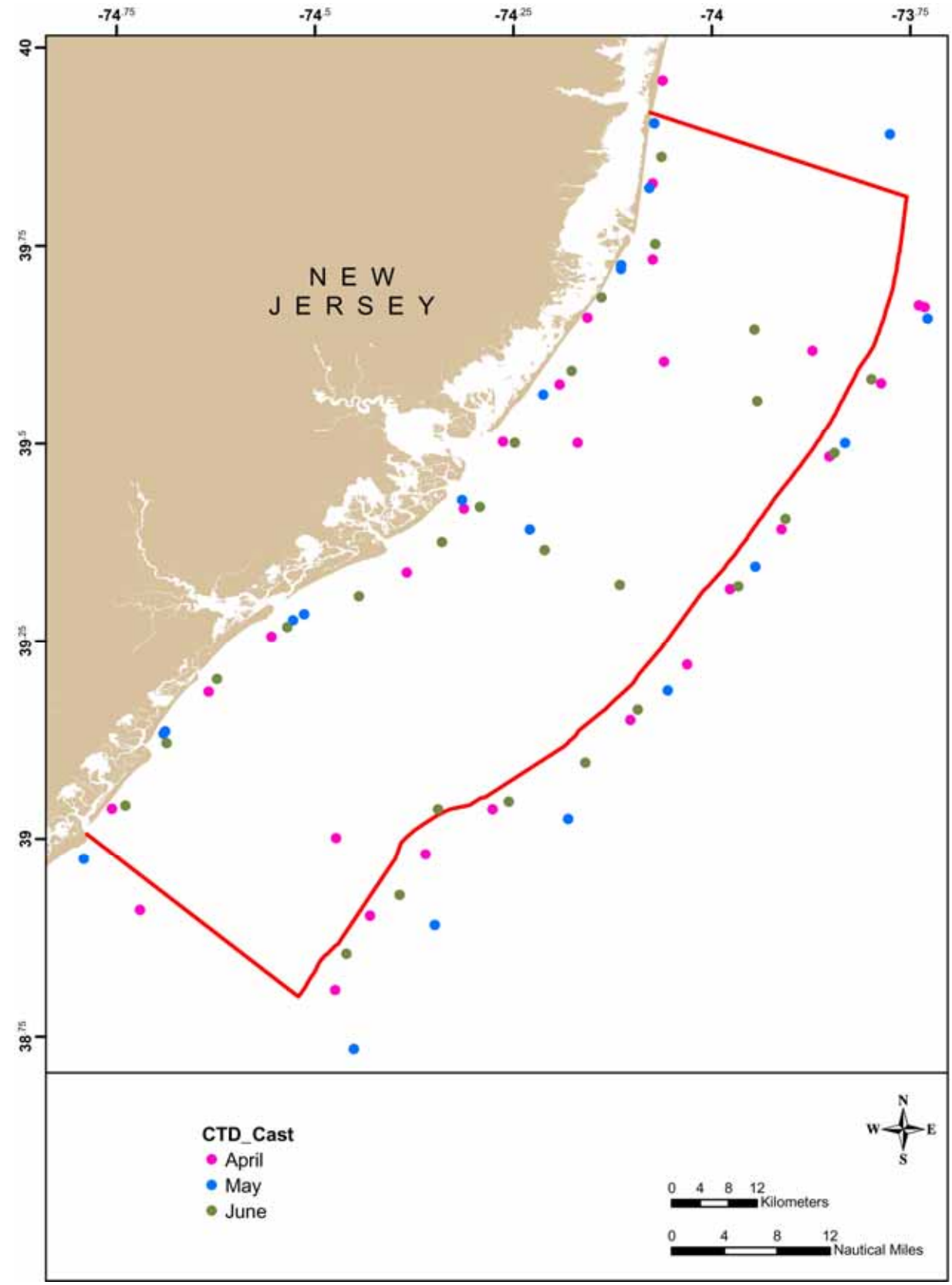

Figure 5.7-4. CTD Measurements Conducted at Point Locations in the NJDEP Study Area off the Coast of New Jersey from April through June 2008.

The CTD measurements were conducted on the following dates:

- April 2008 (28 sites): 4-9, 4-10, and 4-12 through 4-14.
- May 2008 (21 sites): 5-7, 5-8, 5-10, and 5-11.
- June 2008 (31 sites): 6-13 through 6-16.

5.7.3 Acoustic Doppler Current Profiler (ADCP) Measurements

In addition to SMS, and CTD, ADCP measurements were conducted at various site locations to assess local current conditions (**Figures 5.7-1 through 5.7-3**). The ADCP data were collected and processed using the VM-DAS or WIN-RIVER software programs. The raw ADCP data were screened for outlying data and correlated by VM-DAS or WIN and then bin-mapped and transformed to lon-lat coordinates.

The ADCP measurements were conducted on the following dates and times:

- April 2008:
  - 4-09 (13:24:22 to 23:59:59)
  - 4-10 (00:00:00 to 23:59:59)
  - 4-11 (00:00:00 to 23:59:59)
  - 4-12 (00:00:00 to 23:59:59)
  - 4-13 (00:00:00 to 23:59:59)
  - 4-14 (00:00:00 to 21:02:36)

- May 2008:
  - 5-10 (03:17:56 to 23:59:59)
  - 5-11 (00:00:00 to 12:11:10)

- June 2008:
  - 6-12 (22:31:17 to 23:59:59)
  - 6-13 (00:00:00 to 23:59:59)
  - 6-14 (00:00:00 to 23:59:59)
  - 6-15 (00:00:00 to 23:59:59)
  - 6-16 (00:00:00 to 23:59:59)
  - 6-17 (00:00:00 to 00:41:16)

6.0 INITIAL ASSESSMENT OF POTENTIAL ENVIRONMENTAL IMPACTS FROM OFFSHORE WIND POWER FACILITIES

No activity was initiated on this task during this reporting period.

7.0 REPORTING

The final revised version of the first quarterly report was presented to NJDEP on June 30, 2008. This quarterly report was prepared during this period. Responses to comments on the draft QAWP were prepared.

APPENDIX A

REVIEWED LITERATURE

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APPENDIX A-1

FISHES

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APPENDIX A-4

OFFSHORE WIND FARMS

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APPENDIX A-5

SEA TURTLES

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APPENDIX B

PRELIMINARY TRACSCAN® AND VERCAT® SUMMARY RESULTS

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APPENDIX B-1

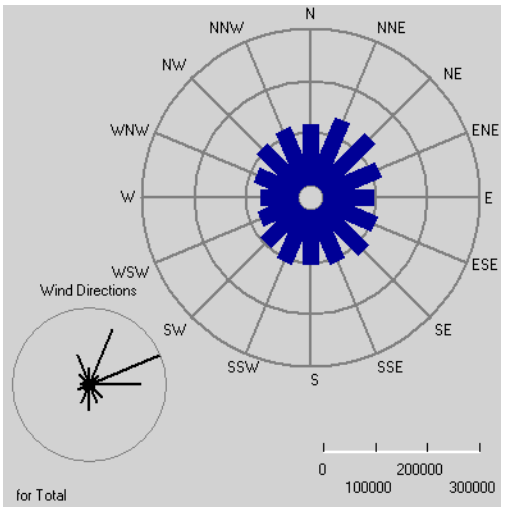
SITE 1

Site 1 – TracScan® Diurnal Activity					
Activity in tracks per hour per kilometer.					
Date	Clear	Fog	Mist	Rain	Total
3/14/2008					
3/15/2008	622.32			476.27	610.12
3/16/2008	462.13			649.82	568.11
3/17/2008	691.74				691.74
3/18/2008	829.53			964.63	873.21
3/19/2008	801.15			696.85	714.54
3/20/2008	1741.08			1580.91	1731.7
3/21/2008	768.32				768.32
3/22/2008					
Mean	876.4			743.81	839.15

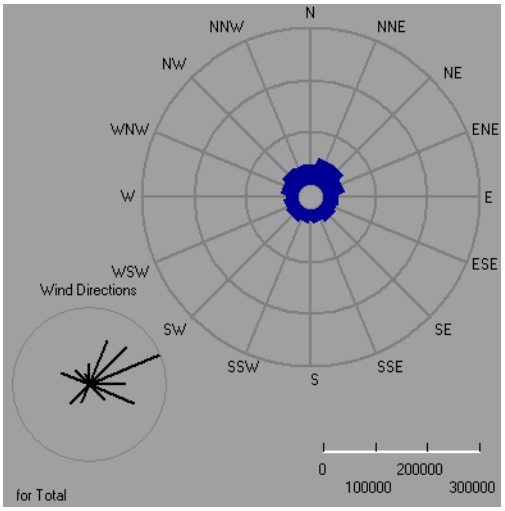
Site 1 – TracScan® Diurnal Activity					
Activity in tracks per hour per cubic kilometer.					
Date	Clear	Fog	Mist	Rain	Total
3/14/2008					
3/15/2008	44.46			34.02	43.59
3/16/2008	33.01			46.42	40.59
3/17/2008	49.42				49.42
3/18/2008	59.26			68.91	62.38
3/19/2008	57.23			49.78	51.05
3/20/2008	124.38			112.94	123.71
3/21/2008	54.89				54.89
3/22/2008					
Mean	62.61			53.14	59.95

Site 1 - TracScan® Nocturnal Activity					
Activity in tracks per hour per kilometer.					
Date	Clear	Fog	Mist	Rain	Total
3/14/2008	50.23			64.79	62.79
3/15/2008	109.62			77.83	84.76
3/16/2008	242.85			164.05	202.8
3/17/2008	317.42				317.42
3/18/2008	478.33			208.08	341.43
3/19/2008	1202.84			594.37	604.59
3/20/2008	993.68			1569.66	1147.38
3/21/2008	165.48			177.07	165.48
3/22/2008	271.65			313.01	301.48
Mean	397.01			370.71	382.65

Site 1 - TracScan® Nocturnal Activity					
Activity in tracks per hour per cubic kilometer.					
Date	Clear	Fog	Mist	Rain	Total
3/14/2008	3.59			4.63	4.49
3/15/2008	7.83			5.56	6.05
3/16/2008	17.35			11.72	14.49
3/17/2008	22.68				22.68
3/18/2008	34.17			14.87	24.39
3/19/2008	85.93			42.46	43.19
3/20/2008	70.99			112.14	81.97
3/21/2008	11.82			12.65	11.82
3/22/2008	19.41			22.36	21.54
Mean	28.36			26.48	27.34



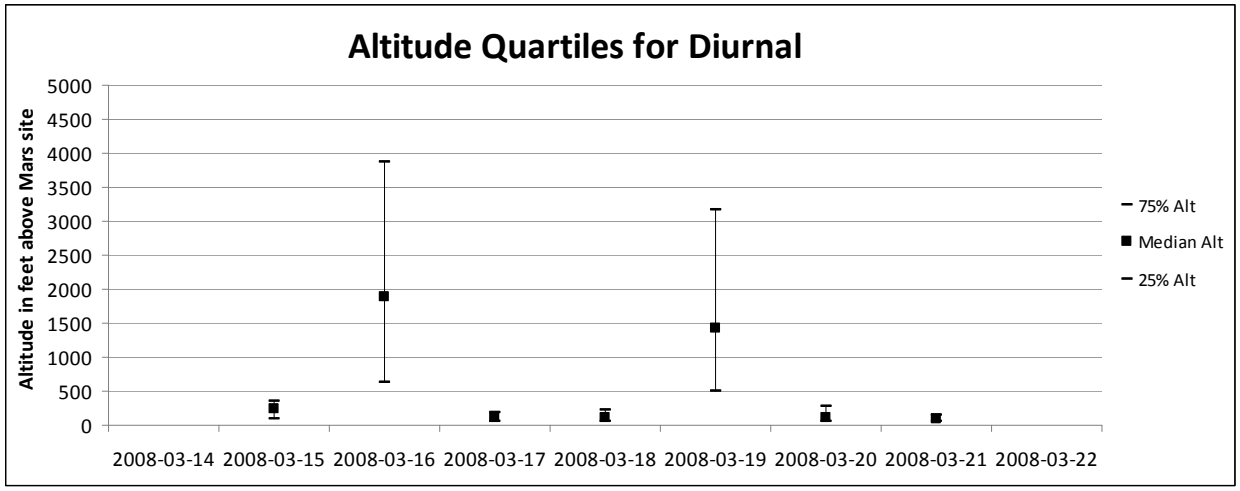
Proportional relative track counts and flight headings for all diurnal targets at Site 1.

