New Jersey Department of Environmental Protection
Baseline Studies

December 2008 – March 2009 Quarterly Report

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LIST OF ACRONYMS AND ABBREVIATIONS

%	Percent
^{o}C	Degree(s) Celsius
µW	Microwatt(s)
ADCP	Acoustic Doppler Current Profiler
AM	Amplitude-modulated
BRP	Bioacoustics Research Program
BSS	Beaufort Sea State
CDOM	Colored Dissolved Organic Matter
cm^2	Square Centimeter(s)
CTD	Conductivity-Temperature-Depth
dB	Decibel(s)
ESA	Endangered Species Act
EDT	Eastern Daylight Time
FM	Frequency-modulated
ft	Foot(Feet)
GMI	Geo-Marine, Inc.
GPS	Global Positioning System
hr	Hour
kHz	Kilohertz
km	Kilometer(s)
kt	Knot
lon-lat	Longitude-Latitude
m	Meter(s)
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)
PAR	Photosynthetically Active Radiation
psu	Practical Salinity Unit(s)
QAWP	Quality Assurance Work Plan
RUMFS	Rutgers University Marine Field Station
s	Second(s)
SE	Southeast
SMS	Surface Mapping System
SST	Sea Surface Temperature
USFWS	United States Fish and Wildlife Service
Xbat	Extensible Bioacoustic Tool

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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 December 2008 through March 2009. 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	December	January	February	March
Ship Offshore Avian Survey	12/09; 12/13-12/14	01/06; 01/10; 01/12-01/14	02/08-02/11; 02/14-02/16	03/11-03/16
Ship Offshore Mammal Survey	12/09; 12/13-12/14	01/06; 01/10; 01/12-01/14	02/08-02/11; 02/14-02/16	03/11-03/16
Aerial Mammal Survey	Not scheduled	01/24-01/26	02/11; 02/22	03/18; 03/20-03/21
Coastal Avian Survey	12/18	01/17	02/21; 02/25	03/22
Radar Sites	Site 1: 12/01-12/15	Not scheduled	Not scheduled	03/16-03/31
Thermal Sites	12/09-12/15[1]	Not scheduled	Not scheduled	Scheduled
Acoustic Surveys	12/3: 3 popups recovered; 12/3 to 12/8: refurbishment; 12/13: 5 popups redeployed	Data analyses	Data analyses	3/20: attempted recovery, 1 popup recovered; 3/25: 3 popups deployed (see report for details)
Oceanographic Surveys	12/09; 12/13-12/14	01/06; 01/10; 01/12-01/14	02/08-02/11; 02/14-02/16	03/11-03/16

[1] Five-Day Period

1.0 QUALITY ASSURANCE WORK PLAN

The draft Quality Assurance Work Plan (QAWP) was submitted on 24 October 2007. NJDEP comments on the draft were addressed and a revised QAWP submitted on 04 January 2008 prior to the initiation of field work. Additional comments were addressed and a revised QAWP submitted on 08 February 2008 and then again on 16 June 2008 after secondary revisions. Changes and comments resulting from the additional funding received and the September 26th meeting with United States Fish and Wildlife Service (USFWS) will be addressed and a revised QAWP will be 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 31 March 2009). 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 31 March 2009)

Categories	Number of References	Appendix
Fishes	146	A-1
Marine Birds	204	A-2
Marine Mammals	220	A-3
Offshore Wind Farms	154	A-4
Sea Turtles	51	A-5
Total		

3.0 DIGITAL DATA COMPILATION

The Principal Investigator for this task has compiled a digital data list from GMI data banks and geospatial data from numerous sources presented in **Appendix B**. These data are currently under review for applicability for this project.

4.0 AVIAN PREDICTIVE/PROBABILITY MODEL

A meeting regarding predictive modeling was conducted with NJDEP on 18 March 2009. Model grid cell size was discussed, but a decision was not reached regarding the final cell size. A meeting is scheduled for 15 April 2009 to continue the discussion.

5.0 BASELINE SURVEYS

5.1 SHIPBOARD OFFSHORE SURVEYS

5.1.1 Avian

5.1.1.1 Survey Effort

Shipboard avian surveys for December 2008 through March 2009 were conducted along the same transect lines as the marine mammal/sea turtle surveys. Avian surveys may be greater in length and duration because of differing visibility requirements between the avian and marine mammal and sea turtle survey methods. Scheduled ship survey transects were completed only in March 2009.

5.1.1.1.1 December 2008

Ship avian surveys commenced on 09 December 2008. Surveys were not conducted on 10, 11, and 12 December because of high sea states (i.e., Beaufort scale >5; survey method requirements [Beaufort scale 0 to 5]). Surveys resumed on 13 December and ended on 14 December 2008. The ship transects covered 206 nautical miles (NM; 381 kilometers [km]; **Figure 5.1-1**). On-effort survey time totaled 21.59 hours (hrs).

5.1.1.1.2 January 2009

Ship avian surveys commenced on 06 January 2009. Surveys were not conducted on 07, 08, 09, and 11 January because of high sea states. Surveys resumed on 10 January but were suspended for 11 January 2009. Surveys resumed on 12 January and concluded on 14 January 2009. The ship transects covered 375 NM (694 km; **Figure 5.1-2**). On-effort survey time totaled 38.87 hrs.

Sea state conditions improved in late January and an attempt was made to complete the remaining survey transects. Surveys resumed on 30 January 2009 but could not be completed on 31 January 2009 because of high sea states. Ship transects covered 52 NM (95.9 km; **Figure 5.1-2**) and on-effort survey time totaled 5.14 hrs.

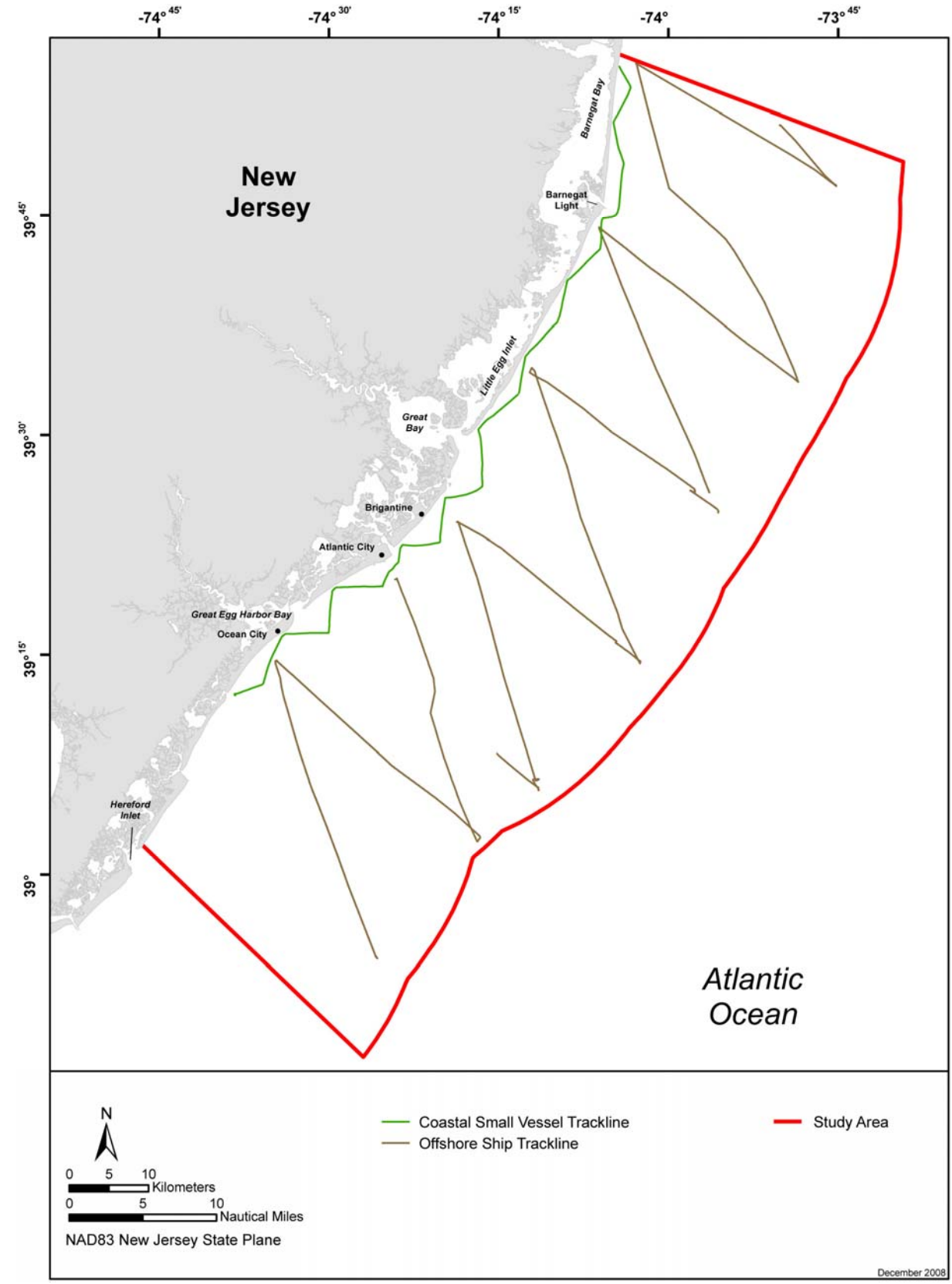

Figure 5.1-1. Avian offshore and coastal survey effort in the New Jersey Study Area during December 2008.

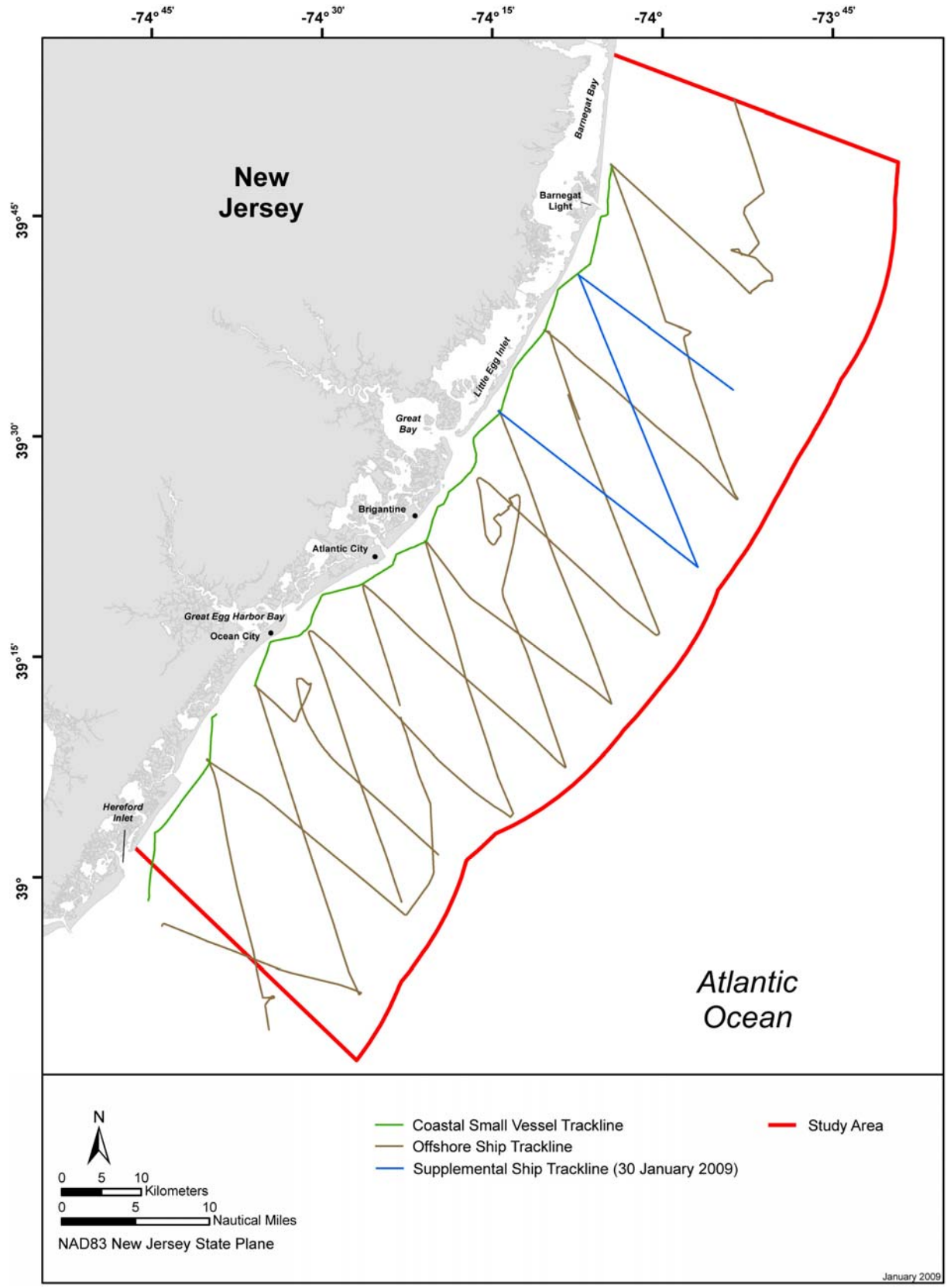

Figure 5.1-2. Avian offshore and coastal survey effort in the New Jersey Study Area during January 2009.

5.1.1.1.3 February 2009

Ship avian surveys commenced on 08 February 2009. Surveys were suspended on 12 and 13 February 2009 because of high sea states. Surveys resumed on 14 February and concluded on 15 February 2009. The ship transects covered 509 NM (941 km; **Figure 5.1-3**). On-effort survey time totaled 50.85 hrs.

5.1.1.1.4 March 2009

Ship avian surveys commenced on 11 March and concluded on 16 March 2009. The ship transects covered 542 NM (1,003 km; **Figure 5.1-4**). On-effort survey time totaled 54.93 hrs.

5.1.1.2 Survey Results

5.1.1.2.1 Avian species occurrence

All avian species that were observed are presented in **Table 5.1-1**. Nineteen species were sighted in December 2008, 18 in January 2009, 23 in February, and 25 in March. Birds that were not identifiable due to weather/sea state conditions, behavior, or distance were identified to the lowest identifiable form or taxon (genus or family).

5.1.1.2.2 Avian abundance

The monthly number of individual birds/km (i.e., number) observed on the offshore surveys increased from December (1.96) to January (2.55), decreased in February (1.82) and then increased in March (3.02) with the onset of spring migration (**Table 5.1-2**). The increase in the number of birds during January resulted from an increase in the number of Long-tailed Ducks, Common Loons, Northern Gannets, and Razorbills. The overall increase in January was balanced somewhat by a large decrease in the number of Bonaparte's Gulls. Another large increase in the number of Long-tailed Ducks in February was negated by large decreases in numbers of scoters, loons, and Northern Gannets. With the arrival of the spring migration season of many waterbirds in March, numbers of Northern Gannets and gulls increased and numbers of loons and alcids greatly increased. These large increases were primarily the result of unusually calm sea states (Beaufort 0 values for nearly four days) which allowed detection of these species at much greater distances than the typical distance (<100 meters [m]). The number of detected Razorbills (492) in March is the highest that has been recorded during the project.

The five most numerous species for each month of offshore transects were calculated (**Table 5.1-3**). Bonaparte's Gull was the most abundant species observed during December (0.42 birds/km) with Red-throated and Common Loon combining for a similar proportion of the total (0.41 birds/km). As a group Surf Scoter and Black Scoter were the most abundant bird group in January (0.73 bird/km). Northern Gannets were the most numerous species (0.64 birds/km). Ducks accounted for the top three species of the February survey, with Long-tailed Duck, Surf Scoters and Black Scoters comprising 1.03 birds/km. Razorbill was the most abundant species in March (0.51 birds/km) because of calm weather conditions, allowing for better visibility and detection. Northern Gannet and Long-tailed Duck were the second and third most abundant species, with 0.47 and 0.46 birds/km, respectively. These numbers were elevated, however, by a single flock of 225 Long-tailed Ducks near Barnegat Inlet.

Two federal species of concern for Bird Conservation Region 30 (New England/Mid-Atlantic coast) were recorded during the offshore surveys: Peregrine Falcon in December and Razorbill in every month (**Table 5-1.1**). Peregrine Falcon, listed by the State of New Jersey as endangered, was recorded in December 2008.

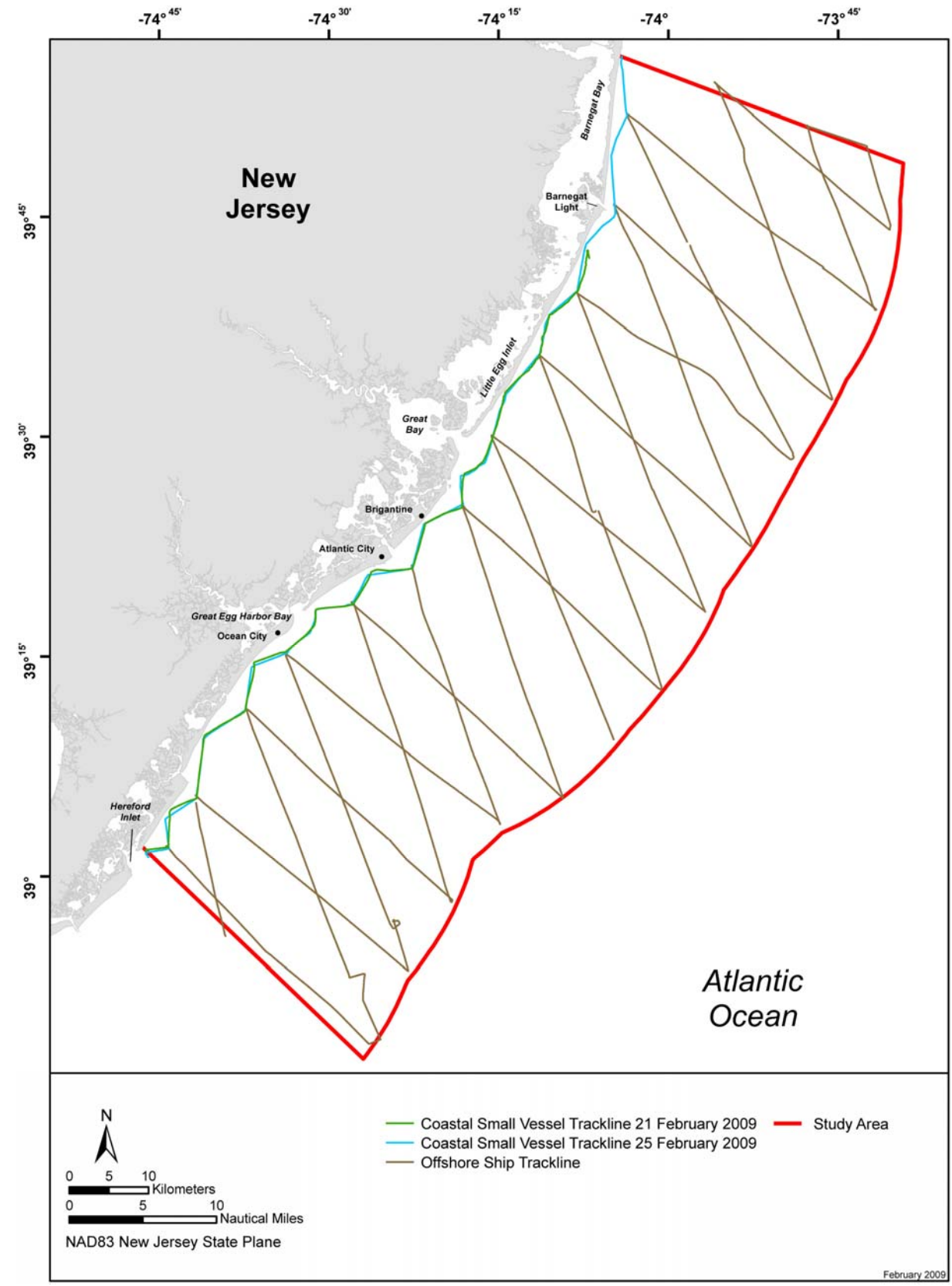

Figure 5.1-3. Avian offshore and coastal survey effort in the New Jersey Study Area during February 2009.

