

APPENDICES

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APPENDIX A
AVIAN SURVEY METHODOLOGY

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Appendix A-1

Avian Observer Packet – Version I

AVIAN OBSERVER PACKET

Ocean/Wind Power Ecological Baseline Studies



New Jersey Department of Environmental Protection
Division of Science, Research, & Technology



Version 1
04 January 2008

AVIAN OBSERVER MANUAL
NJDEP Baseline Survey Research Cruise 2008
4 January 2008

INTRODUCTION

The NJDEP has contracted GMI to conduct avian line transect surveys along the New Jersey coastline. The current study area is depicted in **Figure 1**. This manual is intended as an introduction to the field methodologies, project objectives, and as a general information guide for the biological observers who will be participating in the surveys.

AVIAN SHIP AND SMALL BOAT SURVEYS

Ship and small boat line-transect surveys will be conducted during daylight hours. Depending on visibility (e.g., cloud cover, fog) surveys will be started no earlier than 0.5 hours after sunrise and end no later than 0.5 after sunset. Two (2) experienced seabird biologists will use the appropriate sized stabilized binoculars to enumerate, estimate flight altitude, identify bird species out to an established range, and record other observations (e.g., behaviour, sources of food). Survey methods follow Gould and Forsell (1989) and Camphuysen et al., (2004). The objective of the line-transect method, as presented by Gould and Forsell (1989) is to obtain density estimates for seabirds. Gould and Forsell (1989) discussed and analyzed variables associated with the estimation of seabird density and concluded that counting all birds flying through the transect area would greatly exaggerate water density estimates. In other words counting all birds would represent birds using the air corridor over the water and not the birds associated with the water itself. Therefore, Gould and Forsell (1989) recommended counting flying birds once every 1 km (0.54 NM) along the transect line. Since the primary objective of the seabird surveys is to determine avian abundance, distribution, and flight behaviour (flight altitude and direction), Gould and Forsell's method will be modified to count all birds encountered in the survey strip (300 m).

SHIPBOARD OFFSHORE SURVEYS

Sample Design

Line-transect survey methods (Buckland et al. 2001) will be used to conduct avian, sea turtle, and marine mammal ship surveys. Survey tracklines will be plotted in a 'double saw-tooth' configuration with lines running perpendicular to the bathymetry from the 10-meter (m) isobath to the study area boundary (**Figure 1**). Waypoints for the tracklines will be generated for every survey using the program DISTANCE (Buckland et al. 2004); thereby allowing a true random design to the Study Area coverage.

Starting locations (North or South and East or West) will be decided by the flip of a coin for every survey. Tracklines will be surveyed at approximately 10 knots (kts) during daylight hours when Beaufort sea state (BSS) is ≤ 5 and visibility is ≥ 4 NM. This survey as designed will require 5 to 8 days to complete each month, depending on sea conditions and available daylight.

Standard Operating Procedures, Data Recording, Instrument Calibration

Avian

Hard copies of maps illustrating the numbered transect locations and coordinates of way points (transect start and endpoints) will be produced and given to the boat captain prior to the survey. The avian team will consist of three (3) biologists, one on the bow and one on the port or starboard side of the ship (i.e., dependant on glare), and one biologist off-effort. The survey area will be a 300-m strip on either side of the ship track line. The bow biologist will be responsible for surveying a 45-degree ($^{\circ}$) area ($0-45^{\circ}$ or $315-360^{\circ}$) and the port/starboard biologist will be responsible for surveying the remaining 45° area ($45-90^{\circ}$ or $280-31^{\circ}$). Detailed standard operating procedures including information on data recording and instrument calibration are presented in **Appendix 1**.

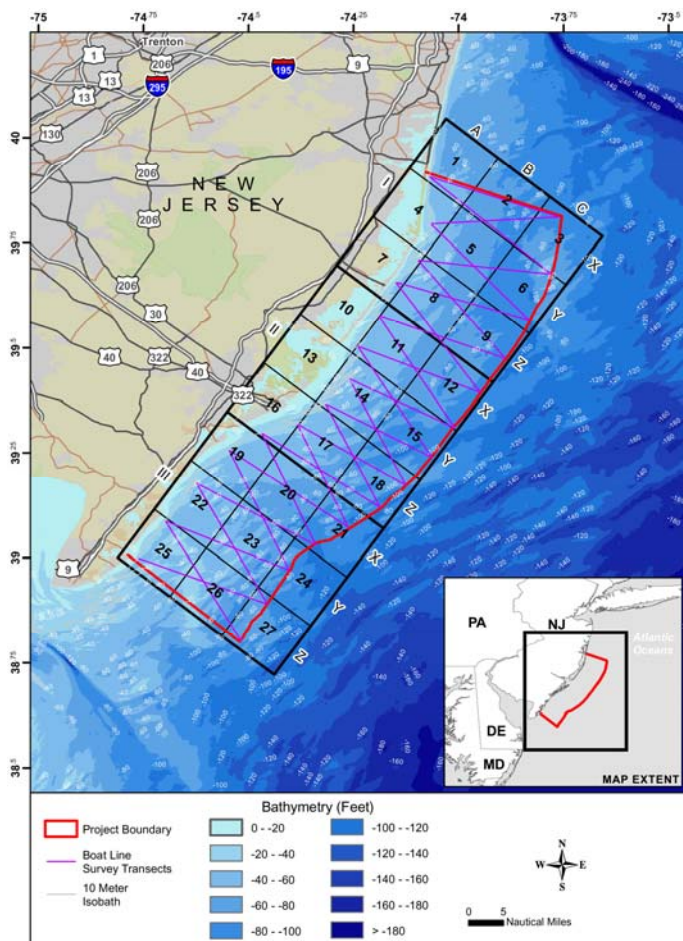


Figure 1. Map showing shipboard survey sampling design with representative tracklines.

Quality Assurance/Control

Avian

Data

The data will be downloaded to a laptop computer and reviewed by the senior seabird biologist after each survey to determine if reporting errors were made. If errors are present, the observer(s) (staff seabird biologists) will meet with the senior seabird biologist to resolve the error(s) the evening following the survey. Any necessary corrections will be made to the data file and noted in the file by the senior seabird biologist. The file will be renamed (QA-QC added to file name) and be saved on a laptop computer and external hard drive (see **Appendix 1** for a detailed protocol).

Observer Efficiency

At least once monthly avian observer efficiency will be determined for each observer. The avian biologist not in the

current rotation will randomly select one of the “on duty” avian biologists (i.e., the bow [1] or port/starboard biologists [2]) to conduct an hour-long observer efficiency survey. This biologist will stand behind the selected on duty observer and simultaneously and independently record survey data for a one-hour period. After the data has been downloaded, the two data sets will be compared.

SMALL VESSEL COASTAL SURVEYS

Small boat surveys will be conducted to capture nearshore coastal bird activity. These surveys will capture nearshore activity that may be missed by the ship due to depth limitations. The small boat coastal surveys will provide additional statistical power to the avian predictive model.

Sample Design

Trackline survey methods (Buckland et al. 2001) will be used to conduct coastal avian boat surveys along the nearshore area extending out to the 10-m isobath. A “single saw-tooth” sample design will be implemented to adequately survey the entire area. Individual transects will be numbered consecutively (**Figure 2**). A total of 67 single-sawtooth transects span three strata, numbered from the northernmost to the southernmost shoreline location in the study area, such that transects 1-22 are in the high-latitude stratum, transects 23-44 are in the mid-latitude stratum, and transects 45-67 are in the low-latitude stratum. The starting location for each survey will be randomly determined selecting among four starting points, A, B, C, and D (see **Figure 2**). Point A (at the beginning of transect 1) is the northernmost shoreline location of the high-latitude stratum, point B (between transects 22 and 23) divides the high-latitude stratum from the mid-latitude stratum, point C (between transects 44 and 45) divides the mid-latitude stratum from the low-latitude stratum, and point D (at the end of transect 67) is the southernmost shoreline location of the low-latitude stratum. In order to minimize down-time for ship relocation to start

sampling a new stratum, the starting direction (north or south) will not be randomly selected, but instead will automatically be determined from the results of the random starting location selection. Specifically, the starting direction for points A and B will be south, and the starting direction for points C and D will be north, allowing at least two complete strata to be sampled before the ship may be required to relocate to start sampling the remaining stratum. If point A or D is chosen as the starting location, then no ship relocation is required. Transect lines will be surveyed until dusk and therefore the area covered will be dependent upon the available daylight during the time of the survey. This approach will allow a truly random sampling (with respect to starting location) of the shoreline and the shoal areas for seabird roosting/resting and feeding areas, while maximizing available ship sampling time (i.e., minimizing ship down time or relocation time).

Quality Assurance/Control

Quality assurance/control would be identical to that described previously for the shipboard surveys.

Standard Operating Procedures, Data Recording, Instrument Calibration

Surveys will be conducted once monthly during months when aerial surveys are not conducted. A total of 12 monthly surveys will be completed. Standard operating procedures, data recording, and instrument calibration are identical to those described for shipboard avian surveys.

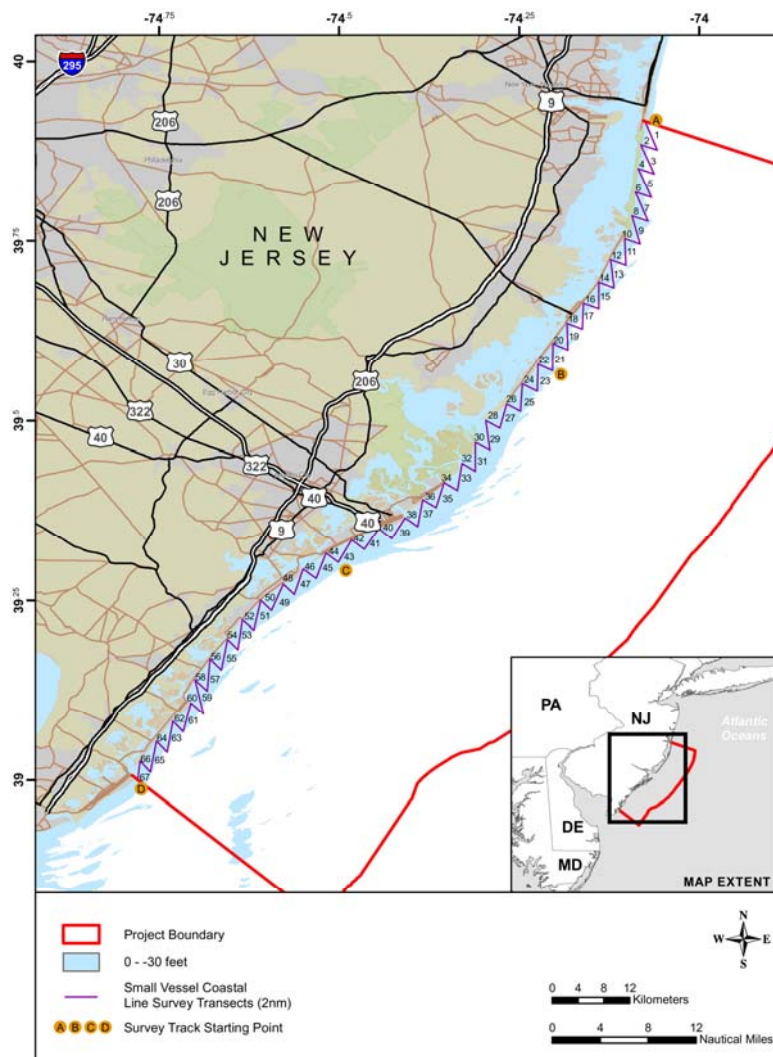


Figure 2. Map showing survey design for the small boat coastal surveys with representative tracklines.

APPENDIX 1

AVIAN SHIP SURVEY STANDARD OPERATING PROCEDURES

AVIAN SHIP AND SMALL BOAT SURVEY STANDARD OPERATING PROCEDURES

I. Personnel

The ultimate responsibility for the avian ship surveys rests with the senior seabird biologist. The senior seabird biologist reports to and coordinates the avian survey effort with the Chief Scientist. In confusing or unique field situations, the senior seabird biologist will consult with the Chief Scientist prior to making a decision.

I.A. Identification Specialists (one)

The senior seabird biologist is an experienced observer who has conducted avian at sea and coastal ship and small boat-based surveys. He has the ability to identify avian species known to occur in the project area, conduct observer efficiency quality assurance protocols, and to complete data quality control procedures. The experience of the senior seabird biologist will maintain the consistency of the data collected during each survey.

The senior seabird biologist is the avian team leader and works with the other team members to make decisions and act by consensus. If team members understand and agree with a particular decision, the avian team will work better together. The senior seabird biologist will be a part of the observation team.

I.B. Observers (three)

Avian seabird biologists (observers) are responsible for collecting the primary avian survey data. The observers use Fujinon 14 X 40 image stabilizing binoculars to identify the birds observed in the survey area. The avian observers are proficient in sighting and identifying birds and recording accurate data on hand-held data recorders. Observers will work together as a team to sight and identify birds in the survey area.

II. Watch Rotations

The primary duties of the three avian observers are conducted during a rotation through two positions. During a given watch, the observers rotate through the positions, normally for a period of forty minutes per position. Observer on duty watch shifts will be 80 minutes (min) followed by a 40 min break. During severe glare or high sea conditions the team may select watch periods of shorter duration to lessen fatigue. The observer will arrive at the position 3-5 min before beginning a watch.

III. Duties

III.A. Pre-Survey

The Chief Scientist will determine if sea state conditions are acceptable (<6 on the Beaufort scale) to begin the survey. If sea state conditions are acceptable, the starting transect number will be selected with a random number generator by the Chief Scientist. The pre-survey section of the avian boat survey checklist (**Appendix 2**) will be completed by the senior seabird biologist prior to leaving port and before the beginning of each survey.

III.B. Survey

A weather form will be completed prior to initiating the survey, at mid-day, and at the end of the survey. Changes in weather between these times will be documented on the weather data form(s) (**see Quality Assurance/Quality Control Plan**). The observers will select the side of the ship with the least glare and position themselves at the two survey positions (bow [observer 1] and port/starboard [observer 2]). Both avian observers will scan the survey area for birds with “naked eyes”. The survey area will be a 300-m strip on either side of the ship track line. The bow biologist will be responsible for surveying a 45-degree (°) area (0-45° or 315-360°) and the port/starboard biologist will be responsible for surveying the

remaining 45° area (45-90° or 280-315°). Observers will identify the birds spotted with image-stabilizing binoculars. Surveys will be conducted daily from dawn to dusk until the double sawtooth survey design is completed. If the boat goes off-transect to investigate a marine mammal sighting, avian data collection will continue. A new transect number will be assigned and the survey effort will continue every time the ship changes direction.

Data will be recorded on a hand-held computer for each bird observation. Data recorded will include: transect number, identity (lowest practical taxon; family, genus, species [four letter standard code]), number of individuals (approximate number for flocks), perpendicular distance from the boat transect line to the bird(s), estimated flight altitude, and behavior (flying, foraging, etc). Cardinal directions will be used to designate flight directions.

III.C. Post Daily Survey

Each night of the cruise, the senior seabird biologist will download the day's data into an Excel spreadsheet on a laptop computer. After downloading is complete, the Chief Seabird Biologist (CSB) will check the data for transcription and downloading errors. If necessary, the CSB will meet with members of the avian team at night to resolve transcription errors and make database corrections. The pre-survey section of the avian boat survey checklist will be finalized by the CSB each night.

III.D. Post Cruise

Survey data is downloaded from the laptop computer onto the field office desktop computer and then to the master project directory on the Geo-Marine, Inc. (GMI) Plano Corporate Office server. The post cruise section of the avian boat survey checklist (**Appendix 2**) will be completed by the CSB when the cruise has been completed.

IV. Data Recording

IV.A. Computer Program

A hand-held computer program was developed by GMI to record avian ship survey data. The program simultaneously records the location of ship (transect line) through a connection to the ship's global positioning system (GPS). When prompted the time and transect location of a bird sighting is recorded.

The data file is divided into two sections. The first section contains general data and lists all of the codes used in the data section. General data categories include: Survey Type, Vehicle, Time Zone Delta, Location Interval, and Altitude. These categories are defined below:

Survey Type

"Bird" or "Mammal"

Vehicle

e.g. "Boat", "Plane", etc.

Time Zone Delta

Value, in hours, added to Zulu time to give local time (May be a decimal).

Location Interval

Time in seconds between writing out location records

Altitude

In feet above sea level

Observers may be at a different altitude.

The second section contains the survey data. Each record in the data section is stored as a single line with identical format. Observers, species, behaviors, weather conditions, sea states, water turbidity, water color, glare, and sunlight are all given codes.

Each entry in the data section has the following fields, separated by commas:

Card:

Year-Month-Day
Hour; Minute: Second
GPS State
Latitude
Longitude
Heading
Speed
Species1
Count1
Behavior1
Range1
Bearing1
Elevation1
Latitude1
Longitude1
Species2
Count2
Behavior2
Range2
Bearing2
Elevation2
Latitude2
Longitude2
Species3
Count3
Behavior3
Range3
Bearing3
Elevation3
Latitude3
Longitude3
Observer
Weather
Sea State
Turbidity
Water Color
Water Temperature
Sun Strength
Glare

The interpretation of the fields:

Card:

A0 Beginning of survey
A9 End of survey
B0 Beginning of transect
B9 End of transect
C0 Going on effort
C9 Going off effort
D0 On effort sighting
D1 Off effort sighting
E0 On Effort location only
E1 Off Effort location only
F0 Change of sighting conditions

Year-Month-Day:
 in Zulu time
 year is four digits
Hour:Minute:Second
 in Zulu time 24 hour clock
GPS State
 1 – acceptable for avian surveys
 2 – not acceptable for avian surveys
Latitude / Longitude
 of the ship in decimal degrees, to the 0.00001 (approx. one meter at the equator)
Heading
 of the ship 0 to 359°
Speed
 ground speed in knots of the ship
SpeciesN
 code of the species sighted. Up to three species may be designated for a given sighting.
CountN
 number of individuals
BehaviorN
 code for the sighting's behavior
RangeN
 In meters from the observer
BearingN
 from the observer to the sighting (e.g. right side observers would have a value of 0 to 180°).
ElevationN
 vertical angle from the observer to the sighting (in a plane this would almost always be negative)
LatitudeN / LongitudeN
 computed position of the sighting based on vehicle position and range / bearing / elevation
Observer
 code of the observer
Weather
 weather code, given in first section
Sea State
 sea state code, given in first section
Turbidity
 turbidity code, given in first section
Water Color
 code for water color, given in the first section
Water Temperature
 temperature of water, degrees Celsius. -9999 means unknown.
Sun Strength
 Strength of sunlight code, given in first section
Glare
 code for glare, given in the first section

APPENDIX 2

SHIP SURVEY QUALITY ASSURANCE/CONTROL PROTOCOL AND CHECKLIST

Ship/Small Boat Survey Quality Assurance Protocol

Protocols for conducting safety, equipment, and data checks will be followed before, during, and after every survey cruise to ensure personnel safety, equipment readiness, and collection of quality data.

Prior to beginning a survey, the chief scientist will determine sea state conditions in the project area by checking online data from National Oceanic and Atmospheric Administration (NOAA) buoys in the area. The chief scientist will then discuss these results with the ship's captain/airplane pilot, at which point the captain will determine if current and forecasted weather conditions are acceptable to begin the survey.

The senior marine mammal and seabird biologists will be responsible for completing pre- and post-survey inspections using the checklist on the following page. These inspections will ensure all necessary survey equipment is available and functional prior to surveys and that all datasheets used during the survey are complete, legible, and accurate. If errors are found on the datasheets, the biologists that logged the data will be consulted to resolve the issue. Once the datasheets are inspected, the data will be entered into an electronic spreadsheet. The spreadsheet will be checked for errors and corrected immediately. Data will be saved with a Quality Assurance-Quality Control (QAQC) notation in the file name (e.g. Avian Ship Survey 01-15-01 QAQC) and in redundant copies (hard drive and external disc). All external media storage devices will be appropriately labeled with the survey dates, type of data, and author.

After returning to shore, the senior marine mammal and/or seabird biologist will download the QAQC data to the corporate office project's drive. Once the download is complete, the project manager or principle investigator will be contacted to verify the data is present and readable.

AVIAN SHIP SURVEY CHECKLIST

DATE: _____

| REQUIREMENT | Yes | No | Signature/Title | Date | Time |
|---|--------------------------|--------------------------|-----------------|------|------|
| PRE-SURVEY | <input type="checkbox"/> | <input type="checkbox"/> | | | |
| Ship Ready Status | <input type="checkbox"/> | <input type="checkbox"/> | | | |
| Sea State Condition | <input type="checkbox"/> | <input type="checkbox"/> | | | |
| Meets Survey Protocol | <input type="checkbox"/> | <input type="checkbox"/> | | | |
| Ship Safety | <input type="checkbox"/> | <input type="checkbox"/> | | | |
| Crew boat safety review | <input type="checkbox"/> | <input type="checkbox"/> | | | |
| Survey Equipment | <input type="checkbox"/> | <input type="checkbox"/> | | | |
| Hand-held data recorders (3) | <input type="checkbox"/> | <input type="checkbox"/> | | | |
| Survey Line Map/Coordinates | <input type="checkbox"/> | <input type="checkbox"/> | | | |
| Laptop Computer (primary) | <input type="checkbox"/> | <input type="checkbox"/> | | | |
| Spare Laptop computer | <input type="checkbox"/> | <input type="checkbox"/> | | | |
| Spare Hand-held data recorder | <input type="checkbox"/> | <input type="checkbox"/> | | | |
| Binoculars (2 primary-1 spare) | <input type="checkbox"/> | <input type="checkbox"/> | | | |
| Field Guides | <input type="checkbox"/> | <input type="checkbox"/> | | | |
| Extra binocular batteries | <input type="checkbox"/> | <input type="checkbox"/> | | | |
| Battery charger | <input type="checkbox"/> | <input type="checkbox"/> | | | |
| Pre-Survey Operation Checks | <input type="checkbox"/> | <input type="checkbox"/> | | | |
| Ship GIS | <input type="checkbox"/> | <input type="checkbox"/> | | | |
| Laptop Computer (Primary) | <input type="checkbox"/> | <input type="checkbox"/> | | | |
| Laptop Computer (Spare) | <input type="checkbox"/> | <input type="checkbox"/> | | | |
| Hand-held data recorders | <input type="checkbox"/> | <input type="checkbox"/> | | | |
| SURVEY | <input type="checkbox"/> | <input type="checkbox"/> | | | |
| Data Requirements | <input type="checkbox"/> | <input type="checkbox"/> | | | |
| Weather Data | <input type="checkbox"/> | <input type="checkbox"/> | | | |
| Weather Form (AM) | <input type="checkbox"/> | <input type="checkbox"/> | | | |
| Weather Form (Noon) | <input type="checkbox"/> | <input type="checkbox"/> | | | |
| Weather Form (PM) | <input type="checkbox"/> | <input type="checkbox"/> | | | |
| Survey Data Downloaded | <input type="checkbox"/> | <input type="checkbox"/> | | | |
| Survey Data checked for errors | <input type="checkbox"/> | <input type="checkbox"/> | | | |
| Survey Data File Saved on PC | <input type="checkbox"/> | <input type="checkbox"/> | | | |
| Survey Data saved on 2 nd PC | <input type="checkbox"/> | <input type="checkbox"/> | | | |
| Observer Efficiency Surveys | <input type="checkbox"/> | <input type="checkbox"/> | | | |
| POST CRUISE | <input type="checkbox"/> | <input type="checkbox"/> | | | |
| Survey Data Downloaded | <input type="checkbox"/> | <input type="checkbox"/> | | | |
| On site office PC | <input type="checkbox"/> | <input type="checkbox"/> | | | |
| P drive: Corporate Office | <input type="checkbox"/> | <input type="checkbox"/> | | | |

Quality Assurance/Control Problems:

1. _____
2. _____

Corrective Actions:

1. _____
2. _____

Sr. Seabird

Biologist: _____ **Date:** _____

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Appendix A-2

Avian Observer Packet – Version II

REVISED AVIAN OBSERVER PACKET

Ocean/Wind Power Ecological Baseline Studies



New Jersey Department of Environmental Protection
Division of Science, Research, & Technology



Revision II
28 February 2008

AVIAN OBSERVER MANUAL
NJDEP Baseline Survey Research Cruise 2008
4 January 2008

INTRODUCTION

The NJDEP has contracted GMI to conduct avian strip transect surveys along tracklines off the New Jersey coastline. The current study area is depicted in **Figure 1**. This manual provided detailed field survey methodologies and protocols, project objectives, and as a general information guide for the avian observers who will be participating in the surveys.