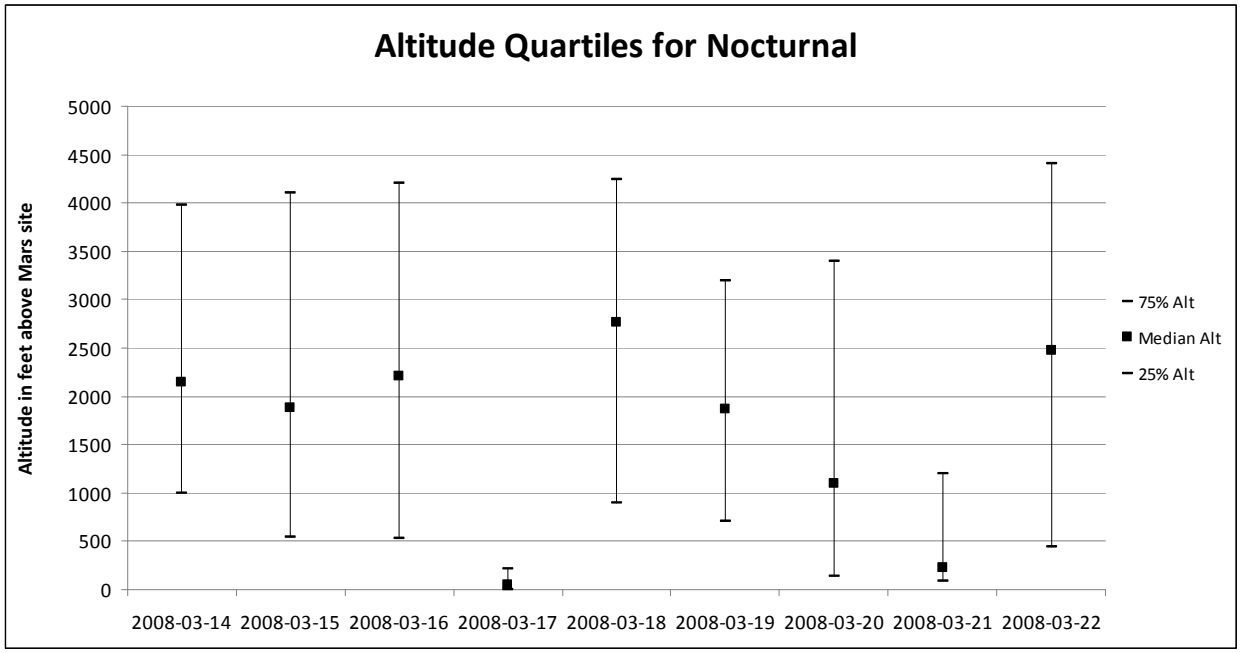


Proportional relative track counts and flight headings for all nocturnal targets at Site 1.

Site 1 - VerCat® Tracks per Hour by Altitude in Relation to Radar					
	Target Type				
Altitude Band	Small	Medium	Large	Flock	Total
Diurnal (1)					
100 feet and below	157.6	676.1	594.5	360.1	1788.2
101 -1000 feet	359.5	1187.3	785.9	559.7	2892.3
1001 - 3000 feet	335.0	1049.4	584.7	319.7	2288.8
Higher than 3000 feet	461.1	1063.6	387.7	303.3	2215.7
Subtotal	1313.2	3976.3	2352.7	1542.7	9184.9
Nocturnal (2)					
100 feet and below	180.4	595.5	441.0	204.4	1421.3
101 -1000 feet	420.4	1347.4	825.8	432.1	3025.8
1001 - 3000 feet	578.0	1846.3	1067.4	580.3	4072.1
Higher than 3000 feet	987.9	2236.1	875.5	708.8	4808.3
Subtotal	2166.7	6025.4	3209.6	1925.6	13327.3
Mean	1741.1	5003.5	2782.3	1734.6	11261.5

Site 1 - VerCat® Tracks per Hour per Kilometer by Altitude in Relation to Radar					
	Target Type				
Altitude Band	Small	Medium	Large	Flock	Total
Diurnal (1)					
100 feet and below	28.4	121.7	107.0	64.8	321.8
101 -1000 feet	64.7	213.7	141.4	100.7	520.6
1001 - 3000 feet	60.3	188.9	105.2	57.5	411.9
Higher than 3000 feet	83.0	191.4	69.8	54.6	398.8
Subtotal	236.4	715.7	423.4	277.7	1653.2
Nocturnal (2)					
100 feet and below	32.5	107.2	79.4	36.8	255.8
101 -1000 feet	75.7	242.5	148.6	77.8	544.6
1001 - 3000 feet	104.0	332.3	192.1	104.5	732.9
Higher than 3000 feet	177.8	402.5	157.6	127.6	865.4
Subtotal	390.0	1084.5	577.7	346.6	2398.7
Mean	313.4	900.6	500.8	312.2	2026.9


Altitude Quartiles for Diurnal
Altitude in feet above Mars site
5000
4500
4000
3500
3000
2500
2000
1500
1000
500
0
2008-03-14
2008-03-15
2008-03-16
2008-03-17
2008-03-18
2008-03-19
2008-03-20
2008-03-21
2008-03-22
75% Alt
Median Alt
25% Alt


Altitude Quartiles for Nocturnal
Altitude in feet above Mars site
5000
4500
4000
3500
3000
2500
2000
1500
1000
500
0
2008-03-14
2008-03-15
2008-03-16
2008-03-17
2008-03-18
2008-03-19
2008-03-20
2008-03-21
2008-03-22
75% Alt
Median Alt
25% Alt

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APPENDIX B-2

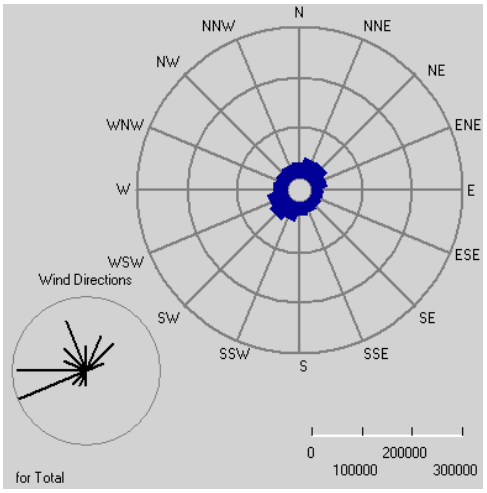
SITE 7

Site 7 - TracScan® Diurnal Activity					
Activity in tracks per hour per kilometer.					
Date	Clear	Fog	Mist	Rain	Total
3/22/2008	301.87			262.5	287.15
3/23/2008	301.61				301.61
3/24/2008	245.95			281.02	247.11
3/25/2008	224.14				224.14
3/26/2008	531.86			351.85	466.66
3/27/2008	276.24			211.34	238.25
Mean	306.54			302.47	304.89

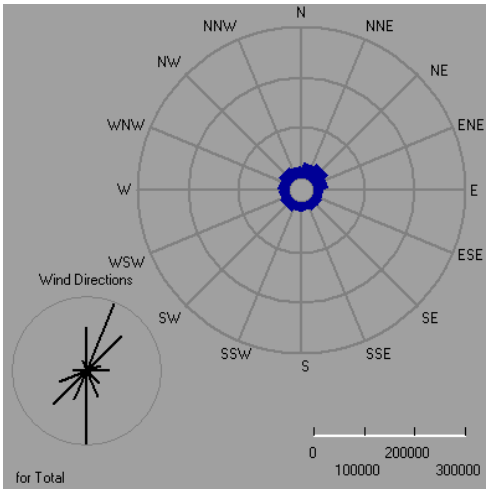
Site 7 - TracScan® Diurnal Activity					
Activity in tracks per hour per cubic kilometer.					
Date	Clear	Fog	Mist	Rain	Total
3/22/2008	21.57			18.75	20.51
3/23/2008	21.55				21.55
3/24/2008	17.57			20.08	17.65
3/25/2008	16.01				16.01
3/26/2008	38			25.14	33.34
3/27/2008	19.73			15.1	17.02
Mean	21.9			21.61	21.78

Site 7 - TracScan® Nocturnal Activity					
Activity in tracks per hour per kilometer.					
Date	Clear	Fog	Mist	Rain	Total
3/22/2008	122.24				122.24
3/23/2008	117.39			160.67	118.2
3/24/2008	84.5				84.5
3/25/2008	245.72			1210.12	541.91
3/26/2008	1061.82			701.89	896.29
3/27/2008	92.08			110.29	96.53
Mean	255.79			773.42	349.03

Site 7 - TracScan® Nocturnal Activity					
Activity in tracks per hour per cubic kilometer.					
Date	Clear	Fog	Mist	Rain	Total
3/22/2008	8.73				8.73
3/23/2008	8.39			11.48	8.44
3/24/2008	6.04				6.04
3/25/2008	17.55			86.45	38.71
3/26/2008	75.86			50.14	64.03
3/27/2008	6.58			7.88	6.9
Mean	18.27			55.25	24.93