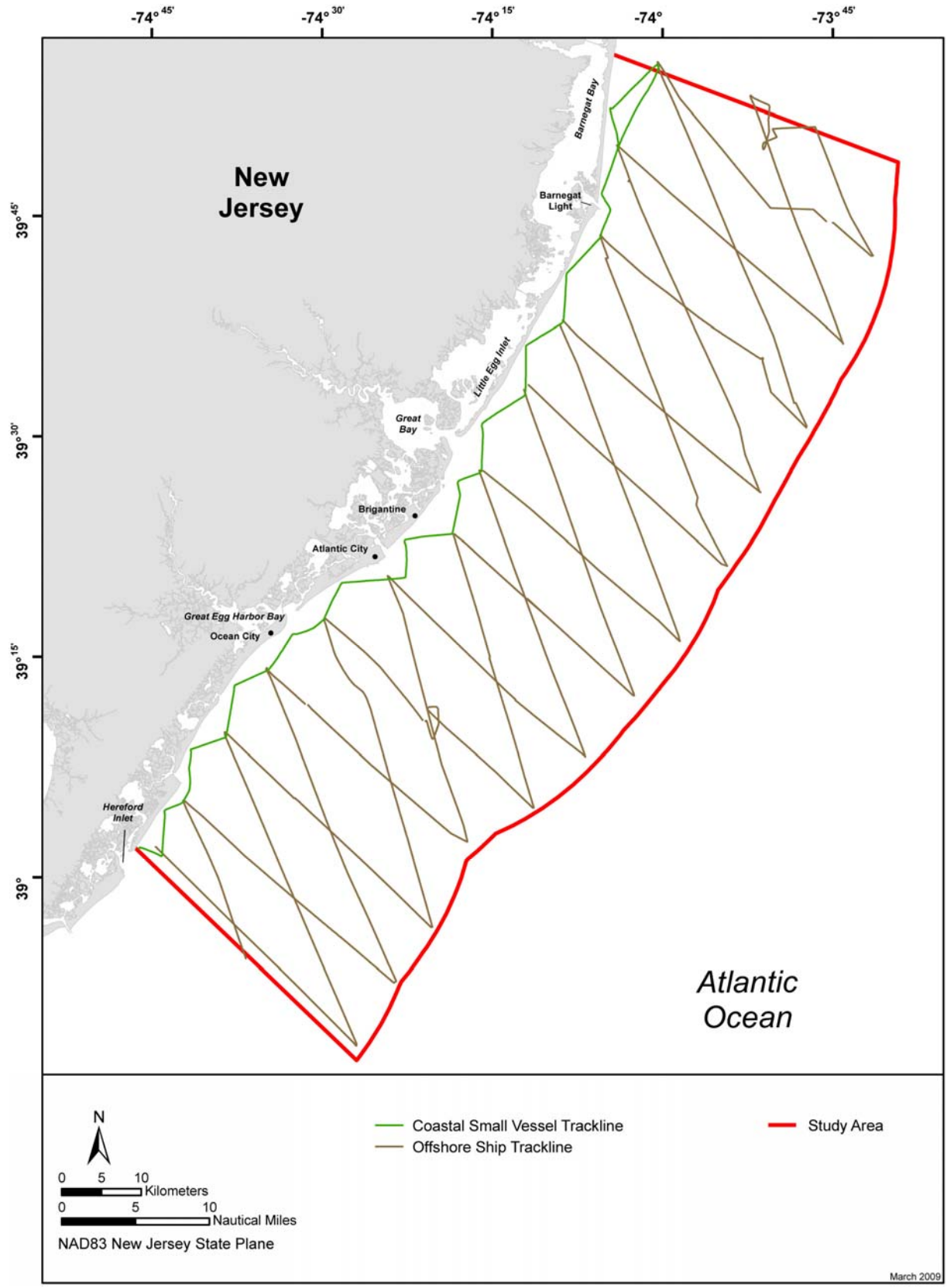

Figure 5.1-4. Avian offshore and coastal survey effort in the New Jersey Study Area during March 2009.

Table 5.1-1
Avian species[1] observed during the December 2008 through March 2009 shipboard offshore surveys[2]

Family Common Name, *Scientific name*	2008	2009			
	Dec	Jan	30 Jan[3]	Feb	Mar
Anatidae (geese, swans, and ducks)					
Atlantic Brant, *Branta bernicla*					X
Wood Duck, *Aix sponsa*				X	
American Black Duck, *Anas rubripes*	X				X
Northern Pintail, *Anas acuta*				X	
Surf Scoter, *Melanitta perspicillata*	X	X	X	X	X
White-winged Scoter, *Melanitta fusca*	X	X		X	X
Black Scoter, *Melanitta niger*	X	X	X	X	X
Long-tailed Duck, *Clangula hyemalis*	X	X	X	X	X
Red-breasted Merganser, *Mergus serrator*	X	X		X	X
Gaviidae (loons)					
Red-throated Loon, *Gavia stellata*	X	X	X	X	X
Common Loon, *Gavia immer*	X	X	X	X	X
Podicipedidae (grebes)					
Horned Grebe, *Podiceps auritus*		X		X	
Red-necked Grebe, *Podiceps grisegena*				X	X
Procellariidae (petrels and shearwaters)					
Northern Fulmar, *Fulmarus glacialis*				X	
Manx Shearwater, *Puffinus puffinus*	X				
Sulidae (gannets and boobies)					
Northern Gannet, *Morus bassanus*	X	X	X	X	X
Phalacrocoracidae (cormorants)					
Double-crested Cormorant, *Phalacrocorax auritus*	X				
Ardeidae (bitterns, egrets, and herons)					
Great Egret, *Ardea alba*					X
Falconidae (falcons)					
Peregrine Falcon, *Falco peregrinus*	X				
Rallidae (rails)					
American Coot, *Fulica americana*	X				
Laridae (gulls)					
Black-legged Kittiwake, *Rissa tridactyla*	X	X		X	
Bonaparte's Gull, *Chroicocephalus philadelphia*	X	X		X	X
Laughing Gull, *Leucophaeus atricilla*					X
Ring-billed Gull, *Larus delawarensis*		X	X	X	
Herring Gull, *Larus argentatus*	X	X	X	X	X
Iceland Gull, *Larus glaucoides*				X	
Great Black-backed Gull, *Larus marinus*	X	X	X	X	X
Alcidae (alcids)					
Dovekie, *Alle alle*	X	X	X	X	X
Common Murre, *Uria aalge*				X	X
Thick-billed Murre, *Uria lomvia*			X	X	X
Razorbill, *Alca torda*	X	X	X	X	X
Atlantic Puffin, *Fratercula arctica*		X			

Table 5.1-1 (*continued*)
Avian species[1] observed during the December 2008 through March 2009 shipboard offshore surveys[2].

Family Common Name, *Scientific name*	2008	2009			
	Dec	Jan	30 Jan[3]	Feb	Mar
Sturnidae (starlings)					
European Starling, *Sturnus vulgaris*					X
Emberizidae (sparrows)					
Song Sparrow, *Melospiza melodia*					X
White-throated Sparrow, *Zonotrichia albicollis*					X
Dark-eyed Junco (Slate-colored), *Junco hyemalis*					X
Icteridae (blackbirds, meadowlarks, and orioles)					
Red-winged Blackbird, *Agelaius phoeniceus*					X

[1] All birds identified to species during avian surveys were included
[2] Includes all birds observed in the in-zone and out-zone
[3] Supplemental data

5.1.1.2.3 Avian Density

Baseline grid density figures for all birds were generated, with monthly color-coded spatial maps illustrating the 72 grid boxes ranked according to avian density (**Figures 5.1-5** through **5.1-8**). The grid boxes depicted in red (indicating avian densities in the top 20 percentile among the positive-density grid boxes) were designated as high-density grid boxes. These high-density grid boxes were further identified on a month-to-month basis. Avian Density Rank sequentially decreases 20 percent for each rank from B to F, respectively.

In December 2008, avian densities were high nearshore and very low offshore (**Figure 5.1-5**). The highest avian densities (i.e., Density Rank A) in December were from Barnegat Light north (Grid 2 and Grid 7) and off of Ocean City (Grid 43). Avian density in January 2009 was high in several nearshore and offshore locations (**Figure 5.1-6**). Near the coast avian density was highest from Barnegat Light north (Grid 7) and off of and south of Ocean City (Grid 42). Offshore avian densities were highest off Brigantine (Grids 30, 36, and 37), Ocean City (Grid 51), and Hereford Inlet (Grid 67). In February 2009, densities were highest in nearshore areas off of the New Jersey coastline (**Figure 5.1-7**). In offshore waters, February 2009 avian densities were highest off of Atlantic City (Grid 53) east of Hereford Inlet (Grid 63 and Grid 64. Avian densities in March 2009 were highest at widely scattered locations near the coast and throughout the northern one-third of the Study Area (**Figure 5.1-8**).

Table 5.1-2
In-zone avian species abundance during the December 2008 through March 2009 shipboard offshore surveys.

Family Common Name, *Scientific name*	**Dec 2008**		**Jan 2009**		**30 Jan 2009**[3]		**Feb 2009**		**Mar 2009**	
	No.[1]	**Abun.**[2]	**No.**[1]	**Abun.**[2]	**No.**[1]	**Abun.**[2]	**No.**[1]	**Abun.**[2]	**No.**[1]	**Abun.**[2]
Anatidae (geese, ducks)	***88***	***0.23***	***628***	***0.97***	***27***	***0.29***	***1,101***	***1.18***	***1,065***	***1.11***
Atlantic Brant, *Branta bernicla*									3	0.00
American Black Duck, *Anas rubripes*	5	0.01								
Northern Pintail, *Anas acuta*							21	0.02		
Surf Scoter, *Melanitta perspicillata*	28	0.07	298	0.46	3	0.03	203	0.22	276	0.29
White-winged Scoter, *Melanitta fusca*	8	0.02	50	0.08			74	0.08	44	0.05
Black Scoter, *Melanitta niger*	33	0.09	174	0.27	12	0.13	169	0.18	174	0.18
Long-tailed Duck, *Clangula hyemalis*	11	0.03	104	0.16	12	0.13	587	0.63	450	0.46
Red-breasted Merganser, *Mergus serrator*	3	0.01	2	0.00			1	0.00	1	0.00
Duck diving (unknown)									5	0.01
Scoter (unknown)							17	0.02		
Scoter dark-winged (unknown)							29	0.03	112	0.12
Gaviidae (loons)	***153***	***0.41***	***315***	***0.48***	***18***	***0.19***	***173***	***0.18***	***451***	***0.47***
Red-throated Loon, *Gavia stellata*	90	0.24	117	0.18	13	0.14	51	0.05	191	0.20
Common Loon, *Gavia immer*	63	0.17	198	0.30	5	0.05	122	0.13	259	0.27
Loon (unknown)									1	0.00
Podicipedidae (grebes)			***1***	***0.00***			***3***	***0.00***	***1***	***0.00***
Horned Grebe, *Podiceps auritus*			1	0.00						
Red-necked Grebe, *Podiceps grisegena*							3	0.00	1	0.00
Procellariidae (petrels and shearwaters)	***1***	***0.00***					***1***	***0.00***		
Northern Fulmar, *Fulmarus glacialis*							1	0.00		
Manx Shearwater, *Puffinus puffinus*	1	0.00								
Sulidae (gannets)	***131***	***0.35***	***421***	***0.64***	***10***	***0.10***	***133***	***0.14***	***458***	***0.47***
Northern Gannet, *Morus bassanus*	131	0.35	421	0.64	10	0.10	133	0.14	458	0.47
Phalacrocoracidae (cormorants)	***2***	***0.01***								
Double-crested Cormorant, *Phalacrocorax auritus*	2	0.01								
Ardeidae (bitterns, egrets, and herons)									***1***	***0.00***
Great Egret, *Ardea alba*									1	0.00
Falconidae (falcons)	***1***	***0.00***								
Peregrine Falcon, *Falco peregrinus*	1	0.00								

Table 5.1-2 (*continued*)
In-zone avian species abundance during the December 2008 through March 2009 shipboard offshore surveys.

Family Common Name, *Scientific name*	**Dec 2008**		**Jan 2009**		**30 Jan 2009**[3]		**Feb 2009**		**Mar 2009**	
	No.[1]	**Abun.**[2]	**No.**[1]	**Abun.**[2]	**No.**[1]	**Abun.**[2]	**No.**[1]	**Abun.**[2]	**No.**[1]	**Abun.**[2]
Rallidae (rails)	***1***	***0.00***								
American Coot, *Fulica americana*	1	0.00								
Laridae (gulls)	***319***	***0.85***	***166***	***0.26***	***21***	***0.22***	***233***	***0.25***	***393***	***0.41***
Black-legged Kittiwake, *Rissa tridactyla*	5	0.01	17	0.03			2	0.00		
Bonaparte's Gull, *Chroicocephalus philadelphia*	158	0.42	8	0.01			7	0.01	2	0.00
Laughing Gull, *Leucophaeus atricilla*									1	0.00
Ring-billed Gull, *Larus delawarensis*			2	0.00	1	0.01	7	0.01		
Herring Gull, *Larus argentatus*	122	0.33	108	0.17	7	0.07	151	0.16	317	0.33
Great black-backed Gull, *Larus marinus*	33	0.09	30	0.05	13	0.14	64	0.07	73	0.08
Iceland Gull, *Larus glaucoides*							1	0.00		
Gull large (unknown)	1	0.00	1	0.00			1	0.00		
Alcidae (alcids)	***42***	***0.11***	***134***	***0.20***	***66***	***0.69***	***58***	***0.07***	***528***	***0.56***
Common Murre, *Uria aalge*							14	0.02	9	0.01
Thick-billed Murre, *Uria lomvia*					1	0.01	2	0.00	5	0.01
Dovekie, *Alle alle*	15	0.04	43	0.07	6	0.06	10	0.01	5	0.01
Razorbill, *Alca torda*	27	0.07	87	0.13	59	0.62	25	0.03	492	0.51
Atlantic Puffin, *Fratercula arctica*			1	0.00						
Alcid (unknown)			3	0.00			7	0.01	17	0.02
Sturnidae (starlings)									***1***	***0.00***
European Starling, *Sturnus vulgaris*									1	0.00
Emberizidae (sparrows)									***3***	***0.00***
Song Sparrow, *Melospiza melodia*									1	0.00
White-throated Sparrow, *Zonotrichia albicollis*									1	0.00
Dark-eyed Junco (slate-colored), *Junco hyemalis*									1	0.00
Icteridae (blackbirds, meadowlarks, orioles)									***1***	***0.00***
Red-winged Blackbird, *Agelaius phoeniceus*									1	0.00
Total	**738**	**1.96**	**1,665**	**2.55**	**42**	**1.49**	**1,702**	**1.82**	**2,902**	**3.02**

[1] Includes avian observations within the 300-m x 300-m survey strip transect when the ship was traveling ≥7 kts
[2] No. birds/km
[3] Supplemental data

Table 5.1-3
The most abundant (No. birds/km) avian species within the in-zone during the December 2008 through March 2009 shipboard offshore transect surveys.

December 2008 Shipboard Offshore In-zone[1]		
Common Name	**Number**	**Abundance[2]**
Bonaparte's Gull	158	0.42
Northern Gannet	131	0.35
Herring Gull	122	0.33
Red-throated Loon	90	0.24
Common Loon	63	0.17
Total	**564**	**1.51**
January 2009 Shipboard Offshore In-zone[1]		
Common Name	**Number**	**Abundance[2]**
Northern Gannet	421	0.64
Surf Scoter	298	0.46
Common Loon	198	0.30
Black Scoter	174	0.27
Red-throated Loon	117	0.18
Total	**1,208**	**1.85**
Supplemental 30 January 2009 Shipboard Offshore In-zone[1]		
Common Name	**Number**	**Abundance[2]**
Razorbill	59	0.62
Red-throated Loon	13	0.14
Great Black-backed Gull	13	0.14
Black Scoter	12	0.13
Long-tailed Duck	12	0.13
Total	**109**	**1.16**
February 2009 Shipboard Offshore In-zone[1]		
Common Name	**Number**	**Abundance[2]**
Long-tailed Duck	587	0.63
Surf Scoter	203	0.22
Black Scoter	169	0.18
Herring Gull	151	0.16
Northern Gannet	133	0.14
Total	**1,243**	**1.33**
March 2009 Shipboard Offshore In-zone[1]		
Common Name	**Number**	**Abundance[2]**
Razorbill	492	0.51
Northern Gannet	458	0.47
Long-tailed Duck	450	0.46
Herring Gull	317	0.33
Surf Scoter	276	0.29
Total	**1,993**	**2.06**

[1] Includes avian observations within the 300-m x 300-m survey strip transect when the ship was traveling ≥7 kts
[2] No. birds/km

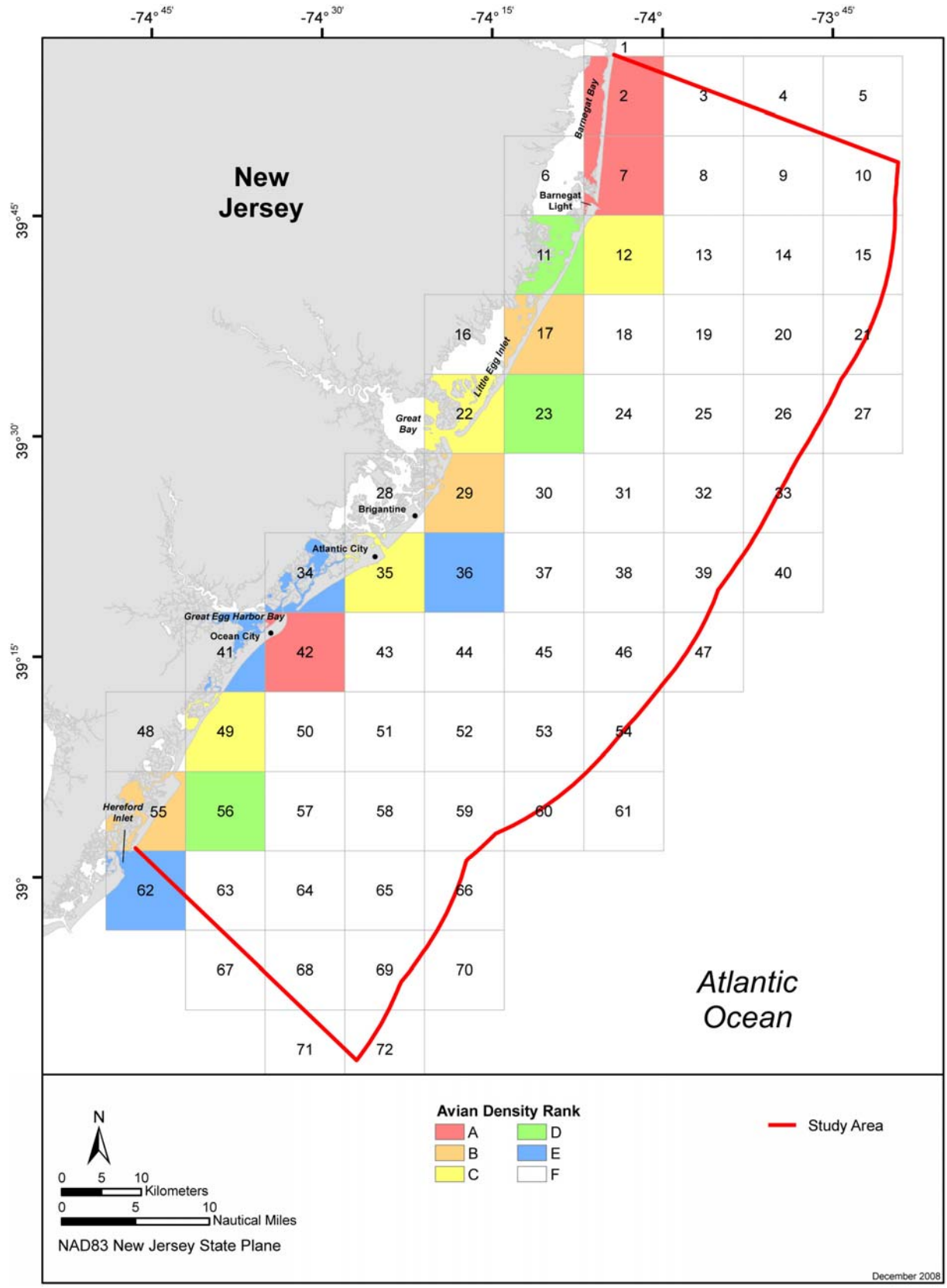

Figure 5.1-5. Avian density rank in the New Jersey Study Area during the shipboard offshore survey in December 2008.