AVIAN SHIP AND SMALL BOAT SURVEYS

Ship and small boat strip transect-surveys will be conducted during daylight hours. Depending on visibility (e.g., cloud cover, fog) surveys will be started as soon as visibility allows and will continue to sunset (i.e., if weather conditions allow). Two (2) experienced seabird biologists will use the appropriate sized stabilized binoculars to enumerate, estimate flight altitude, identify bird species out to an established range, and record other observations (e.g., behavior, sources of food). Survey methods follow Gould and Forsell (1989) and Camphuysen et al., (2004). The objective of the method presented by Gould and Forsell (1989) is to obtain density estimates for seabirds. Gould and Forsell (1989) discussed and analyzed variables associated with the estimation of seabird density and concluded that counting all birds flying through the transect area would greatly exaggerate water density estimates. In other words counting all birds would represent birds using the air corridor over the water and not the birds associated with the water itself. Therefore, Gould and Forsell (1989) recommended counting flying birds once every 1 km (0.54 NM) along the transect line. Since the primary objective of the seabird surveys is to determine avian abundance, distribution, and flight behaviour (flight altitude and direction), Gould and Forsell's method will be modified to count all sitting and flying birds encountered in the survey strip (300 X 300 m square). In addition, avian observations will be conducted outside of the 300 X 300 survey area for "important" birds. Important birds include large flocks of birds and rare birds.

SHIPBOARD OFFSHORE SURVEYS

Sample Design

Line-transect survey methods (Buckland et al. 2001) will be used to conduct avian, sea turtle, and marine mammal ship surveys. Avian strip transects will be conducted on either side of the trackline (Gould and Forsell 1989). Survey tracklines will be plotted in a 'double saw-tooth' configuration with lines running perpendicular to coastline from the western to eastern boundary of the project area (**Figure 1**). Tracklines will be generated for every survey using the program DISTANCE (Buckland et al. 2004); thereby allowing a true random design to the Study Area coverage.

Starting locations (North or South and East or West) will be decided by the flip of a coin for every survey. Tracklines will be surveyed at approximately 10 kts when Beaufort sea state (BSS) is ≤ 6 and visibility is ≥ 4 NM. This survey as designed will require 5 to 7 days to complete each month, depending on sea conditions and available daylight.

Quality Assurance/Control

Avian

Data

The data will be downloaded to a lap top computer and reviewed by the senior seabird biologist (SSB) after each survey to determine if reporting errors were made. If errors are present, the observer(s) (staff seabird biologists) will meet with the SSB to resolve the error(s) the evening following the completion of each daily survey.

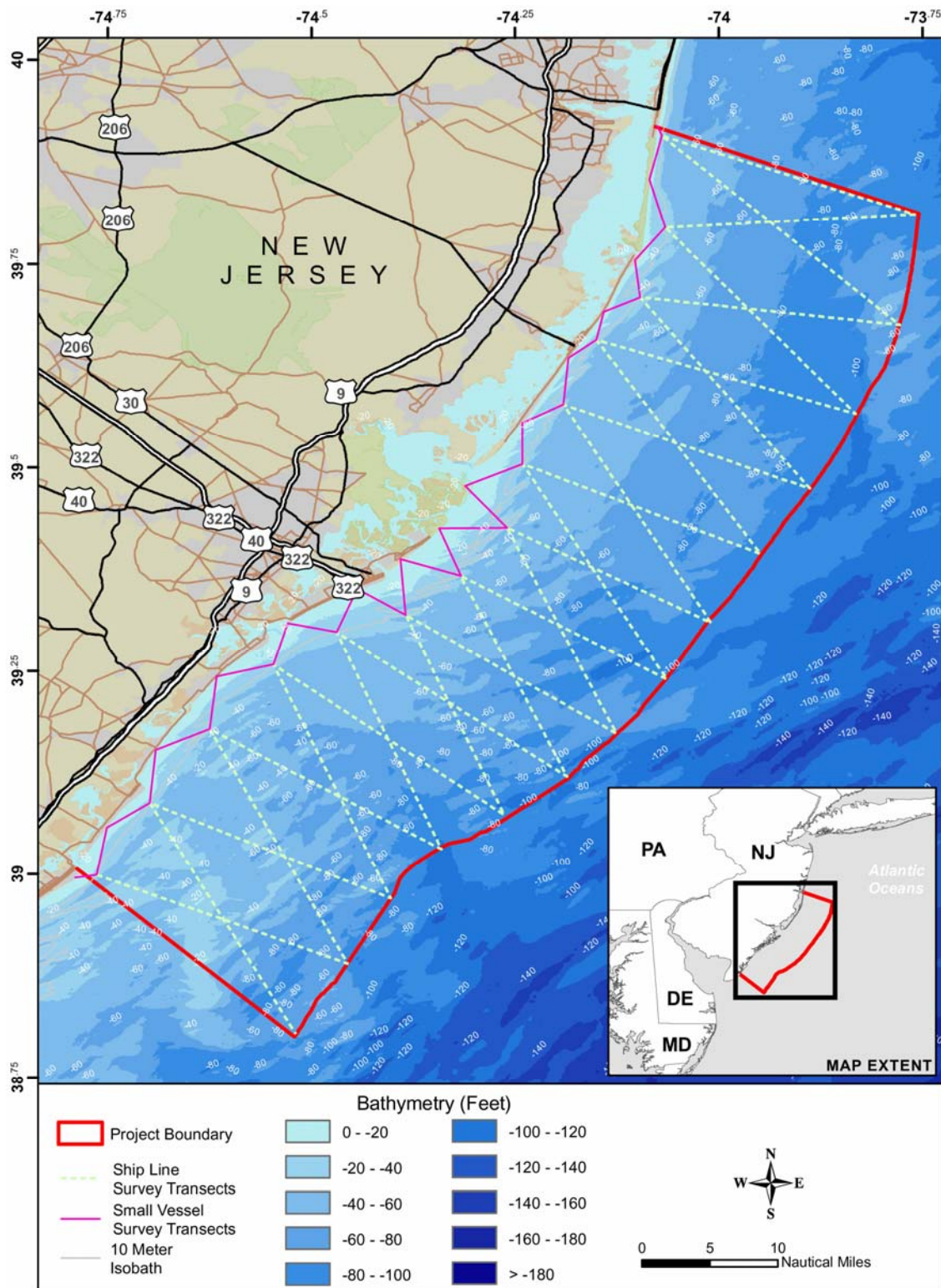


Figure 1. Map showing survey design for the ship offshore and small boat coastal surveys with representative tracklines

Any necessary corrections will be made to the data file by the SSB, as follows:

- All data files will be renamed (QAQC added to the file name) after the file has been checked.
- Upon completion of the QAQC check, raw data files will be placed in the “raw” folder and QAQC files will be placed in the “QAQC” folder.
- All files will then be transferred to an external hard drive for storage (see below for additional instructions).

Observer Efficiency

At least once monthly avian observer efficiency will be determined for each observer. The avian biologist assigned as the senior seabird biologist will randomly select one of the “on duty” staff seabird biologists to conduct a 40 minute observer efficiency survey. This biologist will stand behind or near the selected on duty observer and simultaneously and independently record survey data in the staff seabird biologists assigned survey area for a 40 minute period.

After the QAQC check is completed, the SSB will:

- create an observer efficiency folder
- place a copy of the QAQC staff seabird biologist file in the folder
- place a copy of the SSB observer efficiency file in the folder
- delete the SSB observer efficiency file from the QAQC and raw folders

The two data sets will be compared. Parameters to be compared include species identification, number observed, and range to the bird.

Standard Operating Procedures, Data Recording, Instrument Calibration

Avian

Hard copies of maps illustrating the numbered transect locations and coordinates of way points (transect start and projected endpoints) will be produced and given to the boat captain prior to the initial survey. The avian team will consist of three (3) biologists, one on the bow and one on the port or starboard side of the ship (i.e., dependant on glare), and one biologist off-effort. The primary survey area will be a 300 by 300-m strip on either side of the ship track line. The secondary survey area will be all visible areas outside of the primary survey area. Detailed standard operating procedures and information on data recording and instrument calibration are presented in **Appendix 1**.

SMALL VESSEL COASTAL SURVEYS

Small boat surveys will be conducted to capture nearshore coastal bird activity. These surveys will capture nearshore activity that may be missed by the ship due to depth limitations. The small boat coastal surveys will provide additional statistical power to the avian predictive model.

Sample Design

A strip transect method will be used to conduct the small vessel coastal surveys (Gould and Forsell 1989); the survey method will be identical to the method used for the avian shipboard surveys (see Section 5.1.1) except that a “single saw-tooth” sample design will be implemented to adequately survey the entire area. Nearshore ship waypoints will be plotted after the ship survey is completed. Coastal tracklines will be generated to complete the trackline to the shore. The boat captain will be requested to approach the shoreline as close as safety allows (dependant on tide and weather conditions). Transects length will vary between month and will be entirely dependant on the tide and water depth during both the shipboard and small vessel survey days.

The starting location for each survey will be randomly determined among two starting points (north end and south end). If daylight, weather, and sea state conditions allow, the entire coastal area will be

surveyed in one day. This approach will allow a truly random sampling (with respect to starting location) of shoreline and the shoal areas for seabird roosting/resting and feeding areas, while maximizing available ship sampling time (i.e., minimizing ship down time or relocation time).

Quality Assurance/Control

Quality assurance/control would be identical to that described previously for the shipboard surveys.

Standard Operating Procedures, Data Recording, Instrument Calibration

Surveys will be conducted monthly after the shipboard surveys have been completed. Standard operating procedures, data recording, and instrument calibration are identical to those described for shipboard avian surveys.

APPENDIX 1

AVIAN

APPENDIX 1A

AVIAN SHIP SURVEY STANDARD OPERATING PROCEDURES

AVIAN SHIP AND SMALL BOAT SURVEY STANDARD OPERATING PROCEDURES

I. Personnel

The ultimate responsibility for the avian ship surveys rests with the senior seabird biologist. The senior seabird biologist reports to and coordinates the avian survey effort with the Chief Science Officer (CSF). In confusing or unique field situations, the senior seabird biologist will consult with the CSF before making a decision.

I.A. Identification Specialists (one)

The senior seabird biologist is an experienced observer who has conducted avian at sea and coastal ship and small boat-based surveys. He has the ability to identify avian species known to occur in the project area, conduct observer efficiency quality assurance protocols, and to complete data quality control procedures. The experience of the senior seabird biologist will maintain the consistency of the data collected during each survey.

The senior seabird biologist is the avian team leader and works with the other team members to discuss problems and make decisions. If team members are included in the decision-making process, the avian team will work better together. The senior seabird biologist will be a part of the observation team.

I.B. Observers (three)

Avian seabird biologists (observers) are responsible for collecting the avian survey data. The observers use Fujinon 14 X 40 image stabilizing binoculars to identify the birds observed in the survey area. The avian observers are proficient in sighting and identifying birds and recording accurate data on hand-held data recorders. Observers will work together as a team to sight and identify birds in the survey area. For example, if one observer is recording data, the other will survey the area not being surveyed by the recording biologist.

II. Watch Rotations

The primary duties of the three avian observers are conducted during a rotation through two positions. During a given watch, the observers rotate through the positions. Observer on duty watch shifts will normally be 80 minutes (min) followed by a 15 min break. During the lunch hour rotations will be limited to 20 minutes to allow all observers to eat.

Upon completing a watch rotation, the observer will review set (environmental) conditions on the avian computer and make all necessary changes. The observer will return after the break and remain at the computer station to monitor and to change the environmental conditions when necessary.

The on-effort biologists and the off-effort observer will carry a radio. The on-effort observers will contact the off observer via a radio if the set conditions need to be changed or additional help is needed to record a large group of birds. When large numbers of birds are encountered, the senior seabird biologist may decide to bring the "off" observer out to assist with identification and/or data recording. During severe glare, high sea, or severe cold conditions the team may select watch periods of shorter duration. The observer will arrive at the position 3-5 minutes before beginning a watch.

III. Duties

III.A. Pre-Survey

Prior to initiating the monthly survey effort all observers will review the standard operating procedures for the avian survey. Steiner binoculars equipped with a compass will be used to mark bearings (in 10 degree increments) for each observer position. Range estimation sticks will initially be prepared for observers < 5 ft. 10 inches tall and for individuals taller than 5 ft. 10 inches by using at dock distance

estimates from the observer positions on the ship. Distances will be marked on the range sticks distances from the docked ship (i.e., a laser range finder will be used to determine distances). The range finder stick(s) will be mounted on boards at the observer positions.

The Chief Science Officer will determine if sea state conditions are acceptable (≤ 6 on the Beaufort scale) to begin the survey. If sea state conditions are acceptable, the starting transect number will be selected with a random number generator by the Chief Science Officer. The pre-survey section of the avian boat survey checklist (**Appendix 2**) will be completed by the senior seabird biologist prior to leaving port and before the beginning of each survey. A weather form will be completed prior to initiating the survey, and each observer should synchronize his/her watch with that on the computer.

III.B. Survey

A weather form will be completed at mid-day, and at the end of the survey. Changes in weather will be documented on the weather data form(s) (**Appendix 2**). The senior seabird biologist will select the side of the ship with the least glare and position themselves at the two survey positions (bow [observer 1] and port/starboard [observer 2]). Both avian observers will scan the survey area for birds with “naked eyes”. The “bow” avian observer will scan the 0-45 degree zone within 300-m of his/her position ahead of the ship while the “port/starboard” biologist will scan the remaining area 46-90 degrees. In addition to this primary survey area, observers will scan beyond this area for “important” birds. Important birds include flocks on the water and rare species.

Surveys will be conducted daily as soon as visibility allows to sunset. Observers will assist each other during the surveys. Priority will be given to birds within the primary (300 X 300 m) survey area. An observer may ask another observer to record observation data if the other observer is not busy. Observers will be aware of the activity of the other observer. If the second observer is not recording data while the first observer is recording, the second observer will scan the entire survey area and record any birds observed.

If the boat goes off-transect to investigate a marine mammal sighting, avian data collection will continue. However, the avian computers will go off-effort until the ship is back on-effort (on transect). A new transect number will be assigned and the avian survey effort will continue every time the ship changes direction.

When the ship reaches the end of a transect, observers will continue recording until a new transect is started. Observers will then go off-effort and return immediately to on-effort. When the ship is at the near shore leg; observers will focus their survey effort towards shore (i.e., one observer may have to go off-effort then on-effort to switch survey positions).

Observers will identify the birds spotted with image-stabilizing binoculars. Data will be recorded on a hand-held computer for each bird observation. Data recorded will include,

- identity (lowest practical taxon; family, genus, species [four letter standard code]),
- number of individuals (approximate number for flocks),
- bearing and range (distance) to the bird(s), estimated flight altitude
- behavior (flying, foraging, etc).
- cardinal directions will be used to designate flight directions (cardinal direction will be based on the ship transect line (bow of the ship is North)).
- Observer conditions (perfect to poor)

In addition, observers will incidentally record, if time is available, the following data in the comments section:

- dive altitude (feet) of northern gannets DALT ?
- submersion time of northern gannets after a dive (i.e., in front of the ship, sea state conditions permitting). SUBT=?
- the life state of the bird (A = adult; I = Immature; J = juvenile; U = unknown)

The following protocol is to be followed if an avian observer observes a marine mammal:

- all mammal observations in front of the avian observer (near the bow or along the side of the ship) must be reported to the marine mammal survey team via the radio.
- All mammal observations at a distance in front of the ship can not be reported until the observation is BEHIND the flying bridge.

III.C. Post Daily Survey

Each night of the cruise, the senior seabird biologist will QC the data. The data will be downloaded to a laptop computer and reviewed by the senior seabird biologist (SSB) after each survey to determine if reporting errors were made. If errors are present, the observer(s) (staff seabird biologists) will meet with the SSB to resolve the error(s) the evening following the completion of each daily survey.

Any necessary corrections will be made to the data file by the SSB, as follows:

- All data files will be renamed (QAQC added to the file name) after the file has been checked.
- Upon completion of the QAQC check all files, raw data files will be placed in the “raw” folder and QAQC files will be placed in the “QAQC” folder.
- All files will then be transferred to an external hard drive for storage (see below for additional instructions).

Observer Efficiency

At least once monthly avian observer efficiency will be determined for each observer. The avian biologist assigned as the senior seabird biologist will randomly select one of the “on duty” staff seabird biologists to conduct a 40 minute observer efficiency survey. This biologist will stand behind the selected on duty observer and simultaneously and independently record survey data in the staff seabird biologists assigned area for a 40 minute period.

After the QAQC check is completed, the SSB will:

- create an observer efficiency folder
- place a copy of the QAQC staff seabird biologist file in the folder
- place a copy of the SSB observer efficiency file in the folder
- delete the SSB observer efficiency file from the QAQC and raw folders

The two data sets will be compared. Parameters to be compared include species identification, number observed, and range to the bird.

III.D. Post Cruise

Survey data is downloaded from the laptop computer onto the field office desktop computer and then to the master project directory on the GMI Plano Corporate Office server. The post cruise section of the avian boat survey checklist (**Appendix D-1a**) will be completed by the CSB when the cruise has been completed.

IV. Data Recording

IV.A. Computer Program

A hand-held computer program was developed by GMI to record avian ship survey data. The program simultaneously records the location of ship (transect line) through a connection to the ship's GPS. When prompted the time and transect location of a bird sighting is recorded.

The data file is divided into two sections. The first section contains general data and lists all of the codes used in the data section. General data categories include: Survey Type, Vehicle, Time Zone Delta, Location Interval, and Altitude. These categories are defined below:

Survey Type

"Bird" or "Mammal"

Vehicle

e.g. "Boat", "Plane", etc.

Time Zone Delta

Value, in hours, added to Zulu time to give local time (May be a decimal).

Location Interval

Time in seconds between writing out location records

Altitude

In feet above sea level

Observers may be at a different altitude.

The second section contains the survey data. Each record in the data section is stored as a single line with identical format. Observers, species, behaviors, weather conditions, sea states, water turbidity, water color, glare, and sunlight are all given codes.

Each entry in the data section has the following fields, separated by commas

Card

Year-Month-Day

Hour; Minute: Second

GPS State

Latitude

Longitude

Heading

Speed

Species1

Count1

Behavior1

Range1

Bearing1

Elevation1

Latitude1

Longitude1

Species2

Count2

Behavior2

Range2

Bearing2

Elevation2

Latitude2

Longitude2

Species3

Count3

Behavior3

Range3

Bearing3

Elevation3

Latitude3
Longitude3
Observer
Weather
Sea State
Turbidity
Water Color
Water Temperature
Sun Strength
Glare

The interpretation of the fields:

Card:

A0 Beginning of survey
A9 End of survey
B0 Beginning of transect
B9 End of transect
C0 Going on-effort
C9 Going off-effort
D0 On-effort sighting
D1 Off-effort sighting
E0 On-effort location only
E1 Off-effort location only
F0 Change of sighting conditions

Year-Month-Day:

in Zulu time
year is four digits

Hour:Minute:Second

in Zulu time 24 hour clock

GPS State

1 – acceptable for avian surveys
2 – not acceptable for avian surveys

Latitude / Longitude

of the ship in decimal degrees, to the 0.00001 (approx. one meter at the equator)

Heading

of the ship 0 to 359°

Speed

ground speed in knots of the ship

SpeciesN

code of the species sighted. Up to three species may be designated for a given sighting.

CountN

number of individuals

BehaviorN

code for the sighting's behavior

RangeN

In meters from the observer

BearingN

from the observer to the sighting (e.g. right side observers would have a value of 0 to 180°).

ElevationN

vertical angle from the observer to the sighting (in a plane this would almost always be negative

LatitudeN / LongitudeN

computed position of the sighting based on vehicle position and range / bearing / elevation

Observer

code of the observer

Weather

weather code, given in first section

Sea State
sea state code, given in first section

Turbidity
turbidity code, given in first section

Water Color
code for water color, given in the first section

Water Temperature
temperature of water, degrees Celsius. -9999 means unknown.

Sun Strength
Strength of sunlight code, given in first section

Glare
code for glare, given in the first section

V. Instrument Calibration

None

V. SHIPBOARD FACILITIES AND CONSIDERATIONS

We are fortunate to be aboard the R/V Hugh R. Sharp. Please follow link below to familiarize yourself with the vessel.

<http://www.ocean.udel.edu/marine/rvhugh/index.shtml>

At initial boarding of the research vessel, you will receive a briefing on the specific protocols/procedures of the vessels and there will be a safety overview which will review the protocols for fire and abandon-ship procedures.

The ship will provide all linens and pillows and depending on the time of year it may be prudent to bring additional blankets and/or cold weather gear. This survey will be conducted year-round in acceptable sea states.

V.A. CHAIN OF COMMAND

Members of the scientific party, including marine mammal observers, report directly to the Chief Scientist (or cruise leader). The Chief Scientist represents the scientific party responsible for communicating with the vessel's staff, and has sole authority to act on behalf of the NJDEP and GMI Program Manager. Any and all sensitive or operational communications from the scientific party to the ship's staff needs to pass through the Chief Scientist. The Chief Scientist is responsible for any change in operating procedures or handle any out of the ordinary matter. If you have a problem, please see the cruise leader. Please do not at any time try to resolve the situation yourself by approaching the ship's personnel directly.