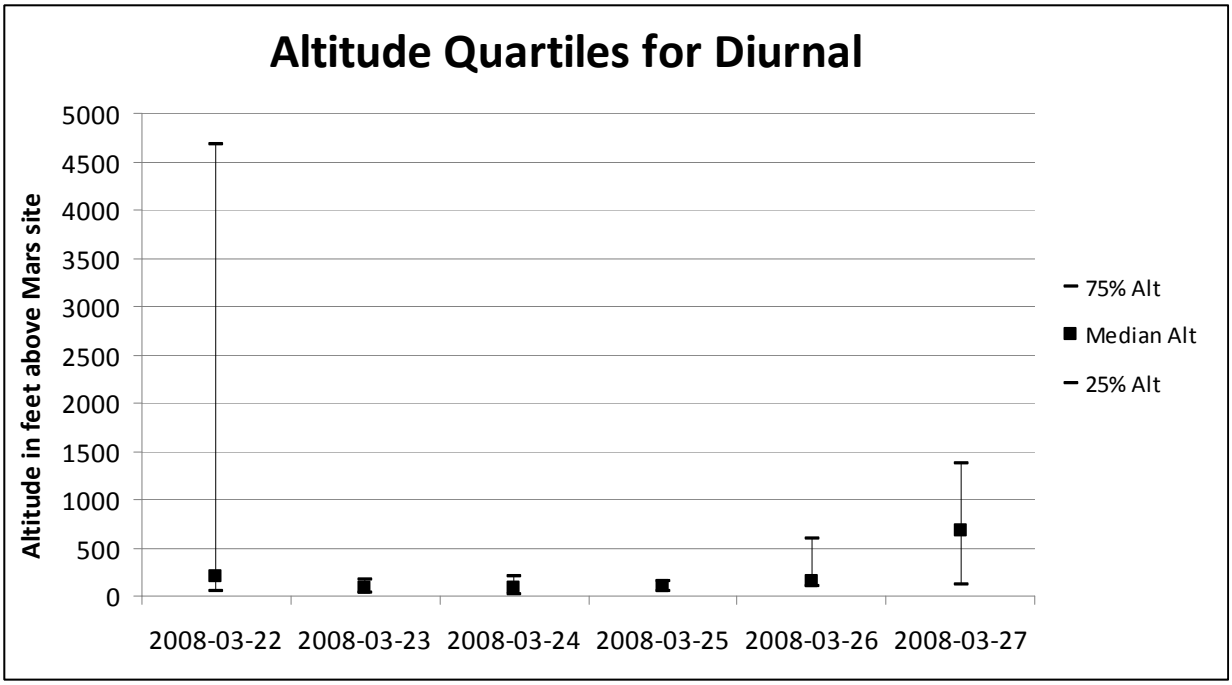
Proportional relative track counts and flight headings for all diurnal targets at Site 7.



Proportional relative track counts and flight headings for all nocturnal targets at Site 7.

Site 7 - VerCat® Tracks per Hour by Altitude in Relation to Radar					
	Target Type				
Altitude Band	Small	Medium	Large	Flock	Total
Diurnal (1)					
100 feet and below	138.8	569.4	453.3	258.5	1420.0
101 -1000 feet	160.7	436.4	483.7	387.0	1467.7
1001 - 3000 feet	5.6	55.6	167.0	56.9	285.2
Higher than 3000 feet	44.0	100.7	47.7	65.5	258.0
Subtotal	349.1	1162.2	1151.8	767.8	3430.9
Nocturnal (2)					
100 feet and below	148.8	538.1	414.5	207.4	1308.7
101 -1000 feet	125.3	397.4	474.7	297.7	1295.2
1001 - 3000 feet	13.5	124.0	288.0	173.3	598.8
Higher than 3000 feet	96.5	253.7	246.4	386.4	983.0
Subtotal	384.1	1313.2	1423.6	1064.8	4185.7
Mean	365.5	1232.9	1279.1	906.9	3784.4

Site 7 - VerCat® Tracks per Hour per Kilometer by Altitude in Relation to Radar					
	Target Type				
Altitude Band	Small	Medium	Large	Flock	Total
Diurnal (1)					
100 feet and below	25.0	102.5	81.6	46.5	255.6
101 -1000 feet	28.9	78.6	87.1	69.6	264.2
1001 - 3000 feet	1.0	10.0	30.1	10.2	51.3
Higher than 3000 feet	7.9	18.1	8.6	11.8	46.4
Subtotal	62.8	209.2	207.3	138.2	617.5
Nocturnal (2)					
100 feet and below	26.8	96.8	74.6	37.3	235.5
101 -1000 feet	22.6	71.5	85.4	53.6	233.1
1001 - 3000 feet	2.4	22.3	51.8	31.2	107.8
Higher than 3000 feet	17.4	45.7	44.3	69.5	176.9
Subtotal	69.1	236.4	256.2	191.7	753.4
Mean	65.8	221.9	230.2	163.2	681.1


Altitude Quartiles for Diurnal
Altitude in feet above Mars site
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4500
4000
3500
3000
2500
2000
1500
1000
500
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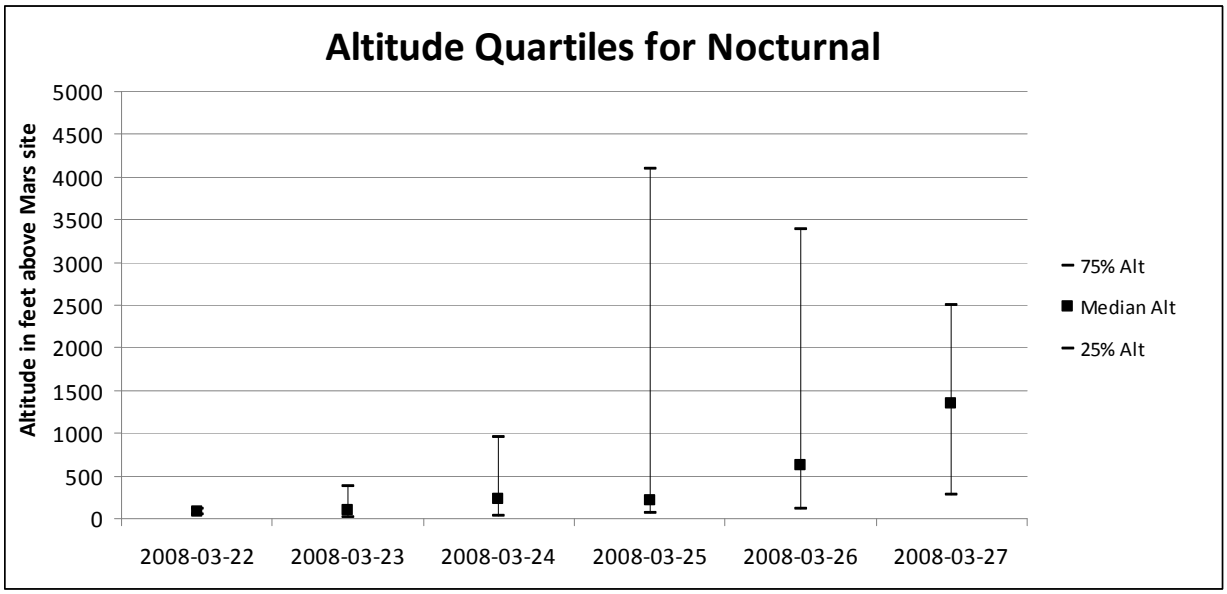
2008-03-22
2008-03-23
2008-03-24
2008-03-25
2008-03-26
2008-03-27
75% Alt
Median Alt
25% Alt


Altitude Quartiles for Nocturnal
Altitude in feet above Mars site
5000
4500
4000
3500
3000
2500
2000
1500
1000
500
0
2008-03-22
2008-03-23
2008-03-24
2008-03-25
2008-03-26
2008-03-27
75% Alt
Median Alt
25% Alt

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APPENDIX B-3

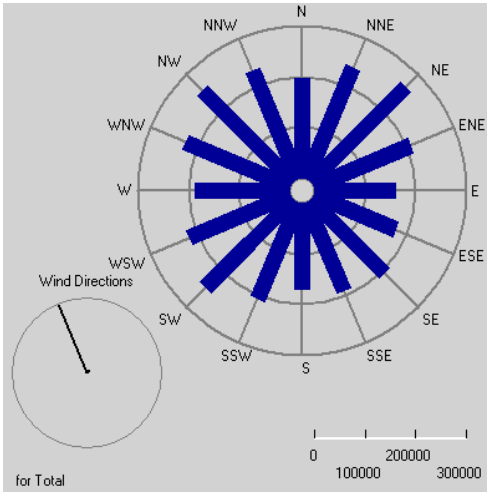
SITE 13

Site 13 - TracScan® Diurnal Activity					
Activity in tracks per hour per kilometer.					
Date	Clear	Fog	Mist	Rain	Total
4/3/2008	156.23			315.13	246.52
4/4/2008	425.09			346.5	361.89
4/5/2008	267.7			249.84	257.8
4/6/2008	807.34			471.86	769.13
4/7/2008	2382.75				2382.75
4/8/2008	3463.49				3463.49
4/9/2008	294.64			223.42	272.86
4/10/2008	325.6			315.04	318.81
4/11/2008	1018.45			764.45	779.1
4/12/2008	462.12			833.5	813.61
4/13/2008	724.49			681.06	715.64
Mean	1316.12			510.59	983.91

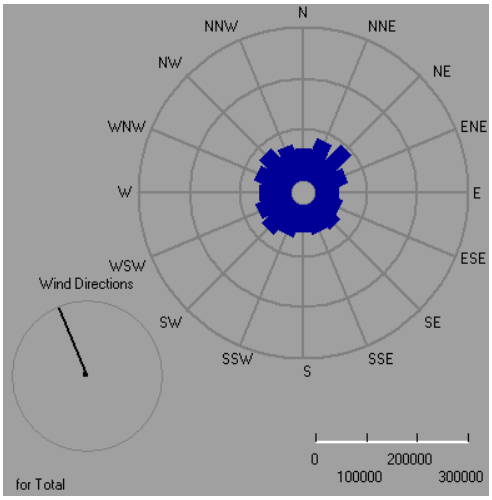
Site 13 - TracScan® Diurnal Activity					
Activity in tracks per hour per cubic kilometer.					
Date	Clear	Fog	Mist	Rain	Total
4/3/2008	11.16			22.51	17.61
4/4/2008	30.37			24.75	25.85
4/5/2008	19.12			17.85	18.42
4/6/2008	57.68			33.71	54.95
4/7/2008	170.22				170.22
4/8/2008	247.43				247.43
4/9/2008	21.05			15.96	19.49
4/10/2008	23.26			22.51	22.78
4/11/2008	72.76			54.61	55.66
4/12/2008	33.01			59.54	58.12
4/13/2008	51.76			48.65	51.12
Mean	94.02			36.48	70.29