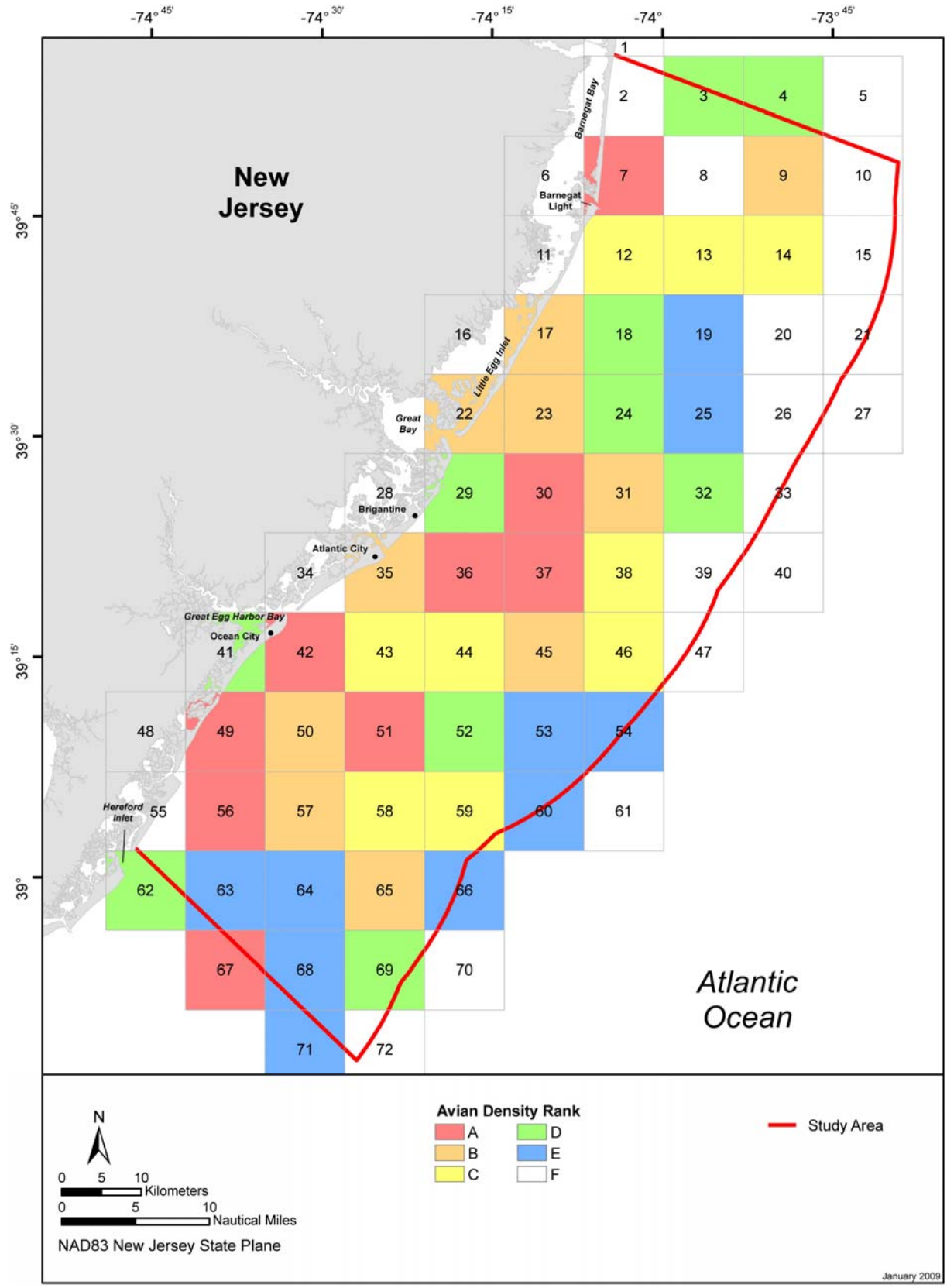

Figure 5.1-6. Avian density rank in the New Jersey Study Area during the shipboard offshore survey in January 2009.

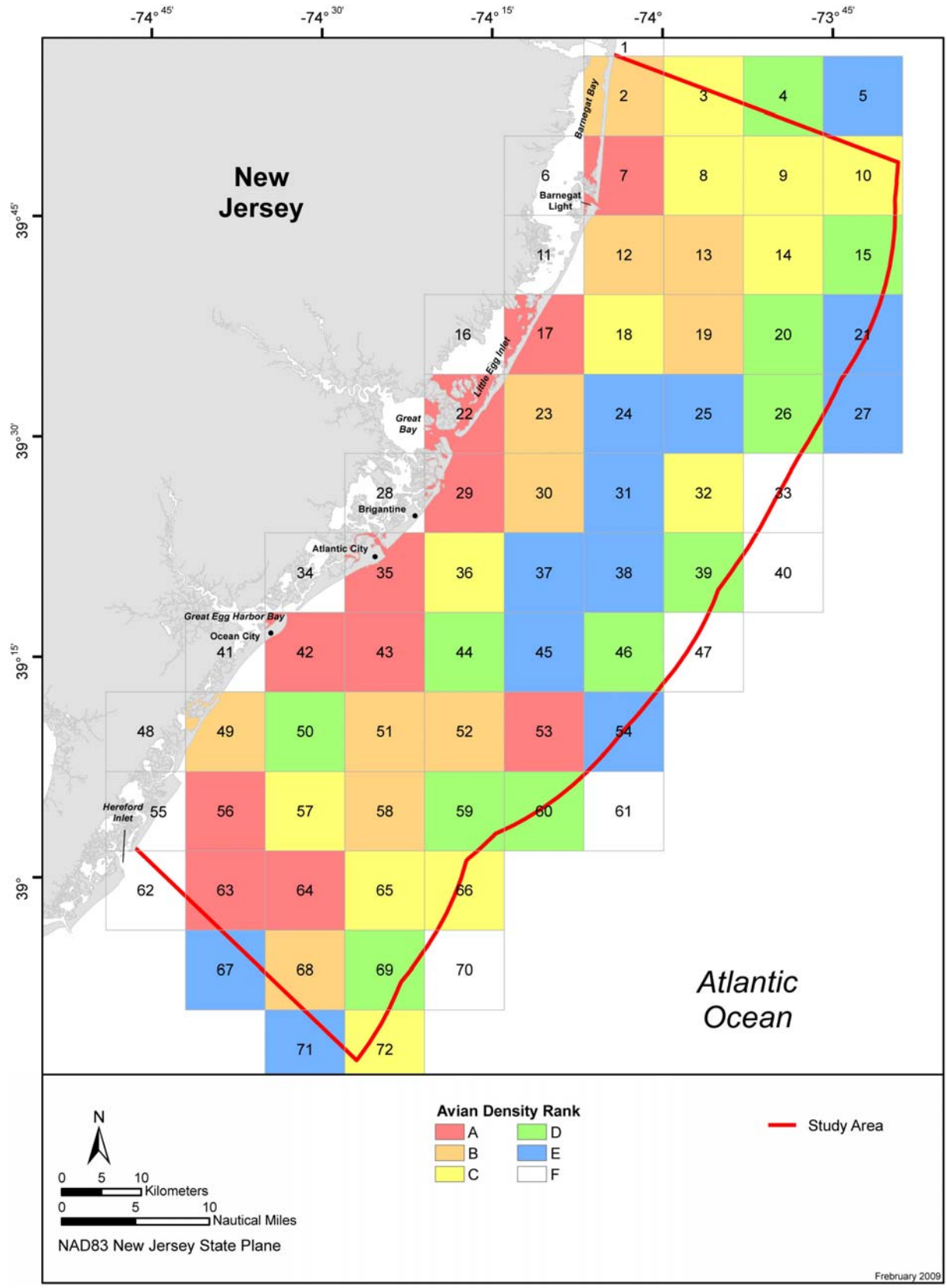

Figure 5.1-7. Avian density rank in the New Jersey Study Area during the shipboard offshore survey in February 2009.

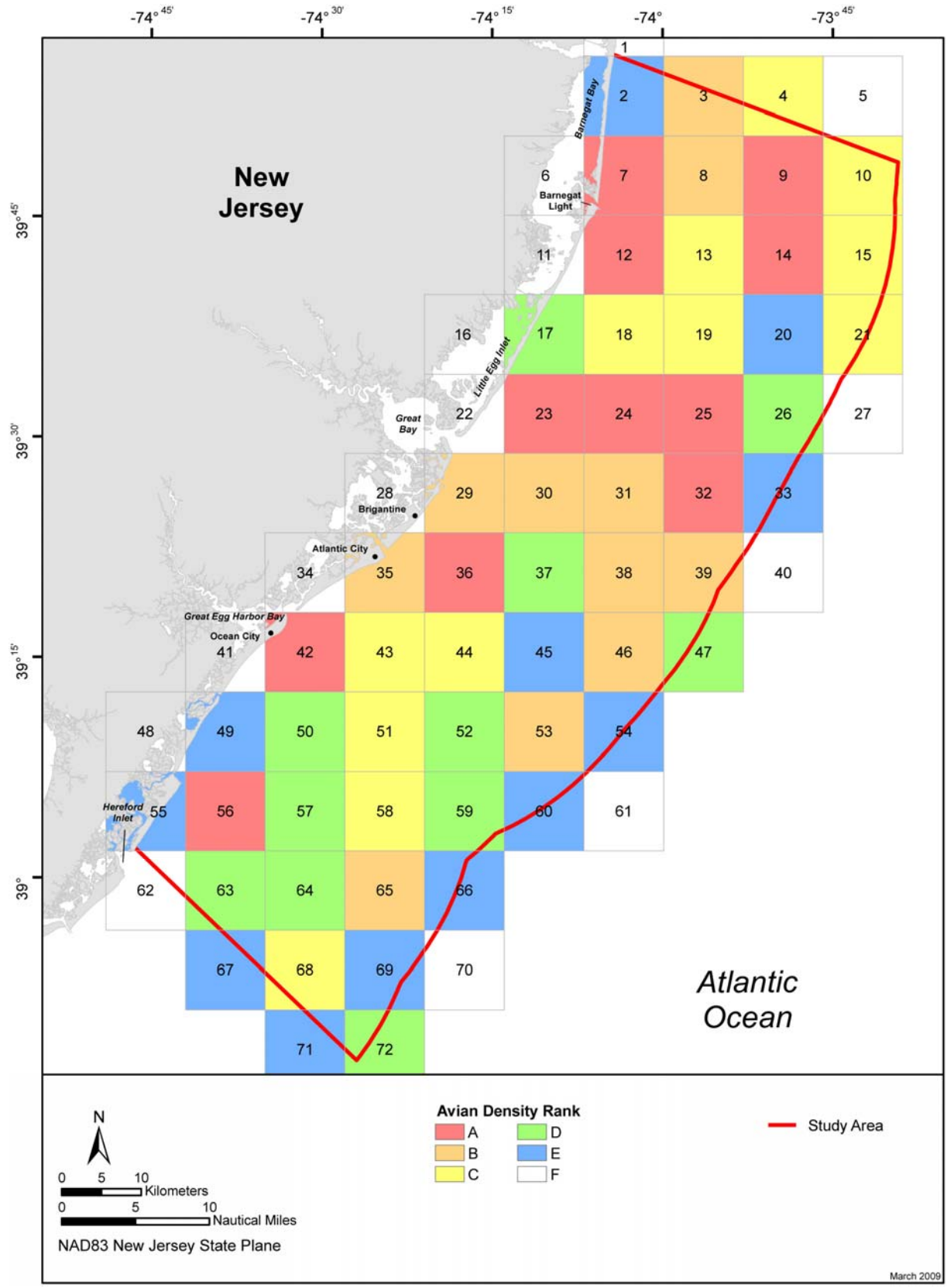

Figure 5.1-8. Avian density rank in the New Jersey Study Area during the shipboard offshore survey in March 2009.

5.1.2 Marine Mammals and Sea Turtles

5.1.2.1 Survey Effort

Shipboard marine mammal/sea turtle survey lines for the December, January, February, and March surveys differ from avian lines due to varying sea state conditions/observation requirements.

5.1.2.1.1 December 2008

Marine mammal/sea turtle shipboard surveys were initiated on 08 December and concluded on 14 December. The start of the survey was delayed due to strong winds (30 knots [kts]). Survey effort on 09 December was cut short due to the increasing Beaufort sea state (BSS; >6), and effort was suspended through 12 December due to the strong winds. The survey covered 199.4033 NM (362.914 km) of on-effort trackline (**Figure 5.1-9)**.

5.1.2.1.2 January 2009

Marine mammal/sea turtle shipboard surveys were initiated on 06 January and concluded on 14 January. Survey effort was canceled on 07, 08, 09, 11 January due to strong winds and/or rain. The survey covered 351.138 NM (639.071 km) of on-effort trackline (**Figure 5.1-10**).

5.1.2.1.3 February 2009

Marine mammal/sea turtle shipboard surveys were initiated on 08 February and concluded on 16 February. Survey effort was suspended in the afternoon on 11 February due to increasing winds (BSS>6). No survey effort was conducted on 12 or 13 February due to gale force winds. The survey covered 520.765 NM (947.792 km) of on-effort trackline (**Figure 5.1-11**).

5.1.2.1.4 March 2009

Marine mammal/sea turtle shipboard surveys were initiated on 11 March and concluded on 16 March. Survey effort was suspended in the late afternoon on 11 March due to diminishing visibility (<1 NM). Only partial survey effort was conducted on 15 March due to thick fog. The survey covered 489.270 NM (890.471 km) of on-effort trackline (**Figure 5.1-12**).

5.1.2.2 Survey Results

Five marine mammal species were observed on the ship surveys from December 2008 through March 2009. Unidentified cetaceans (unidentified dolphins, unidentified large whales, and unidentified rorqual/ *Balaenoptera* sp.) and unidentified pinnipeds which could not be identified to species were also observed during these surveys. All sightings from this time period are summarized in **Table 5.1-3**. Three of the five species are listed as threatened or endangered under the Endangered Species Act (ESA).

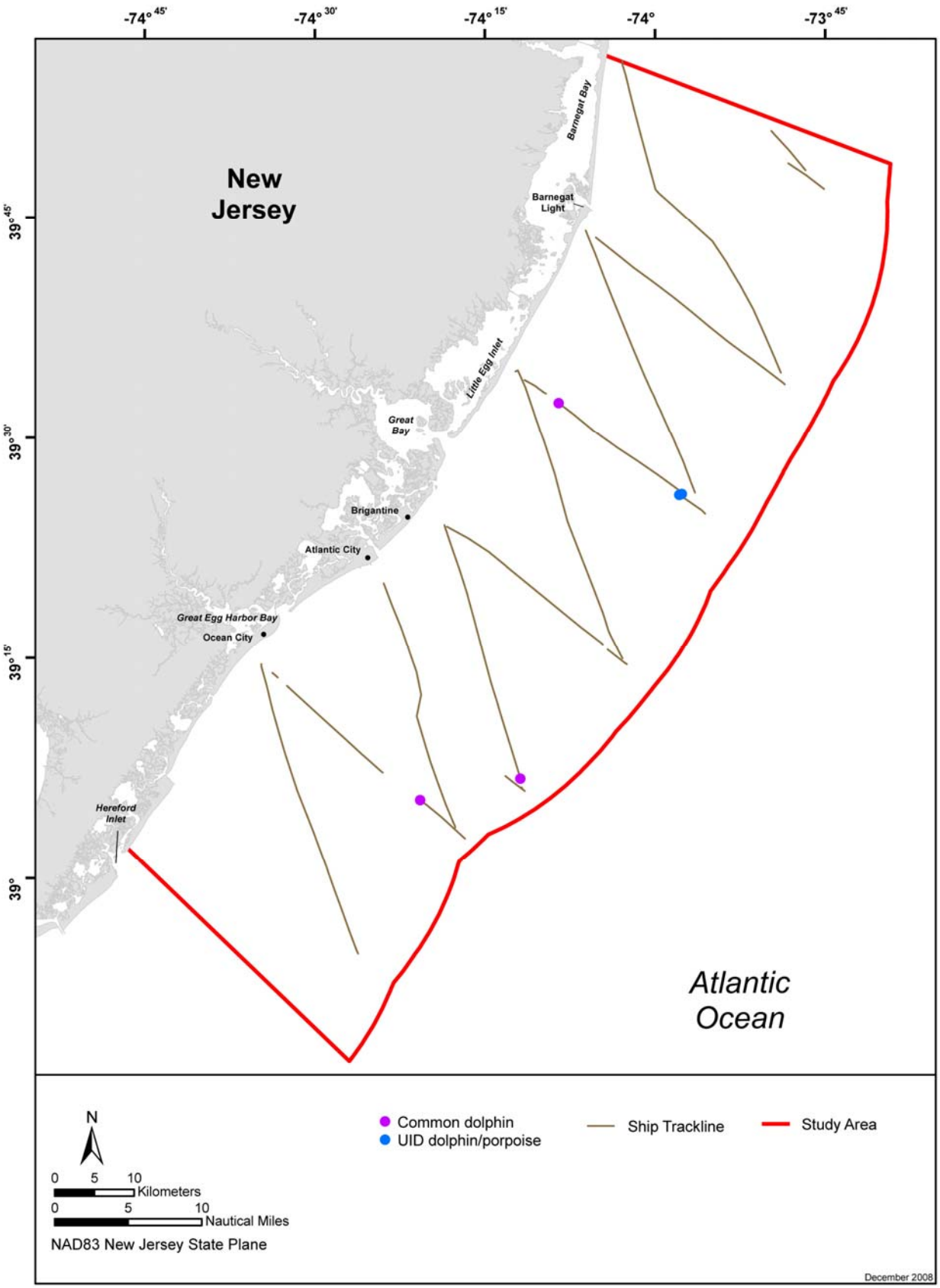

Figure 5.1-9. Shipboard Marine Mammal/Sea Turtle Survey for December 2008.