V.B. RELATIONS WITH SHIP PERSONNEL

While living and working aboard the research vessel, all scientific personnel should keep in mind that the officers and crew spend a greater portion of the year on the vessel than they do on shore. Therefore, procedures and expectations of the ship personnel have become established through many projects throughout the years, not just the current survey. Please respect their experience when dealing with the ship personnel. In addition, always ask before using any ship equipment.

The daily, work-related interaction with the officers and crew that observers will have most frequently will be radio communications between the flying bridge and bridge during chase or other survey activities. A good working relationship with the bridge team can be established by maintaining a professional demeanor and framing clear and concise requests.

V.C STATEROOMS

Space is limited at sea. Bring only the necessary gear, as there will be little (or no) storage space outside your stateroom.

Noise levels should be maintained with respect for off-watch personnel. Scientific staterooms adjoin the crew's quarters and since ship personnel work throughout the night, some people will be sleeping at all times during some part of the day.

Walls in the staterooms are painted plasterboard. Nails and tack holes are unacceptable as they damage the walls. However, you are able to use Handi-tak, which is a product that can be used to mount pictures or wall decoration without harming the surface. Bedding is furnished, although some people bring their own to make their space more personal. The ship also provides bathroom towels and soap. However, the ship's towels are not allowed on deck, so bring along your own beach towel if you'll be "sun tanning" on the "steel beach."

In most cases rooms will be shared with others, so be respectful and keep your area neat and tidy.

V.D. MEALS

Three meals are served aboard ship every day at scheduled times.

Observers should be punctual to meals. The ship's cook should be contacted if for any reason you will miss or be late for a meal. Except when oceanographic stations are conducted at noon, marine mammal watch does not stop during mealtime. Customarily, off-effort observers eat promptly and then replace on-effort observers for about 20 min so that the on-effort team can get their meals too. Besides regular meals, the ship has juice and milk dispensers, fresh fruit (when available), and snacks. These are accessible at all times. An attempt is made to accommodate vegetarian diets during most meals, but the non-meat selection will at times be limited. The standard vegetarian fare may contain eggs or cheese.

V.E. LAUNDRY

The ship has washer and dryer facilities with detergent. They are operated on a come first-serve basis. Please make sure that your clothes are removed promptly from the washer or dryer so the next person can use the machine.

V.F. EXERCISE ROOM

The vessel may have areas set aside for work-outs and weight training. When using those facilities, please take care of the equipment and do not abuse your privileges by spending too much time in those limited areas so that others are denied use. Additionally, make sure to wipe down any equipment you use.

V.G. FOOTWEAR

Closed-toe shoes are mandatory while traveling throughout the ship. Thongs or other open-toe sandals are permitted only while on the flying bridge (wear closed-toe shoes to and from this location) or in the living quarters.

V.H. DRUGS, ALCOHOL, AND SMOKING

1. *Drugs and Alcohol*

There is a zero tolerance policy on the possession of drugs and alcohol on this survey cruise.

2. *Smoking*

Smoking is prohibited in all interior spaces on the ship. Smoking is only allowed on the weather decks and only in designated areas.

V.I. COMMUNICATIONS

1. *Phone Calls and Radio Patches*

The ship is equipped with INMARSAT, a satellite phone system. Calls cost about \$10.00 per minute and there is a 3 min minimum. It is expensive but nice to have in an emergency. Sometimes radio phone patches are an option. Cell phones should be available when near shore.

2. *Email*

The ship will have services available for use by scientific personnel to send and receive messages. The project will pay for satellite time for reasonable usage. Please do not send large files, graphics, or attachments and inform your correspondents not to send them to you.

3. *Emergency Contact*

In the event of an emergency on land; please provide a family member or friend the following list of contacts and their contact information.

Chief Scientist – Dr. Greg Fulling
214-578-1377
gfulling@geo-marine.com

Geo-Marine, Inc. – Main Office
Dr. Dan Wilkinson
972-423-5480

Hugh R. Sharp - Main Office:
Sharyn Bressler
Staff Assistant
Phone: 302.645.4320
Email: sharyn@udel.edu

Cruise Planning, Scheduling, and Budgets:
[Matthew Hawkins](#)
Director of Marine Ops
Office Phone: 302.645.4341
Cell Phone: 410.924.2472
Email: hawkins@udel.edu

Cruise Planning and Logistics:
Captain Bill Byam
Master
Office Phone: 302.645.4343
Cell Phone: 302.381.0346
Email: byam@udel.edu

Cruise Planning and Technical Support:
Timothy Deering
Oceanographic Coordinator
Office Phone: 302.645.4338
Cell Phone: 302.249.6149
Email: deering@udel.edu

V.J. INTER-PERSONAL RELATIONS

1. *Social Considerations*

People working and living together on a ship creates an unusual environment. There is minimal privacy and space for individuals spending an extended amount of time together in an isolated setting. Thus, in this environment, otherwise minor incidents can sometimes escalate unnecessarily. Be aware that your personal feelings may intensify at sea and try to keep things in perspective.

2. *Problems*

Sometimes challenging and difficult situations arise while out to sea. If you have difficulty working with someone, feel threatened, or discriminated against, please alert the cruise leader of your situation. Any situation will be kept confidential; your comments will only be used to resolve the issue. Please inform the cruise leaders as soon as an issue arises so that they can help resolve the issue and prevent an

exacerbation of the problem. It is of utmost importance to the Chief Scientist and the CO's that scientists are comfortable and happy working while living aboard the ship.

3. Contact Information

University of Delaware, Marine Operations – Contact Numbers

Revised: 01/15/07

| | |
|-----------------|--------------|
| Main Office | 302-645-4320 |
| Main Office Fax | 302-645-4006 |

R/V HUGH R. SHARP:

| | | Comments |
|----------------|-------------------------|---|
| Alongside | 302-645-4340 | |
| Ship Cellular | 302-448-5061 | Within 30 nm of shore |
| | | |
| INMARSAT Voice | 011-874-764-471-442 | Dialed as international call. |
| | Or dial: 1-800-551-7534 | at prompt dial 485-837-5907 then 0-764-471-442 |
| INMARSAT Fax | 011-874-600-714-099 | Used for all Faxes. Dialed as international call. |
| | Or dial: 1-800-551-7534 | at prompt dial 485-837-5907 then 0-600-714-099 |
| | | |

KEY PERSONNEL:

| Name | Position | Office | E-mail | Cellular | Home |
|-----------------|---|--------------|--|--------------|------------------------------|
| Sharyn Bressler | Staff Assistant | 302-645-4320 | sharyn@udel.edu | - | 302-945-0106 |
| Matthew Hawkins | Director, Marine Ops | 302-645-4341 | hawkins@udel.edu | 410-924-2472 | 302-424-1852 |
| Bill Byam | Master | 302-645-4343 | byam@udel.edu | 302-381-0346 | 302-645-7837 843-842-4410 |
| Jim Warrington | Chief Mate | 302-645-4343 | idw@udel.edu | 302-373-9954 | 302-934-8193 |
| Tim North | Chief Engineer | 302-645-4343 | tnorth@udel.edu | 410-463-0205 | 410-476-4485 |
| Tim Deering | Coordinator, Oceanographic Services | 302-249-6149 | deering@udel.edu | 302-249-6149 | - |
| Brian Kidd | Oceanographic Tech. | 302-645-4336 | kidd@udel.edu | 302-249-1695 | - |
| Wynn Tucker | Oceanographic Specialist | 302-645-4324 | tucker@udel.edu | 910-547-5159 | - |

Policies on Harassment and Drug and Alcohol Use

The following is general policy information for all ships leased by GMI. Additional information about a specific ship can be found on that ship's home page.

- * Possession or Use of Alcohol or Illegal Drugs
- * Sexual Harassment
- * Smoking Restrictions
- * Underway Shipboard Emergencies
 - Fire
 - Abandon Ship
 - Man Overboard
- * Drills at Sea
- * Seasickness Working On Deck
- * Firearms and Other Weapons

Please Note: As a U.S. Government commissioned vessel, all persons boarding give an implied consent to conform with all safety and security policies and regulations which are administered by the CO. All spaces and equipment on the vessel are subject to inspection or search at any time. Additionally, the following is prohibited aboard any U.S. Government vessels: possession and/or use of intoxicating alcoholic beverages, illegal drugs, controlled drugs without a prescription, sexual harassment, or use of shipboard spaces for purpose of sexual liaison. Violators may be removed from the vessel at the earliest opportunity.

Possession or Use of Alcohol or Illegal Drugs

Possession or use of alcohol, illegal drugs, or prescription medications without a prescription, on board any GMI vessel, by any member of the embarked complement is strictly forbidden and will not be tolerated. When violations of this policy are discovered, the following procedures will be adhered to:

- * The alcohol will be confiscated and immediately disposed of in the presence of a witness.
- * Drugs will be confiscated and placed in a secured location until the vessel reaches home port or another port of call, at which time the offense will be reported, and the drugs turned over to the appropriate authorities for action.
- * Disciplinary or corrective action will be taken in accordance with the applicable Table of Offenses and Penalties.
- * Department of Commerce employees will be given information regarding the availability of the Department of Commerce Employees Assistance Program.

Sexual Harassment

Sexual harassment will not be tolerated aboard GMI vessels. This applies to all persons, male and female, including members of the operating crew and any embarked scientific personnel or other personnel. Sexual harassment is sex (gender) discrimination that involves unwelcome sexual conduct, which can include both verbal and physical behavior. Some examples of such behavior are: pressure for dates or sex; sexually suggestive looks, comments or gestures; sexual jokes; displaying material of a sexual nature; and deliberate touching. Conduct is unwelcome if it is unsolicited and an individual finds it undesirable and/or offensive. All instances of sexual harassment should be immediately reported to your CO, the Chief Scientist, and project manager.

Smoking Restrictions

Smoking in Federal workplaces is prohibited by regulations applicable government-wide. Aboard GMI ships, personnel who smoke may do so only on the weather decks in designated areas. There is no smoking permitted on the interior of any GMI ship. Smokers are expected to observe particular care in

disposing of cigarettes or smoking materials. Use ashtrays or butt kits located around the ship for this purpose.

Smoking is prohibited when:

- * on any part of the weather decks when the vessel is fueling or taking on flammable cargo.
- * in the vicinity of any gasoline engine undergoing repair
- * in the vicinity of any compressed gas cylinder carrying a flammable gas sticker, which may be stored on deck for the use of the embarked science party
- * during certain types of scientific missions or in the immediate vicinity of sensitive science mission equipment

Underway Shipboard Emergencies

Fire

Fire at sea, no matter how small, can become a life-threatening situation. At sea, everyone aboard ship, be they crew, scientist, or passenger, is a member of the fire department. When the General Alarm sounds, everyone has a specific emergency billet assignment and each person is relied upon by all others aboard to carry out that assignment. Be aware of your emergency responsibilities so that carrying them out becomes second nature. Firefighting at sea is a team effort.

Emergency billet assignments are posted on the Watch, Quarter, and Station Bill. These are posted at convenient places throughout the ship. Additionally, each person is provided with a "bunk card" which lists his/her individual emergency billet assignments.

The signal for fire or emergency is a 10 second continuous ringing of the General Alarm bell and a 10 second continuous sounding of the ship's whistle. This alarm will be followed by an appropriate announcement on the general announcing system. When you hear the signal, immediately proceed to your fire and emergency billet station. Firefighting and emergency equipment is distributed throughout the ship. All hands should familiarize themselves with the locations of this equipment, as well as the Damage Control Lockers and their contents.

Abandon Ship

Abandoning ship in the open sea is an action of last resort. All reasonable efforts required of mariners for the saving of their ship must clearly have failed before any decision to abandon the vessel will be taken. Only when there is no reasonable chance of saving the ship will the order ever be given to abandon it. The decision to abandon ship is made only by the CO, or in the CO's incapacity, the senior member of the chain of command.

The signal to abandon ship is seven (7) or more short blasts on the ship's whistle and General Alarm, followed by one (1) long blast.

When the order is given to abandon ship, all hands will proceed to their assigned life raft muster stations. Each shall bring his/her protective survival clothing, survival suit, personal floatation device life jacket), and other equipment assigned in abandon ship billet. Once the order to abandon ship has been given, the life raft Officers in Charge (OIC) will muster their respective parties and dispatch the assigned crew members to the life raft locations to launch their respective life rafts. Once launched, the remaining personnel will have to act in concert to haul the deployed rafts alongside the main deck embarkation stations. Orderly seamanlike actions at the embarkation stations will assure the rapid and efficient abandoning of the ship.

Man Overboard

Except for uncontrollable fire at sea, there is perhaps no more personally terrifying situation for a member of the ship's complement than being lost overboard. There are two basic man overboard scenarios: witnessed and unwitnessed.

Witnessed Man Overboard -Actions of the Witness

Upon observing a person going overboard, the witness shall take the following actions:

1. Call out for assistance and throw a life ring buoy into the water, preferably one equipped with a strobe light. Pass the word to the Bridge by any means possible.
2. Wait about one minute and throw a second life ring buoy (at night –one equipped with a strobe light) into the water. This will create a visual range for the OOD and the lookouts, aiding the search effort.
3. Keep the victim under surveillance if at all possible, but do not delay passing the word to the Bridge.

Unwitnessed Man Overboard

Underway, until proven otherwise, when a crew member is unaccounted, it will be presumed that the individual has been lost overboard. This situation then becomes a search and rescue problem of a far more complicated nature. The time of the casualty will be unknown, or at best, only grossly estimated. The ship's navigation record, as contained on the Marine Operations Abstract or Dead Reckoning Abstract, will be crucial for search planning, as will the hourly weather observations entered into the Weather Log. Initial actions will be to notify the Marine Operations Center Director of the situation and to notify the nearest Rescue Coordination Center for assistance. Search operations will be conducted with the advice and guidance of SAR professionals.

Drills at Sea

Emergency drills at sea will be held in accordance with the requirements of NC Instruction 5100.1B. Reporting for drills, in accordance with the billets assigned in the Watch, Quarter, and Station Bill, is mandatory for all hands, including the embarked science party, unless the absence is specifically authorized by the CO, XO, or Safety Officer.

For Abandon Ship drills, unless otherwise advised, all hands are required to wear life jackets and carry their survival suits when reporting to their life raft muster stations. All personnel shall be attired in, or bring to the muster, clothing that fully covers legs and arms, a hat, socks and shoes. Signals to call all hands to emergency stations shall be identical to those that are used for actual emergencies. When a drill is held, the OOD will always state "This is a drill. This is a drill." followed by an appropriate announcement on the general announcing system.

The signals are as follows:

| | |
|----------------------|---|
| Fire and Emergency | Continuous ringing of the General Alarm bell for 10 seconds and continuous sounding of the ship's whistle for 10 seconds [Image] |
| Abandon Ship | 7 or more short blasts on the ship's whistle and General Alarm bell, followed by one prolonged blast [Image] |
| Man Overboard | 3 prolonged blasts on the ship's whistle and General Alarm bell [Image] |
| Dismissal from Drill | 3 short blasts on the ship's whistle and General Alarm bell [Image] |

Working on deck

The following safety regulations will be observed when working on deck:

- * Life vests or floats coats will be properly worn when handling equipment over the side, deploying equipment over the side, and on all launches (whether alongside the ship, launching, or recovering).
- * Safety belts and lines will be worn by those handling equipment over the side.
- * Hardhats will be worn by all those involved in recovery or deployment of equipment and boats.
- * Proper footwear should be worn at all times (Open toe shoes are NOT proper work footwear).
- * Ship's equipment is to be operated only by qualified members of the ship's complement.

Seasickness

Information on sea sickness and treatments available will be provided by the Medical Officer. Those requiring preventative treatment should see the Medical Officer prior to sailing.

One of the least pleasant aspects of sea duty is the possibility of seasickness. An individual's susceptibility to seasickness is highly variable. If you've experienced motion sickness in cars, planes, or amusement park rides, you may experience seasickness during the cruise. Regardless, most people feel some level of illness or discomfort when they first go to sea. Seasickness is a result of an imbalance in the inner ear (where the human balance mechanism resides) caused by the erratic motion of the ship through the water. Inside the cabin of a rocking boat, for example, the inner ear detects changes in linear and angular acceleration as the body moves with the boat. But since the cabin moves with the passenger, the eyes register a relatively stable scene. Agitated by this perceptual incongruity, the brain responds with a cascade of stress-related hormones that can ultimately lead to nausea and vomiting. Its effect can be magnified by strong smells (like diesel fumes or fish). It usually occurs in the first 12-24 hrs after sailing, and typically dissipates when the body becomes acclimated to the ship's motion (getting one's "sea-legs"). Rarely does anyone stay ill beyond the first couple of days at sea, regardless of sea state, but this can occur. There are several over-the-counter medications available to prevent or minimize motion sickness. These need to be taken about an hour before sailing and as needed at sea; as always, you should follow the instructions for the medication you are taking. All of these medications tend to dehydrate the body, so fluid intake is important. If you should get seasick, take comfort in the fact that recovery is usually only a matter of time, and the survival rate is 100%. Each ship has a trained medical officer who can treat severe cases of sea-sickness. However, all that is usually required for a complete recovery is some sensible eating/drinking and some patience. Here are a few tips and considerations regarding seasickness:

- * Vomiting offers relief. Make an effort to continue eating items like crackers, dry toast, dry cereal, etc. (avoid anything greasy, sweet, or hard to digest). Keeping something in your stomach suppresses nausea, or, if vomiting, eliminates painful "dry heaves". Antacid tablets help some people.
- * Maintain fluids. Seasickness and related medications cause dehydration and headaches. Try to drink juices low in acidity, clear soups, or water, and stay away from milk or coffee.
- * Keep working. Most people find that being busy on deck keeps their minds off their temporary discomfort. Also, the fresh air out on deck is often enough to speed up recovery.
- * Carry a plastic bag. This simple trick allows some peace of mind and eliminates some of the panic of getting sick. Do not vomit in sinks or trash cans. If you vomit "over the side", be aware of which way the wind and waves are coming. Going to the "lee" will ensure that an unpleasant experience doesn't become any more unpleasant.

Above all, don't be embarrassed or discouraged! If you get sick, chances are that others are sick too! No one --fishermen, ship's officers, scientists --is immune to seasickness.

Firearms and Other Weapons

Personally owned firearms are not permitted aboard the ship without the advance written approval of the CO. Any firearm permitted aboard the ship must be accompanied by any applicable permits. All firearms

and their ammunition will be locked in the ship's weapon's locker until they are removed from the vessel. Firecrackers, fireworks and similar pyrotechnics will not be permitted aboard the ship. Sheath knives are not permitted aboard the ship with the exception of fishing fillet knives which are permitted. Folding knives are permitted to be carried aboard ship and their use is encouraged.

APPENDIX 1b

SHIP SURVEY QUALITY ASSURANCE/CONTROL PROTOCOL AND CHECKLIST

Ship/Small Boat Survey Quality Assurance Protocol

Protocols for conducting safety, equipment, and data checks will be followed before, during, and after every survey cruise to ensure personnel safety, equipment readiness, and collection of quality data.

Prior to beginning a survey, the chief scientist will determine sea state conditions in the project area by checking online data from NOAA buoys in the area. The chief scientist will then discuss these results with the ship's captain/airplane pilot, at which point the captain will determine if current and forecasted weather conditions are acceptable to begin the survey.

The senior marine mammal and seabird biologists will be responsible for completing pre- and post-survey inspections using the checklist on the following page. These inspections will ensure all necessary survey equipment is available and functional prior to surveys and that all datasheets used during the survey are complete, legible, and accurate. If errors are found on the datasheets, the biologists that logged the data will be consulted to resolve the issue. Once the datasheets are inspected, the data will be entered into an electronic spreadsheet. The spreadsheet will be checked for errors and corrected immediately. Data will be saved with a QAQC notation in the file name (e.g. Avian Ship Survey 01-15-01 QAQC) and in redundant copies (hard drive and external disc). All external media storage devices will be appropriately labeled with the survey dates, type of data, and author.

After returning to shore, the senior marine mammal and/or seabird biologist will download the QAQC data to the corporate office project's drive. Once the download is complete, the project manager or principle investigator will be contacted to verify the data is present and readable.

AVIAN SHIP SURVEY CHECKLIST

DATE: _____

| REQUIREMENT | Yes | No | Signature/Title | Date | Time |
|---|--------------------------|--------------------------|-----------------|------|------|
| PRE-SURVEY | <input type="checkbox"/> | <input type="checkbox"/> | | | |
| Ship Ready Status | <input type="checkbox"/> | <input type="checkbox"/> | | | |
| Sea State Condition | <input type="checkbox"/> | <input type="checkbox"/> | | | |
| Meets Survey Protocol | <input type="checkbox"/> | <input type="checkbox"/> | | | |
| Ship Safety | <input type="checkbox"/> | <input type="checkbox"/> | | | |
| Crew boat safety review | <input type="checkbox"/> | <input type="checkbox"/> | | | |
| Survey Equipment | <input type="checkbox"/> | <input type="checkbox"/> | | | |
| Hand-held data recorders (3) | <input type="checkbox"/> | <input type="checkbox"/> | | | |
| Survey Line Map/Coordinates | <input type="checkbox"/> | <input type="checkbox"/> | | | |
| Laptop Computer (primary) | <input type="checkbox"/> | <input type="checkbox"/> | | | |
| Spare Laptop computer | <input type="checkbox"/> | <input type="checkbox"/> | | | |
| Spare Hand-held data recorder | <input type="checkbox"/> | <input type="checkbox"/> | | | |
| Binoculars (2 primary-1 spare) | <input type="checkbox"/> | <input type="checkbox"/> | | | |
| Field Guides | <input type="checkbox"/> | <input type="checkbox"/> | | | |
| Extra binocular batteries | <input type="checkbox"/> | <input type="checkbox"/> | | | |
| Battery charger | <input type="checkbox"/> | <input type="checkbox"/> | | | |
| Pre-Survey Operation Checks | <input type="checkbox"/> | <input type="checkbox"/> | | | |
| Ship GIS | <input type="checkbox"/> | <input type="checkbox"/> | | | |
| Laptop Computer (Primary) | <input type="checkbox"/> | <input type="checkbox"/> | | | |
| Laptop Computer (Spare) | <input type="checkbox"/> | <input type="checkbox"/> | | | |
| Hand-held data recorders | <input type="checkbox"/> | <input type="checkbox"/> | | | |
| SURVEY | <input type="checkbox"/> | <input type="checkbox"/> | | | |
| Data Requirements | <input type="checkbox"/> | <input type="checkbox"/> | | | |
| Weather Data | <input type="checkbox"/> | <input type="checkbox"/> | | | |
| Weather Form (AM) | <input type="checkbox"/> | <input type="checkbox"/> | | | |
| Weather Form (Noon) | <input type="checkbox"/> | <input type="checkbox"/> | | | |
| Weather Form (PM) | <input type="checkbox"/> | <input type="checkbox"/> | | | |
| Survey Data Downloaded | <input type="checkbox"/> | <input type="checkbox"/> | | | |
| Survey Data checked for errors | <input type="checkbox"/> | <input type="checkbox"/> | | | |
| Survey Data File Saved on PC | <input type="checkbox"/> | <input type="checkbox"/> | | | |
| Survey Data saved on 2 nd PC | <input type="checkbox"/> | <input type="checkbox"/> | | | |
| Observer Efficiency Surveys | <input type="checkbox"/> | <input type="checkbox"/> | | | |
| POST CRUISE | <input type="checkbox"/> | <input type="checkbox"/> | | | |
| Survey Data Downloaded | <input type="checkbox"/> | <input type="checkbox"/> | | | |
| On site office PC | <input type="checkbox"/> | <input type="checkbox"/> | | | |
| P drive: Corporate Office | <input type="checkbox"/> | <input type="checkbox"/> | | | |

Quality Assurance/Control Problems:

1. _____

2. _____

Corrective Actions:

1. _____

2. _____

Sr. Seabird

Biologist: _____ **Date:** _____

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Appendix A-3

Avian Observer Packet – Version III

REVISED AVIAN OBSERVER PACKET

Ocean/Wind Power Ecological Baseline Studies



New Jersey Department of Environmental Protection
Division of Science, Research, & Technology



Version III

28 October 2008

AVIAN OBSERVER MANUAL

NJDEP Environmental Baseline Survey

INTRODUCTION

The NJDEP has contracted GMI to conduct avian strip transect surveys along tracklines off the New Jersey coast as part of an Ocean/Wind Power Ecological Baseline Studies Project. Seabird density will be determined from strip transect survey data and will be incorporated with other avian data from the project area to develop an avian predictive/probability model. This manual provides an overview of project objectives and a detailed description of field survey methodologies and protocols for the avian observers participating in the surveys.