Site 13 - TracScan® Nocturnal Activity					
Activity in tracks per hour per kilometer.					
Date	Clear	Fog	Mist	Rain	Total
4/3/2008				129.44	129.44
4/4/2008	68.58			84.42	84.35
4/5/2008	46.03			84.39	80.6
4/6/2008	1928.65			22.49	978.68
4/7/2008	2582.14				2582.14
4/8/2008	1990.44				1990.44
4/9/2008	187.83			13.79	110.01
4/10/2008	181.57			337.43	322.22
4/11/2008				305.24	305.24
4/12/2008				195.76	195.76
4/13/2008	95.89			76.88	87.01
Mean	1611.43			152.37	696.12

Site 13 - TracScan® Nocturnal Activity					
Activity in tracks per hour per cubic kilometer.					
Date	Clear	Fog	Mist	Rain	Total
4/3/2008				9.25	9.25
4/4/2008	4.9			6.03	6.03
4/5/2008	3.29			6.03	5.76
4/6/2008	137.78			1.61	69.92
4/7/2008	184.47				184.47
4/8/2008	142.2				142.2
4/9/2008	13.42			0.98	7.86
4/10/2008	12.97			24.11	23.02
4/11/2008				21.81	21.81
4/12/2008				13.98	13.98
4/13/2008	6.85			5.49	6.22
Mean	115.12			10.89	49.73



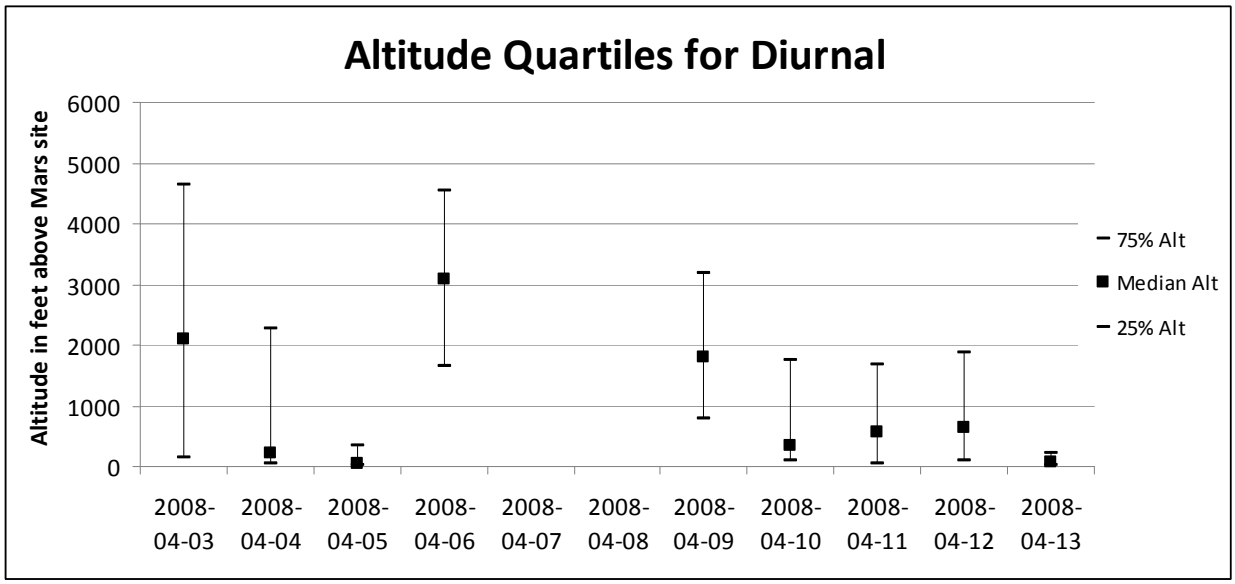
Proportional relative track counts and flight headings for all diurnal targets at Site 13.



Proportional relative track counts and flight headings for all nocturnal targets at Site 13.

Site 13 - Tracks per Hour by Altitude in Relation to Radar					
	Target Type				
Altitude Band	Small	Medium	Large	Flock	Total
Diurnal (1)					
100 feet and below	226.1	553.5	519.9	308.2	1607.7
101 -1000 feet	117.6	541.5	863.3	363.6	1886.1
1001 - 3000 feet	133.4	653.7	811.1	320.6	1918.8
Higher than 3000 feet	184.2	601.1	276.7	231.1	1293.1
Subtotal	661.3	2349.8	2471.0	1223.5	6705.7
Nocturnal (2)					
100 feet and below	137.6	340.3	322.4	96.7	897.0
101 -1000 feet	237.2	965.5	1539.8	663.4	3405.9
1001 - 3000 feet	299.5	1105.4	1536.4	759.6	3700.9
Higher than 3000 feet	590.0	1510.4	808.3	549.6	3458.3
Subtotal	1264.2	3921.7	4206.9	2069.4	11462.2
Mean	933.2	3058.5	3253.7	1604.9	8850.3

Site 13 - Tracks per Hour per Kilometer by Altitude in Relation to Radar					
	Target Type				
Altitude Band	Small	Medium	Large	Flock	Total
Diurnal (1)					
100 feet and below	40.7	99.6	93.6	55.5	289.4
101 -1000 feet	21.2	97.5	155.4	65.4	339.5
1001 - 3000 feet	24.0	117.7	146.0	57.7	345.4
Higher than 3000 feet	33.2	108.2	49.8	41.6	232.7
Subtotal	119.0	422.9	444.7	220.2	1206.9
Nocturnal (2)					
100 feet and below	24.8	61.2	58.0	17.4	161.4
101 -1000 feet	42.7	173.8	277.1	119.4	613.0
1001 - 3000 feet	53.9	199.0	276.5	136.7	666.1
Higher than 3000 feet	106.2	271.9	145.5	98.9	622.5
Subtotal	227.5	705.8	757.2	372.5	2063.0
Mean	168.0	550.5	585.6	288.9	1592.9


Altitude Quartiles for Diurnal
Altitude in feet above Mars site
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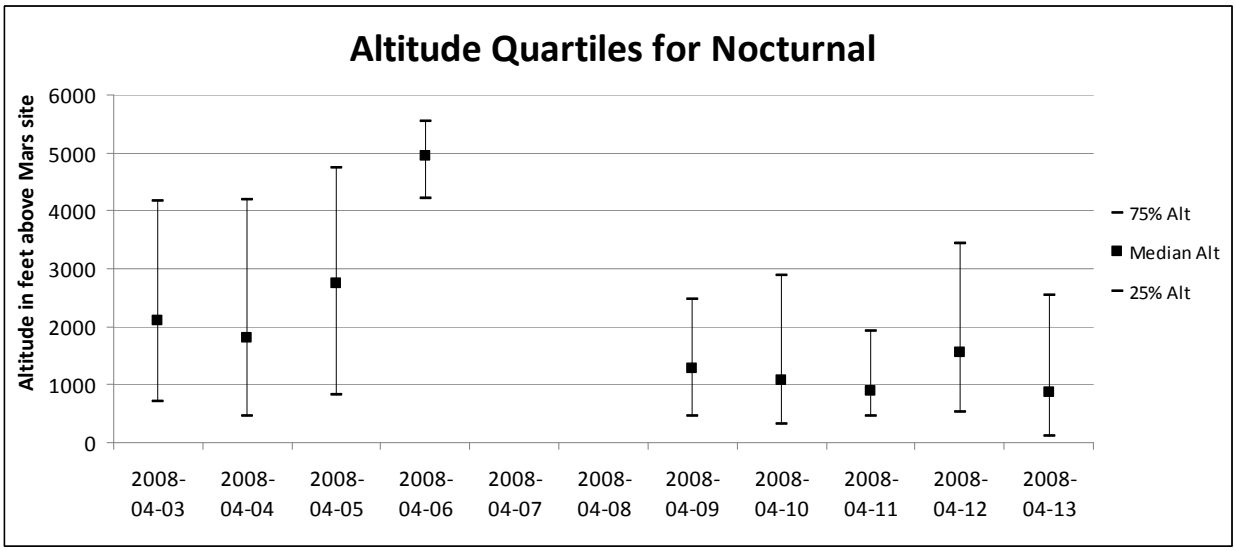
5000
4000
3000
2000
1000
0
2008-04-03
2008-04-04
2008-04-05
2008-04-06
2008-04-07
2008-04-08
2008-04-09
2008-04-10
2008-04-11
2008-04-12
2008-04-13
75% Alt
Median Alt
25% Alt


Altitude Quartiles for Nocturnal
Altitude in feet above Mars site
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5000
4000
3000
2000
1000
0
2008-04-03
2008-04-04
2008-04-05
2008-04-06
2008-04-07
2008-04-08
2008-04-09
2008-04-10
2008-04-11
2008-04-12
2008-04-13
75% Alt
Median Alt
25% Alt

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APPENDIX B-4

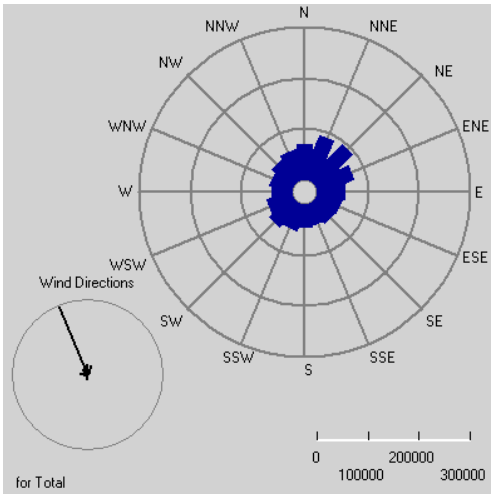
SITE 19

Site 19 - TracScan® Diurnal Activity					
Activity in tracks per hour per kilometer.					
Date	Clear	Fog	Mist	Rain	Total
4/13/2008	584.9			553.92	554.79
4/14/2008	607.35				607.35
4/15/2008	301.7				301.7
4/16/2008	353.93				353.93
4/17/2008	465.9			292.99	440.55
4/18/2008	596.88			620.94	598.24
4/19/2008				673.79	673.79
Mean	462.2			558.17	475.64

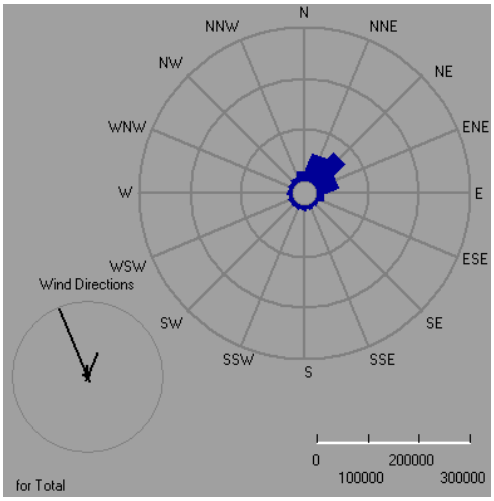
Site 19 - TracScan® Diurnal Activity					
Activity in tracks per hour per cubic kilometer.					
Date	Clear	Fog	Mist	Rain	Total
4/13/2008	41.79			39.57	39.63
4/14/2008	43.39				43.39
4/15/2008	21.55				21.55
4/16/2008	25.28				25.28
4/17/2008	33.28			20.93	31.47
4/18/2008	42.64			44.36	42.74
4/19/2008				48.14	48.14
Mean	33.02			39.88	33.98