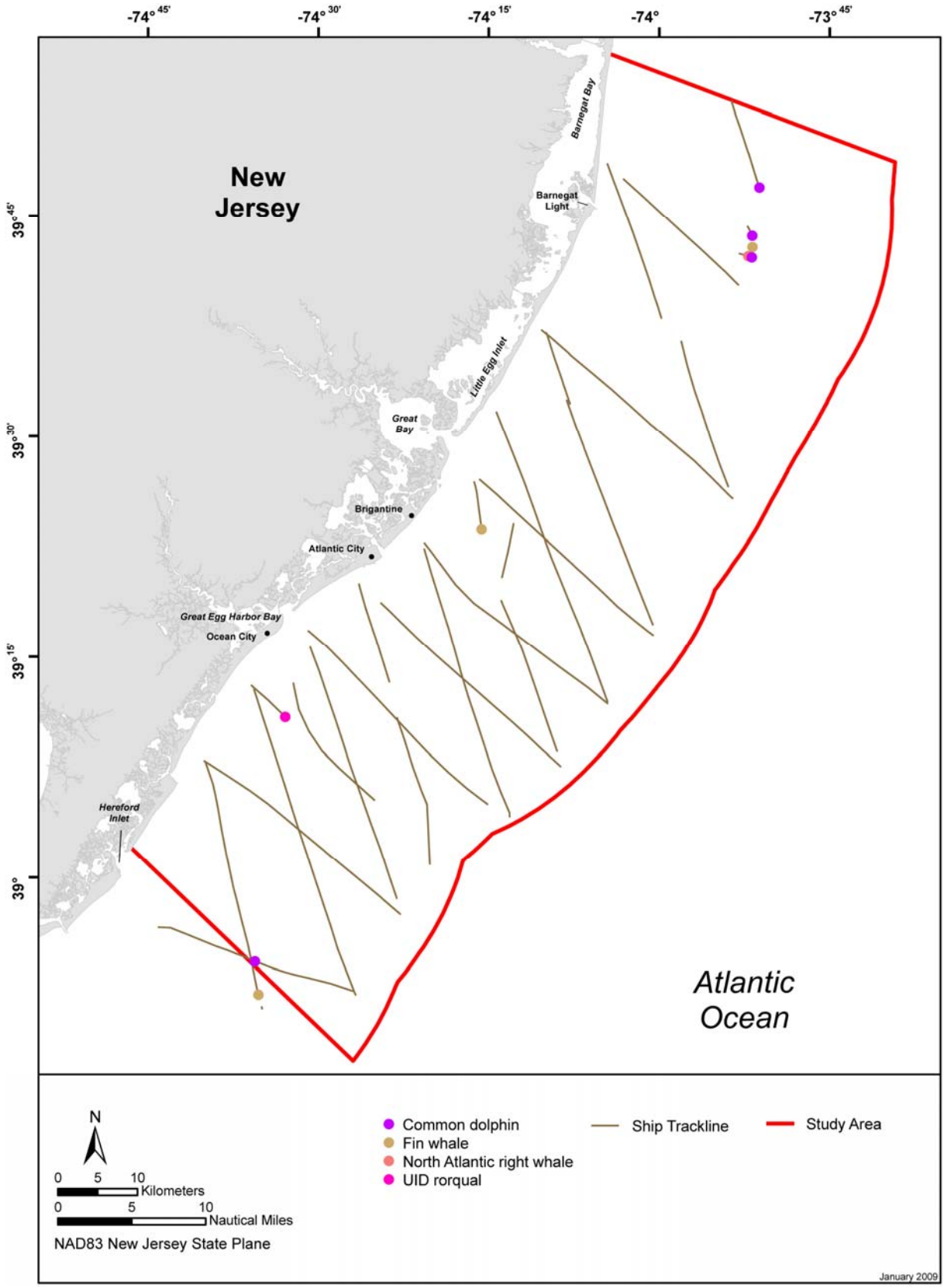

Figure 5.1-10. Shipboard Marine Mammal/Sea Turtle Survey for January 2009.

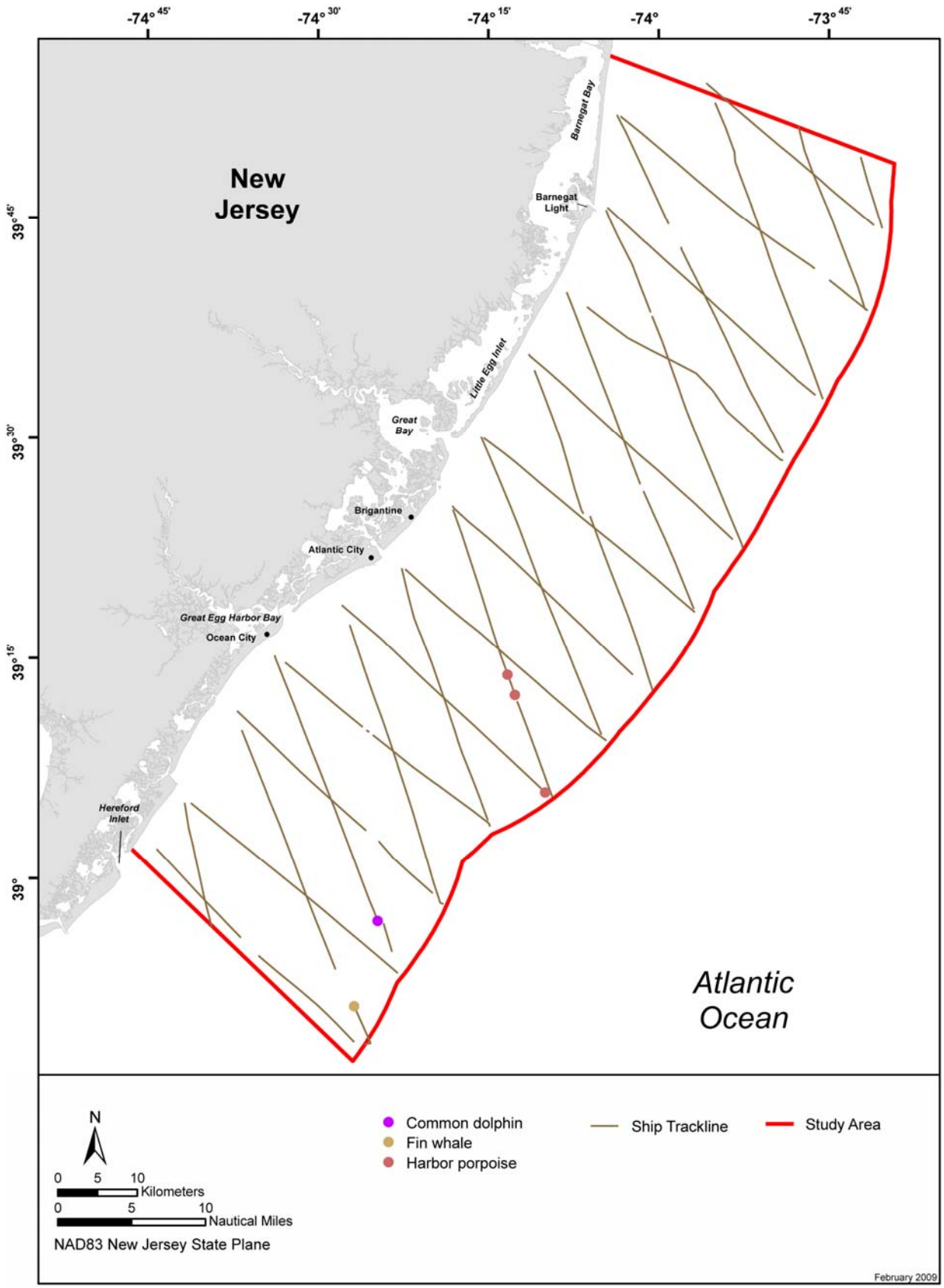

Figure 5.1-11. Shipboard Marine Mammal/Sea Turtle Survey for February 2009.

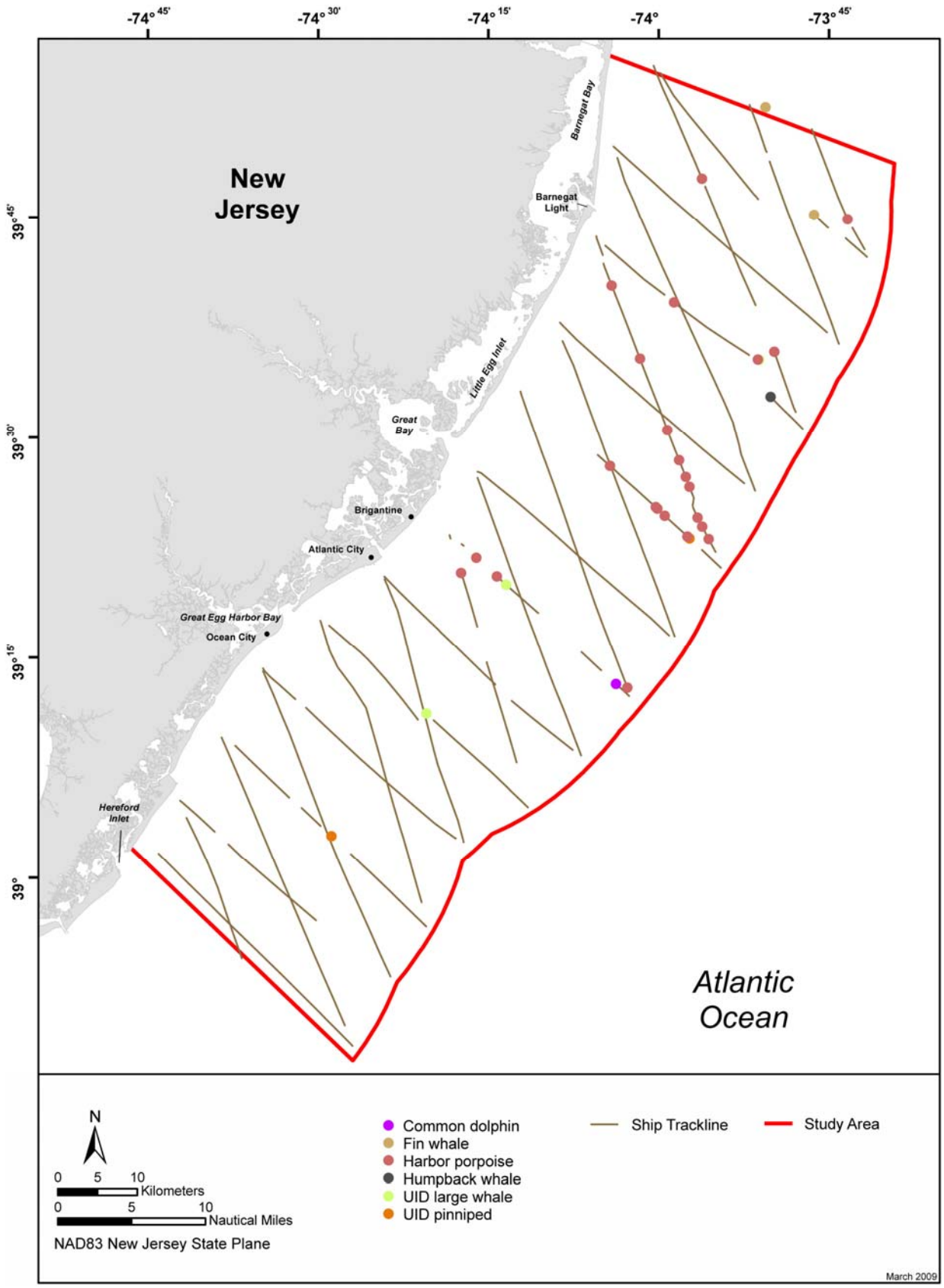

Figure 5.1-12. Shipboard Marine Mammal/Sea Turtle Survey for March 2009.

Table 5.1-3
Summary of Marine Mammal/Sea Turtle Sightings from the Shipboard Surveys from December 2008 through March 2009.

Common Name, *Scientific Name*	Sightings by Month			
	December	January	February	March
North Atlantic right whale, *Eubalaena glacialis**		1		
Humpback whale, *Megaptera novaeangliae**				1
Fin whale, *Balaenoptera physalus**		3	1	2
Common dolphin, *Delphinus delphis*	3	4	1	1
Harbor porpoise, *Phocoena phocoena*			3	23
Unidentified dolphin	2			
Unidentified large whale				3
Balaenoptera sp. (Unidentified rorqual)		1		
Unidentified pinniped				2

*ESA species
This table is a summary of sightings and not the total number of animals observed. Note that a sighting can include more than one animal.

5.2 AERIAL SURVEYS

5.2.1 Avian

Aerial avian surveys were discontinued for the remainder of the project.

5.2.2 Marine Mammals and Sea Turtles

No marine mammal/sea turtle aerial surveys were conducted during the fourth quarter of 2008. Surveys commenced in January 2009.

5.2.2.1 Survey Effort

5.2.2.1.1 January 2009

Two complete marine mammal/sea turtle aerial surveys were flown during this month. Shoreline pinniped surveys were flown on 24 and 26 January; the surveys covered 211.549 NM (391.79 km) of on-effort trackline (**Figure 5.2-1**). The offshore surveys were flown on 25 and 26 January, and covered 865.701 NM (1603.28 km) of on-effort trackline (**Figure 5.2-1**). Surveys were delayed in the morning of 24 January due to bad weather.

5.2.2.1.2 February 2009

The marine mammal/sea turtle offshore survey and shoreline pinniped survey were completed on 11 February. Additional offshore and pinniped surveys were flown on 21 February. There were no weather delays. The shoreline surveys covered 143.164 NM (265.14 km) of on-effort trackline while the offshore surveys covered 957.240 NM (1772.81 km) of on-effort trackline (**Figure 5.2-2**).

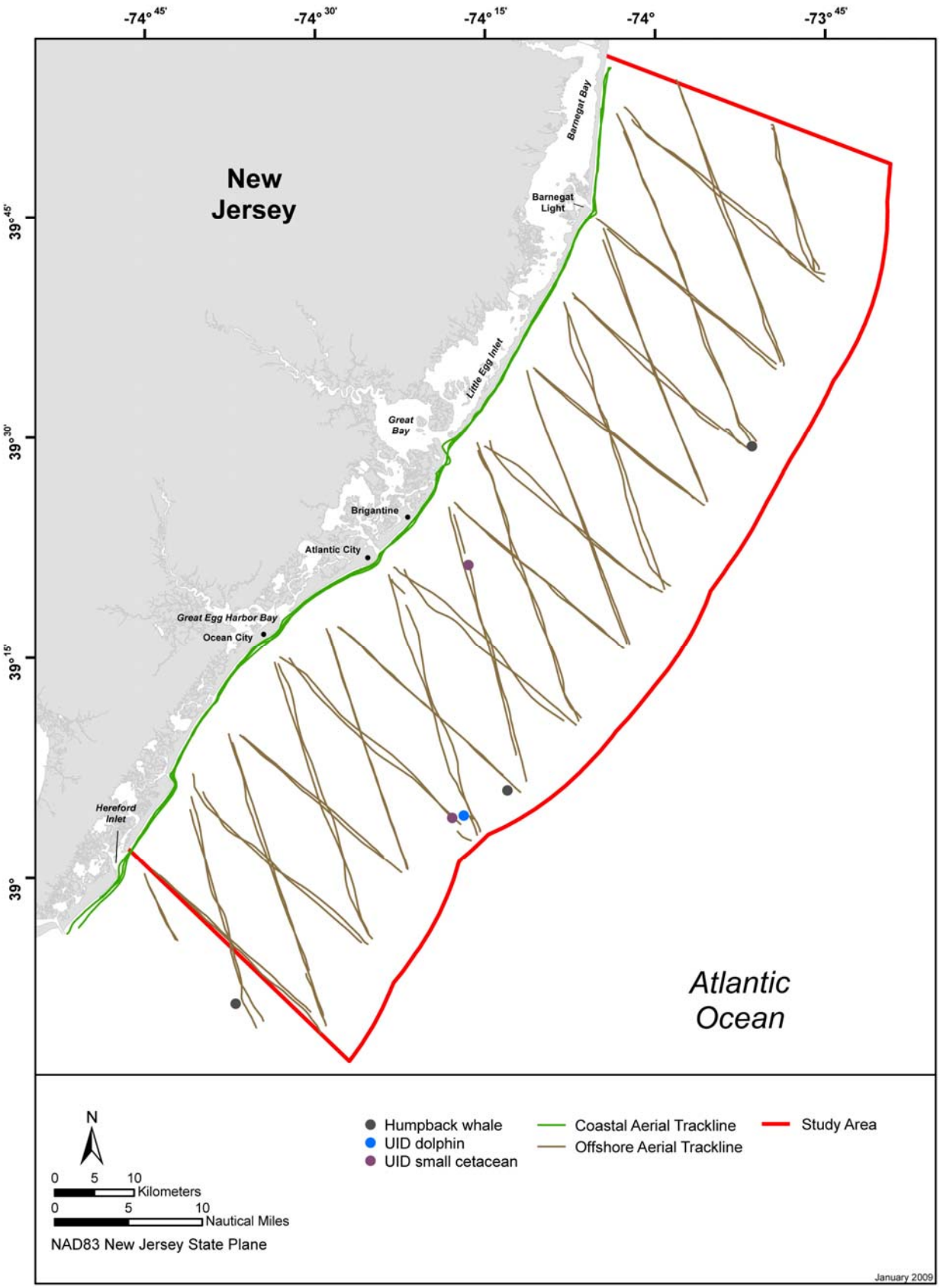

Figure 5.2-1. Aerial Marine Mammal/Sea Turtle Survey for January 2009.

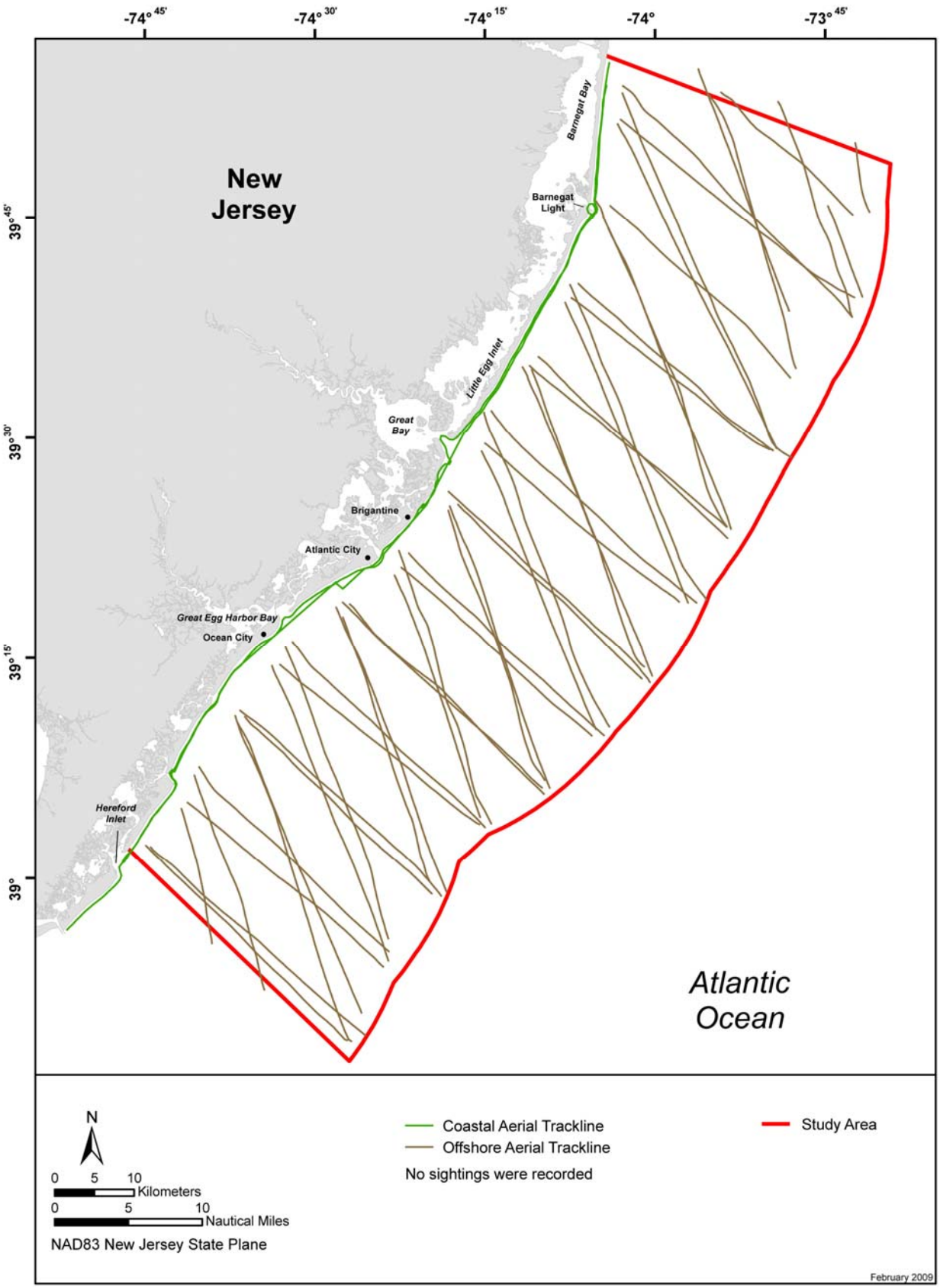

Figure 5.2-2. Aerial Marine Mammal/Sea Turtle Survey for February 2009.