AVIAN OFFSHORE AND COASTAL SURVEYS

Project Objectives

The primary objectives of the seabird surveys are to determine avian abundance, distribution, flight behavior (flight altitude and direction), and to develop an avian predictive model. The project's secondary objectives are to collect data on "important birds" (federal and state listed and federal species of concern) and migrating, foraging, and roosting flocks outside of the strip transect survey area. Data collection efforts for birds within the strip transect survey area will have priority over birds outside of the strip transect survey area.

Overview of the Field Survey Sample Design and Survey Method

Gould and Forsell (1989) discussed and analyzed variables associated with the estimation of seabird density and concluded that counting all birds flying through the transect area during surveys would greatly exaggerate water density estimates. In other words, counting all birds would represent birds using the air corridor over the water and not the birds associated with the water itself. Therefore, Gould and Forsell (1989) recommended counts of flying birds once every 1 km (0.54 NM) for a specified time interval. Camphuysen et al. (2004) also recommended non-continuous survey time intervals to determine seabird densities. To meet the project objectives, the data collection method used by Gould and Forsell (1989) and Camphuysen et al. (2004) will be modified to continuously count all sitting and flying birds encountered in the strip transect (300 m X 300 m) 90 degrees to one side of the ship's trackline.

SHIPBOARD OFFSHORE SURVEYS

Sample Design

Survey tracklines will be plotted in a 'double saw-tooth' configuration with lines running perpendicular to the coastline from the western to eastern boundary of the project area (**Figure 1**). Tracklines will be generated for every survey using the program DISTANCE (Buckland et al. 2004), thereby allowing a true random coverage design to the Study Area. Strip-transects will be conducted on either side of the trackline depending on viewing conditions (i.e., glare) (Gould and Forsell 1989). Tracklines will be surveyed at approximately 10 kts when the Beaufort Sea State (BSS) is ≤ 5 and visibility is ≥ 300 m.

Survey Protocols

Prior to initiating the monthly survey effort, all observers will review the standard operating procedures for the avian survey. A compass will be used to mark bearings (in 10-degree increments) for each observer position. Range estimation sticks will be prepared according to observers' individual heights by using at-dock known distances from the observer positions on the ship (Heinemann 1981). Distances of 100, 200, and 300 m will be marked on the range estimation sticks, which will be mounted at the observer positions.

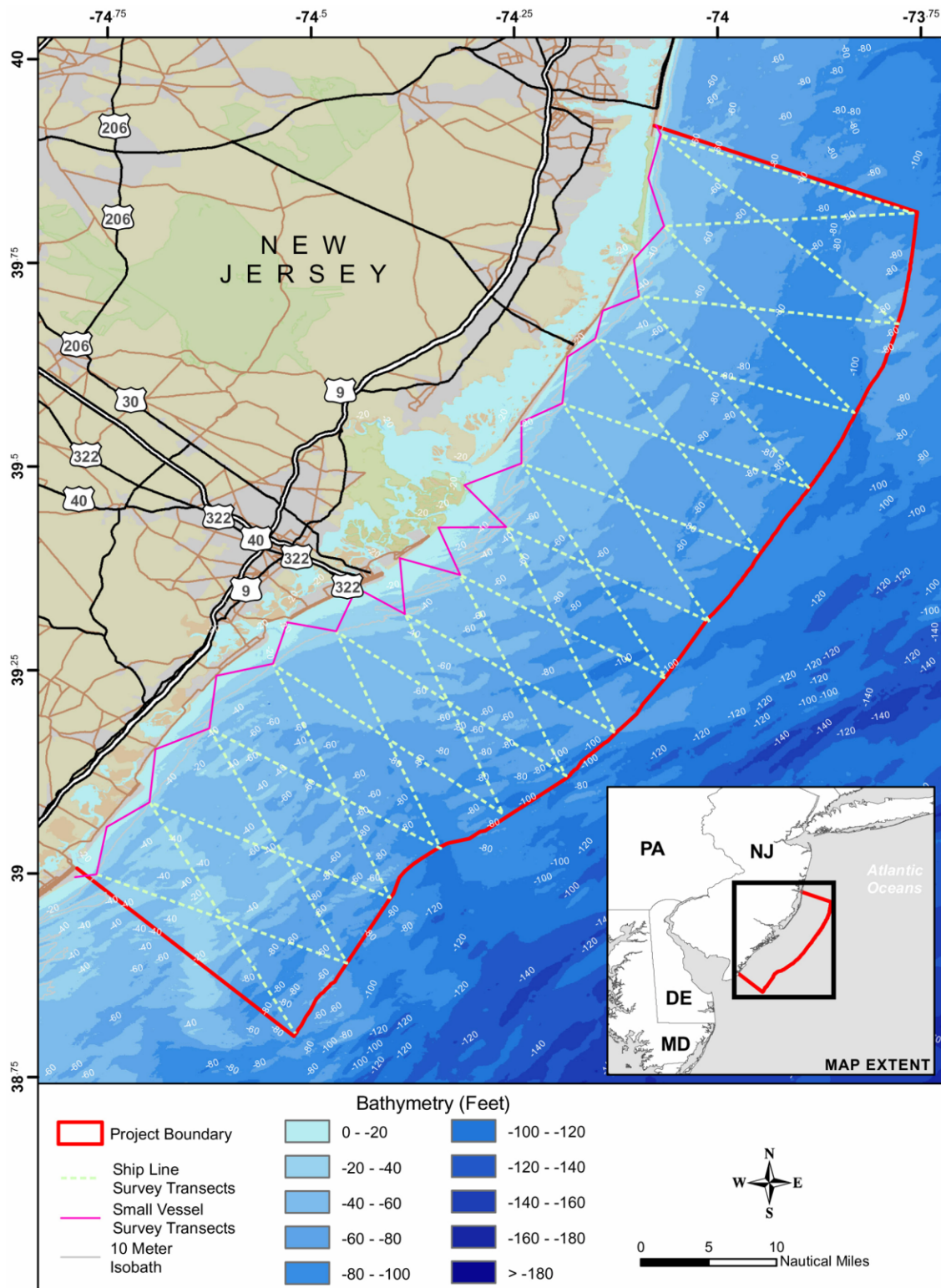


Figure 1. Map showing survey design for the shipboard offshore and small-boat coastal surveys with representative tracklines.

The Chief Science Officer (CSO) will determine if sea state conditions are acceptable (≤ 5 on the BSS) to begin the survey. If sea state conditions are acceptable, the starting transect will be selected with a random number generator by the CSO. The pre-survey section of the avian boat survey checklist will be completed by the Senior Seabird Biologist (SSB) before the beginning of each survey.

Survey protocols incorporate many of the recommendations made by Gould and Forsell (1989) and Camphuysen et al. (2004). Shipboard (NJ offshore) and small-boat (NJ coastal) strip-transect surveys will be conducted during daylight hours within the project boundary (study area). Survey team responsibilities and qualifications will follow those stated in **Appendix A**. Additionally, all members of the survey team will follow the captain's rules for shipboard facilities, emergencies, etc.

The Primary Avian Observer (PAO) will ensure the strip transect survey protocols are followed. The survey will be conducted from the flying bridge of the ship (approximately 30 feet above the water) with the PAO standing at the front of the flying bridge on the ship's centerline. The PAO will be on duty for 1-hour periods before being relieved by one of the other survey team members.

The first priority of the PAO is to identify, enumerate, and estimate bearing and distance of the bird and to record bird behavior (e.g., flying or sitting, directional or non-directional flight, feeding), flight altitude, and flock composition within the 300 m X 300 m survey area (In zone). The PAO will scan with naked eyes and binoculars the 0-90 or 270-0 degree zone (selected and switched as needed to avoid glare) within the survey area while the ship travels along the trackline.

Hand-held computers are used to record all data, and are equipped with a database program developed by GMI specifically for this project (**Appendix B**). The hand-held data recorders are synchronized for time with the field laptop, which is connected to the ship's GPS. This allows for the data entered onto the program to be merged with the resultant trackline.

Data will be recorded on a hand-held computer for each bird observation. Data recorded will include:

- identity (lowest identifiable form or taxon) with a four-letter code
- number of individuals (or best-count estimates for large flocks)
- estimated bearing and range (distance) to the bird(s) using range estimation sticks
- estimated flight altitude
- behavior category
 - sitting (includes birds seen landing or taking off)
 - directional flight (always accompanied by a cardinal direction)
 - non-directional flight
 - piracy
 - following the ship
 - feeding (may be accompanied by a cardinal direction)
- cardinal directions will be used to designate perceived flight directions (cardinal direction will be based on the ship transect line, where the bow of the ship is north).

The second priority of the PAO is to conduct observations in all visible areas outside of the 300 m X 300 m survey area (out zone) for "important" birds. Important birds include large flocks of birds and rare birds such as federal- and state-listed species and federal species of concern. The PAO visually scans the out zone area for flying birds and then scans the area with binoculars. All avian behaviors observed, with the exception of range, are recorded for out zone observations. In addition, observers will opportunistically record the following data in the comments section:

- dive altitude (in feet) of birds, especially Northern Gannets, as DIVA
- submersion time (in seconds) of birds after a dive (i.e., near the ship, sea state conditions permitting) as SUBT
- the life state (age, plumage, morphology) and sex of the bird (e.g., A = adult, J = juvenile, F = female)

- boat traffic observed during the survey, as they often serve as attractants to birds

The PAO and the off-effort observer(s) will carry radios and the PAO will contact the off-effort observer(s) if the set conditions need to be changed or additional help is needed to record a large group of birds. When large numbers of birds are encountered, the SSB on board may decide to call on an off-effort observer to assist with out of zone observations and/or data recording. The PAO/SSB may ask another observer to record observation data outside the survey zone and/or to scribe for him/her. Each observer will be aware of the activity of the other. Unless directed by the PAO, the additional observer will not record data for birds in the survey area or birds on course to enter the survey area.

Because marine mammal surveys are occurring simultaneously with the avian surveys, the ship may break tracklines in order to appropriately survey marine mammals. In the event the trackline is broken, the following protocol is to be followed if an avian observer observes a marine mammal:

- If the boat goes off-transect to investigate a marine mammal sighting, avian data collection will continue. However, since the strip-transect methodology is not applicable in such instances, all data collected during this period will become supplemental, with observations no longer being prioritized.
- When the marine mammal team has completed a sighting, the ship will resume course on a new heading back toward the trackline. Avian data collection will resume following the strip-transect methodology on this new transect leg.
- If an avian biologist observes a marine mammal, the observer should not point out the animal to on-watch marine mammal observers until the mammals have passed abeam to either side of the ship.

In addition to marine mammal surveys, oceanographic data is also collected during each survey. CTD (Conductivity-Temperature-Depth) instruments are dropped into the water at the end of each transect line, requiring the ship to stop and remain idle until data collection is complete. During CTD data collection, avian observers will continue recording as in the event of a marine mammal sighting until a new transect is started. This data will be separated from the transect data and analyzed. Additionally, when the ship is at the near-shore point for CTD data collection, observers will focus their survey effort toward shore, glare conditions permitting.

Lastly, a weather form will be completed prior to initiation of daily surveys, at mid-day, and immediately following final afternoon surveys (**Appendix C**). Surveys conditions (e.g., cloud cover, glare, sea state) will be checked and changed on the avian computer when necessary by the PAO when the PAO goes off duty.

Quality Assurance/Control

Observer Efficiency

It is important to maintain consistency among observers in their ability to detect, identify, and count birds. Observer efficiency is defined as a measure of concordance between observers in their “agreement” on the detection, identification, counts, and other metrics (e.g., altitude) of birds. To do this, we must collect data on birds simultaneously with two observers. One off-duty biologist will conduct the observer efficiency protocol. Kendall’s Coefficient of Concordance will be used to determine if the observers agree.

Monthly avian observer efficiency will be determined for each observer. One of the “off-duty” staff seabird biologists will stand behind or near the selected on-duty observer and simultaneously record survey data in the staff seabird biologist’s assigned survey area for a 30-minute period. In addition, the 30-minute period will be divided into two separate periods.

The first 15-minute period will focus on observer efficiency in detecting, identifying and enumerating birds. During this time the off-duty and on-duty observer will independently detect, identify and count birds. The second 15-minute period will be used to evaluate observer efficiency in estimating the altitude, range,

bearing, and heading of birds detected by the on-duty observer. During this time the on-duty observer will choose individual birds or flocks of birds whose altitude, range, bearing, and heading will be independently recorded by the off-duty and on-duty observer.

Post Daily Survey Checklist

Each night following a survey, the senior seabird biologist will proof the day's data and complete the QA/QC Checklist in **Appendix D**. The data will be downloaded to a laptop computer and reviewed by the SSB to determine if reporting errors were made. If errors are present, the observer(s) will meet with the SSB that evening to resolve the error(s).

Any necessary corrections will be made to the data file by the SSB, as follows:

- All data files will be renamed (QAQC added to the file name) after the file has been checked.
- Upon completion of the QAQC check, all raw data files will be placed in the "raw" folder and all QAQC files will be placed in the "QAQC" folder.
- All files will then be transferred to an external hard drive for storage (see below for additional instructions).

The following electronic documents will also be placed in the "QAQC" folder:

- Avian Ship Survey Daily Checklist
- Survey Daily Log
- Weather Data Form
- .csv file

On days that observer efficiency tests are performed, the SSB will:

- create an observer efficiency folder
- place a copy of the QAQC staff seabird biologist data file in the folder
- place a copy of the off-duty observer efficiency data file in the folder
- perform standard QAQC procedures on observer efficiency data file
- delete the off-duty observer efficiency data file from the raw folder

SMALL-BOAT COASTAL SURVEYS

Small-boat surveys will be conducted to capture nearshore bird activity that may be missed during shipboard surveys due to depth limitations of the ship. The small-boat coastal surveys will provide additional statistical power to the avian predictive model.

Sample Design

The survey design will be similar to the previously described ship survey design except that a "single saw-tooth" design will be implemented to survey the coastal area. Nearshore ship waypoints will be plotted after the ship survey is completed. Coastal tracklines will be generated to complete the trackline to the shore. The boat captain will be requested to approach the shoreline as close as safety allows (dependent on tide and weather conditions). Transect lengths and positions will vary monthly and will be entirely dependent on the tide and water depth during both the shipboard and small-boat survey days. In the event that an offshore survey is cancelled or incomplete, the associated coastal survey will still be performed. If the ship does not complete the scheduled number of transects, the coastal transects illustrated in **Figure 1** will be surveyed.

The starting location for each survey will be randomly determined among two starting points (north end and south end), or north or south from the inlet the vessel is departing. If daylight, weather, and sea state conditions allow, the entire coastal area will be surveyed in one day. This approach will allow for random sampling (with respect to starting location) of shoreline and the shoal areas for seabird roosting/resting and feeding areas, while maximizing available ship sampling time (i.e., minimizing ship down time or relocation time).

Survey Protocols

Pre-survey, survey, and post-survey methods and protocols will be identical to those established for the ship survey.

Quality Assurance/Control

Quality assurance/control for small-boat surveys will be identical to that described previously for the shipboard surveys.

Ship/Small-boat Pre-Survey Protocol

Protocols for conducting safety, equipment, and data checks will be followed before, during, and after every survey cruise to ensure personnel safety, equipment readiness, and collection of quality data.

Prior to beginning a survey, the chief scientist will determine sea state conditions in the project area by checking online data from NOAA buoys in the area. The chief scientist will then discuss these results with the ship's captain, at which point the captain will determine if current and forecasted weather conditions are acceptable to begin the survey.

The senior marine mammal and seabird biologists will be responsible for completing pre- and post-survey inspections using the checklist below. These inspections will ensure all necessary survey equipment is available and functional prior to surveys.

AVIAN SHIP SURVEY CHECKLIST

DATE: _____

| REQUIREMENT | Yes | No | Signature/Title | Date | Time |
|------------------------------------|--------------------------|--------------------------|-----------------|------|------|
| PRE-SURVEY | <input type="checkbox"/> | <input type="checkbox"/> | | | |
| Ship Ready Status | <input type="checkbox"/> | <input type="checkbox"/> | | | |
| Sea State Condition | <input type="checkbox"/> | <input type="checkbox"/> | | | |
| Meets Survey Protocol | <input type="checkbox"/> | <input type="checkbox"/> | | | |
| Ship Safety | <input type="checkbox"/> | <input type="checkbox"/> | | | |
| Crew boat safety review | <input type="checkbox"/> | <input type="checkbox"/> | | | |
| Survey Equipment | <input type="checkbox"/> | <input type="checkbox"/> | | | |
| Hand-held data recorders (3) | <input type="checkbox"/> | <input type="checkbox"/> | | | |
| Survey Line Map/Coordinates | <input type="checkbox"/> | <input type="checkbox"/> | | | |
| Laptop Computer (primary) | <input type="checkbox"/> | <input type="checkbox"/> | | | |
| Spare Laptop computer | <input type="checkbox"/> | <input type="checkbox"/> | | | |
| Spare Hand-held data recorder | <input type="checkbox"/> | <input type="checkbox"/> | | | |
| Binoculars (2 primary-1 spare) | <input type="checkbox"/> | <input type="checkbox"/> | | | |
| Field Guides | <input type="checkbox"/> | <input type="checkbox"/> | | | |
| Extra binocular batteries | <input type="checkbox"/> | <input type="checkbox"/> | | | |
| Battery charger | <input type="checkbox"/> | <input type="checkbox"/> | | | |
| Pre-Survey Operation Checks | <input type="checkbox"/> | <input type="checkbox"/> | | | |
| Ship GIS | <input type="checkbox"/> | <input type="checkbox"/> | | | |
| Laptop Computer (Primary) | <input type="checkbox"/> | <input type="checkbox"/> | | | |
| Laptop Computer (Spare) | <input type="checkbox"/> | <input type="checkbox"/> | | | |
| Hand-held data recorders | <input type="checkbox"/> | <input type="checkbox"/> | | | |

Sr. Seabird Biologist: _____ **Date:** _____

APPENDIX A

AVIAN TEAM RESPONSIBILITIES AND QUALIFICATIONS

Personnel

The ultimate responsibility for the avian ship surveys rests with the senior seabird biologist. The SSB reports to and coordinates the avian survey effort with the CSO. In confusing or unique field situations, the SSB will consult with the CSO before making a decision.

Identification Specialist/Senior Seabird Biologist (one)

The SSB is an experienced observer who has conducted avian offshore and coastal surveys. He or she has the ability to identify avian species known to occur in the project area, conduct observer-efficiency quality-assurance protocols, and to complete data-quality control procedures. The experience of the SSB will maintain the consistency of the data collected during each survey.

The SSB is the avian team leader and works with the other team members to discuss problems and make decisions. If team members are included in the decision-making process, the avian team will work better together.

Observers (two to four)

Seabird biologists (avian observers) are responsible for collecting the avian survey data. The avian observers are proficient in sighting and identifying birds and recording accurate data on hand-held data recorders.

Watch Rotations

Upon completing a watch rotation, the observer going off-duty will review the set (environmental) conditions on the avian computer and make all necessary changes.

APPENDIX B

SURVEY DATA PROGRAM

Data Recording Computer Program

The data file is divided into two sections. The first section contains general data and lists all of the codes used in the data section. General data categories include: Survey Type, Vehicle, Time Zone Delta, Location Interval, and Altitude. These categories are defined below:

Survey Type

"Bird" or "Mammal"

Vehicle

e.g. "Boat", "Plane", etc.

Time Zone Delta

value, in hours, added to Zulu time to give local time (May be a decimal).

Location Interval

time in seconds between writing out location records

Altitude

in feet above sea level

observers may be at a different altitude.

The second section contains the survey data. Each record in the data section is stored as a single line with identical format. Observers, species, behaviors, weather conditions, sea states, water turbidity, water color, glare, and sunlight are all given codes.

Each entry in the data section has the following fields, separated by commas:

Card

Year-Month-Day

Hour; Minute: Second

GPS State

Latitude

Longitude

Heading

Speed

Species1

Count1

Behavior1

Range1

Bearing1

Elevation1

Latitude1

Longitude1

Species2

Count2

Behavior2

Range2

Bearing2

Elevation2

Latitude2

Longitude2

Species3
Count3
Behavior3
Range3
Bearing3
Elevation3
Latitude3
Longitude3
Observer
Weather
Sea State
Turbidity
Water Color
Water Temperature
Sun Strength
Glare

The interpretation of the fields:

Card:

A0 Beginning of survey
A9 End of survey
B0 Beginning of transect
B9 End of transect
C0 Going on-effort
C9 Going off-effort
D0 On-effort sighting
D1 Off-effort sighting
E0 On-effort location only
E1 Off-effort location only
F0 Change of sighting conditions

Year-Month-Day:

in Zulu time
year is four digits

Hour:Minute:Second

in Zulu time, 24 hour clock

GPS State

1 – acceptable for avian surveys
2 – not acceptable for avian surveys

Latitude / Longitude

of the ship in decimal degrees, to the 0.00001 (approx. one meter at the equator)

Heading

of the ship 0 to 359°

Speed

ground speed in knots of the ship

SpeciesN

code of the species sighted. Up to three species may be designated for a given sighting.