Site 19 - TracScan® Nocturnal Activity					
Activity in tracks per hour per kilometer.					
Date	Clear	Fog	Mist	Rain	Total
4/13/2008				223.97	223.97
4/14/2008	225.08			63.81	193.74
4/15/2008	166.61			275.46	168.05
4/16/2008	266.24			374.09	267.63
4/17/2008	119.45			490.75	272.35
4/18/2008	212.76			409.36	381.59
4/19/2008				473.5	473.5
Mean	202.12			369.24	271.16

Site 19 - TracScan® Nocturnal Activity					
Activity in tracks per hour per cubic kilometer.					
Date	Clear	Fog	Mist	Rain	Total
4/13/2008				16	16
4/14/2008	16.08			4.56	13.84
4/15/2008	11.9			19.68	12.01
4/16/2008	19.02			26.72	19.12
4/17/2008	8.53			35.06	19.46
4/18/2008	15.2			29.24	27.26
4/19/2008				33.83	33.83
Mean	14.44			26.38	19.37



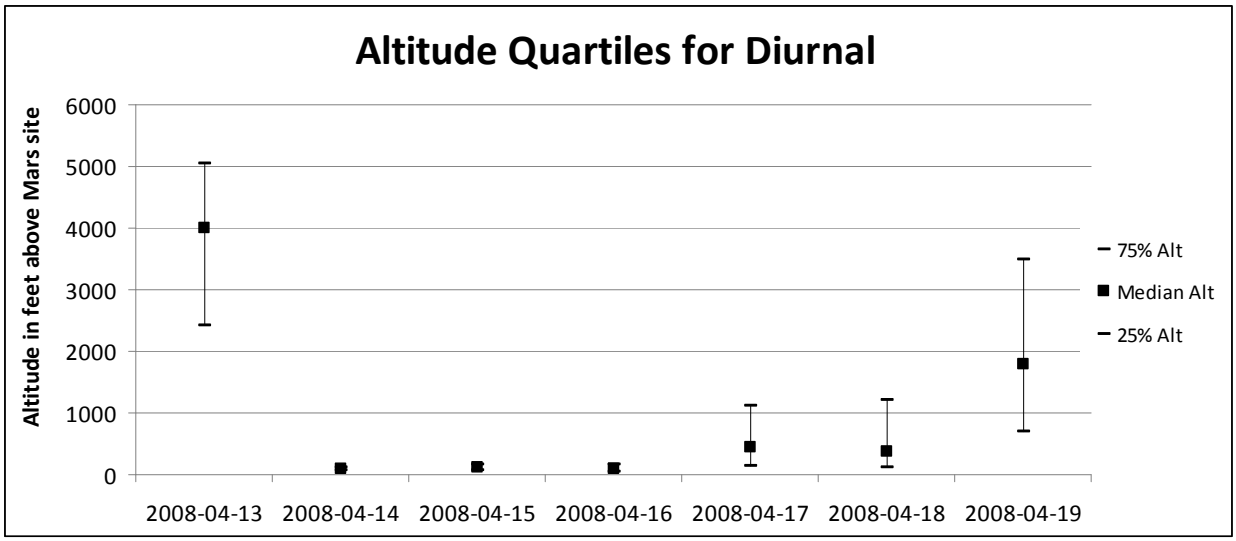
Proportional relative track counts and flight headings for all diurnal targets at Site 19.



Proportional relative track counts and flight headings for all nocturnal targets at Site 19.

Site 19 - Tracks per Hour by Altitude in Relation to Radar					
	Target Type				
Altitude Band	Small	Medium	Large	Flock	Total
Diurnal (1)					
100 feet and below	35.2	256.9	384.6	283.7	960.4
101 -1000 feet	55.2	238.5	580.0	463.1	1336.7
1001 - 3000 feet	24.7	222.8	410.1	141.1	798.7
Higher than 3000 feet	147.0	550.9	312.2	239.9	1249.9
Subtotal	262.1	1269.0	1686.9	1127.8	4345.7
Nocturnal (2)					
100 feet and below	58.5	363.3	514.9	232.7	1169.4
101 -1000 feet	192.9	936.8	1478.1	858.5	3466.4
1001 - 3000 feet	291.6	1292.0	1376.6	735.8	3696.0
Higher than 3000 feet	520.1	1910.1	981.8	674.0	4086.0
Subtotal	1063.1	4502.3	4351.3	2501.0	12417.7
Mean	610.4	2674.9	2845.4	1724.9	7855.5

Site 19 - Tracks per Hour per Kilometer by Altitude in Relation to Radar					
	Target Type				
Altitude Band	Small	Medium	Large	Flock	Total
Diurnal (1)					
100 feet and below	6.3	46.2	69.2	51.1	172.9
101 -1000 feet	9.9	42.9	104.4	83.3	240.6
1001 - 3000 feet	4.4	40.1	73.8	25.4	143.8
Higher than 3000 feet	26.5	99.1	56.2	43.2	225.0
Subtotal	47.2	228.4	303.6	203.0	782.2
Nocturnal (2)					
100 feet and below	10.5	65.4	92.7	41.9	210.5
101 -1000 feet	34.7	168.6	266.0	154.5	623.9
1001 - 3000 feet	52.5	232.5	247.8	132.4	665.2
Higher than 3000 feet	93.6	343.8	176.7	121.3	735.4
Subtotal	191.3	810.4	783.2	450.1	2235.0
Mean	109.9	481.4	512.1	310.5	1413.9


Altitude Quartiles for Diurnal
Altitude in feet above Mars site
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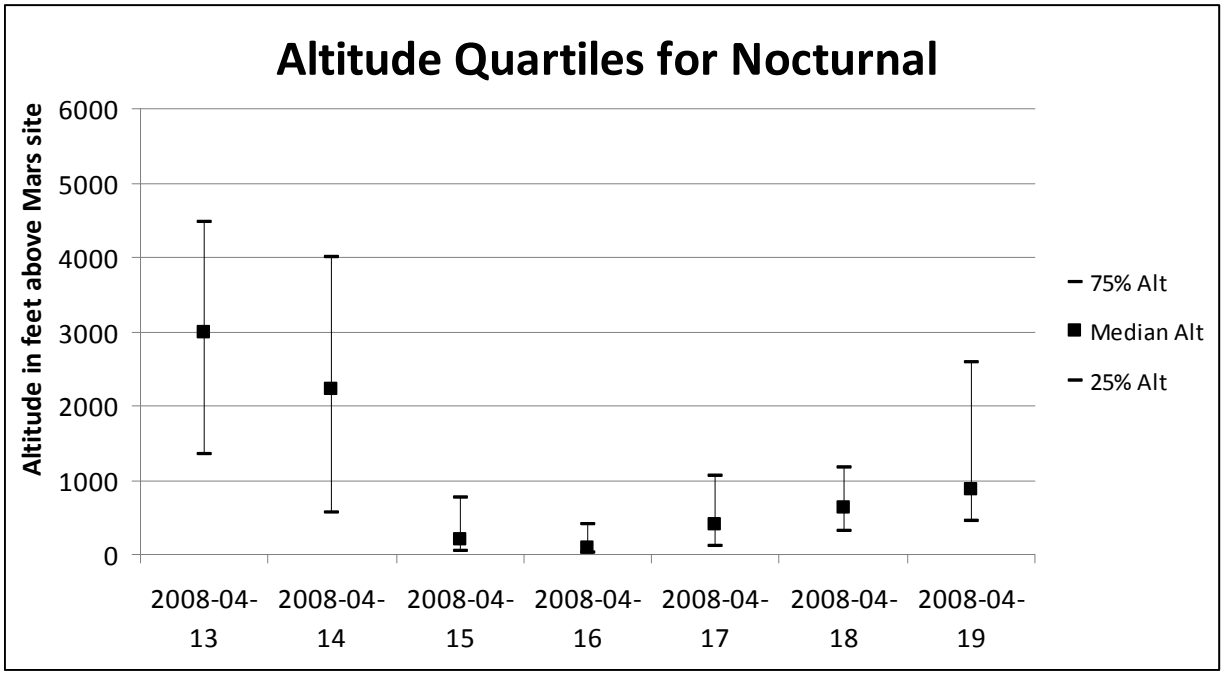
5000
4000
3000
2000
1000
0
2008-04-13
2008-04-14
2008-04-15
2008-04-16
2008-04-17
2008-04-18
2008-04-19
75% Alt
Median Alt
25% Alt


Altitude Quartiles for Nocturnal
Altitude in feet above Mars site
6000
5000
4000
3000
2000
1000
0
2008-04-13
2008-04-14
2008-04-15
2008-04-16
2008-04-17
2008-04-18
2008-04-19
75% Alt
Median Alt
25% Alt

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APPENDIX B-5

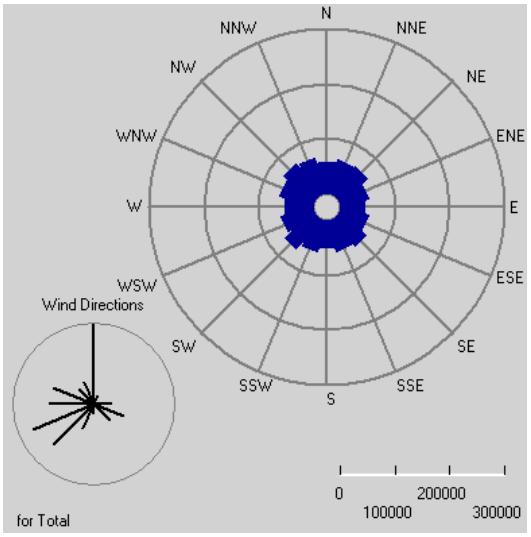
SITE 26

Site 26 - TracScan® Diurnal Activity					
Activity in tracks per hour per kilometer.					
Date	Clear	Fog	Mist	Rain	Total
4/24/2008	46.6			60.31	49.34
4/25/2008	50.25			89.18	52.01
4/26/2008	1146			308.81	450.8
4/27/2008	892.59			988.33	971.08
4/28/2008	520.19			651.94	641.47
4/29/2008	565.38			525.22	553.37
4/30/2008	68.34			153.79	68.75
Mean	309.67			617.74	465.92