5.2.2.1.3 March 2009

A shoreline pinniped survey and marine mammal/sea turtle offshore survey were flown on 18 March. The last two tracklines of the offshore survey could not be completed due to increasing winds and the degeneration of the sea state (BSS=5). Another shoreline pinniped survey was conducted at low tide on 20 March. Marine mammal/sea turtle offshore surveys could not be conducted on this day due to strong offshore winds (BSS=5). The offshore survey was completed on 21 March despite a slight delay in the morning due to cold weather (engine would not start) and frost on the wings of the plane. The shoreline surveys covered 206.70 NM (382.81 km) of on-effort trackline while the offshore surveys covered 833.477 NM (1543.60 km) of on-effort trackline (**Figure 5.2-3**).

5.2.2.2 Survey Results

One species was observed on the aerial surveys from January through March 2009 along with unidentified small cetaceans, unidentified dolphins, and an unidentified pinniped which could not be identified to species. All aerial survey sightings from this time period are summarized in **Table 5.2-1**.

Table 5.2-1
Summary of Marine Mammal/Sea Turtle Sightings from the Aerial Surveys from January through March 2009. (No surveys were flown in December 2008)

Common Name, *Scientific Name*	Sightings by Month		
	January	February**	March
Humpback whale, *Megaptera novaeangliae**	4		
Unidentified small cetacean	2		
Unidentified pinniped			1
Unidentified dolphin	2		

* ESA species
**No sightings were recorded during the aerial surveys in February 2009.
This table is a summary of sightings and not total number of animals observed. Note that a sighting can include more than one animal.

5.3 SMALL BOAT COASTAL SURVEYS

5.3.1 Survey Effort

5.3.1.1 December 2008

The small boat coastal survey was conducted on 18 December 2008. The small boat transects covered 59 NM (108 km; **Figure 5.1-1**). The small boat survey started in the northern section of the project area at 0700 Eastern Daylight Time (EDT). The boat proceeded north and completed the northern section of the Study Area at 1005 EDT. The boat returned to the starting point, resumed the survey to the south at 1239 EDT, and completed the survey. The total daily effort was 5.80 hrs.

5.3.1.2 January 2009

The small boat coastal survey was conducted on 17 January 2009. The small boat transects covered 61 NM (113 km; **Figure 5.1-2**). Survey effort began while heading north at 0713 EDT near the northern end of the Study Area. Survey effort stopped at 0830 EDT when the boat reached the northern end of the Study Area, then resumed at 1227 EDT in a southerly direction when the boat reached the initial starting point. The total daily effort was 5.71 hrs.

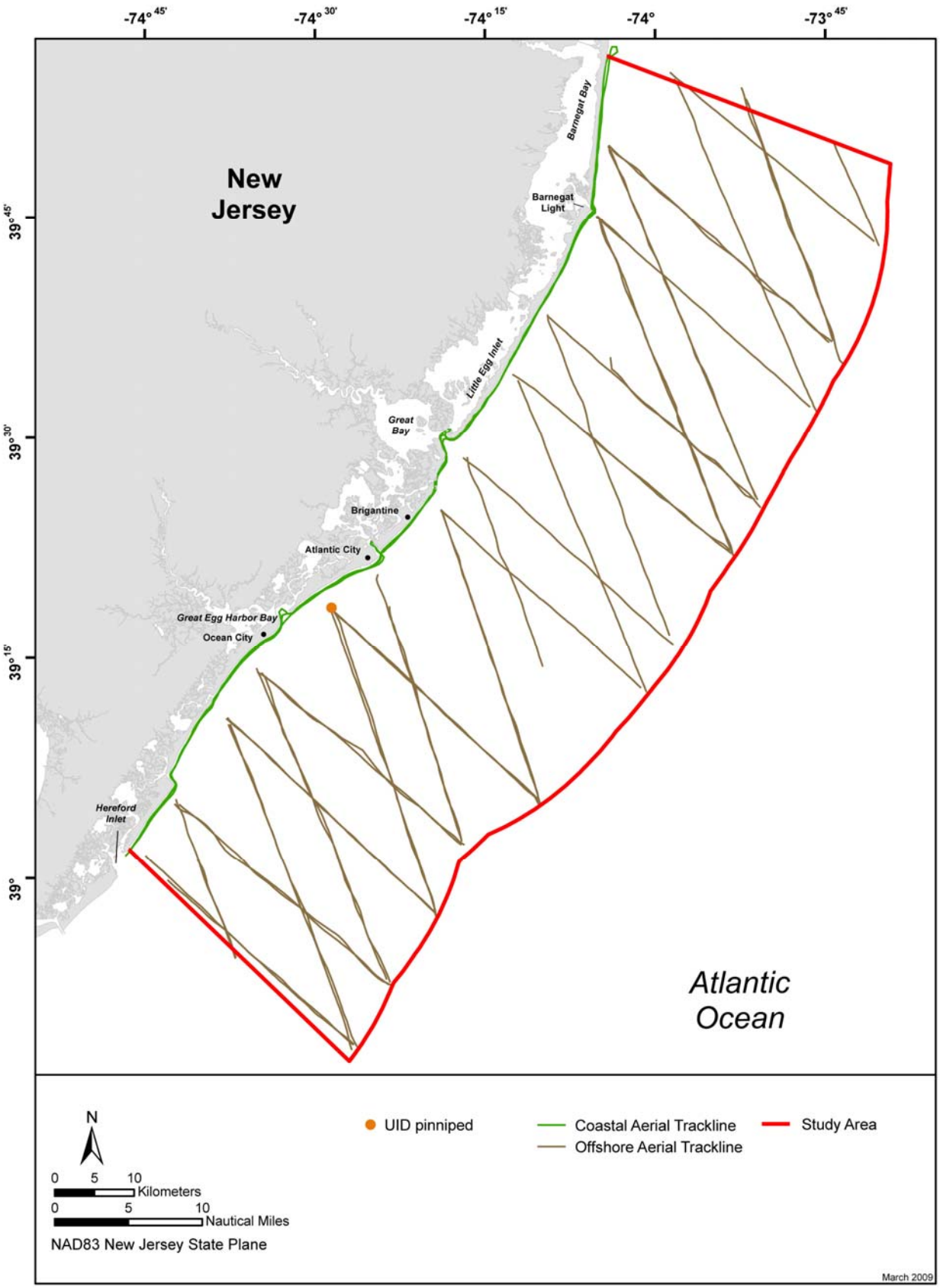

Figure 5.2-3. Aerial Marine Mammal/Sea Turtle Survey for March 2009.

5.3.1.3 February 2009

At the request of NJDEP, two small boat coastal surveys were conducted in February 2009. The first small boat coastal survey was conducted on 21 February. The small boat transects covered 71 NM (131 km; **Figure 5.1-3**). Survey effort was continuous and from north to south; the total daily effort was 6.84 hrs.

The second small boat coastal survey was conducted on 25 February 2009. The small boat transects covered 58 NM (131 km; **Figure 5.1-3**). Survey effort was continuous from south to north but did not include the four northernmost transects due to problems with the boat's engine; the total daily effort was 5.62 hrs.

5.3.1.4 March 2009

The small boat coastal survey was conducted on 22 March 2009. The small boat transects covered 75 NM (139 km; **Figure 5.1-4**). Survey effort began heading north at 0714 EDT near the northern end of the Study Area. Survey effort stopped when the boat reached the northern end of the Study Area, turned around and headed south to the initial starting point, and then resumed at 0826 EDT in a southerly direction. The total daily effort was 7.07 hrs.

5.3.2 Survey Results

5.3.2.1 Avian Species Occurrence

All avian species observed during the coastal surveys are presented in **Table 5.3-1**. Species diversity was fairly high through the winter and then declined greatly in March, primarily due to a decline in duck diversity. Twenty-two species were sighted during December 2008, 23 in January 2009, 19 and 17 respectively in the two February surveys, and 15 in March 2009.

5.3.2.2 Avian Abundance

The number of individual birds/km (i.e., number) increased from December (29.74) to January (41.51) and then declined through March (**Table 5.3-2**). The increase in numbers from December to January was primarily the result of higher numbers of waterfowl forced to the coast from frozen freshwater habitats by very cold weather. The number of Greater Scaup increased from 4 in December to 1,566 in January. With the return to a more normal temperature regime, February abundance declined to fairly typical levels. The differences in abundance between the two February surveys is at least partly the result of not including the northernmost four transects, an area of typically high duck densities (this area includes Barnegat Inlet). The low duck diversity in March was matched by low abundance.

For the coastal effort, **Table 5.3-3** presents the top five most numerous species (No. birds/km) for each trip, one each in December, January, and March, and two in February. As is typical in winter and migration, ducks dominated the coastal survey area, with Long-tailed Duck and Surf and Black scoters being in the top five most numerous species on all trips with the exception of the January survey when no Surf Scoters were identified; however, the 575 unidentified scoters (fifth highest total for the month) counted on the January trip undoubtedly included many Surf Scoters. The large number of scaup on the January trip was because of the previously discussed cold weather that displaced many waterfowl from then-frozen inland water bodies to the coast. Red-throated and Common Loons, Northern Gannet, and Herring Gull were the only other species that were the top five species in any month.

Three federal species of concern for Bird Conservation Region 30 (New England/Mid-Atlantic coast) were recorded during the coastal surveys: Peregrine Falcon and Razorbill in December 2008, and Purple Sandpiper in the February 25 survey. Four species with State of New Jersey endangered, threatened, or special concern status were recorded: Peregrine Falcon in December; Sanderling in January and both February surveys; Northern Harrier in the February 25 survey; and Osprey in March.

Table 5.3-1
Avian species[1] observed in the in-zone during the December 2008 through March 2009 small boat coastal surveys[2].

Family Common Name, *Scientific name*	2008	2009			
	18 Dec	17 Jan	21 Feb	25 Feb	22 Mar
Anatidae (geese, swans, and ducks)					
Snow Goose, *Chen caerulescens*		X			
Atlantic Brant, *Branta bernicla*	X	X	X		X
Canada Goose, *Branta canadensis*	X				
American Black Duck, *Anas rubripes*		X	X	X	
Greater Scaup, *Aythya marila*	X	X	X		
Lesser Scaup, *Aythya affinis*		X			
Common Eider, *Somateria mollissima*					X
Surf Scoter, *Melanitta perspicillata*	X	X	X	X	X
White-winged Scoter, *Melanitta fusca*	X	X	X		
Black Scoter, *Melanitta niger*	X	X	X	X	X
Long-tailed Duck, *Clangula hyemalis*	X	X	X	X	X
Bufflehead, *Bucephala albeola*		X			
Common Goldeneye, *Bucephala clangula*		X		X	
Red-breasted Merganser, *Mergus serrator*	X	X	X	X	
Ruddy Duck, *Oxyura jamaicensis*		X			
Gaviidae (loons)					
Red-throated Loon, *Gavia stellata*	X	X	X	X	X
Common Loon, *Gavia immer*	X	X	X	X	X
Podicipedidae (grebes)					
Horned Grebe, *Podiceps auritus*	X	X	X	X	
Red-necked Grebe, *Podiceps grisegena*			X		
Sulidae (gannets and boobies)					
Northern Gannet, *Morus bassanus*	X	X	X		X
Phalacrocoracidae (cormorants)					
Double-crested Cormorant, *Phalacrocorax auritus*	X				X
Great Cormorant, *Phalacrocorax carbo*	X	X			
Accipitridae (eagles and hawks)					
Osprey, *Pandion haliaetus*					X
Northern Harrier, *Circus cyaneus*				X	
Falconidae (falcons)					
Peregrine Falcon, *Falco peregrinus*	X				
Scolopacidae (sandpipers)					
Ruddy Turnstone, *Arenaria interpres*	X				
Sanderling, *Calidris alba*		X	X	X	
Purple Sandpiper, *Calidris maritima*				X	
Dunlin, *Calidris alpina*	X		X	X	
Laridae (gulls)					
Bonaparte's Gull, *Chroicocephalus philadelphia*	X	X			
Laughing Gull, *Leucophaeus atricilla*					X
Ring-billed Gull, *Larus delawarensis*	X	X	X	X	X
Herring Gull, *Larus argentatus*	X	X	X	X	X
Great Black-backed Gull, *Larus marinus*	X	X	X	X	X

Table 5.3-1 (*continued*)
Avian species[1] observed in the in-zone during the December 2008 through March 2009 small boat coastal surveys[2].

Family Common Name, *Scientific name*	2008	2009			
	18 Dec	17 Jan	21 Feb	25 Feb	22 Mar
Alcidae (alcids)					
Razorbill, *Alca torda*	X				
Corvidae (crows)					
Fish Crow, *Corvus ossifragus*			X		X
Icteridae (blackbirds, meadowlarks, and orioles)					
Boat-tailed Grackle, *Quiscalus major*				X	

[1] All birds identified to species during avian surveys were included
[2] Includes all birds observed in the in-zone and out-zone

5.3.3 Discussion

As expected for the season, onshore bird abundance was much greater than that offshore in all months, being an order of magnitude higher. Species composition/diversity varied between coastal and offshore survey areas, with the offshore efforts having higher species diversity because of the occurrence of truly marine species such as alcids and tubenoses (petrels and shearwaters). Additionally, abundances between the coastal and offshore areas did not vary as expected, such as in March, when offshore abundance was the highest of the period, but coastal abundance was lowest.

5.4 RADAR SURVEYS

5.4.1 Data Collection

Avian onshore radar surveys were extended into December at Sea Isle City and data were collected from 01 to 15 December 2008. A ground truth survey was conducted on 15 December.

5.4.2 Data Analysis

The radar data and ground truth survey are currently being analyzed.

5.5 THERMAL SURVEYS

5.5.1 Data collection

Thermal imaging data were collected over a period of five days from 09 to 15 December 2008.

5.5.2 Data Analysis

The thermal imaging data are currently being analyzed.

Table 5.3-2
In-zone avian species abundance observed during the December 2008 through March 2009 small boat coastal surveys.

Family Common Name, *Scientific name*	**18 Dec 2008**		**17 Jan 2009**		**21 Feb 2009**		**25 Feb 2009**		**22 Mar 2009**	
	No.[1]	**Abun.[2]**	**No.[1]**	**Abun.[2]**	**No.[1]**	**Abun.[2]**	**No.[1]**	**Abun.[2]**	**No.[1]**	**Abun.[2]**
Anatidae (geese, ducks)	***2,874***	***26.85***	***5,484***	***49.09***	***1,491***	***11.36***	***1,034***	***9.80***	***1,000***	***7.23***
Atlantic Brant, *Branta bernicla*	70	0.65								
American Black Duck, *Anas rubripes*			5	0.04						
Surf Scoter, *Melanitta perspicillata*	695	6.49	213	1.91	393	3.00	460	4.36	321	2.32
White-winged Scoter, *Melanitta fusca*	7	0.07	10	0.09	24	0.18				
Black Scoter, *Melanitta niger*	1,299	12.13	808	7.23	247	1.88	81	0.77	424	3.07
Long-tailed Duck, *Clangula hyemalis*	81	0.76	788	7.05	733	5.59	443	4.20	207	1.50
Bufflehead, *Bucephala albeola*			118	1.06						
Red-breasted Merganser, *Mergus serrator*	3	0.03	183	1.64	3	0.02				
Ruddy Duck, *Oxyura jamaicensis*			24	0.21						
Common Eider, *Somateria mollissima*									2	0.01
Greater Scaup, *Aythya marila*	4	0.04	1,566	14.02	2	0.02				
Lesser Scaup, *Aythya affinis*			2	0.02						
Scaup (unknown), *Aythya* (unknown)			900	8.06						
Scoter (unknown)	2	0.02	575	5.15	40	0.30				
Scoter dark-winged (unknown)	713	6.66	292	2.61	49	0.37	50	0.47	46	0.33
Gaviidae (loons)	***283***	***2.64***	***132***	***1.18***	***527***	***4.01***	***171***	***1.62***	***72***	***0.52***
Red-throated Loon, *Gavia stellata*	241	2.25	18	0.16	70	0.53	17	0.16	54	0.39
Common Loon, *Gavia immer*	42	0.39	113	1.01	457	3.48	154	1.46	18	0.13
Loon (unknown)			1	0.01						
Podicipedidae (grebes)	***1***	***0.01***	***14***	***0.13***	***10***	***0.08***	***4***	***0.04***		
Horned Grebe, *Podiceps auritus*	1	0.01	14	0.13	9	0.07	4	0.04		
Red-necked Grebe, *Podiceps grisegena*					1	0.01				
Sulidae (gannets)	***237***	***2.21***	***1***	***0.01***	***3***	***0.02***			***74***	***0.54***
Northern Gannet, *Morus bassanus*	237	2.21	1	0.01	3	0.02			74	0.54
Phalacrocoracidae (cormorants)	***16***	***0.15***								
Double-crested Cormorant, *Phalacrocorax auritus*	13	0.12								
Great Cormorant, *Phalacrocorax carbo*	3	0.03								

Table 5.3-2 (*continued*)
In-zone avian species abundance observed during the December 2008 through March 2009 small boat coastal surveys.

Family Common Name, *Scientific name*	**18 Dec 2008**		**17 Jan 2009**		**21 Feb 2009**		**25 Feb 2009**		**22 Mar 2009**	
	No.[1]	**Abun.[2]**	**No.[1]**	**Abun.[2]**	**No.[1]**	**Abun.[2]**	**No.[1]**	**Abun.[2]**	**No.[1]**	**Abun.[2]**
Scolopacidae (sandpipers)	***52***	***0.49***			***30***	***0.23***	***63***	***0.59***		
Ruddy Turnstone, *Arenaria interpres*	7	0.07								
Sanderling, *Calidris alba*					30	0.23				
Purple Sandpiper, *Calidris maritima*							13	0.12		
Dunlin, *Calidris alpina*	45	0.42					50	0.47		
Laridae (gulls)	***151***	***1.40***	***106***	***0.95***	***261***	***1.99***	***258***	***2.45***	***257***	***1.87***
Bonaparte's Gull, *Chroicocephalus philadelphia*	48	0.45	2	0.02						
Laughing Gull, *Leucophaeus atricilla*									85	0.62
Ring-billed Gull, *Larus delawarensis*	25	0.23	9	0.08	29	0.22	6	0.06	1	0.01
Herring Gull, *Larus argentatus*	55	0.51	50	0.45	208	1.59	234	2.22	141	1.02
Great black-backed Gull, *Larus marinus*	23	0.21	20	0.18	24	0.18	17	0.16	30	0.22
Gull large (unknown)			25	0.22						
Alcidae (alcids)	***1***	***0.01***								
Razorbill, *Alca torda*	1	0.01								
Icteridae (blackbirds, meadowlarks, orioles)							***1***	***0.01***		
Boat-tailed Grackle							1	0.01		
Total	**3,615**	**33.76**	**5,737**	**51.36**	**2,322**	**17.69**	**1,530**	**14.51**	**1,403**	**10.16**

[1] Includes avian observations within the 300-m x 300-m survey strip transect when the ship was traveling ≥7 kts
[2] No. birds/km

Table 5.3-3
The most abundant (No. birds/km) avian species within the In-zone during the December 2008 through March 2009 small boat coastal transect surveys.