CountN

number of individuals

BehaviorN

code for the sighting's behavior

RangeN

in meters from the observer

BearingN

from the observer to the sighting (e.g. right-side observers would have a value of 0 to 180°).

ElevationN

vertical angle from the observer to the sighting (in a plane this would almost always be negative)

LatitudeN / LongitudeN

computed position of the sighting based on vehicle position and range / bearing / elevation

Observer

identification code of the observer

Observer State

- 1) perfect
- 2) excellent
- 3) very good
- 4) good
- 5) fair
- 6) poor
- 7) very poor

Survey Conditions (Avian Computer)

Weather

weather code, given in first section

Sea State

sea state code, given in first section

Turbidity

turbidity code, given in first section

Water Color

code for water color, given in the first section

Water Temperature

temperature of water, degrees Celsius. -9999 means unknown.

Sun Strength

Strength of sunlight code, given in first section

Glare

code for glare, given in the first section

APPENDIX C
WEATHER FORM

Date

| | | | | |
|--|--|--|--|--|
| | | | | |
|--|--|--|--|--|

Weather Data

>5000 m

[illegible]

Date _____

APPENDIX D

Ship/Small-boat Survey Quality Assurance Protocol

The senior seabird biologists will be responsible for completing post-survey inspections (see checklist below) of all datasheets used during the survey and ensuring they are complete, legible, and accurate. If errors are found on the datasheets, the biologists who logged the data will be consulted to resolve the issue. Once the datasheets are inspected, the data will be entered into an electronic spreadsheet. The spreadsheet will be checked for errors and corrected immediately. Data will be saved with a QAQC notation in the file name (e.g., Avian Ship Survey 01-15-01 QAQC) and in redundant copies (hard drive and external disc). All external media storage devices will be appropriately labelled with the survey dates, type of data, and author.

After returning to shore, the seabird biologist will download the QAQC data to the corporate office project's drive. Once the download is complete, the project manager or principle investigator will be contacted to verify the data is present and readable.

AVIAN SHIP SURVEY QA/QC CHECKLIST

DATE: _____

| | | | | | |
|---|--------------------------|--------------------------|--|--|--|
| SURVEY | <input type="checkbox"/> | <input type="checkbox"/> | | | |
| Data Requirements | <input type="checkbox"/> | <input type="checkbox"/> | | | |
| Weather Data | <input type="checkbox"/> | <input type="checkbox"/> | | | |
| Weather Form (AM) | <input type="checkbox"/> | <input type="checkbox"/> | | | |
| Weather Form (Noon) | <input type="checkbox"/> | <input type="checkbox"/> | | | |
| Weather Form (PM) | <input type="checkbox"/> | <input type="checkbox"/> | | | |
| Survey Data downloaded | <input type="checkbox"/> | <input type="checkbox"/> | | | |
| Survey Data checked for errors | <input type="checkbox"/> | <input type="checkbox"/> | | | |
| .csv file copied to data folder | <input type="checkbox"/> | <input type="checkbox"/> | | | |
| Survey Data file saved on PC | <input type="checkbox"/> | <input type="checkbox"/> | | | |
| Survey Data saved on 2 nd PC | <input type="checkbox"/> | <input type="checkbox"/> | | | |
| Observer Efficiency Surveys | <input type="checkbox"/> | <input type="checkbox"/> | | | |
| POST-CRUISE | <input type="checkbox"/> | <input type="checkbox"/> | | | |
| Survey Data downloaded | <input type="checkbox"/> | <input type="checkbox"/> | | | |
| On site office PC | <input type="checkbox"/> | <input type="checkbox"/> | | | |
| P drive: Corporate Office | | | | | |

Quality Assurance/Control Problems:

1. _____

2. _____

Corrective Actions:

1. _____

2. _____

Sr. Seabird

Biologist:_____ **Date:**_____

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Appendix A-4

Supplemental Avian Surveys

Recent discussions with the U.S. Fish and Wildlife Service have identified the need for additional avian data to supplement the ongoing baseline studies. Avian data needs include: 1) the identification of avian foraging locations; 2) avian use of fishing locations, and 3) Northern gannet roosting locations. Supplemental avian surveys will be scheduled, when practical, during the final 7 months of the study to collect avian data relating to the identified data needs. The specific goals of the supplemental avian surveys negate use of the collected data in the avian predictive model.

Identification of Avian Foraging Locations

Monthly avian boat surveys of shoal areas will be conducted to determine avian shoal use in the Study Area. Survey methods are discussed below.

Methods

The station count method (Gould and Forsell 1989) will be modified to survey shoal areas. The survey area will consist of two concentric circles with the observer as the center of the circle. The radius of the first circle (A) will range from 0 to 300 meters (m); the radius of the second circle (B) will range from 301 to 600 m.

Shoal area maps will be generated with a geographic information system (GIS) and numbered sequentially from north to south. Shoal size varies greatly in the Study Area; small shoals may require only one station; larger shoals may have numerous stations. All shoal stations will be located a minimum of 1 km apart.

When the boat is on station, the start time, station number, station location global positioning system (GPS) coordinates will be recorded on a field data sheet (**Appendix 1**). Weather data will be recorded at the beginning, middle, and end of the survey day on the standard weather data sheet currently being used to conduct avian boat surveys for the study. Weather changes will be noted on the data sheet.

Within the survey area (two concentric circles), all birds will be identified and counted during a circular five- (5-) minute survey. Concentrations of out of zone birds (>50 birds) will be recorded on the incidental observations data sheet (**Appendix 1**). After the modified station count is completed, the observer will record dive altitudes and submersion times of foraging birds (gannets, pelicans, terns) within the survey area for a period of 5 minutes. If time is available, data will be collected for diving ducks and gulls.

This survey sequence will be repeated three (3) times. If bird foraging activity is low (<25 birds), the survey will be terminated and the boat will proceed to the next shoal station. If moderate to high bird foraging activity (>25 birds) is present at the end of the 30-minute period, a second 30-minute survey period will be completed. If time is available, each shoal station will be visited twice daily to document temporal variation in utilization.

Two days of avian boat surveys will be scheduled twice monthly to survey shoal areas. Shoal survey sequence will be reversed during the second monthly survey to document temporal variation in utilization. Shoals throughout the study area will be surveyed.

Avian Use of Fishing Locations

An avian survey will be conducted from a recreational fishing boat to document avian species attracted to fishing boats and to gather data on fishing locations in the Study Area. Survey methods are discussed below.

Methods

Reservations will be made on fishing boat charters to conduct the avian survey. During the trip from the dock to fishing grounds and between fishing grounds the boat often travels well above speeds used to conduct avian transect surveys (10 knots); however, the avian observer will record incidental observations of foraging birds (identity and number) and record location coordinates of the boat at the time of the sighting on the incidental observations data sheet (**Appendix 1**).

When the fishing boat is anchored on station, the start time, station number, station location GPS coordinates will be recorded on a field data sheet along with the start time (**Appendix 1**). Weather data will be recorded at the beginning, middle, and end of the survey day on the standard weather data sheet currently being used to conduct avian boat surveys for the study. Weather changes will be noted on the data sheet.

The station count method (Gould and Forsell 1989) will be used to survey the area around the boat. The survey area will consist of two concentric circles with the observer as the center of the circle. The radius of the first circle (A) will range from 0 to 300 m; the radius of the second circle (B) will range from 301 to 600 m.

Within the survey area (two concentric circles), all birds will be identified and counted during a 5-minute circular sweep. After the station count is completed, the observer will record dive altitudes and submersion times of foraging birds (gannets, pelicans, terns) for a period of 5 minutes. If time is available, data will be collected for diving ducks and gulls. This survey sequence will be repeated until the boat leaves for another fishing spot.

An attempt will be made to schedule one to two trips per month during the winter season and one trip per week during the spring/summer season.

Northern Gannet Roosting Locations

The goal of this survey is attempt to identify the night roosting location of Northern gannet. Boats will attempt to be used to follow the gannet evening flight to the roost site(s).

Methods

Data from previous surveys will be reviewed to identify concentration locations of Northern gannets in the study area. When weather permits (Beaufort 1-3), a boat (capable of speeds of up to 20 knots) will attempt to follow the gannets from one concentration area as they leave for the night roosting location. If the boat is successful in locating the roost, the location coordinates of the site will be recorded. Other gannet concentration locations in the Study Area will be visited in an attempt to find additional roosting locations.

DATA SHEETS

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**New Jersey Department of Environmental Protection
Ocean/Wind Power Environmental Baseline Studies**

Supplemental Avian Survey Shoals

Date: _____

Shoal Number:_____

Page:_____

Observer: _____

Location Coordinates:_____

Start Time:_____ **End Time:**_____

[illegible]

Supplemental Avian Survey Foraging Behavior

Page:_____

Location Coordinates: _____

[illegible]

**New Jersey Department of Environmental Protection
Ocean/Wind Power Environmental Baseline Studies**

Supplemental Avian Survey Incidental Observations

Date: _____

Page:_____

Observer: _____

[illegible]

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APPENDIX B

AVIAN SHIPBOARD OFFSHORE/SMALL VESSEL COASTAL SURVEYS

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Appendix B-1

Survey Effort

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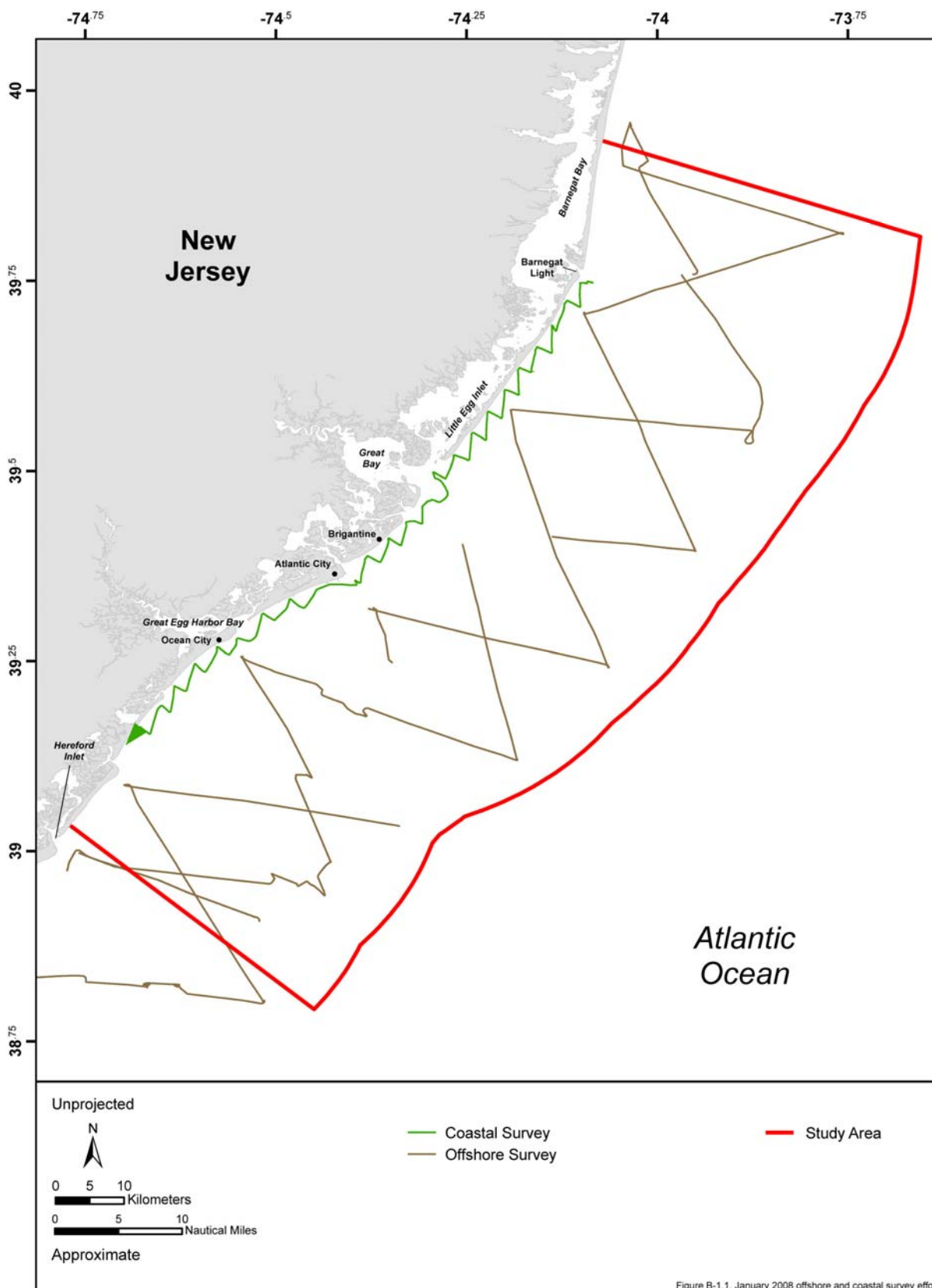


Figure B-1.1. Avian offshore and coastal survey effort in the New Jersey Study Area during January 2008.

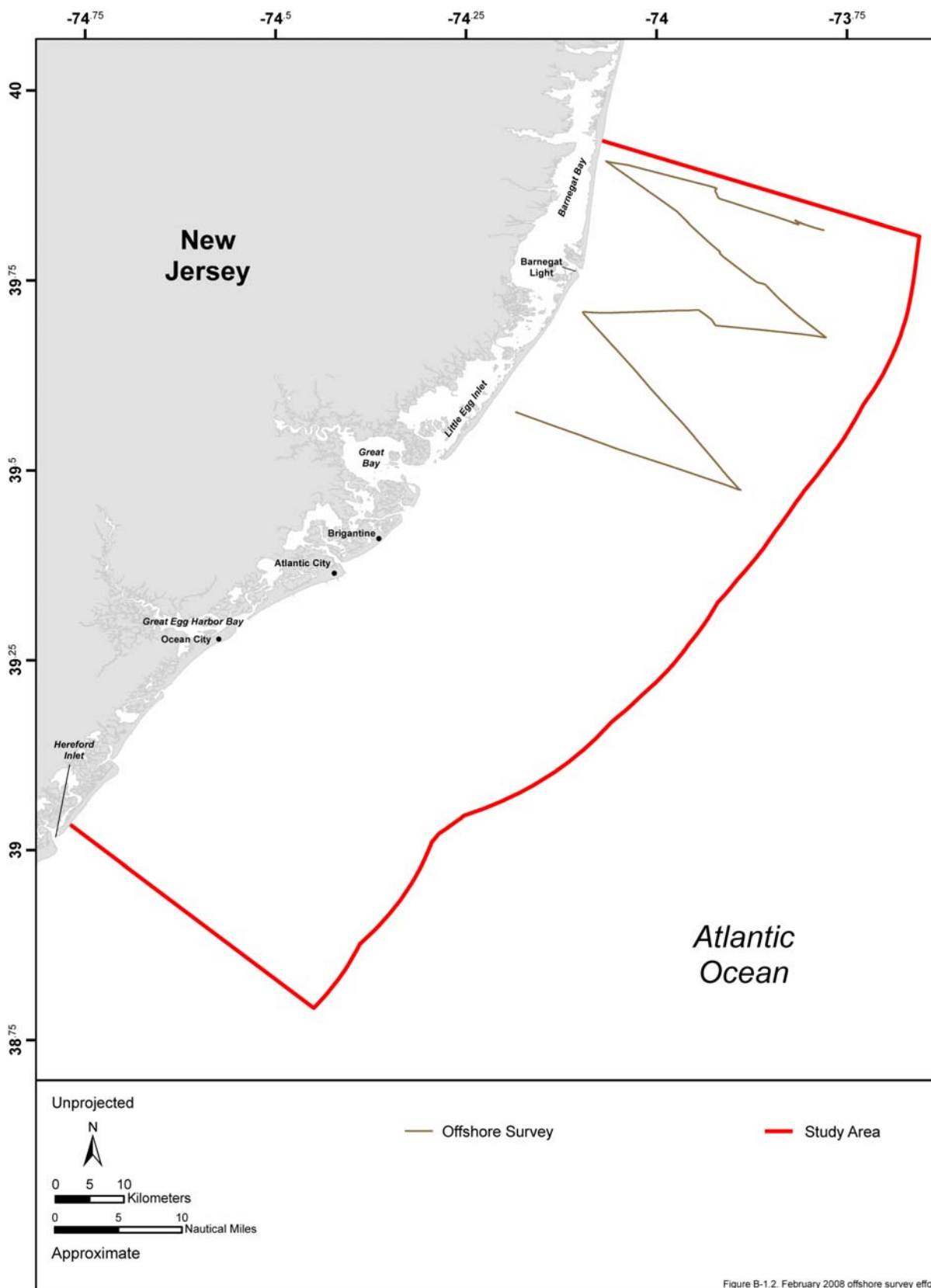


Figure B-1.2. Avian offshore effort in the New Jersey Study Area during February 2008. No coastal survey was conducted during this month.

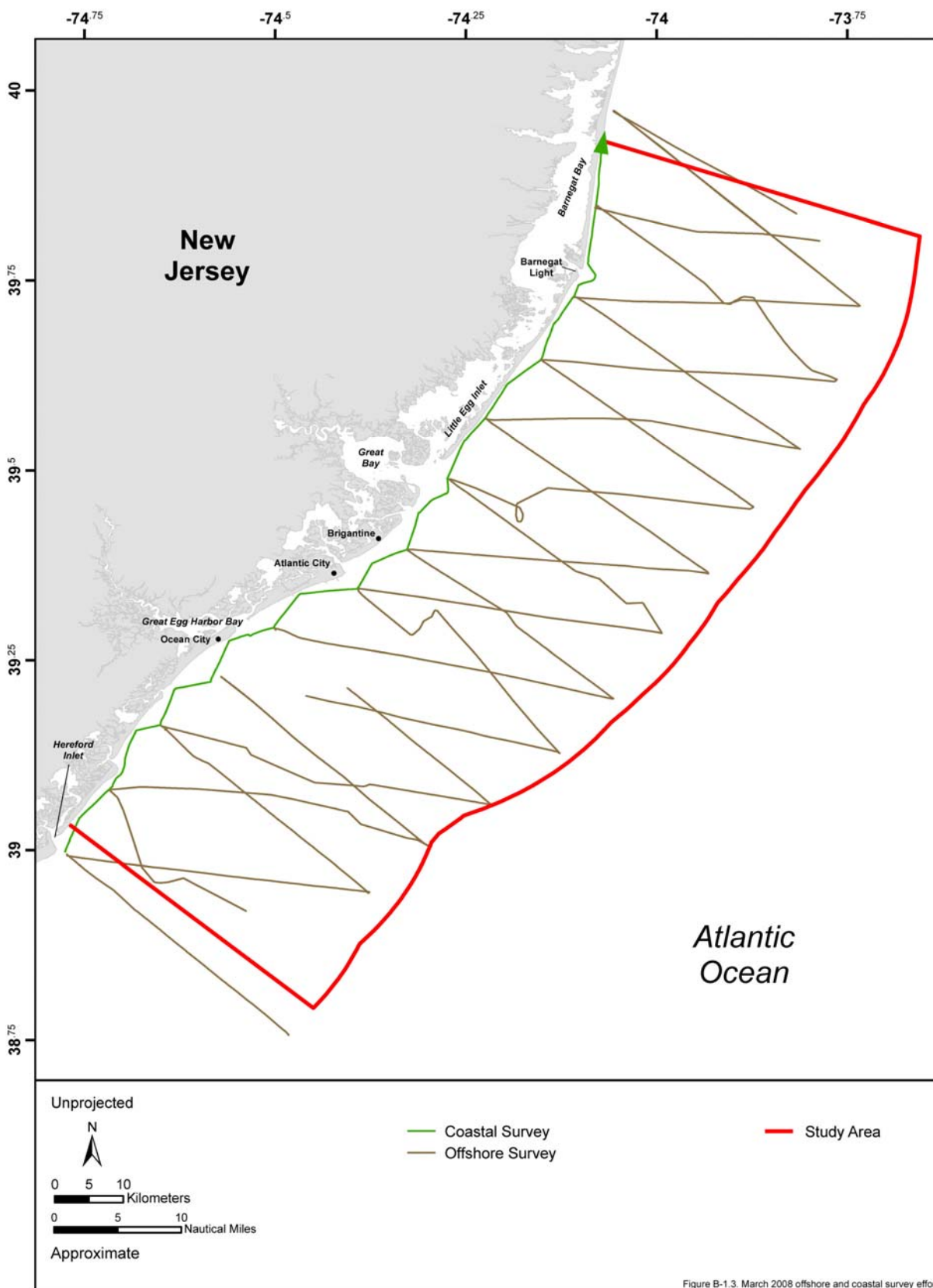


Figure B-1.3. Avian offshore and coastal survey effort in the New Jersey Study Area during March 2008.

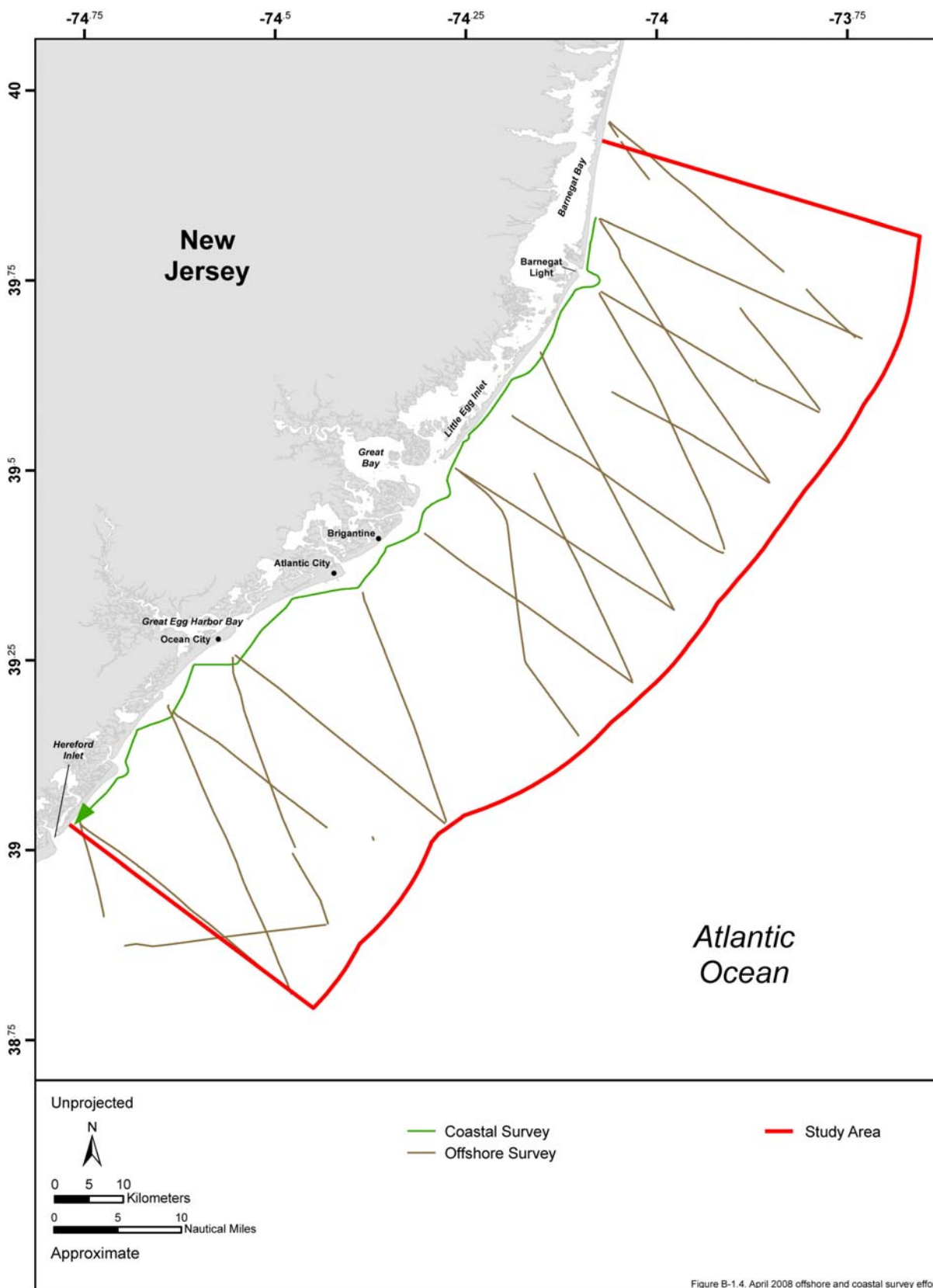


Figure B-1.4. Avian offshore and coastal survey effort in the New Jersey Study Area during April 2008.