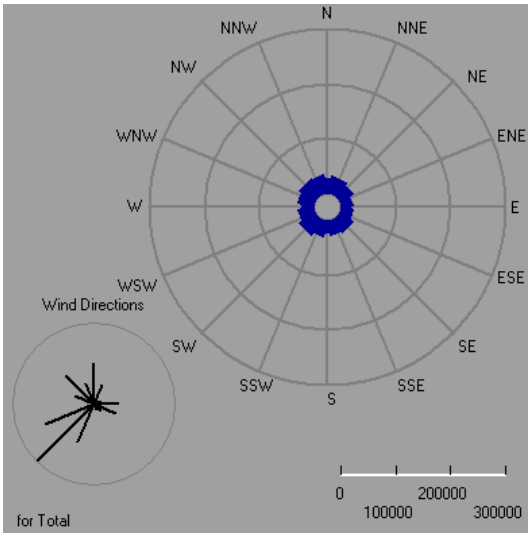
Site 26 - TracScan® Diurnal Activity					
Activity in tracks per hour per cubic kilometer.					
Date	Clear	Fog	Mist	Rain	Total
4/24/2008	3.33			4.31	3.53
4/25/2008	3.59			6.37	3.72
4/26/2008	81.87			22.06	32.21
4/27/2008	63.77			70.61	69.37
4/28/2008	37.16			46.57	45.83
4/29/2008	40.39			37.52	39.53
4/30/2008	4.88			10.99	4.91
Mean	22.12			44.13	33.28

Site 26 - TracScan® Nocturnal Activity					
Activity in tracks per hour per kilometer.					
Date	Clear	Fog	Mist	Rain	Total
4/24/2008	34.42			83.16	74.34
4/25/2008	61.34			92.76	84.51
4/26/2008	1074.18			400.34	518.4
4/27/2008	1212.78			951.4	975.59
4/28/2008	1201.31			633.97	663.91
4/29/2008	74.24			41.06	54.24
4/30/2008	25.23			14.71	18.61
Mean	338.44			405.72	390.37

Site 26 - TracScan® Nocturnal Activity					
Activity in tracks per hour per cubic kilometer.					
Date	Clear	Fog	Mist	Rain	Total
4/24/2008	2.46			5.94	5.31
4/25/2008	4.38			6.63	6.04
4/26/2008	76.74			28.6	37.03
4/27/2008	86.64			67.97	69.7
4/28/2008	85.82			45.29	47.43
4/29/2008	5.3			2.93	3.87
4/30/2008	1.8			1.05	1.33
Mean	24.18			28.98	27.89



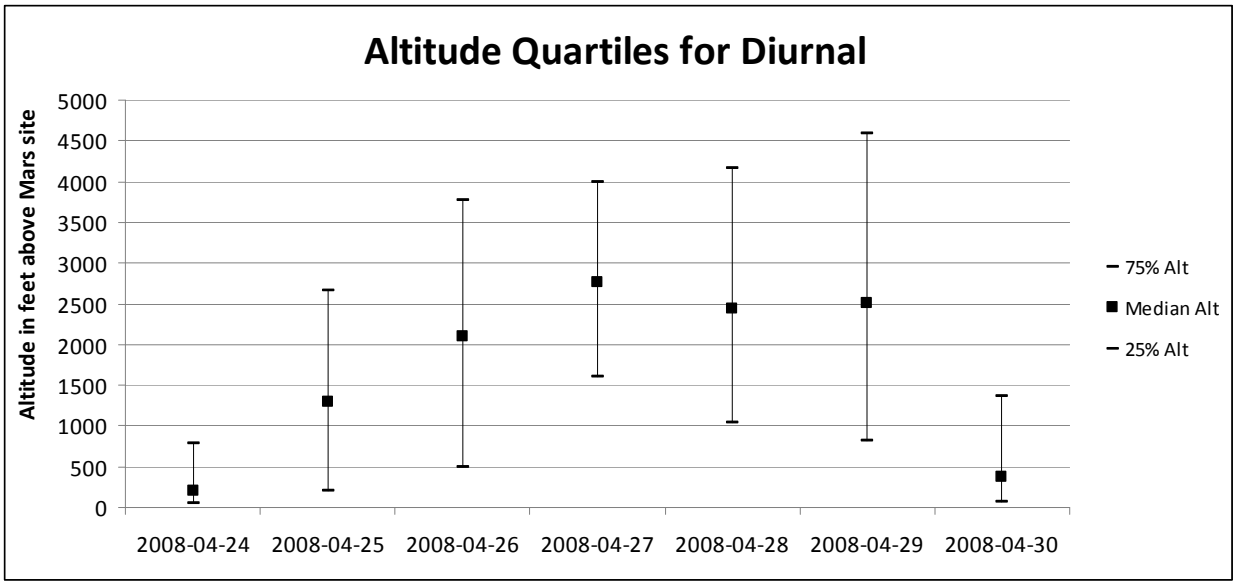
Proportional relative track counts and flight headings for all diurnal targets at Site 26.

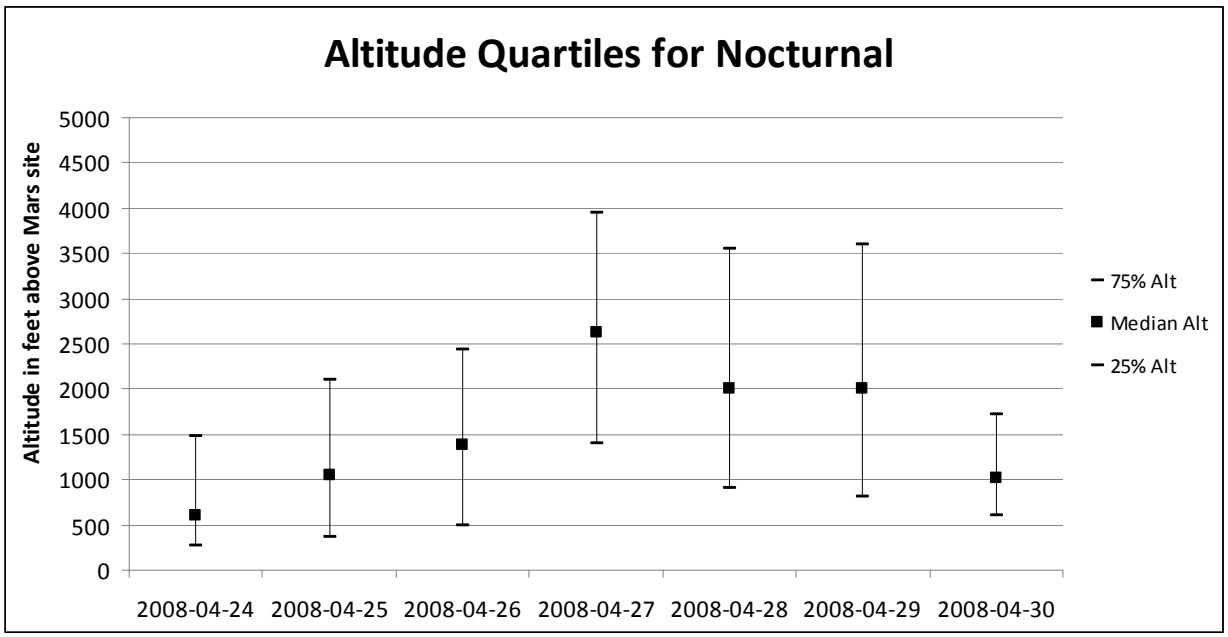


Proportional relative track counts and flight headings for all nocturnal targets at Site 26.

Site 26 - Tracks per Hour by Altitude in Relation to Radar					
	Target Type				
Altitude Band	Small	Medium	Large	Flock	Total
Diurnal (1)					
100 feet and below	30.6	148.7	151.6	51.3	382.3
101 -1000 feet	220.6	642.3	565.6	187.0	1615.6
1001 - 3000 feet	374.6	1107.9	926.5	333.5	2742.4
Higher than 3000 feet	621.9	1575.7	667.9	372.4	3237.9
Subtotal	1247.7	3474.7	2311.7	944.2	7978.2
Nocturnal (2)					
100 feet and below	30.2	159.3	210.9	46.7	447.2
101 -1000 feet	251.1	1044.9	1486.2	480.3	3262.5
1001 - 3000 feet	409.6	1824.8	1990.6	997.1	5222.1
Higher than 3000 feet	644.6	1943.8	984.2	623.4	4195.9
Subtotal	1335.5	4972.9	4671.9	2147.5	13127.7
Mean	1282.8	4074.0	3255.8	1425.5	10038.0

Site 26 - Tracks per Hour per Kilometer by Altitude in Relation to Radar					
	Target Type				
Altitude Band	Small	Medium	Large	Flock	Total
Diurnal (1)					
100 feet and below	5.5	26.8	27.3	9.2	68.8
101 -1000 feet	39.7	115.6	101.8	33.7	290.8
1001 - 3000 feet	67.4	199.4	166.8	60.0	493.6
Higher than 3000 feet	111.9	283.6	120.2	67.0	582.8
Subtotal	224.6	625.4	416.1	169.9	1436.0
Nocturnal (2)					
100 feet and below	5.4	28.7	38.0	8.4	80.5
101 -1000 feet	45.2	188.1	267.5	86.4	587.2
1001 - 3000 feet	73.7	328.4	358.3	179.5	939.9
Higher than 3000 feet	116.0	349.9	177.1	112.2	755.2
Subtotal	240.4	895.0	840.9	386.5	2362.8
Mean	230.9	733.3	586.0	256.6	1806.7


Altitude Quartiles for Diurnal
Altitude in feet above Mars site
5000
4500
4000
3500
3000
2500
2000
1500
1000
500
0
2008-04-24
2008-04-25
2008-04-26
2008-04-27
2008-04-28
2008-04-29
2008-04-30
75% Alt
Median Alt
25% Alt


Altitude Quartiles for Nocturnal
Altitude in feet above Mars site
5000
4500
4000
3500
3000
2500
2000
1500
1000
500
0
2008-04-24
2008-04-25
2008-04-26
2008-04-27
2008-04-28
2008-04-29
2008-04-30
75% Alt
Median Alt
25% Alt

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APPENDIX B-6

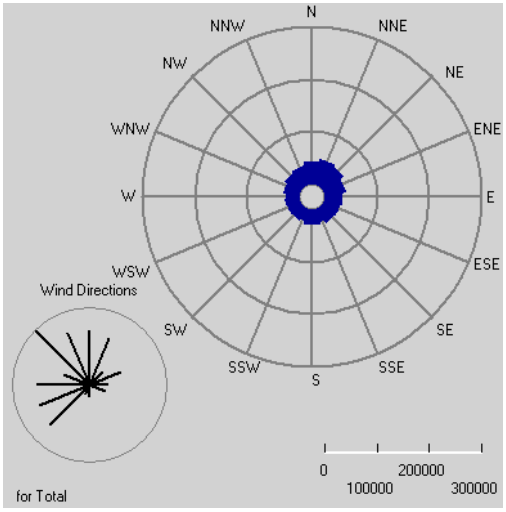
SITE 23

Site 23 - TracScan® Diurnal Activity					
Activity in tracks per hour per kilometer.					
Date	Clear	Fog	Mist	Rain	Total
4/30/2008	74.27				74.27
5/1/2008	101.94			140.68	118.12
5/2/2008	120.7			162.15	148.3
5/3/2008	114.74	99.13		101.79	103.34
5/4/2008	263.08			209.96	255.8
5/5/2008	478.26			199.88	467.59
5/6/2008	274.2			292.15	286.04
5/7/2008	279.71			293.99	281.69
Mean	268.41	99.13		179.63	227.87