18 December 2008 Small Boat Coastal In-zone[1]		
Common Name	**Number**	**Abundance[2]**
Black Scoter	1,299	12.13
Scoter, dark-winged (unknown)	713	6.66
Surf Scoter	695	6.49
Red-throated Loon	241	2.25
Northern Gannet	237	2.21
Total	**3,185**	**29.74**
17 January 2009 Small Boat Coastal In-zone[1]		
Common Name	**Number**	**Abundance[2]**
Greater Scaup	1,566	14.02
Scaup (unknown), *Aythya* (unknown)	900	8.06
Black Scoter	808	7.23
Long-tailed Duck	788	7.05
Scoter (unknown)	575	5.15
Total	**4,637**	**41.51**
21 February 2009 Small Boat Coastal In-zone[1,3]		
Common Name	**Number**	**Abundance[2]**
Long-tailed Duck	733	5.59
Common Loon	457	3.48
Surf Scoter	393	3.00
Black Scoter	247	1.88
Herring Gull	208	1.59
Total	**2,038**	**15.54**
25 February 2009 Small Boat Coastal In-zone[1,3]		
Common Name	**Number**	**Abundance[2]**
Surf Scoter	460	4.36
Long-tailed Duck	443	4.20
Herring Gull	234	2.22
Common Loon	154	1.46
Black Scoter	81	0.77
Total	**1,372**	**13.01**
22 March 2009 Small Boat Coastal In-zone[1]		
Common Name	**Number**	**Abundance[2]**
Black Scoter	424	3.07
Surf Scoter	321	2.32
Long-tailed Duck	207	1.50
Herring Gull	141	1.02
Laughing Gull	85	0.62
Total	**1,178**	**8.53**

[1] Includes avian observations within the 300-m x 300-m survey strip transect when the ship was traveling ≥7 kts
[2] No. birds/km
[3] Two small boat coastal surveys were conducted in February 2009

5.6 ACOUSTIC SURVEYS

This report presents an update on deployment and recovery activity for December 2008 and March 2009. Details regarding the status of data processing and analyses are also included.

5.6.1 December 2008

Three of the five Marine Autonomous Recording Units (i.e., PopUps) that were deployed on 01 October 2008, were recovered in December 2008. Two of the units (PU081 and PU063, from station #2 and #1, respectively) did not respond to hello or burn acoustic signals and were deemed lost.

5.6.1.1 Recovery

The three units successfully recovered on 03 December 2008, include those from Stations #3, #4 and #5 in the array configuration (i.e., PU202, PU086, PU203, respectively; **Figure 5.6-1**). PU063 (S#1) and PU081 (S#2) did not respond to hello or to burn acoustic signals for two sets each spread over 10-15 minutes (min) each. These units were deemed lost.

5.6.1.2 Refurbishment

PU086, PU202, and PU203 were cleaned of bio-fouling and refurbishment was begun. These three units were refurbished by Dudzinski and T. Lunsman (GMI) between 04 and 08 December 2008: their external hard hats and internal spheres were cleaned of marine growth; the internal power source components (i.e., batteries, hard drive) were replaced. Each unit's hydrophone o-rings were examined and new burn units were attached to each popup. Cornell's Bioacoustics Research Program (BRP) replaced both lost popups with new units (PU134 and PU179). One unit (PU146) was damaged during shipping from BRP and was replaced by PU134.

Three hard drives were recovered during the December recovery from the September re-deployment. The popups deployed at Stations #3 (PU202) and #5 (PU203) of our array configuration had a 2-kilohertz (kHz) sampling code with continuous sampling. The eastern-most, center-line popup (S#4, PU086) was loaded with a 31.25-kHz sampling code with 5 min on/25 min off sampling rate. The data on these hard drives have been extracted, compensated, and sound files created for analysis for the September to December 2008 quarter. Additional details are presented in the analyses section of this report.

The December re-deployment included a pop-up in each of the five stations in the cross-configuration along the NJ coastline (**Figure 5.6-1**). The southern-most station (S#1) was PU179; S#4 was PU086; S#3 was PU202; S#2 was PU134; and the northern-most station (S#5) was PU203. PU179, PU202, and PU203 were loaded with a 2-kHz sample rate for continuous recording over the three-month deployment. PU134 and PU086 were loaded with a 31.25-kHz sample rate with a duty cycle of 5 min on/25 min off recording for the deployment duration.

5.6.1.3 Redeployment

All five popups responded successfully to electronic/computer communication during refurbishment. Each popup responded well to all acoustic hello and burn tests (direct, time, and auto). The five refurbished pop-ups were turned on to record and synchronized on 12 December 2008 and were redeployed on 13 December 2008. (Poor sea and weather conditions caused a delay from the originally planned redeployment date of 10 December 2008.)

5.6.2 March 2009

Recovery was originally planned for 19 March, but was pushed a day due to weather forecasts and sea conditions. Recovery was attempted on Friday, 20 March 2009 under rough sea conditions (sea state of 5 to 6 and seas at 5 to 8 feet [ft]).

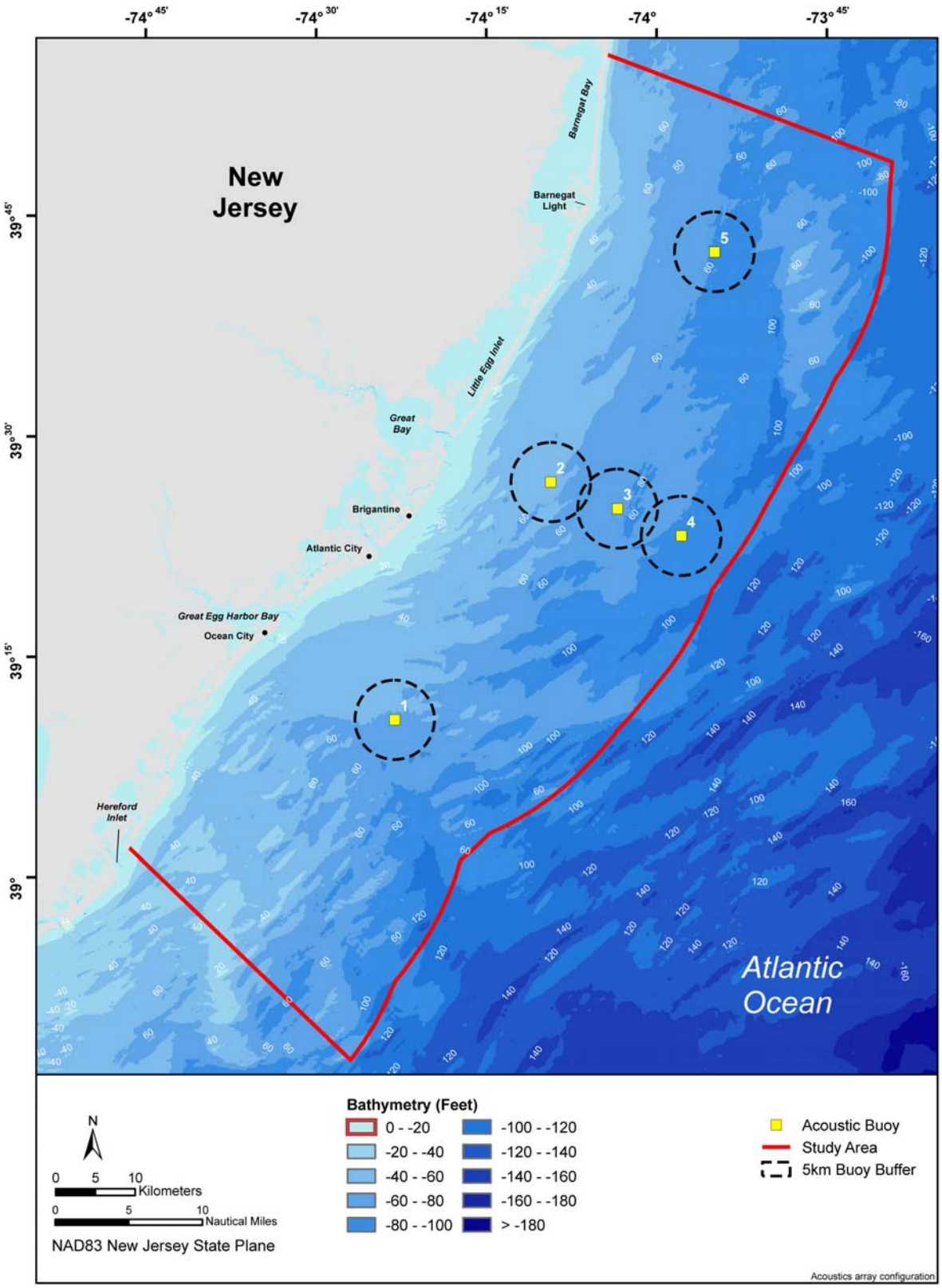

Figure 5.6-1. The array configuration for acoustic data collection with passive acoustic monitoring. The yellow squares represent a recording unit and station numbers are indicated next to each yellow square.

5.6.2.1 Recovery

No units were recovered on 20 March 2009. PU203 (S#5) and PU086 (S#4) did not respond to acoustic hello or burn signals. Nor did either unit present a confirmation of radio signal on the radio-tracking unit. PU202 (S#3) and PU134 (S#2) both responded to their specific hello signal, to the global hello signal and to their acoustic burn signals (both distinct sets of burn signal beep sequences were heard); however, neither unit surfaced after two to three sets of signals were played to the units from the surface. Each unit's radio frequency was cued on the radio-tracking system, but neither unit was detected at the specific radio signal. Thus, it was suggested that the units did not pop to the surface for an as-yet unidentified cause.

The decision was made to return to port and not recover PU179 (S#1) considering sea conditions. Should PU179 be intact and present, its auto-burn was not scheduled until 26 March. Thus, it could be collected when all options were discussed and decided upon with respect to collecting PU134 and PU202. Because our return to port was Friday afternoon, no decision would be made until Monday (23 March) morning. BRP and GMI personnel were alerted to the situation. Rutgers University Marine Field Station (RUMFS) personnel indicated that divers and the R/V *Arabella* could be available for recovery.

PU134 was found floating off Atlantic City, New Jersey, after sunset on 20 March 2009, by Tug Boat Captain Dan Lindal. Lindal called the unit in to BRP; Dudzinski retrieved PU134 from Lindal on the morning of 24 March from their port of Staten Island, New York. The unit was transported to BRP on 26 March 2008 with Chris Tessaglia-Hynes for assessment and examination in an attempt to determine why the unit burn did not operate as planned or predicted.

After discussion with GMI NJDEP Project Managers and BRP staff, the decision was made to redeploy three units (new from BRP) to cover the southern half of the array configuration (S#1, S#2, S#4) in an attempt to collect data during the spring season from the southern end of the Study Area. A BRP tech (Chris Tessaglia-Hynes) joined Dudzinski for redeployment on 26 March 2009 – our only weather window for the week. Divers were not available; therefore, we would confirm the presence of PU202 (at S#3) and check for PU179 (S#1). PU179 was not present and did not respond to audio signals (hello or burn signals). A grid was run with the drop global positioning system (GPS) coordinates as the center point from which ¼-mile (mi) transects were run at the compass points to determine whether PU179 might be present but moved slightly. No response was received from PU179. This unit was deemed lost.

Our trip on 26 March was joined by Gary Buchanan, NJDEP representative. After confirming the loss of PU179, the decision was made to deploy PU002 about 5-6 mi southeast (SE) of the first Station #1 in the original array configuration. Also, the popup was shackled to the anchor to investigate whether the burn unit might be subjected to undue stress from weather conditions in this shallow-water habitat.

PU182 was deployed at S#4 in the array configuration. Prior to deployment, but after arrival on station, the burn signals for PU086 were played to confirm that the unit was not present. PU182 was deployed with the burn unit intact and in use. Next, we checked on PU202 (S#3) to confirm whether the unit was still on the bottom: PU202 responded to hello and burn signals but did not surface. Because divers were not present, a future recovery date will be scheduled to retrieve this unit. PU171 was deployed at the western-most station in the center-line of the array configuration. After deployment of PU182, PU171 emitted the 3-beep signal, which would indicate that the unit had reset itself. Connection with cross-cut software and discussion with the BRP tech suggested this was not the case. The unit also responded to hello signals on deck and during deployment. PU171 was also shackled to the anchor with the burn unit bypassed. Thus, PU171 and PU002 will require diver recovery in June.

PU182 and PU002 were set with a 2-kHz sample code and a continuous duty cycle. PU171 was loaded with a 31.25-kHz code and a 5 min on/25 min off duty cycle. The units are scheduled to be recovered in mid-late June, with final date to be weather dependent.

5.6.2.2 Refurbishment

Units deployed on 26 March 2009 were refurbished by BRP staff prior to date of deployment.

5.6.3 Data Analyses/Processing

Data analysis details refer to data collected from late March 2008 through 03 December 2008, unless otherwise noted. Data analysis details are presented per deployment for ease of reference.

5.6.3.1 March 2008 Deployment

Data from four popups were collected at a 2-kHz sample rate facilitating an examination of baleen whale vocalizations that might have been made from late March 2008 through 16 June 2008. Data from each pop-up were examined using automated detection algorithms for Fin whale and North Atlantic right whale calls. Data are still being opportunistically examined for vocalizations of other species, as guided by survey data for other species identified during transect surveys. Daily presence of fin whales (**Table 5.6-1**) and North Atlantic right whales (**Table 5.6-2**) are presented for all deployments. Only presence of identified species and date of presence have been documented for these analyses.

5.6.3.2 June 2008 Deployment

Data from four popups were collected: two at a 2-kHz sample rate (continuous duty cycle) facilitating an examination of baleen whale vocalizations and two at a 31.25-kHz sample rate (5 min on/25 min off duty cycle) facilitating an examination of toothed whale calls. The lower sample rate data have been analyzed for presence of fin and North Atlantic right whale calls using a preset data template detector in extensible bioacoustic tool (Xbat) and BRP's ISRAT call detection, respectively. Results for species presence and date of presence are presented in **Tables 5.6-1** and **5.6-2**, respectively. Toothed whale (likely a dolphin species) vocalizations have been detected in the date from both high-frequency data sets (**Table 5.6-3**). Little research has been conducted to definitively identify different delphinid species via frequency-modulated (FM) or amplitude-modulated (AM) calls alone; thus, identification to species based on call detection has been reserved although survey data suggest these calls to be from either bottlenose dolphins or common dolphins. Whistles, squawks, chirps, clicks, whines, pops, and claps were all detected from various days of recordings.

Sample spectrograms of right whale up calls (**Figure 5.6-2**), fin whale pulses (**Figure 5.6-3**), and delphinid calls (**Figure 5.6-4**) are included with this report. Details are presented in each figure legend. Sample sound files (.wav or mp3) are available on request.

Table 5.6-1
Fin whale pulses detected by date and location are presented in chronological order. Popup ID (PU###) and Station location (S#) within array configuration provided. Dates of detection are presented per month for each popup. There could be calls from late December from the December deployment to add to this table; however, data from the December deployment have yet to be examined.

Month Deployed	PU081 (S#4)	PU063 (S#3)	PU134 (S#5)	PU086 (S#2)	PU202 (S#3)	PU203 (S#5)
March	29th	29th	29th	29th, 30th	Not in use	Not in use
April	4th 6th 7th 9th 10th 12th 27th	4th 9th	4th 9th 13th 15th 27th	1st 5th 7th 8th 15th	Not in use	Not in use
May	19th 20th 21st 22nd 23rd	none	2nd	4th 5th 9th 18th 19th 22nd	Not in use	Not in use

Table 5.6-2 (*continued*)
North Atlantic right whale calls detected by date and location are presented in chronological order. Popup ID (PU###) and Station location (S#) within array configuration provided. Dates of detection are presented per month for each popup. There could be calls from late December from the December deployment to add to this table; however, data from the December deployment have yet to be examined.

Month Deployed	PU081 (S#4)	PU063 (S#3)	PU134 (S#5)	PU086 (S#2)	PU202 (S#3)	PU203 (S#5)
June	4th 10th 11th 15th 16th	2nd 4th	6th 8th 9th 10th 11th 12th 13th 14th 16th 17th 24th – 30th	No data	Not in use	Not in use
July	High frequency code	none	1st 6th 11th 13th 16th 17th 19th 20th 21st 22nd 26th – 31st	High frequency code	Not in use	Not in use
August	High frequency code	6th 8th – 14th 18th 19th 24th 28th 31st	1st – 12th 17th 18th 23rd 24th 25th 27th – 31st	High frequency code	Not in use	Not in use
September	High frequency code	3rd 10th – 12th 14th	1st – 4th 6th 7th 12th 13th	High frequency code	Not in use	Not in use
October	lost	Lost	Not in use	High frequency code	4th 5th 8th 10th 12th 13th 18th 23rd 27th 28th	19th 27th
November	lost	Lost	Not in use	High frequency code	3rd 4th 7th 8th 13th 14th 16th	2nd 14th
December	lost	lost	Not in use	High frequency code	1st	1st 2nd
March	27th 28th 29th	27th 28th	27th	26th 27th 28th	Not in use	Not in use
April	6th 20th 25th 27th 28th	20th 21st 25th 26th 27th	20th 22nd 26th 27th	1st 2nd 3rd 19th 20th 29th	Not in use	Not in use
May	5th 6th 15th 17th	2nd 6th 15th 17th	1st 2nd 5th 6th 15th 16th 17th	2nd 3rd 6th 10th 11th 15th 21st 22nd 28th 29th	Not in use	Not in use
June	11th	11th	10th	No data	Not in use	Not in use
July	High frequency code	27th?	20th 24th	High frequency code	Not in use	Not in use
August	High frequency code	none	3rd 5th 24th 28th	High frequency code	Not in use	Not in use
September	High frequency code	none	14th – 17th	High frequency code	Not in use	Not in use

Table 5.6-2 (*continued*)
North Atlantic right whale calls detected by date and location are presented in chronological order. Popup ID (PU###) and Station location (S#) within array configuration provided. Dates of detection are presented per month for each popup. There could be calls from late December from the December deployment to add to this table; however, data from the December deployment have yet to be examined.

Month Deployed	PU081 (S#4)	PU063 (S#3)	PU134 (S#5)	PU086 (S#2)	PU202 (S#3)	PU203 (S#5)
October	lost	Lost	Not in use	High frequency code	None	None
November	lost	Lost	Not in use	High frequency code	16th 17th 19th 26th	11th 12th
December	lost	lost	Not in use	High frequency code	1st	none

Table 5.6-3
Toothed whale calls detected by date and location are presented in chronological order. No calls identified for first deployment (26 March 08 – 17 June 08) since the sample rate was too low to detect toothed whale calls. Popup ID (PU###) and Station location (S#) within array configuration provided. Dates of detection are presented per month for each popup. These high frequency data are under continuing analyses. See text for details.