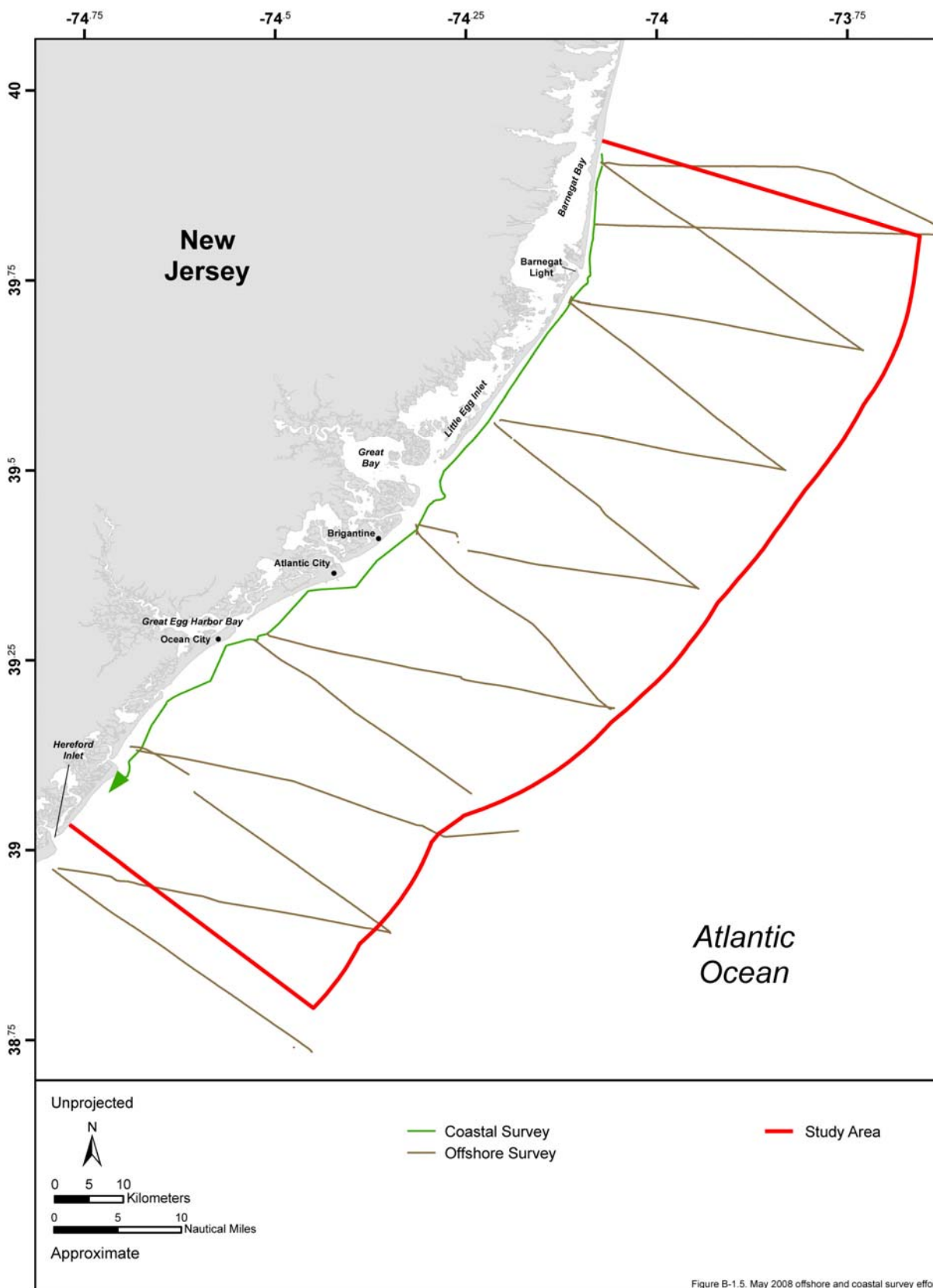


Figure B-1.5. Avian offshore and coastal survey effort in the New Jersey Study Area during May 2008.

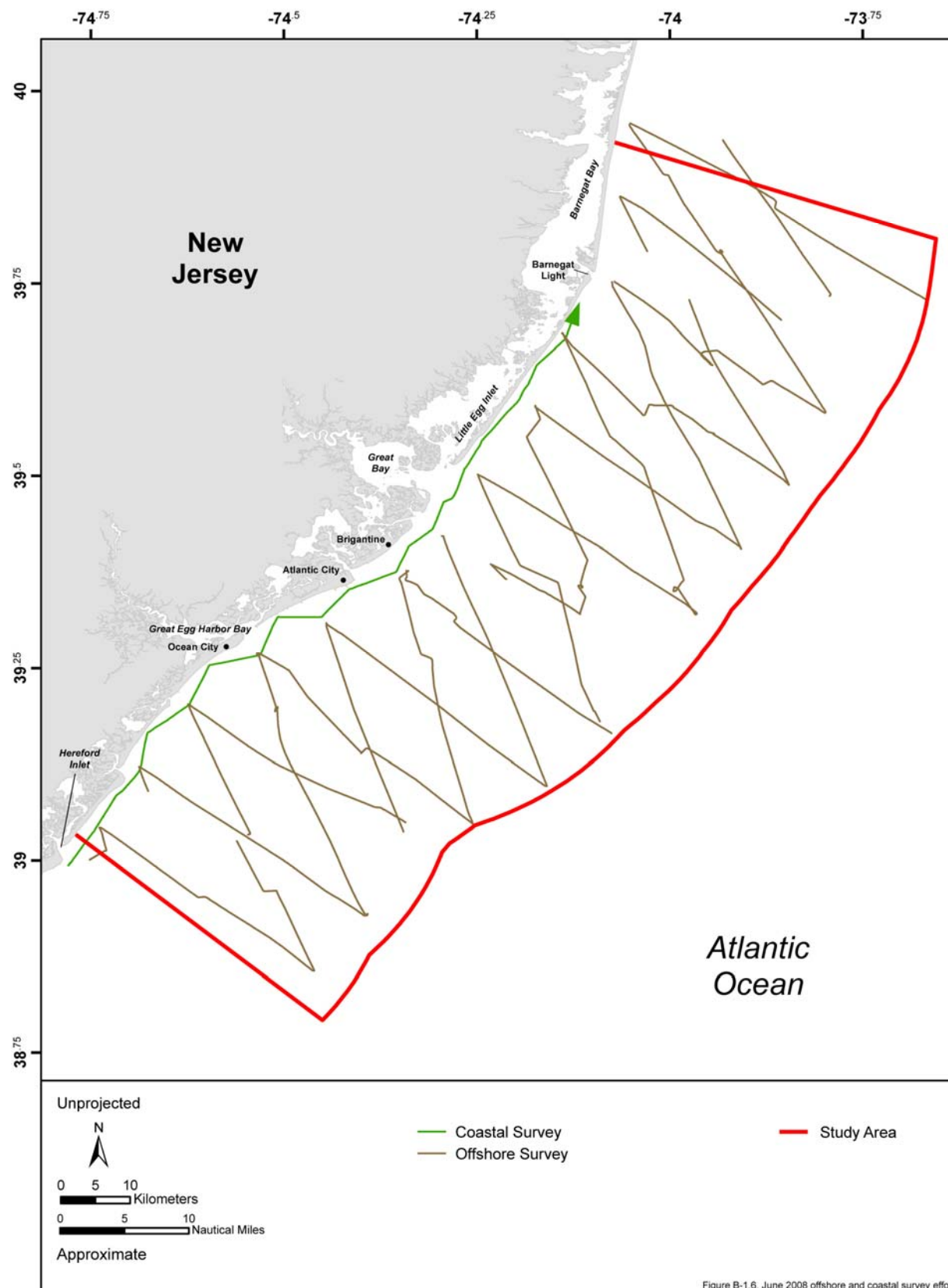


Figure B-1.6. Avian offshore and coastal survey effort in the New Jersey Study Area during June 2008.

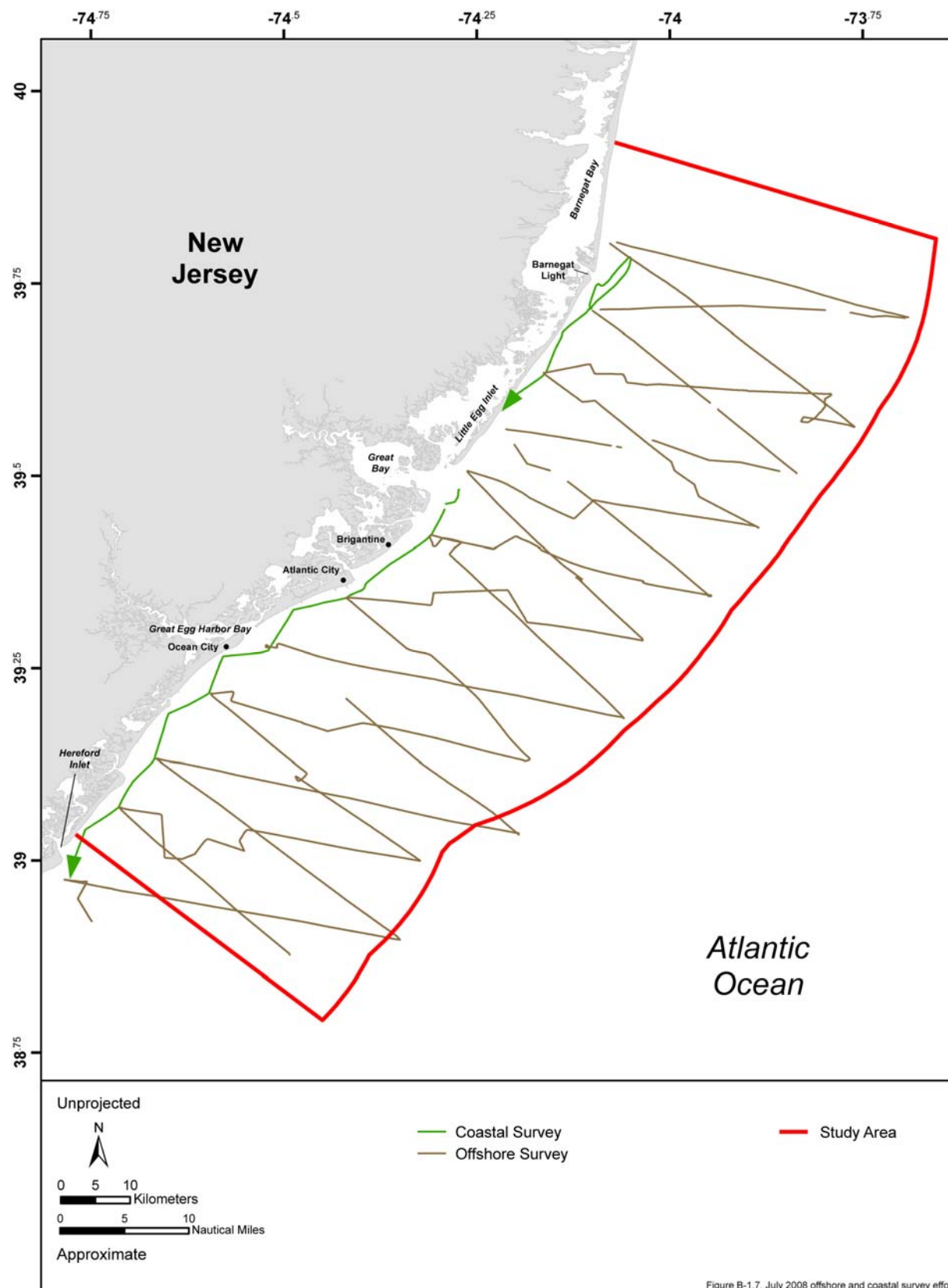


Figure B-1.7. Avian offshore and coastal survey effort in the New Jersey Study Area during July 2008.

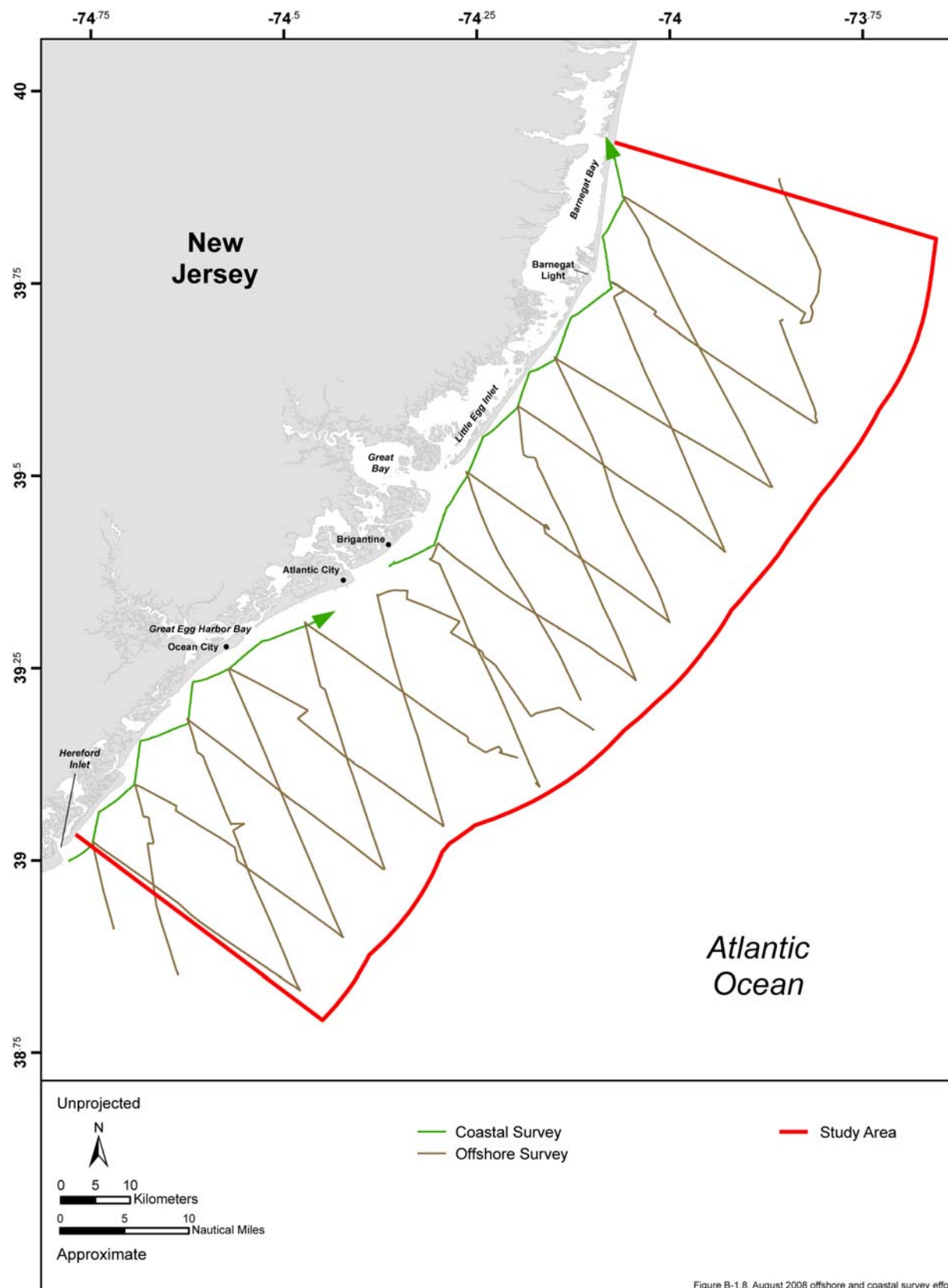


Figure B-1.8. Avian offshore and coastal survey effort in the New Jersey Study Area during August 2008.

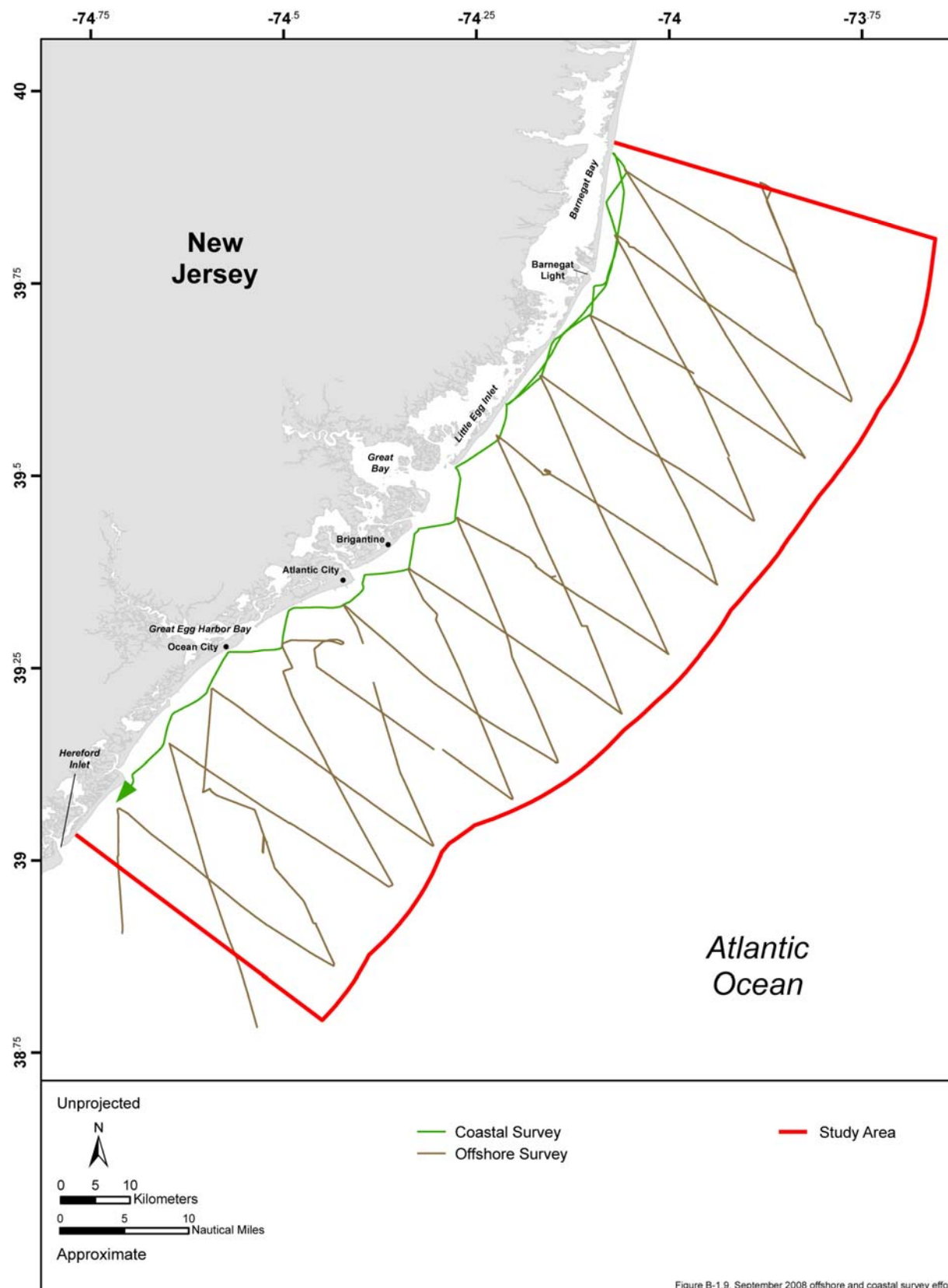


Figure B-1.9. Avian offshore and coastal survey effort in the New Jersey Study Area during September 2008.