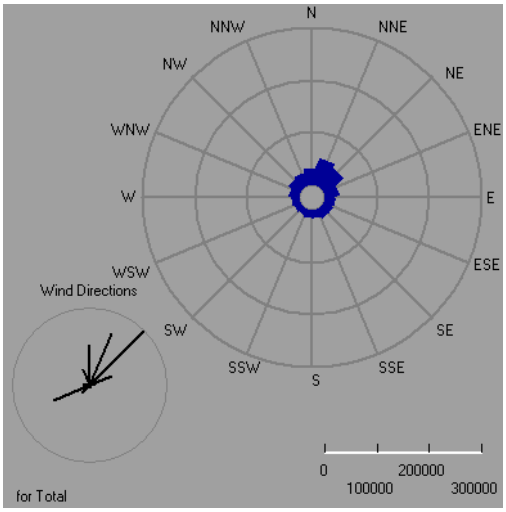
Site 23 - TracScan® Diurnal Activity					
Activity in tracks per hour per cubic kilometer.					
Date	Clear	Fog	Mist	Rain	Total
4/30/2008	5.31				5.31
5/1/2008	7.28			10.05	8.44
5/2/2008	8.62			11.58	10.59
5/3/2008	8.2	7.08		7.27	7.38
5/4/2008	18.79			15	18.27
5/5/2008	34.17			14.28	33.4
5/6/2008	19.59			20.87	20.43
5/7/2008	19.98			21	20.12
Mean	19.18	7.08		12.83	16.28

Site 23 - TracScan® Nocturnal Activity					
Activity in tracks per hour per kilometer.					
Date	Clear	Fog	Mist	Rain	Total
4/30/2008	54.89			65.17	62.9
5/1/2008	97.98			170.18	166.48
5/2/2008				274.76	274.76
5/3/2008	40.06			95.16	91.09
5/4/2008	19.29			89.21	85.03
5/5/2008	68.88			73.52	72.97
5/6/2008				300.72	300.72
5/7/2008				1356.48	1356.48
Mean	56.42			251.25	239.82

Site 23 - TracScan® Nocturnal Activity					
Activity in tracks per hour per cubic kilometer.					
Date	Clear	Fog	Mist	Rain	Total
4/30/2008	3.92			4.66	4.49
5/1/2008	7			12.16	11.89
5/2/2008				19.63	19.63
5/3/2008	2.86			6.8	6.51
5/4/2008	1.38			6.37	6.07
5/5/2008	4.92			5.25	5.21
5/6/2008				21.48	21.48
5/7/2008				96.91	96.91
Mean	4.03			17.95	17.13



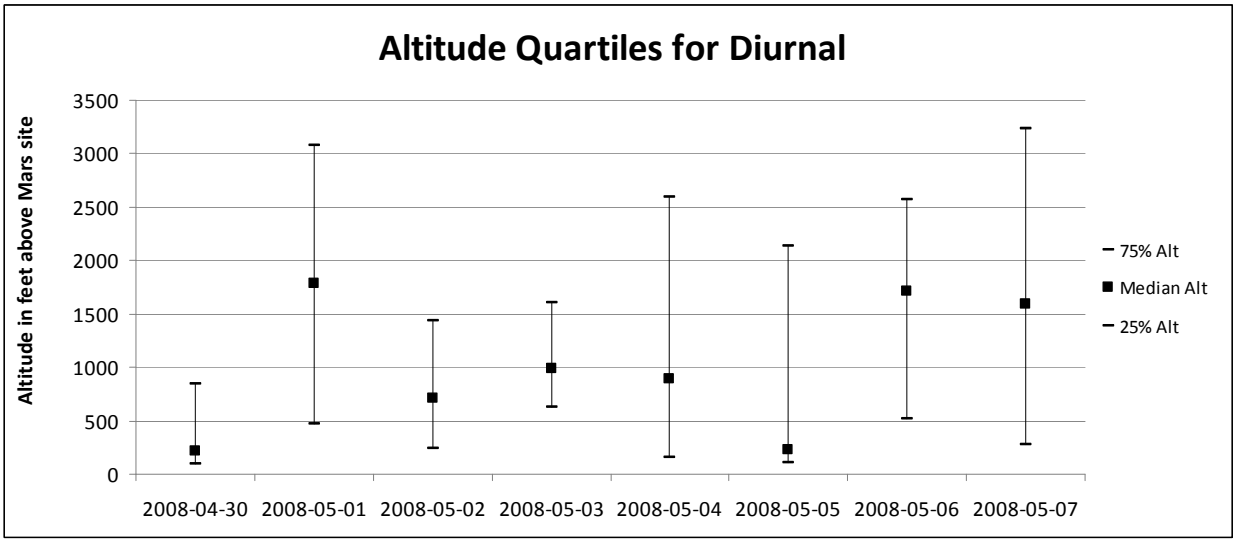
Proportional relative track counts and flight headings for all diurnal targets at Site 23.

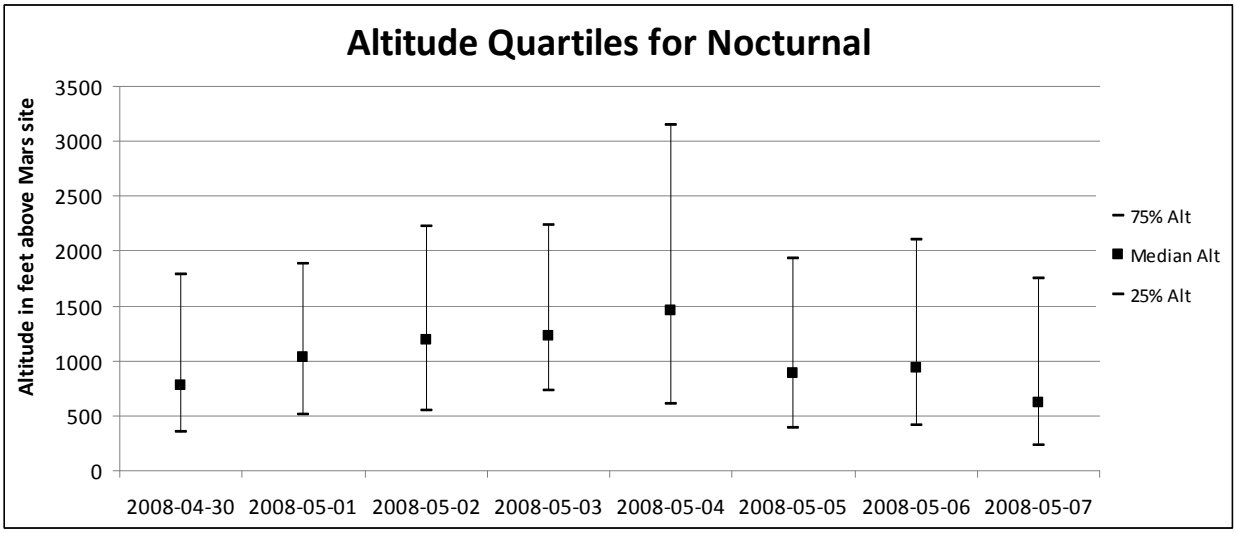


Proportional relative track counts and flight headings for all nocturnal targets at Site 23.

Site 23 - Tracks per Hour by Altitude in Relation to Radar					
	Target Type				
Altitude Band	Small	Medium	Large	Flock	Total
Diurnal (1)					
100 feet and below	11.7	126.8	223.2	106.9	468.6
101 -1000 feet	34.2	308.4	959.8	373.5	1675.8
1001 - 3000 feet	17.8	397.5	1034.7	242.7	1692.7
Higher than 3000 feet	47.2	389.8	240.1	122.2	799.3
Subtotal	110.9	1222.5	2457.7	845.3	4636.4
Nocturnal (2)					
100 feet and below	3.0	122.9	470.5	153.3	749.7
101 -1000 feet	54.3	949.1	2915.2	1549.6	5468.2
1001 - 3000 feet	54.1	1296.3	3264.2	1995.0	6609.7
Higher than 3000 feet	112.5	1476.3	1297.9	751.7	3638.4
Subtotal	223.9	3844.6	7947.8	4449.6	16465.9
Mean	155.6	2259.6	4629.1	2270.9	9315.2

Site 23 - Tracks per Hour per Kilometer by Altitude in Relation to Radar					
	Target Type				
Altitude Band	Small	Medium	Large	Flock	Total
Diurnal (1)					
100 feet and below	2.1	22.8	40.2	19.2	84.3
101 -1000 feet	6.2	55.5	172.7	67.2	301.6
1001 - 3000 feet	3.2	71.5	186.2	43.7	304.7
Higher than 3000 feet	8.5	70.2	43.2	22.0	143.9
Subtotal	20.0	220.0	442.3	152.1	834.5
Nocturnal (2)					
100 feet and below	0.5	22.1	84.7	27.6	134.9
101 -1000 feet	9.8	170.8	524.7	278.9	984.2
1001 - 3000 feet	9.7	233.3	587.5	359.1	1189.6
Higher than 3000 feet	20.3	265.7	233.6	135.3	654.9
Subtotal	40.3	692.0	1430.5	800.9	2963.6
Mean	28.0	406.7	833.2	408.7	1676.6


Altitude Quartiles for Diurnal
Altitude in feet above Mars site
3500
3000
2500
2000
1500
1000
500
0
2008-04-30
2008-05-01
2008-05-02
2008-05-03
2008-05-04
2008-05-05
2008-05-06
2008-05-07
75% Alt
Median Alt
25% Alt


Altitude Quartiles for Nocturnal
Altitude in feet above Mars site
3500
3000
2500
2000
1500
1000
500
0
2008-04-30
2008-05-01
2008-05-02
2008-05-03
2008-05-04
2008-05-05
2008-05-06
2008-05-07
75% Alt
Median Alt
25% Alt

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APPENDIX B-7

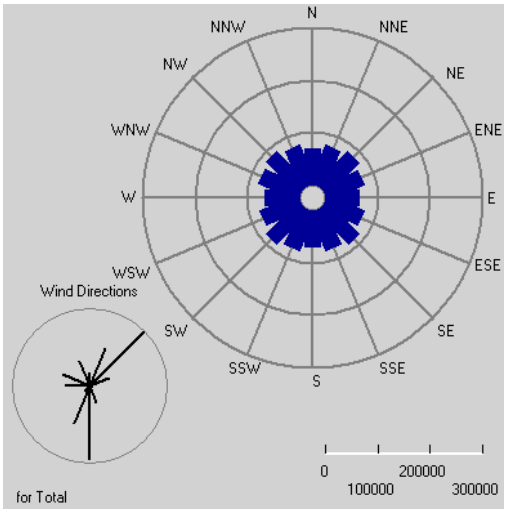
SITE 17

Site 17 - TracScan® Diurnal Activity					
Activity in tracks per hour per kilometer.					
Date	Clear	Fog	Mist	Rain	Total
5/7/2008	314.62			290.25	306.71
5/8/2008	659.4			380.09	391.62
5/9/2008	1459.12			1961.59	1899.02
5/10/2008	668.65			699.61	685.93
5/11/2008				769.35	769.35
Mean	664.31			985.67	910.99