Month Deployed	PU081 (S#4)	PU063 (S#3)	PU134 (S#5)	PU086 (S#2)	PU202 (S#3)	PU203 (S#5)
June	\	low frequency code	low frequency code	\	Not in use	Not in use
July	All examined, calls present every day	low frequency code	low frequency code	Half dates examined, calls present for each examined day	Not in use	Not in use
August	All examined, calls present every day	low frequency code	low frequency code	*Data not yet analyzed*	Not in use	Not in use
September	All dates examined	low frequency code	low frequency code	*Data not yet analyzed*	Not in use	Not in use
October	lost	lost	Not in use	*Data not yet analyzed*	low frequency code	low frequency code
November	lost	lost	Not in use	*Data not yet analyzed*	low frequency code	low frequency code
December	lost	lost	Not in use	*Data not yet analyzed*	low frequency code	low frequency code

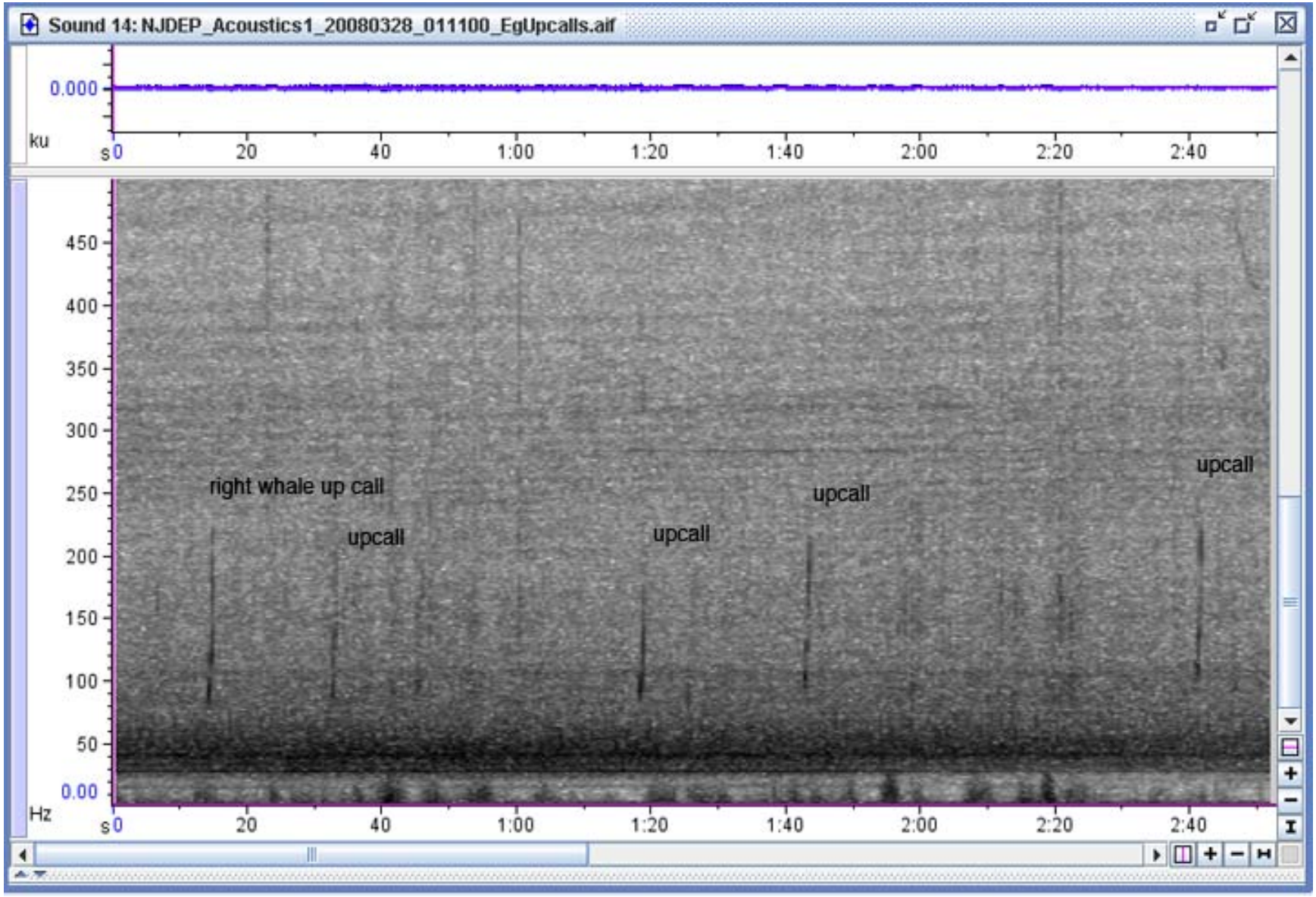

Figure 5.6-2. Spectrogram sample of North Atlantic right whale upcalls collected on 28 March 2008.

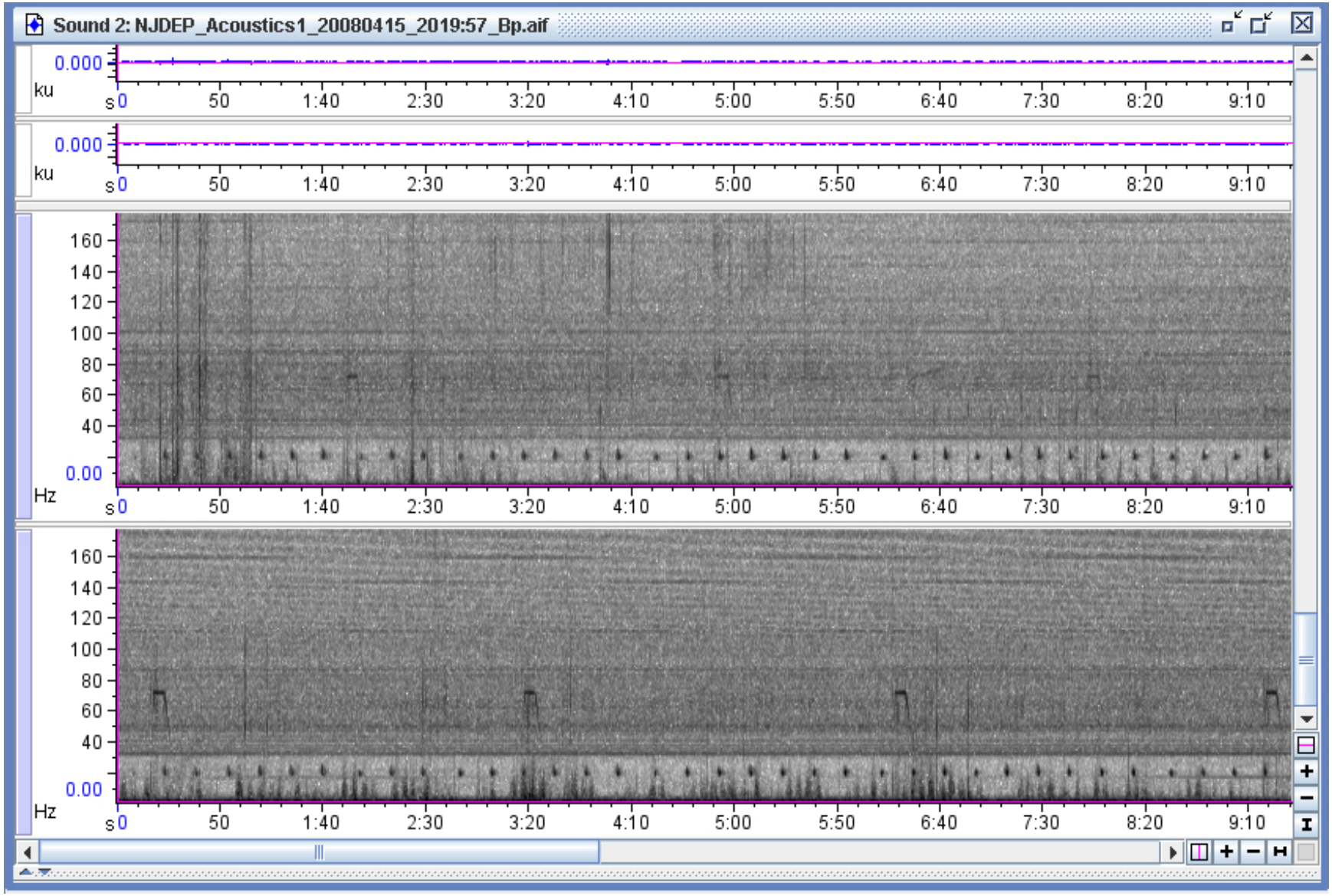

Figure 5.6-3. Spectrogram sample of fin whale pulses collected in April 2008.

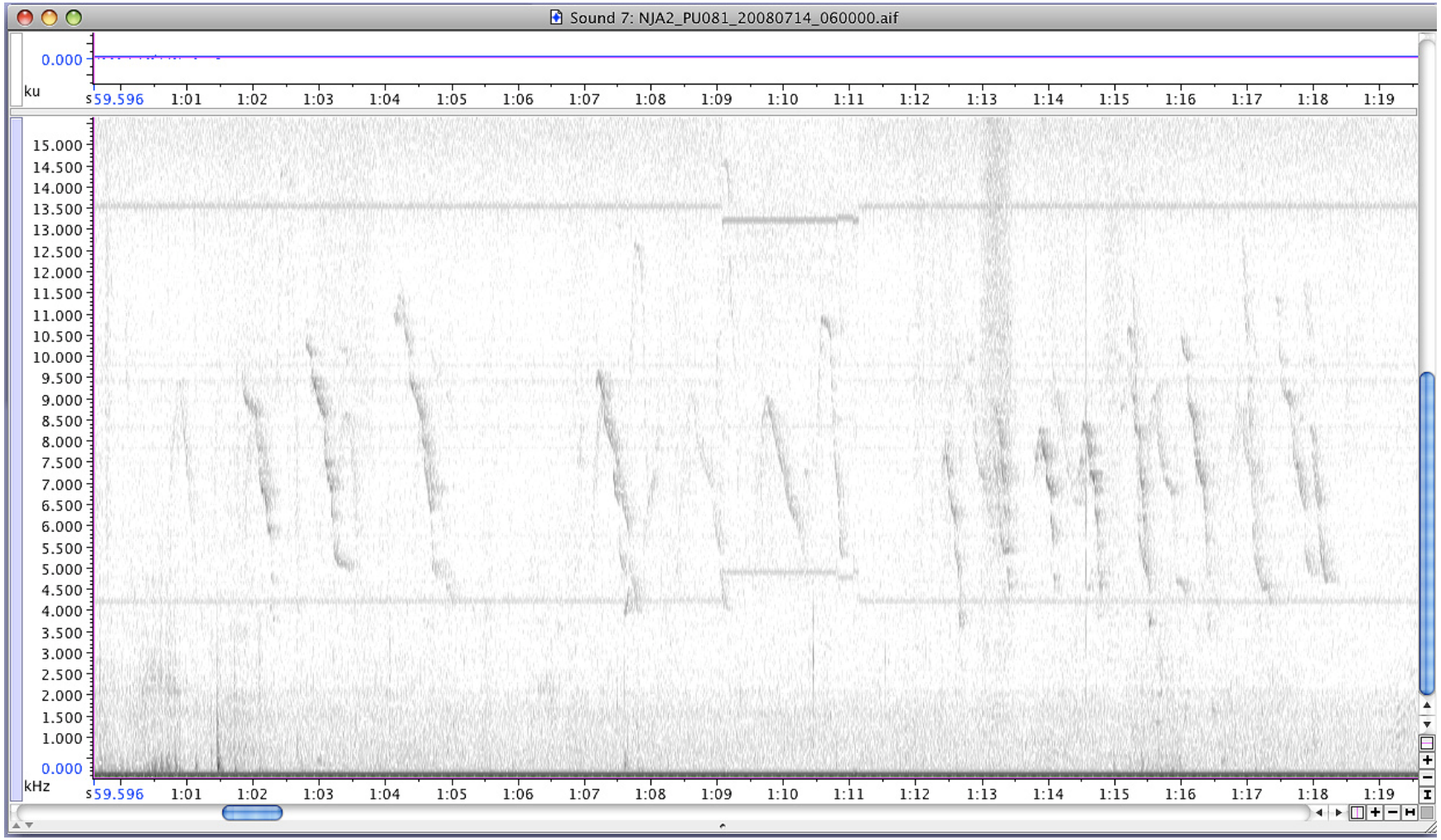

Figure 5.6-4. Spectrogram sample of frequency-modulated tones (whistles) from dolphins collected on 14 July 2008.

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 December 2008 and the first quarter (January-March) of 2009.

5.7.1 Surface Mapping System (SMS)

For the SMS, measured static parameters include the measurement date and time, water depth (ft or m), and longitude-latitude (lon-lat) location. Measured climatic parameters include wind speed (knots), wind direction (deg), air temperature (degrees Celsius [°C]), relative humidity (percent [%]), and atmospheric barometric pressure (millibars [mbar]). Measured dynamic oceanographic parameters include water (sea surface) temperature (SST, °C), salinity (practical salinity units [psu]), fluorometric chlorophyll and colored dissolved organic matter (CDOM; Turner raw), and photosynthetically active radiation (PAR; quanta per second [quanta/ 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 nanomaters [nm]) and a strong fluorescent peak at red wavelengths (670 nm), whereas CDOM absorbs strongly in the blue region (412 nm) 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: microwatts [uW] per square centimeter [cm^{-2}] per nm^{-1}).

These SMS measurements were conducted and recorded every 10 s on the following dates:

- December 2008: 5:29 PM on 12-5 through 2:06 AM on 12-15; 1:28 PM on 12-16 through 5:44 PM on 12-16.
- January 2009: 9:20 AM on 1-6 through 7:48 AM on 1-7; 11:25 PM on 1-9 through 11:15 PM on 1-14.
- February 2009: 11:04 AM on 2-8 through 4:06 AM on 2-12; 1:41 AM on 2-14 through 3:19 PM on 2-16.
- March 2009: 2:53 PM on 3-10 through 2:42 AM on 3-17.

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 9th hour on 06 January 2009 were recorded to the text file “09010609.txt”.

5.7.2 Conductivity-Temperature-Depth (CTD) Measurements

In addition to water surface properties, water depth profiles (extending from the surface down to a depth corresponding to 30 decibels [dB] pressure) were generated for water temperature (°C), salinity (psu), dissolved oxygen (milligrams 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. Graphical plots of these depth profiles were saved as Excel files “CTDxxx.cnv” (where “xxx” = site number: “001”, “002”, *etc.*). Other CTD data files that were generated include BL files (*.bl), CON files (*.con), HDR files (*.hdr), HEX files (*.hex), ROS files (*.ros), and WMF Image files (*.wmf). The CON files contain the sensor calibrations: Voltage: 0 = fluorometer (Wetlabs ECO), 1=transmissometer, 2=oxygen (SEB 43), 3=free, 4=transmissometer (C-Star), 5=free, 6=altimeter, 7=free.

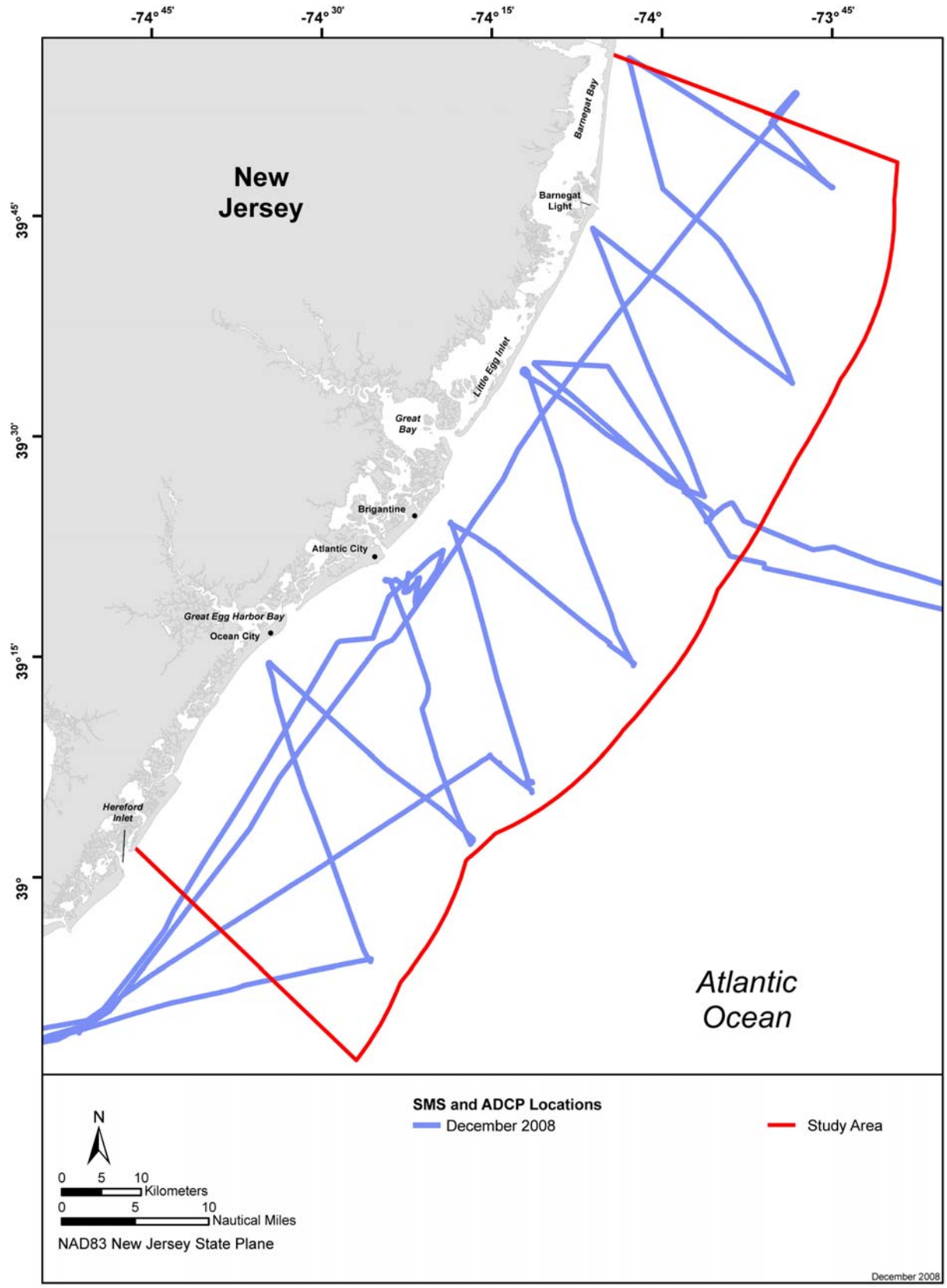

Figure 5.7-1. SMS and ADCP Measurements Conducted during Shipboard Surveys in the NJDEP Study Area off the Coast of New Jersey in December 2008.

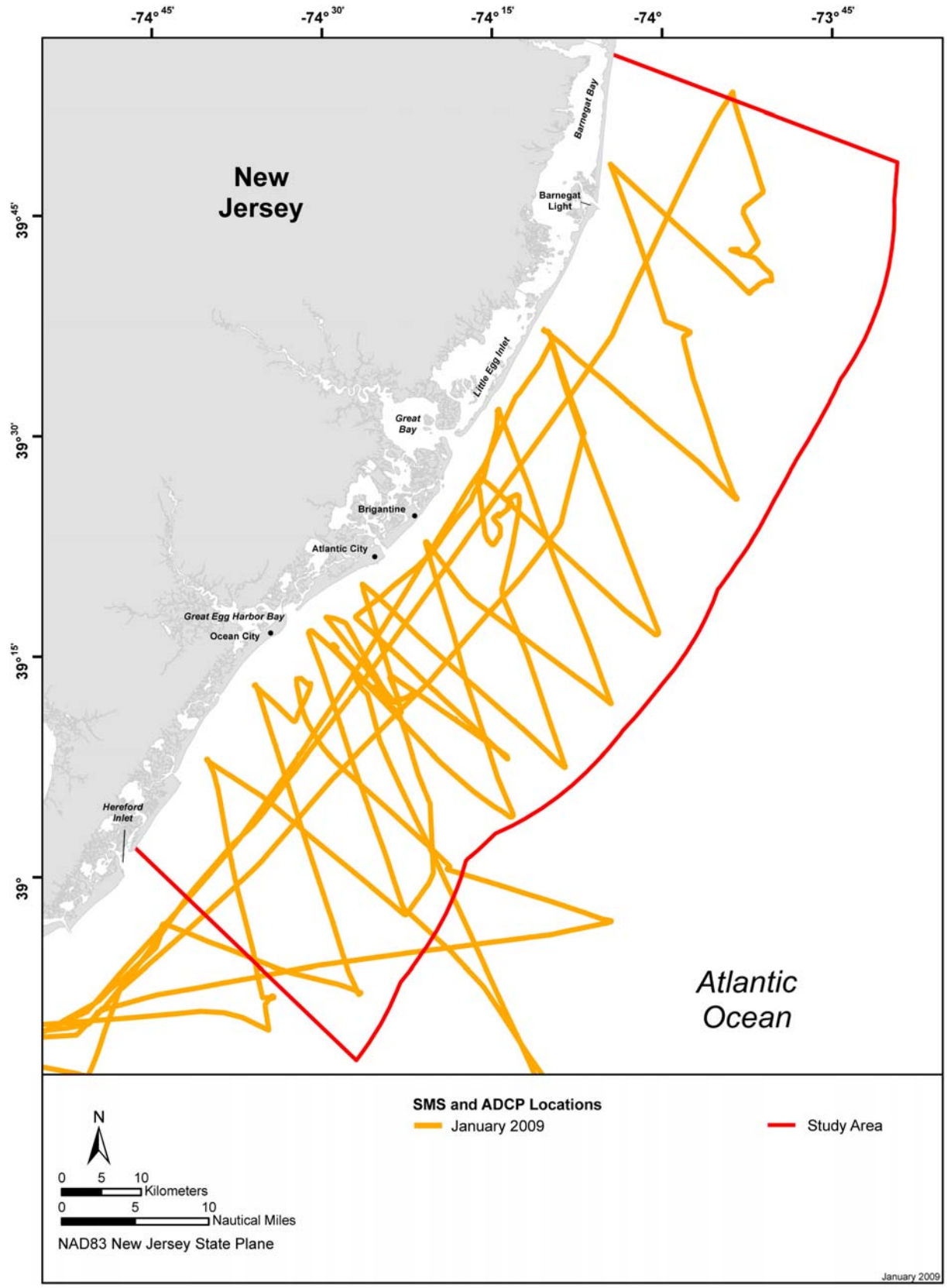

Figure 5.7-2. SMS and ADCP Measurements Conducted during Shipboard Surveys in the NJDEP Study Area off the Coast of New Jersey in January 2009.