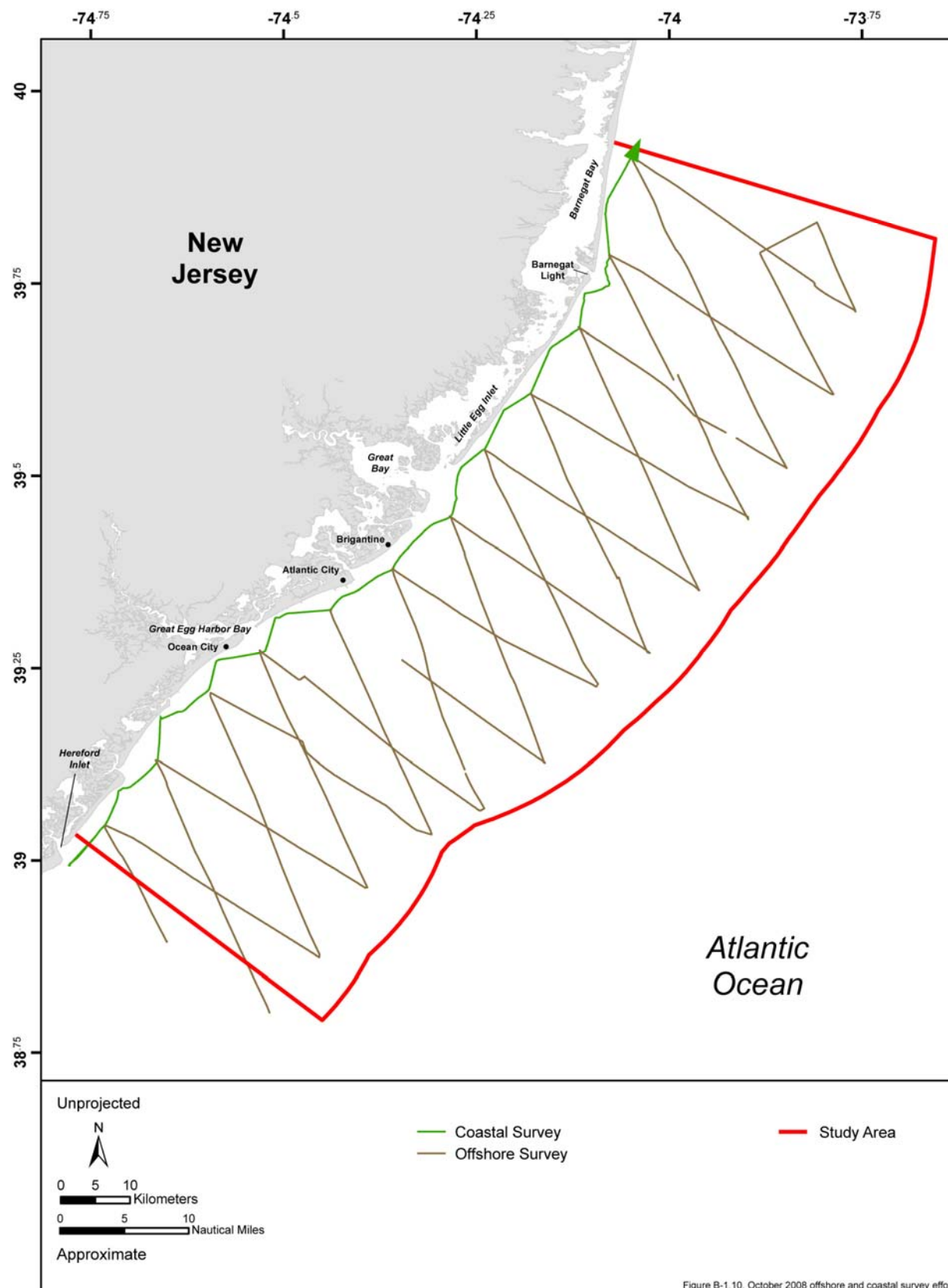


Figure B-1.10. Avian offshore and coastal survey effort in the New Jersey Study Area during October 2008.

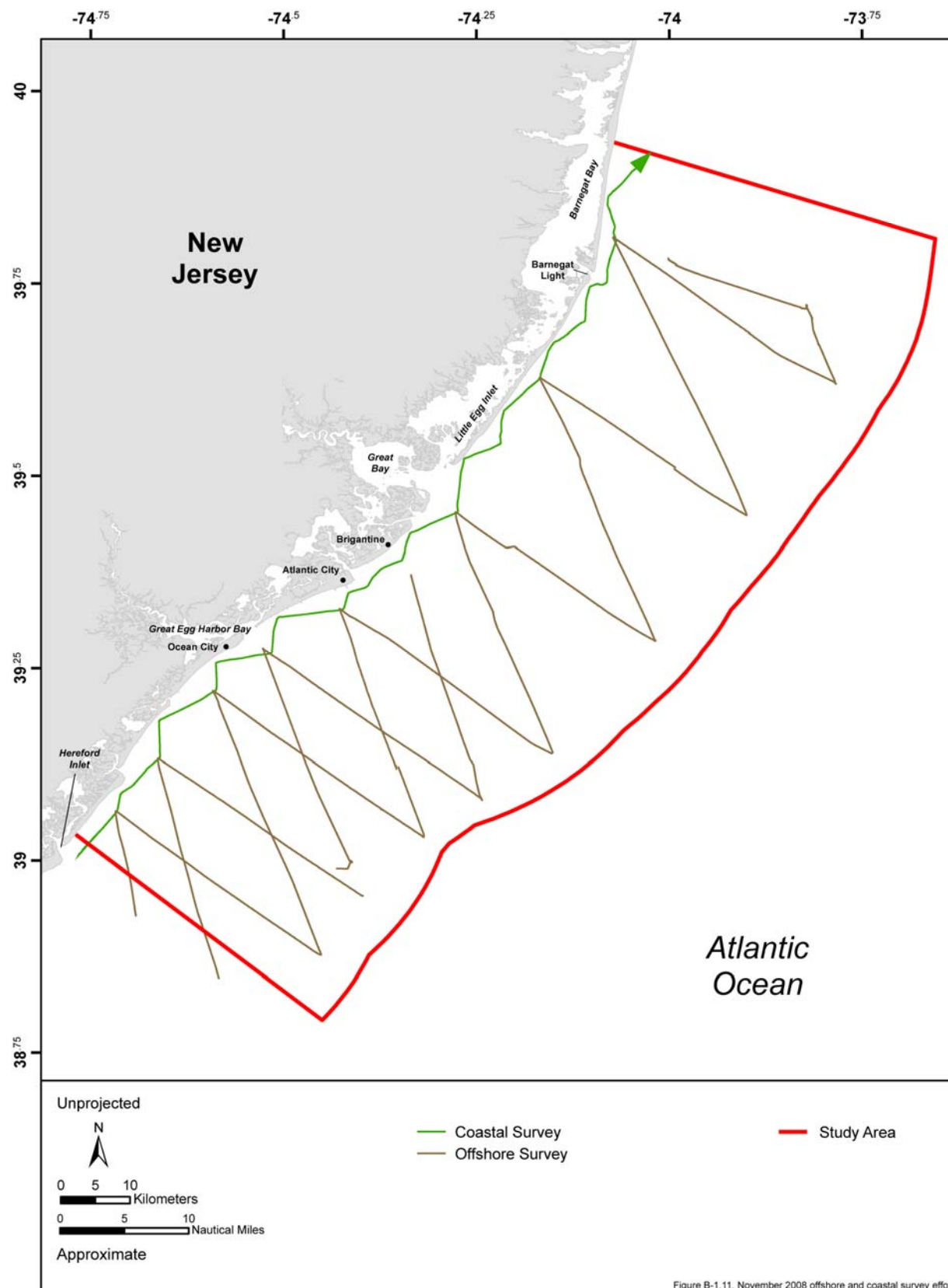


Figure B-1.11. Avian offshore and coastal survey effort in the New Jersey Study Area during November 2008.

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Appendix B-2

Avian Occurrence and Abundance

Table B-2.1. Avian species* observed during the winter (January and February) 2008 shipboard offshore and small boat coastal surveys. In February only a partial shipboard offshore survey was conducted.

| Family Common Name, <i>Scientific name</i> | January | February ¹ |
|---|----------------|-----------------------|
| Anatidae (geese, swans, and ducks) | | |
| Atlantic Brant, <i>Branta bernicla</i> | X ^o | |
| Scaup (unknown), Lesser Scaup, <i>Aythya marila</i> /Greater Scaup, <i>A. affinis</i> | X ^C | |
| Surf Scoter, <i>Melanitta perspicillata</i> | X | X |
| White-winged Scoter, <i>Melanitta fusca</i> | X | X |
| Black Scoter, <i>Melanitta niger</i> | X | X |
| Long-tailed Duck, <i>Clangula hyemalis</i> | X | X |
| Bufflehead, <i>Bucephala albeola</i> | X ^C | |
| Common Goldeneye, <i>Bucephala clangula</i> | X ^C | |
| Red-breasted Merganser, <i>Mergus serrator</i> | X ^C | |
| Gaviidae (loons) | | |
| Red-throated Loon, <i>Gavia stellata</i> | X | X |
| Common Loon, <i>Gavia immer</i> | X | X |
| Podicipedidae (grebes) | | |
| Red-necked Grebe, <i>Podiceps grisegena</i> | | X |
| Sulidae (gannets) | | |
| Northern Gannet, <i>Morus bassanus</i> | X | X |
| Accipitridae (eagles and hawks) | | |
| Bald Eagle, <i>Haliaeetus leucocephalus</i> | X ^C | |
| Haematopodidae , (oystercatchers) | | |
| American Oystercatcher, <i>Haematopus palliatus</i> | X ^C | |
| Scolopacidae (sandpipers) | | |
| Sanderling, <i>Calidris alba</i> | X ^C | |
| Laridae (gulls) | | |
| Black-legged Kittiwake, <i>Rissa tridactyla</i> | X ^o | |
| Bonaparte's Gull, <i>Chroicocephalus philadelphia</i> | X | |
| Ring-billed Gull, <i>Larus delawarensis</i> | X ^C | |
| Herring Gull, <i>Larus argentatus</i> | X | X |
| Great Black-backed Gull, <i>Larus marinus</i> | X | X |
| Alcidae (alcids) | | |
| Dovekie, <i>Alle alle</i> | X ^o | |
| Razorbill, <i>Alca torda</i> | X | X |

* All birds identified to species during shipboard surveys were included

¹ No coastal survey was performed in February

^o Species was recorded only on the offshore survey for that month

^C Species was recorded only on the coastal survey for that month

Table B-2.2. Avian species* observed during the spring (March through May) 2008 shipboard offshore and small boat coastal surveys.

| Family Common Name, <i>Scientific name</i> | March | April | May |
|--|----------------|----------------|----------------|
| Anatidae (geese, swans, and ducks) | | | |
| Snow Goose, <i>Chen caerulescens</i> | | X° | |
| Atlantic Brant, <i>Branta bernicla</i> | X ^C | X° | |
| Canada Goose, <i>Branta canadensis</i> | X | X° | |
| Mallard, <i>Anas platyrhynchos</i> | | | X ^C |
| American Black Duck, <i>Anas rubripes</i> | X° | X | |
| Northern Shoveler, <i>Anas clypeata</i> | X ^C | | |
| Northern Pintail, <i>Anas acuta</i> | X ^C | X° | |
| Green-winged Teal, <i>Anas crecca</i> | | X° | |
| Surf Scoter, <i>Melanitta perspicillata</i> | X | X | X ^C |
| White-winged Scoter, <i>Melanitta fusca</i> | X | X | |
| Black Scoter, <i>Melanitta nigra</i> | X | X | X° |
| Long-tailed Duck, <i>Clangula hyemalis</i> | X | X° | |
| Bufflehead, <i>Bucephala albeola</i> | | X° | |
| Common Goldeneye, <i>Bucephala clangula</i> | X ^C | | |
| Red-breasted Merganser, <i>Mergus serrator</i> | X° | X° | X° |
| Gaviidae (loons) | | | |
| Red-throated Loon, <i>Gavia stellata</i> | X | X | X |
| Common Loon, <i>Gavia immer</i> | X | X | X |
| Podicipedidae (grebes) | | | |
| Horned Grebe, <i>Podiceps auritus</i> | X | X° | |
| Red-necked Grebe, <i>Podiceps grisgena</i> | X° | | |
| Procellariidae (petrels and shearwaters) | | | |
| Manx Shearwater, <i>Puffinus puffinus</i> | | | X° |
| Sulidae (gannets) | | | |
| Northern Gannet, <i>Morus bassanus</i> | X | X | X |
| Phalacrocoracidae (cormorants) | | | |
| Double-crested Cormorant, <i>Phalacrocorax auritus</i> | | X | X |
| Great Cormorant, <i>Phalacrocorax carbo</i> | X ^C | X ^C | |
| Ardeidae (bitterns, egrets, and herons) | | | |
| Great Blue Heron, <i>Ardea herodias</i> | X° | X | X ^C |
| Yellow-crowned Night-heron, <i>Nyctanassa violacea</i> | | | X° |
| Cathartidae (vultures) | | | |
| Turkey Vulture, <i>Cathartus aura</i> | | | X° |
| Accipitridae (eagles and hawks) | | | |
| Osprey, <i>Pandion haliaetus</i> | | X | X |
| Northern Harrier, <i>Circus cyaneus</i> | | X ^C | X° |

Table B-2.2 (continued). Avian species* observed during the spring (March through May) 2008 shipboard offshore and small boat coastal surveys.

| Family Common Name, <i>Scientific name</i> | March | April | May |
|---|----------------|----------------|----------------|
| Falconidae (falcons) | | | |
| Merlin, <i>Falco columbarius</i> | | | X ^C |
| Haematopodidae (oystercatchers) | | | |
| American Oystercatcher, <i>Haematopus palliatus</i> | X | X ^C | |
| Scolopacidae (sandpipers) | | | |
| Ruddy Turnstone, <i>Arenaria interpres</i> | | | X ^C |
| Sanderling, <i>Calidris alba</i> | X ^C | X ^C | X ^C |
| Semipalmated Sandpiper, <i>Calidris pusilla</i> | | | X ^C |
| Least Sandpiper, <i>Calidris minutilla</i> | | | X ^o |
| White-rumped Sandpiper, <i>Calidris fuscicollis</i> | | | X ^o |
| Purple Sandpiper, <i>Calidris maritima</i> | X ^C | | |
| Dunlin, <i>Calidris alpina</i> | X | | |
| Red Phalarope, <i>Phalaropus fulicarius</i> | X ^o | | |
| Laridae (gulls and terns) | | | |
| Bonaparte's Gull, <i>Larus philadelphia</i> | X ^o | X | |
| Little Gull, <i>Larus minutus</i> | | X ^o | |
| Laughing Gull, <i>Larus atricilla</i> | X | X | X |
| Ring-billed Gull, <i>Larus delawarensis</i> | X | X | |
| Herring Gull, <i>Larus argentatus</i> | X | X | X |
| Lesser Black-backed Gull, <i>Larus fuscus</i> | X ^o | X ^o | X ^o |
| Great Black-backed Gull, <i>Larus marinus</i> | X | X | X |
| Least Tern, <i>Sterna antillarum</i> | | | X |
| Caspian Tern, <i>Hydroprogne caspia</i> | | | X ^o |
| Common Tern, <i>Sterna hirundo</i> | | X ^o | X |
| Forster's Tern, <i>Sterna forsteri</i> | | X | X |
| Royal Tern, <i>Thalasseus maxima</i> | | X ^o | X |
| Alcidae (alcids) | | | |
| Dovekie, <i>Alle alle</i> | | X ^o | |
| Thick-billed Murre, <i>Uria lomvia</i> | X ^o | | |
| Razorbill, <i>Alca torda</i> | X | X ^o | |
| Black Guillemot, <i>Cephus grylle</i> | X ^o | | |
| Columbidae (pigeons and doves) | | | |
| Rock Pigeon, <i>Columba livia</i> | | X | X ^o |
| Mourning Dove, <i>Zenaidura macroura</i> | | X ^C | X |
| Picidae (woodpeckers) | | | |
| Northern Flicker, <i>Colaptes auratus</i> | | X ^o | |

Table B-2.2 (continued). Avian species* observed during the spring (March through May) 2008 shipboard offshore and small boat coastal surveys.

| Family Common Name, <i>Scientific name</i> | March | April | May |
|---|----------------|----------------|----------------|
| Corvidae (crows) | | | |
| American Crow, <i>Corvus brachyrhynchos</i> | X [°] | | |
| Fish Crow, <i>Corvus ossifragus</i> | | X ^C | X |
| Hirundinidae (swallows) | | | |
| Tree Swallow, <i>Tachycineta bicolor</i> | | | X ^C |
| Barn Swallow, <i>Hirundo rustica</i> | | | X |
| Certhidae (creepers) | | | |
| Brown Creeper, <i>Certhia americana</i> | X [°] | | |
| Turdidae (thrushes) | | | |
| American Robin, <i>Turdus migratorius</i> | | | X [°] |
| Sturnidae (starlings) | | | |
| European Starling, <i>Sturnus vulgaris</i> | | | X ^C |
| Parulidae (wood-warblers) | | | |
| Yellow-rumped Warbler, <i>Dendroica coronata</i> | | | X [°] |
| American Redstart, <i>Setophaga ruticilla</i> | | | X [°] |
| Emberizidae (sparrows) | | | |
| Eastern Towhee, <i>Pipilo erythrophthalmus</i> | | X ^C | |
| Vesper Sparrow, <i>Poocetes gramineus</i> | X [°] | | |
| Song Sparrow, <i>Melospiza melodia</i> | X [°] | X [°] | X [°] |
| White-throated Sparrow, <i>Zonotrichia albicollis</i> | | | X [°] |
| Dark-eyed Junco, <i>Junco hyemalis</i> | | X [°] | |
| Icteridae (blackbirds and meadowlarks) | | | |
| Red-winged Blackbird, <i>Agelaius phoeniceus</i> | X [°] | X | X ^C |
| Eastern Meadowlark, <i>Sturnella magna</i> | X [°] | | |
| Boat-tailed Grackle, <i>Quiscalus major</i> | | X ^C | X ^C |
| Fringillidae (finches) | | | |
| American Goldfinch, <i>Carduelis tristis</i> | | | X [°] |

* All birds identified to species during shipboard surveys were included

[°] Species was recorded only on the offshore survey for that month

^C Species was recorded only on the coastal survey for that month

Table B-2.3. Avian species* observed during the summer (June and July) 2008 shipboard offshore and small boat coastal surveys.

| Family Common Name, <i>Scientific name</i> | June | July |
|---|----------------|----------------|
| Anatidae (geese, swans, and ducks) | | |
| Gadwall, <i>Anas strepera</i> | X ^C | |
| Surf Scoter, <i>Melanitta perspicillata</i> | X | |
| Gaviidae (loons) | | |
| Common Loon, <i>Gavia immer</i> | X | X ^o |
| Procellariidae (petrels and shearwaters) | | |
| Cory's Shearwater, <i>Calonectris diomedea</i> | X ^o | X ^o |
| Greater Shearwater, <i>Puffinus gravis</i> | X ^o | |
| Sooty Shearwater, <i>Puffinus griseus</i> | X ^o | |
| Manx Shearwater, <i>Puffinus puffinus</i> | | X ^o |
| Hydrobatidae (storm-petrels) | | |
| Wilson's Storm-petrel, <i>Oceanites oceanicus</i> | X ^o | X ^o |
| Sulidae (gannets) | | |
| Northern Gannet, <i>Morus bassanus</i> | X | X |
| Pelecanidae (pelicans) | | |
| Brown Pelican, <i>Pelecanus erythrorhynchos</i> | X ^C | X |
| Phalacrocoracidae (cormorants) | | |
| Double-crested Cormorant, <i>Phalacrocorax auritus</i> | X | X ^o |
| Ardeidae (bitterns, egrets, and herons) | | |
| Great Egret, <i>Ardea alba</i> | X ^C | |
| Black-crowned Night-heron, <i>Nycticorax nycticorax</i> | | X ^o |
| Accipitridae (eagles and hawks) | | |
| Osprey, <i>Pandion haliaetus</i> | X ^C | X ^C |
| Scolopacidae (sandpipers) | | |
| Whimbrel, <i>Numenius borealis</i> | | X ^C |
| Marbled Godwit, <i>Limosa fedoa</i> | | X ^o |
| Sanderling, <i>Calidris alba</i> | | X ^C |
| Least Sandpiper, <i>Calidris minutilla</i> | | X ^o |
| Pectoral Sandpiper, <i>Calidris melanotos</i> | | X ^o |
| Laridae (gulls and terns) | | |
| Laughing Gull, <i>Leucophaeus atricilla</i> | X | X |
| Herring Gull, <i>Larus argentatus</i> | X | X |
| Great Black-backed Gull, <i>Larus marinus</i> | X | X |
| Common Tern, <i>Sterna hirundo</i> | X | X |
| Forster's Tern, <i>Sterna forsteri</i> | X | X |
| Royal Tern, <i>Thalasseus maximus</i> | X | X |
| Stercorariidae (skuas and jaegers) | | |
| Parasitic Jaeger, <i>Stercorarius parasiticus</i> | X ^o | |

Table B-2.3 (continued). Avian species* observed during the summer (June and July) 2008 shipboard offshore and small boat coastal surveys.

| Family Common Name, <i>Scientific name</i> | June | July |
|---|----------------|----------------|
| Columbidae (pigeons and doves) | | |
| Rock Pigeon, <i>Columba livia</i> | X ^o | X ^C |
| Hirundinidae (swallows) | | |
| Purple Martin, <i>Progne subis</i> | X | |
| Tree Swallow, <i>Tachycineta bicolor</i> | | X ^C |
| Bank Swallow, <i>Riparia riparia</i> | | X ^o |
| Barn Swallow, <i>Hirundo rustica</i> | X ^o | X ^C |
| Icteridae (blackbirds and meadowlarks) | | |
| Boat-tailed Grackle, <i>Quiscalus major</i> | X ^C | |

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

^o Species was recorded only on the offshore survey for that month.

^C Species was recorded only on the coastal survey for that month.