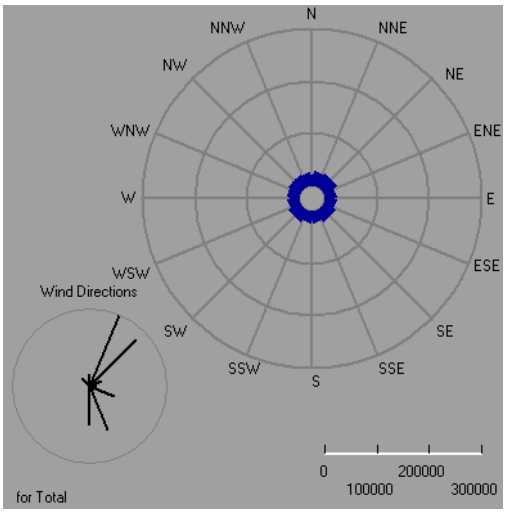
Site 17 - TracScan® Diurnal Activity					
Activity in tracks per hour per cubic kilometer.					
Date	Clear	Fog	Mist	Rain	Total
5/7/2008	22.48			20.74	21.91
5/8/2008	47.11			27.15	27.98
5/9/2008	104.24			140.14	135.67
5/10/2008	47.77			49.98	49
5/11/2008				54.96	54.96
Mean	47.46			70.42	65.08

Site 17 - TracScan® Nocturnal Activity					
Activity in tracks per hour per kilometer.					
Date	Clear	Fog	Mist	Rain	Total
5/7/2008	133.8			745.24	604
5/8/2008				584.2	584.2
5/9/2008				1174.66	1174.66
5/10/2008	104.48			253.41	242.89
5/11/2008				137.07	137.07
Mean	122.95			618.53	595.13

Site 17 - TracScan® Nocturnal Activity					
Activity in tracks per hour per cubic kilometer.					
Date	Clear	Fog	Mist	Rain	Total
5/7/2008	9.56			53.24	43.15
5/8/2008				41.73	41.73
5/9/2008				83.92	83.92
5/10/2008	7.46			18.1	17.35
5/11/2008				9.79	9.79
Mean	8.78			44.19	42.52



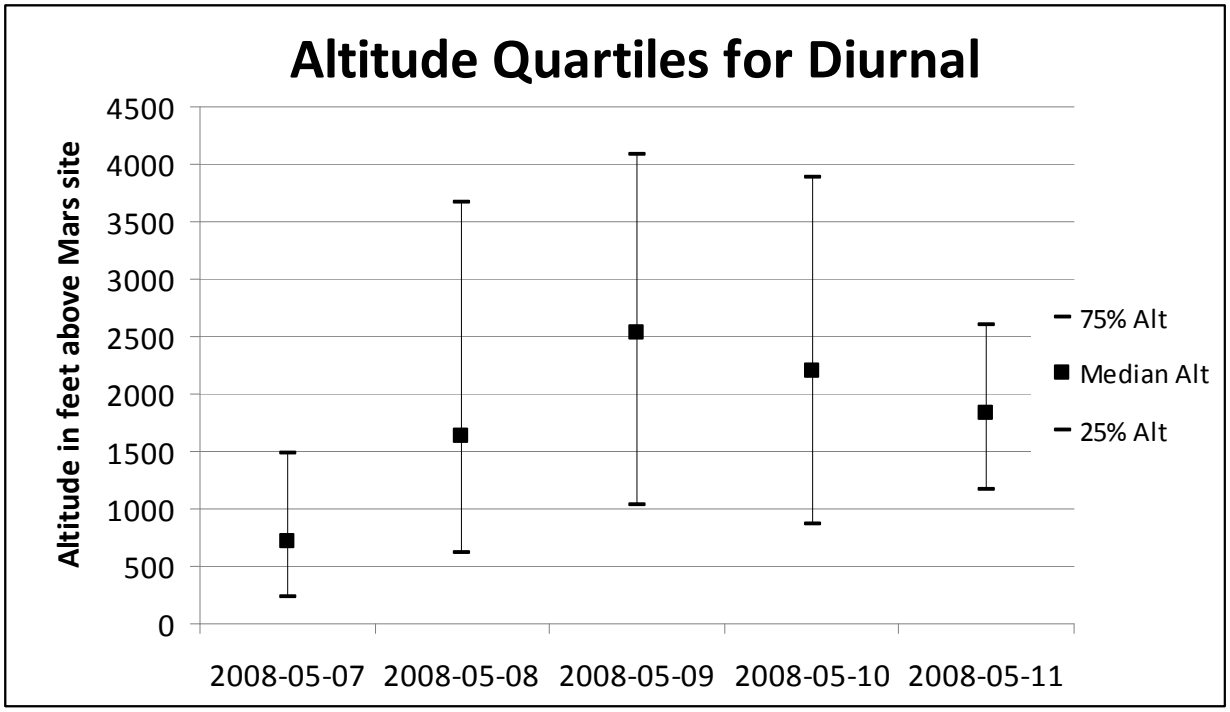
Proportional relative track counts and flight headings for all diurnal targets at Site 17.



Proportional relative track counts and flight headings for all nocturnal targets at Site 17.

Site 17 - Tracks per Hour by Altitude in Relation to Radar					
	Target Type				
Altitude Band	Small	Medium	Large	Flock	Total
Diurnal (1)					
100 feet and below	4.1	74.0	151.6	57.3	287.0
101 -1000 feet	210.3	807.6	904.2	377.6	2299.8
1001 - 3000 feet	321.0	1252.8	1172.9	463.9	3210.6
Higher than 3000 feet	652.7	1538.2	601.3	437.9	3230.1
Subtotal	1188.1	3672.7	2830.0	1336.7	9027.5
Nocturnal (2)					
100 feet and below	2.8	100.4	353.8	100.8	557.8
101 -1000 feet	176.8	1127.1	2659.9	1211.4	5175.2
1001 - 3000 feet	274.9	1815.9	3211.2	1958.4	7260.4
Higher than 3000 feet	358.3	2375.5	1652.5	1103.0	5489.4
Subtotal	812.8	5418.9	7877.5	4373.6	18482.8
Mean	1036.6	4378.0	4868.5	2563.2	12846.2

Site 17 - Tracks per Hour per Kilometer by Altitude in Relation to Radar					
	Target Type				
Altitude Band	Small	Medium	Large	Flock	Total
Diurnal (1)					
100 feet and below	0.7	13.3	27.3	10.3	51.7
101 -1000 feet	37.8	145.4	162.7	68.0	413.9
1001 - 3000 feet	57.8	225.5	211.1	83.5	577.9
Higher than 3000 feet	117.5	276.9	108.2	78.8	581.4
Subtotal	213.8	661.0	509.4	240.6	1624.8
Nocturnal (2)					
100 feet and below	0.5	18.1	63.7	18.1	100.4
101 -1000 feet	31.8	202.9	478.8	218.0	931.5
1001 - 3000 feet	49.5	326.8	578.0	352.5	1306.8
Higher than 3000 feet	64.5	427.6	297.4	198.5	988.0
Subtotal	146.3	975.3	1417.8	787.2	3326.6
Mean	186.6	788.0	876.3	461.3	2312.1


Altitude Quartiles for Diurnal
Altitude in feet above Mars site
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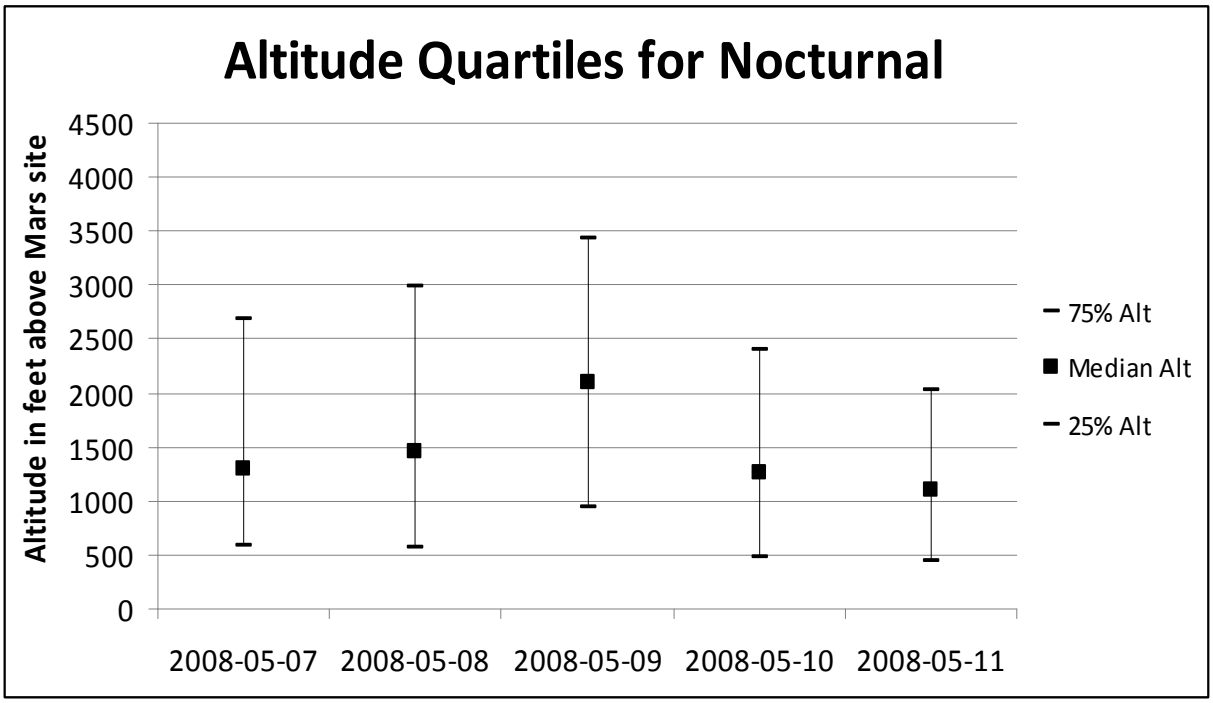
4000
3500
3000
2500
2000
1500
1000
500
0
2008-05-07
2008-05-08
2008-05-09
2008-05-10
2008-05-11
75% Alt
Median Alt
25% Alt


Altitude Quartiles for Nocturnal
Altitude in feet above Mars site
4500
4000
3500
3000
2500
2000
1500
1000
500
0
2008-05-07
2008-05-08
2008-05-09
2008-05-10
2008-05-11
75% Alt
Median Alt
25% Alt

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