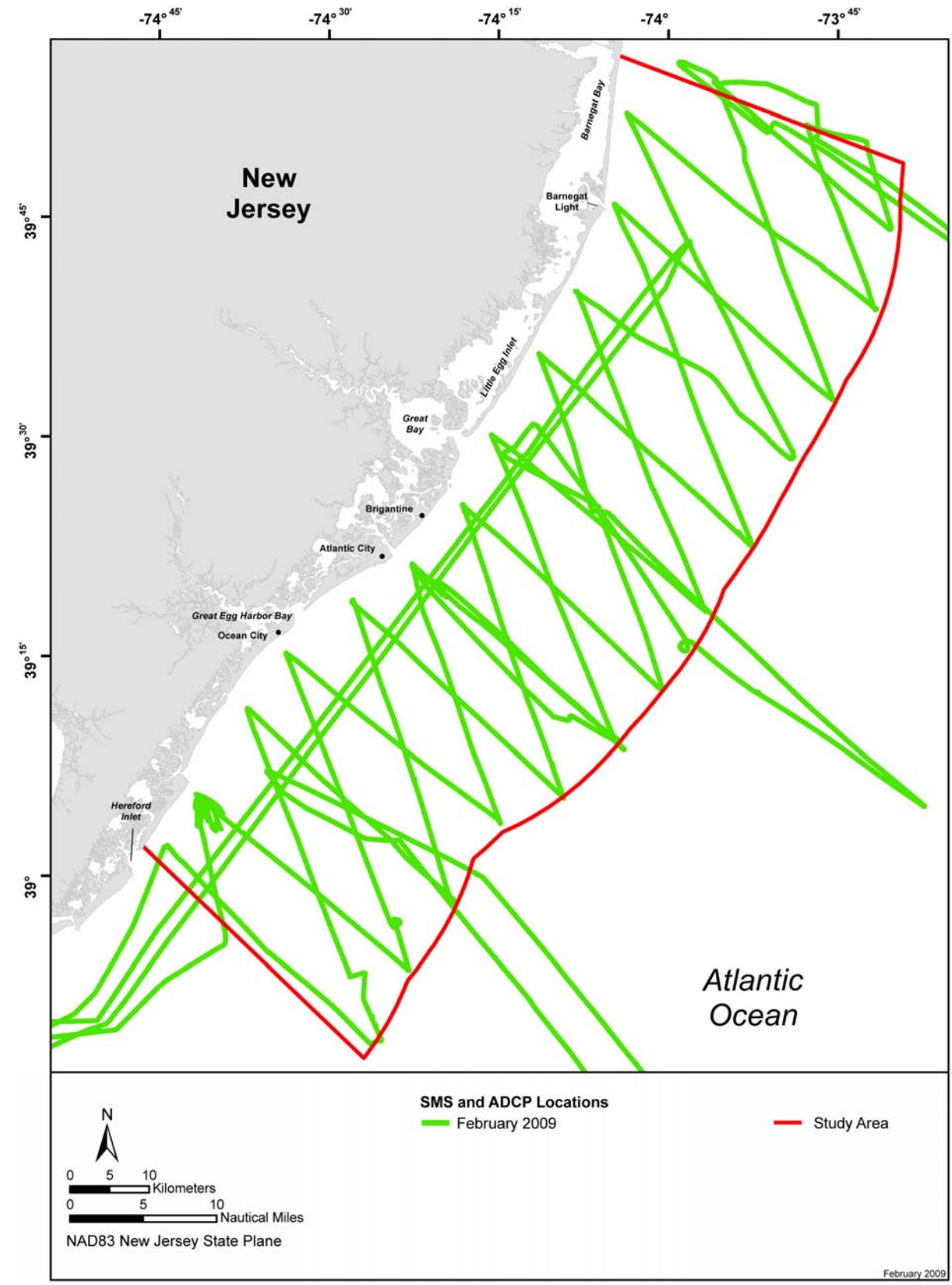

Figure 5.7-3. SMS and ADCP Measurements Conducted during Shipboard Surveys in the NJDEP Study Area off the Coast of New Jersey in February 2009.

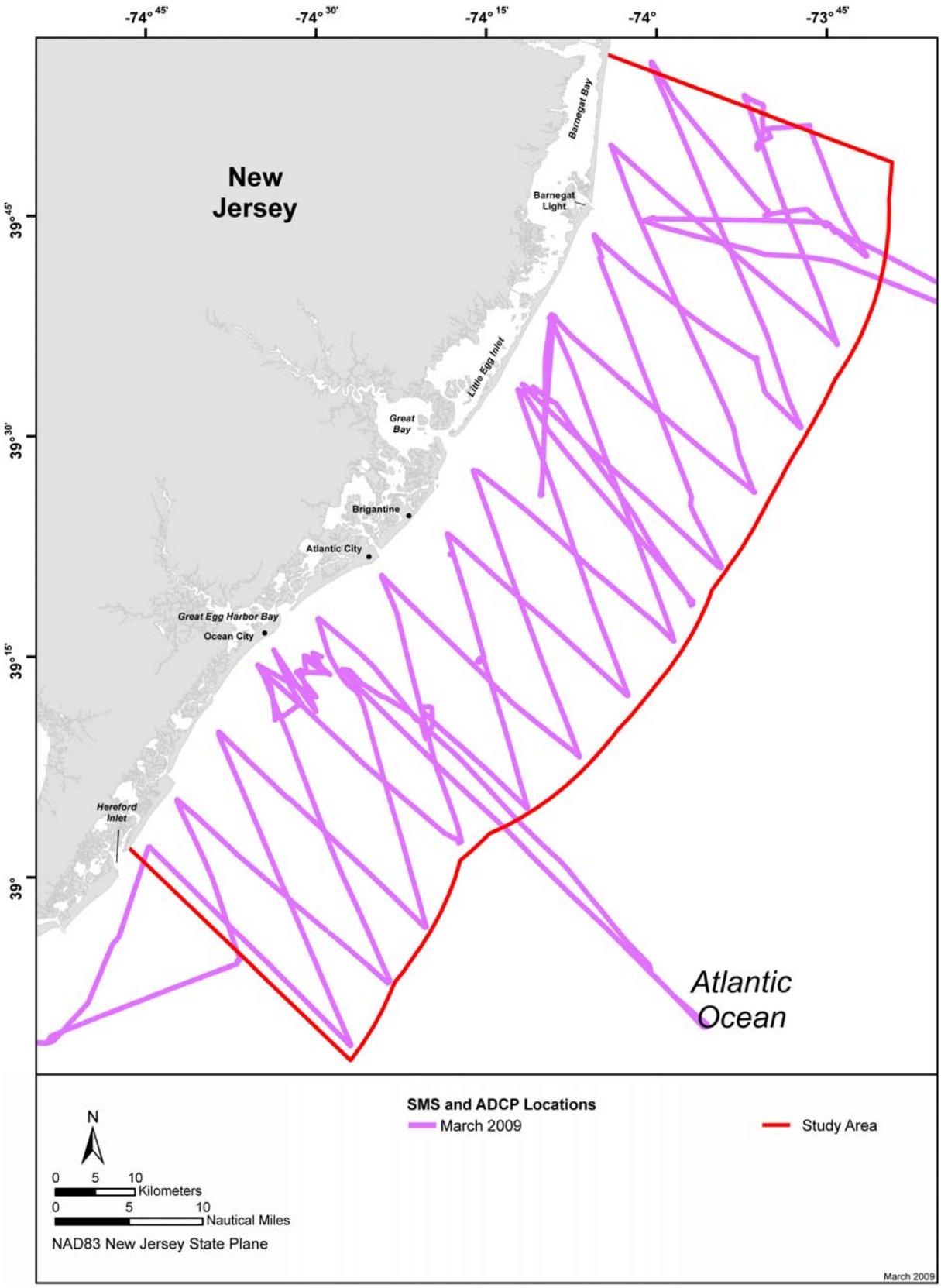

Figure 5.7-4. SMS and ADCP Measurements Conducted during Shipboard Surveys in the NJDEP Study Area off the Coast of New Jersey in March 2009.

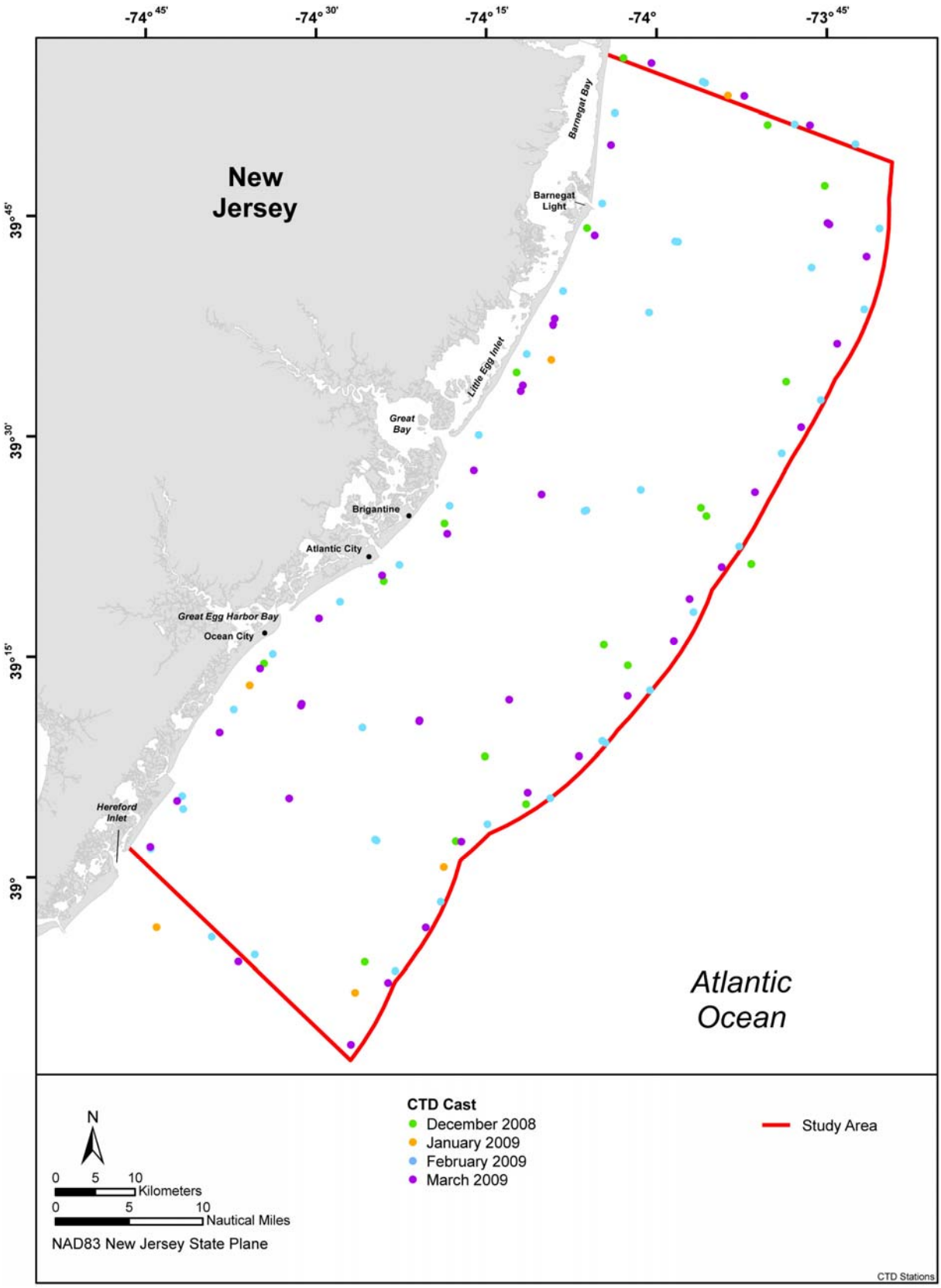

Figure 5.7-5. CTD Measurements Conducted at Point Locations in the NJDEP Study Area off the Coast of New Jersey from December 2008 through March 2009.

The CTD measurements were conducted at 19 sites in December 2008, 6 sites in January 2009, 43 sites in February 2009, and 42 sites in March 2009. The enclosed map shows the lon-lat locations of the sites of the CTD casts at which data collection occurred. The CTD measurements were conducted on the following dates:

- December 2008 (19 sites): 12-9, and 12-13 through 12-14.
- January 2009 (6 sites): 1-6, 1-10, and 1-12.
- February 2009 (43 sites): 2-8 through 2-11, and 2-14 through 2-16.
- March 2009 (42 sites): 3-11 through 3-16.

5.7.3 Acoustic Doppler Current Profiler (ADCP) Measurements

In addition to SMS and CTD, ADCP measurements were conducted at various site locations. The ADCP data were collected and processed using the VM-DAS or WIN-RIVER software programs. The raw ADCP data (generated in files *.enr) were screened for RSSI and correlated by VM-DAS or WIN-RIVER (files *.ens) and then bin-mapped and transformed to Earth coordinates. The single-ping ADCP data after this transformation are in the files "*.enx". The text files "*.vmo" contain the option settings for collecting the ADCP data. The general ADCP file format "*" = "ADCPxxx_eeeeee", where "xxx" = sequence of data collection files (initially "001" at the beginning of the cruise, and then increases by 1 every time the system is turned on and off), and "eeeeee" = ensemble number. The additional labels "yyyymmdd" = date of ADCP pinging, and "hhmmss.ss" = time of ADCP pinging.

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

December 2008: No ADCP data.

January 2009:
- 1-9 (23:03:02 to 23:59:59)
- 1-10 (00:00:00 to 23:59:59)
- 1-11 (00:00:00 to 23:59:59)
- 1-12 (00:00:00 to 23:59:59)
- 1-13 (00:00:00 to 23:59:59)
- 1-14 (00:00:00 to 10:59:39)

February 2009:
- 2-14 (01:40:43 to 23:59:59)
- 2-15 (00:00:00 to 23:59:59)
- 2-16 (00:00:00 to 15:19:33)

March 2009:
- 3-11 (11:43:09 to 23:59:59)
- 3-12 (00:00:00 to 23:59:59)
- 3-13 (00:00:00 to 23:59:59)
- 3-14 (00:00:00 to 23:59:59)
- 3-15 (00:00:00 to 23:59:59)
- 3-16 (00:00:00 to 23:59:59)
- 3-17 (00:00:00 to 02:42:01)

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 second 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. The Year 1 Interim Report was submitted on 20 January 2009. Comments were received and addressed in a revised version submitted on 03 March 2009.

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APPENDIX A

REVIEWED LITERATURE

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APPENDIX A-1

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APPENDIX A-3

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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

DIGITAL DATA COMPILATION

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Table B-1
Digital Data Compilation from Multi-Source Data Banks

Agency	Data
NOAA National Geophysical Data Center	Bathymetry
New Jersey Department of Environmental Protection NJDEP	Earthquakes Epicentered In New Jersey
	New Jersey Tidal Benchmark Network
	Bedrock-Surface Topography of New Jersey (1:100,000-scale)
	Bedrock Outcrops of New Jersey
	Surficial Geology of New Jersey
NOAA ENC®	Electronic navigational chart
Environmental Protection Agency	Geospatial Data Download Relational Feature Class
Minerals Management Service	Baseline tangent lines and bay closing lines/points
	Preliminary Federal Outer Continental Shelf (OCS) Administrative Boundaries
	OCS block outlines
	Continental Shelf Boundary
	Submerged Lands Act boundary line
	Limit of '8(g) Zone'
	Marine Sanctuaries
	MMS Planning Area outlines
	Official Protraction Diagram
NOAA's Marine Protected Areas Center	MPA Inventory
National Pipeline Mapping System	Commercially Navigable Waterways
National Atlas	Hydrography
New Jersey Highlands Water Protection and Planning Council	Conservation Priority Areas
	Critical Habitat (Final Draft)
	Conservation Priority Areas (Final Draft)
	Critical Habitat Resource Area (Draft)
	Highlands Open Waters (Draft) - Water Bodies
	New Jersey Highlands Council Final Draft Land Use Capability
	Highlands Open Waters (Draft) - Wetlands
	New Jersey Highlands Water Protection and Planning Council
	Low Density Residential Land Use (Final Draft)
	Open Space
	Source Water Protection Area (Draft)
	Baseline Transportation & Transit (Final Draft)
NJDEP	2002 Landuse
	2002 Streams Update
	2003 Aerials
	Bald Eagle Foraging
	Beach
	Coastal Area Facilities Review Act Boundary
	Coastal Centers
	Coastal Flooding
	Counties
	Dedicated Open Space
	10-meter Digital Elevation Grid
	Emergent Wetland
	Forest
	Forested Wetland
	Grassland
	Habitat Delineation
	Historical Shorelines
	Known Contaminated Sites
	Lakes
	Landscape Project Endangered Species Habitat

Table B-1 (*continued*)
Digital Data Compilation from Multi-Source Data Banks

Agency	Data
NJDEP	Natural Heritage Priority Sites
	Natural Heritage Program Priority Sites
	Hydrography
	NJPDES Ground Water Discharges
	NJPDES Surface Water Discharges
	Open Space
	Place Name Locations
	Roads
	Sewer Service Status
	Shellfish Classification 2007
	Shoreline Structures
	Shoreline Type
	Soil
	South Jersey Marsh
	STORET Water Quality Monitoring Stations
	Stormwater Rule Areas Affected by 300 Foot Buffers
	Streams
	Surface Water Quality Standards
	Tidelines
	Upper Wetlands Boundary
	Urban Peregrine
	USGS Quarter Quad Index
	Water Bodies
	Water Supply Planning Areas
	Watershed Management Areas
	Watersheds
	Wetlands
NJDOT	Roadway Network.
NOAA	National Geodetic Survey's Vector Shoreline
U.S. Fish and Wildlife Service, Region 5, National Wildlife Refuge System	E.B. Forsythe National Wildlife Refuge Boundary
	Great Swamp NWR
	Cape May
	Supawna Meadows
	Wallkill River NWR
Pinelands Management Areas	Pinelands Management Area Boundaries
NOAA Raster Navigational Chart	Raster Navigational Charts
U.S. Department of Agriculture, Natural Resources	Soil
USGS Coastal and Marine Geology Program	Coastal Vulnerability
	Erosion and Accretion Rates
	Geology
	Geomorphology
	Sediment Distribution