Table B-2.4. Avian species* observed during the fall (August through November) 2008 shipboard offshore and small boat coastal surveys.

| Family Common Name, <i>Scientific name</i> | August | September | October | November |
|--|----------------|----------------|----------------|----------------|
| Anatidae (geese, swans, and ducks) | | | | |
| Snow Goose, <i>Chen caerulescens</i> | | | | X ^C |
| Atlantic Brant, <i>Branta bernicla</i> | | | X | |
| Canada Goose, <i>Branta canadensis</i> | | X ^o | X ^C | X ^C |
| Tundra Swan, <i>Cygnus columbianus</i> | | | | X ^o |
| Wood Duck, <i>Aix sponsa</i> | | | X ^C | X |
| Gadwall, <i>Anas strepera</i> | | X ^o | X ^o | |
| American Black Duck, <i>Anas rubripes</i> | | | X | X |
| Mallard, <i>Anas platyrhynchos</i> | | | X ^C | X |
| Northern Pintail, <i>Anas acuta</i> | | | X | X ^o |
| Green-winged Teal, <i>Anas crecca</i> | | X | X ^o | X ^o |
| Greater Scaup, <i>Aythya marila</i> | | | X ^C | X |
| Lesser Scaup, <i>Aythya affinis</i> | | | | X ^C |
| Common Eider, <i>Somateria mollissima</i> | | | | X ^o |
| Surf Scoter, <i>Melanitta perspicillata</i> | | X ^C | X | X |
| White-winged Scoter, <i>Melanitta fusca</i> | | | X | X |
| Black Scoter, <i>Melanitta nigra</i> | | | X ^o | X |
| Long-tailed Duck, <i>Clangula hyemalis</i> | | | | X |
| Bufflehead, <i>Bucephala albeola</i> | | | X ^C | X ^C |
| Common Goldeneye, <i>Bucephala clangula</i> | | | | X ^o |
| Red-breasted Merganser, <i>Mergus serrator</i> | | | X ^C | X |
| Ruddy Duck, <i>Oxyura jamaicensis</i> | | | X ^C | |
| Gaviidae (loons) | | | | |
| Red-throated Loon, <i>Gavia stellata</i> | | | X | X |
| Common Loon, <i>Gavia immer</i> | | X ^o | X | X |
| Podicipedidae (grebes) | | | | |
| Pied-billed Grebe, <i>Podilymbus podiceps</i> | | | | X ^o |
| Procellariidae (petrels and shearwaters) | | | | |
| Cory's Shearwater, <i>Calonectris diomedea</i> | X ^o | X ^o | X ^o | X ^o |
| Greater Shearwater, <i>Puffinus gravis</i> | | | | X ^o |
| Audubon's Shearwater, <i>Puffinus lherminieri</i> | | X ^o | | |
| Hydrobatidae (storm-petrels) | | | | |
| Wilson's Storm-petrel, <i>Oceanites oceanicus</i> | X ^o | X ^o | | |
| Leach's Storm-petrel, <i>Oceanodroma leucorhoa</i> | X ^o | | | |
| Sulidae (gannets) | | | | |
| Northern Gannet, <i>Morus bassanus</i> | X | X | X | X |
| Pelecanidae (pelicans) | | | | |
| Brown Pelican, <i>Pelecanus erythrorhynchos</i> | X | X ^C | | |

Table B-2.4 (continued). Avian species* observed during the fall (August through November) 2008 shipboard offshore and small boat coastal surveys.

| Family Common Name, <i>Scientific name</i> | August | September | October | November |
|---|----------------|----------------|----------------|----------------|
| Phalacrocoracidae (cormorants) | | | | |
| Double-crested Cormorant, <i>Phalacrocorax auritus</i> | X ^C | X | X | X |
| Great Cormorant, <i>Phalacrocorax carbo</i> | | | X ^C | X ^o |
| Ardeidae (bitterns, egrets, and herons) | | | | |
| Great Blue Heron, <i>Ardea Herodias</i> | X ^o | X ^C | X | X ^o |
| Great Egret, <i>Ardea alba</i> | | | X ^C | |
| Yellow-crowned Night-heron, <i>Nycticorax violaceus</i> | X ^o | | | |
| Accipitridae (eagles and hawks) | | | | |
| Osprey, <i>Pandion haliaetus</i> | X | X ^C | X ^o | |
| Falconidae (falcons) | | | | |
| Merlin, <i>Falco columbarius</i> | | X ^o | | |
| Peregrine Falcon, <i>Falco peregrinus</i> | | | X ^o | |
| Rallidae (rails) | | | | |
| American Coot, <i>Fulica americana</i> | | | | X ^o |
| Charadriidae (plovers) | | | | |
| Semipalmated Plover, <i>Charadrius semipalmatus</i> | X ^C | | X ^C | |
| Haematopodidae (oystercatchers) | | | | |
| American Oystercatcher, <i>Haematopus palliatus</i> | | | X ^C | |
| Scolopacidae (sandpipers) | | | | |
| Sanderling, <i>Calidris alba</i> | X | X ^C | X ^C | X ^C |
| Least Sandpiper, <i>Calidris minutilla</i> | X | | | |
| Semipalmated Sandpiper, <i>Calidris pusilla</i> | X | | | |
| Pectoral Sandpiper, <i>Calidris melanotos</i> | | | X ^o | |
| Dunlin, <i>Calidris alpina</i> | | X ^C | X | |
| Red-necked Phalarope, <i>Phalaropus lobatus</i> | | X ^o | | |
| Red Phalarope, <i>Phalaropus fulicarius</i> | | X ^o | | |
| American Woodcock, <i>Scolopax minor</i> | | | | X ^o |
| Laridae (gulls and terns) | | | | |
| Sabine's Gull, <i>Xema sabini</i> | | X ^o | | |
| Bonaparte's Gull, <i>Chroicocephalus philadelphia</i> | | | X ^C | X |
| Little Gull, <i>Hydrocoloeus minutes</i> | | | | X ^o |
| Laughing Gull, <i>Leucophaeus atricilla</i> | X | X | X | X |
| Ring-billed Gull, <i>Larus delawarensis</i> | X ^C | X ^C | X | X |
| Herring Gull, <i>Larus argentatus</i> | X | X | X | X |
| Iceland Gull, <i>Larus glaucoideus</i> | | | X ^o | |
| Lesser Black-backed Gull, <i>Larus fuscus</i> | | | X ^o | X |
| Great Black-backed Gull, <i>Larus marinus</i> | X | X | X | X |
| Caspian Tern, <i>Hydroprogne caspia</i> | | X | X ^o | |

Table B-2.4 (continued). Avian species* observed during the fall (August through November) 2008 shipboard offshore and small boat coastal surveys.

| Family Common Name, <i>Scientific name</i> | August | September | October | November |
|---|----------------|-----------|---------|----------|
| Laridae (gulls and terns) | | | | |
| Black Tern, <i>Chlidonias niger</i> | | X° | | |
| Common Tern, <i>Sterna hirundo</i> | X | X | X° | |
| Forster's Tern, <i>Sterna forsteri</i> | X | X | X | X |
| Royal Tern, <i>Thalasseus maximus</i> | X | X | X | X° |
| Sandwich Tern, <i>Thalasseus sandvicensis</i> | X ^C | | | |
| Stercorariidae (skuas and jaegers) | | | | |
| Parasitic Jaeger, <i>Stercorarius parasiticus</i> | | X° | X° | X° |
| Columbidae (pigeons and doves) | | | | |
| Mourning Dove, <i>Zenaida macroura</i> | | | X° | |
| Apodidae (swifts) | | | | |
| Chimney Swift, <i>Chaetura pelagica</i> | X ^C | | | |
| Picidae (woodpeckers) | | | | |
| Northern Flicker, <i>Colaptes auratus</i> | | X | X° | |
| Hirundinidae (swallows) | | | | |
| Purple Martin, <i>Progne subis</i> | X | | | |
| Tree Swallow, <i>Tachycineta bicolor</i> | X | | | |
| Bank Swallow, <i>Riparia riparia</i> | X ^C | | | |
| Barn Swallow, <i>Hirundo rustica</i> | X | | | |
| Troglodytidae (wrens) | | | | |
| Marsh Wren, <i>Cistothorus palustris</i> | | X° | | |
| Regulidae (kinglets) | | | | |
| Golden-crowned Kinglet, <i>Regulus satrapa</i> | | | X° | |
| Sturnidae (starlings) | | | | |
| European Starling, <i>Sturnus vulgaris</i> | | | | X° |
| Parulidae (wood-warblers) | | | | |
| Northern Parula, <i>Parula americana</i> | | | | X° |
| Black-throated Green Warbler, <i>Dendroica virens</i> | | | X° | |
| Yellow-rumped Warbler, <i>Dendroica coronata</i> | | | X° | X° |
| Palm Warbler, <i>Dendroica palmarum</i> | | X° | X° | |
| Prothonotary Warbler, <i>Protonotaria citrea</i> | X° | | | |
| Mourning Warbler, <i>Oporornis philadelphia</i> | | X° | | |
| Common Yellowthroat, <i>Geothlypis trichas</i> | | X° | | |
| Emberizidae (sparrows) | | | | |
| Song Sparrow, <i>Melospiza melodia</i> | | | X° | |
| Swamp Sparrow, <i>Melospiza Georgiana</i> | | | X° | |
| White-throated Sparrow, <i>Zonotrichia albicollis</i> | | | X° | |
| Dark-eyed Junco, <i>Junco hyemalis</i> | | | X° | |

Table B-2.4 (continued). Avian species* observed during the fall (August through November) 2008 shipboard offshore and small boat coastal surveys.

| Family Common Name, <i>Scientific name</i> | August | September | October | November |
|---|----------------|-----------|---------|----------------|
| Icteridae (blackbirds and meadowlarks) | | | | |
| Red-winged Blackbird, <i>Agelaius assimilis</i> | X ^o | | | X ^o |
| Eastern Meadowlark, <i>Sturnella magna</i> | | | | X ^o |
| Brown-headed Cowbird, <i>Molothrus ater</i> | | | | X ^o |
| Fringillidae (finches) | | | | |
| House Finch, <i>Carpodacus mexicanus</i> | X ^o | | | |
| Pine Siskin, <i>Carduelis pinus</i> | | | | X ^o |
| American Goldfinch, <i>Carduelis tristis</i> | | | | X ^o |

* All birds identified to species during shipboard surveys were included

^o Species was recorded only on the offshore survey for that month

^c Species was recorded only on the coastal survey for that month

Table B-2.5. January 2008 shipboard offshore and small boat coastal surveys.

| Family Common Name | Shipboard Offshore | | | Small Boat Coastal | | |
|---|----------------------|-------------------|-------------------------|----------------------|-------------------|-------------------------|
| | In-Zone ¹ | | Incidental ² | In-Zone ¹ | | Incidental ² |
| | No. | Abun ³ | No. | No. | Abun ³ | No. |
| Anatidae (geese, swans, and ducks) | 170 | 0.35 | 60 | 2,507 | 22.24 | 138 |
| Atlantic Brant | 9 | 0.02 | | | | |
| Scaup (unknown), <i>Aythya</i> (unknown) | | | | 750 | 6.65 | |
| Surf Scoter | 5 | 0.01 | 1 | 52 | 0.46 | |
| White-winged Scoter | 43 | 0.09 | | 22 | 0.20 | |
| Black Scoter | 63 | 0.13 | 56 | 1,245 | 11.04 | 5 |
| Scoter (unknown) | 3 | 0.01 | | | | |
| Scoter, dark-winged (unknown) | 7 | 0.01 | | | | |
| Long-tailed Duck | 40 | 0.08 | 3 | 427 | 3.79 | 133 |
| Bufflehead | | | | 4 | 0.04 | |
| Common Goldeneye | | | | 6 | 0.05 | |
| Red-breasted Merganser | | | | 1 | 0.01 | |
| Gaviidae (loons) | 202 | 0.41 | 27 | 151 | 1.34 | 28 |
| Red-throated Loon | 118 | 0.24 | 17 | 100 | 0.89 | 8 |
| Common Loon | 83 | 0.17 | 10 | 51 | 0.45 | 20 |
| Loon (unknown) | 1 | 0.00 | | | | |
| Sulidae (gannets) | 776 | 1.55 | 111 | 11 | 0.10 | |
| Northern Gannet | 776 | 1.55 | 111 | 11 | 0.10 | |
| Accipitridae (eagles and hawks) | | | | | | 1 |
| Bald Eagle | | | | | | 1 |
| Haematopodidae (oystercatchers) | | | | 10 | 0.09 | 53 |
| American Oystercatcher | | | | 10 | 0.09 | 53 |
| Scolopacidae (sandpipers) | | | | 219 | 1.95 | |
| Sanderling | | | | 206 | 1.83 | |
| Shorebird, small (unknown) | | | | 13 | 0.12 | |
| Laridae (gulls and terns) | 132 | 0.26 | 33 | 1,275 | 11.31 | 502 |
| Black-legged Kittiwake | 4 | 0.01 | 1 | | | |
| Bonaparte's Gull | 7 | 0.01 | | 22 | 0.20 | 44 |
| Ring-billed Gull | | | | 400 | 3.55 | 170 |
| Herring Gull | 71 | 0.14 | 18 | 782 | 6.93 | 287 |
| Great Black-backed Gull | 39 | 0.08 | 14 | 71 | 0.63 | 1 |
| Gull, large (unknown) | 11 | 0.02 | | | | |
| Alcidae (alcids) | 70 | 0.14 | 8 | 15 | 0.13 | |
| Dovekie | 16 | 0.03 | 6 | | | |
| Razorbill | 36 | 0.07 | 1 | 15 | 0.13 | |
| Alcid (unknown) | 18 | 0.04 | 1 | | | |
| Total | 1,350 | 2.71 | 239 | 4,188 | 37.16 | 722 |

¹ includes avian observations within the 300-m x 300-m survey strip transect when the ship was traveling ≥7 kts² includes avian observations within the out-zone and when the ship was traveling <7 kts (e.g., in-zone stationary water sampling stations, marine mammal chases)³ No./km

Table B-2.6. February 2008 shipboard offshore surveys.

| Family Common Name | Shipboard Offshore | |
|---|----------------------|-------------------------|
| | In-Zone ¹ | Incidental ² |
| | No. | No. |
| Anatidae (geese, swans, and ducks) | 120 | 192 |
| Surf Scoter | 3 | 15 |
| White-winged Scoter | 9 | 11 |
| Black Scoter | 32 | 155 |
| Scoter, dark-winged (unknown) | | 2 |
| Long-tailed Duck | 76 | 6 |
| Duck (unknown) | | 3 |
| Gaviidae (loons) | 44 | 69 |
| Red-throated Loon | 3 | 13 |
| Common Loon | 41 | 56 |
| Podicipedidae (grebes) | | 1 |
| Red-necked Grebe | | 1 |
| Sulidae (gannets) | 29 | 20 |
| Northern Gannet | 29 | 20 |
| Laridae (gulls and terns) | 50 | 48 |
| Herring Gull | 30 | 31 |
| Great Black-backed Gull | 14 | 11 |
| Gull, large (unknown) | 6 | 6 |
| Alcidae (alcids) | 8 | 5 |
| Razorbill | 6 | 5 |
| Alcid (unknown) | 2 | |
| Total | 251 | 335 |

¹ includes avian observations within the 300-m x 300-m survey strip transect when the ship was traveling ≥ 7 kts

² includes avian observations within the out-zone and when the ship was traveling < 7 kts (e.g., in-zone stationary water sampling stations, marine mammal chases)

Table B-2.7. March 2008 shipboard offshore and small boat coastal surveys.

| Family Common Name | Shipboard Offshore | | | Small Boat Coastal | | |
|--|----------------------|-------------------|-------------------------|----------------------|-------------------|-------------------------|
| | In-Zone ¹ | | Incidental ² | In-Zone ¹ | | Incidental ² |
| | No. | Abun ³ | No. | No. | Abun ³ | No. |
| Anatidae (geese, swans, and ducks) | 807 | 0.97 | 2,165 | 1,166 | 9.11 | 1,064 |
| Canada Goose | 4 | 0.00 | | | | 1 |
| Goose, dark (unknown) | | | 27 | | | |
| American Black Duck | 1 | 0.00 | 6 | | | |
| Northern Shoveler | | | | | | 7 |
| Northern Pintail | | | | | | 1 |
| Surf Scoter | 126 | 0.15 | 409 | 1,014 | 7.92 | 632 |
| White-winged Scoter | 54 | 0.07 | 16 | | | 47 |
| Black Scoter | 142 | 0.17 | 88 | 33 | 0.26 | 115 |
| Scoter (unknown) | 65 | 0.08 | 124 | | | 7 |
| Scoter, dark-winged (unknown) | 109 | 0.13 | 1,305 | 6 | 0.05 | 102 |
| Long-tailed Duck | 306 | 0.37 | 183 | 113 | 0.88 | 150 |
| Common Goldeneye | | | | | | 2 |
| Red-breasted Merganser | | | 7 | | | |
| Gaviidae (loons) | 286 | 0.35 | 629 | 72 | 0.56 | 81 |
| Red-throated Loon | 180 | 0.22 | 530 | 46 | 0.36 | 35 |
| Common Loon | 105 | 0.13 | 99 | 26 | 0.20 | 45 |
| Loon (unknown) | 1 | 0.00 | | | | 1 |
| Podicipedidae (grebes) | 2 | 0.00 | 2 | 8 | 0.06 | |
| Horned Grebe | | | 2 | 8 | 0.06 | |
| Red-necked Grebe | 2 | 0.00 | | | | |
| Sulidae (gannets) | 1,497 | 1.81 | 2,239 | 256 | 2.00 | 982 |
| Northern Gannet | 1,497 | 1.81 | 2,239 | 256 | 2.00 | 982 |
| Phalacrocoracidae (cormorants) | | | | 1 | 0.01 | 1 |
| Great Cormorant | | | | 1 | 0.01 | |
| Cormorant (unknown) | | | | | | 1 |
| Ardeidae (bitterns, egrets, and herons) | | | 5 | | | |
| Great Blue Heron | | | 5 | | | |
| Haematopodidae (oystercatchers) | | | 2 | | | 2 |
| American Oystercatcher | | | 2 | | | 2 |
| Scolopacidae (sandpipers) | 1 | 0.00 | 350 | 35 | 0.27 | 571 |
| Sanderling | | | | 35 | 0.27 | 414 |
| Purple Sandpiper | | | | | | 12 |
| Dunlin | | | 350 | | | 120 |
| Red Phalarope | 1 | 0.00 | | | | |
| Shorebird, small (unknown) | | | | | | 25 |
| Laridae (gulls and terns) | 541 | 0.65 | 692 | 1,106 | 8.64 | 2,806 |
| Bonaparte's Gull | 9 | 0.01 | 5 | | | |
| Laughing Gull | 7 | 0.01 | 5 | 19 | 0.15 | 5 |
| Ring-billed Gull | 1 | 0.00 | 3 | 14 | 0.11 | 6 |
| Herring Gull | 466 | 0.56 | 484 | 947 | 7.40 | 1,746 |
| Lesser Black-backed Gull | | | | 1 | 0.01 | |

Table B-2.7 (*continued*). March 2008 shipboard offshore and small boat coastal surveys.

| Family Common Name | Shipboard Offshore | | | Small Boat Coastal | | |
|---|----------------------|-------------------|-------------------------|----------------------|-------------------|-------------------------|
| | In-Zone ¹ | | Incidental ² | In-Zone ¹ | | Incidental ² |
| | No. | Abun ³ | No. | No. | Abun ³ | No. |
| Laridae (gulls and terns) | 541 | 0.65 | 692 | 1,106 | 8.64 | 2,806 |
| Great Black-backed Gull | 52 | 0.06 | 58 | 117 | 0.91 | 368 |
| Gull, large (unknown) | 6 | 0.01 | 137 | 8 | 0.06 | 681 |
| Alcidae (alcids) | 23 | 0.02 | 10 | | | 1 |
| Thick-billed Murre | 1 | 0.00 | | | | |
| Razorbill | 20 | 0.02 | 9 | | | 1 |
| Black Guillemot | 1 | 0.00 | | | | |
| Alcid (unknown) | 1 | 0.00 | 1 | | | |
| Corvidae (crows) | | | 2 | | | |
| American Crow | | | 2 | | | |
| Certhiidae (creepers) | 1 | 0.00 | | | | |
| Brown Creeper | 1 | 0.00 | | | | |
| Emberizidae (sparrows) | 6 | 0.01 | | | | |
| Vesper Sparrow | 1 | 0.00 | | | | |
| Song Sparrow | 5 | 0.01 | | | | |
| Icteridae (blackbirds and meadowlarks) | 2 | 0.00 | | | | |
| Red-winged Blackbird | 1 | 0.00 | | | | |
| Eastern Meadowlark | 1 | 0.00 | | | | |
| Total | 3,166 | 3.81 | 6,096 | 2,644 | 20.65 | 5,508 |

¹ includes avian observations within the 300-m x 300-m survey strip transect when the ship was traveling ≥ 7 kts

² includes avian observations within the out-zone and when the ship was traveling < 7 kts (e.g., in-zone stationary water sampling stations, marine mammal chases)

³ No./km

Table B-2.8. April 2008 shipboard offshore and small boat coastal surveys.

| Family Common Name | Shipboard Offshore | | | Small Boat Coastal | | |
|--|----------------------|-------------------|-------------------------|----------------------|-------------------|-------------------------|
| | In-Zone ¹ | | Incidental ² | In-Zone ¹ | | Incidental ² |
| | No. | Abun ³ | No. | No. | Abun ³ | No. |
| Anatidae (geese, swans, and ducks) | 1,906 | 2.65 | 4,429 | 395 | 3.65 | 793 |
| Snow Goose | | | 10 | | | |
| Atlantic Brant | | | 54 | | | |
| Canada Goose | | | 4 | | | |
| American Black Duck | 18 | 0.02 | 78 | | | 6 |
| Northern Pintail | | | 25 | | | |
| Green-winged Teal | 1 | 0.00 | | | | |
| Duck, dabbling (unknown) | 4 | 0.01 | 30 | | | |
| Scaup (unknown), <i>Aythya</i> (unknown) | 4 | 0.01 | | | | |
| Surf Scoter | 1,297 | 1.80 | 1,111 | 301 | 2.78 | 339 |
| White-winged Scoter | 4 | 0.01 | 4 | 35 | 0.32 | 3 |
| Black Scoter | 335 | 0.46 | 149 | 58 | 0.54 | 25 |
| Scoter (unknown) | 33 | 0.05 | 1,392 | | | 182 |
| Scoter, dark-winged (unknown) | 204 | 0.28 | 1,446 | 1 | 0.01 | 234 |
| Long-tailed Duck | 1 | 0.00 | 2 | | | |
| Bufflehead | | | 2 | | | |
| Red-breasted Merganser | 5 | 0.01 | 14 | | | |
| Duck, diving (unknown) | | | 6 | | | 1 |
| Duck (unknown) | | | 102 | | | 3 |
| Gaviidae (loons) | 285 | 0.40 | 570 | 54 | 0.50 | 45 |
| Red-throated Loon | 156 | 0.22 | 408 | 25 | 0.23 | 11 |
| Common Loon | 128 | 0.18 | 143 | 29 | 0.27 | 34 |
| Loon (unknown) | 1 | 0.00 | 19 | | | |
| Podicipedidae (grebes) | 1 | 0.00 | 1 | | | |
| Horned Grebe | 1 | 0.00 | 1 | | | |
| Sulidae (gannets) | 809 | 1.12 | 1,984 | 176 | 1.63 | 302 |
| Northern Gannet | 809 | 1.12 | 1,984 | 176 | 1.63 | 302 |
| Phalacrocoracidae (cormorants) | | | 296 | 29 | 0.27 | 1,525 |
| Double-crested Cormorant | | | 296 | 28 | 0.26 | 1,522 |
| Great Cormorant | | | | | | 3 |
| Cormorant (unknown) | | | | 1 | 0.01 | |
| Ardeidae (bitterns, egrets, and herons) | | | 18 | | | 1 |
| Great Blue Heron | | | 18 | | | 1 |
| Accipitridae (eagles and hawks) | | | 4 | | | 11 |
| Osprey | | | 4 | | | 9 |
| Northern Harrier | | | | | | 2 |
| Haematopodidae (oystercatchers) | | | | | | 1 |
| American Oystercatcher | | | | | | 1 |
| Scolopacidae (sandpipers) | | | | 35 | 0.32 | |
| Sanderling | | | | 35 | 0.32 | |

Table B-2.8 (*continued*). April 2008 shipboard offshore and small boat coastal surveys.

| Family Common Name | Shipboard Offshore | | Small Boat Coastal | | | |
|---|----------------------|-------------------|-------------------------|------------|-------------------------|--------------|
| | In-Zone ¹ | | Incidental ² | | Incidental ² | |
| | No. | Abun ³ | No. | No. | Abun ³ | No. |
| Laridae (gulls and terns) | 416 | 0.57 | 869 | 176 | 1.63 | 413 |
| Bonaparte's Gull | 150 | 0.21 | 241 | 5 | 0.05 | |
| Little Gull | 1 | 0.00 | | | | |
| Laughing Gull | 24 | 0.03 | 50 | 14 | 0.13 | 24 |
| Ring-billed Gull | 4 | 0.01 | 1 | 6 | 0.06 | 3 |
| Herring Gull | 160 | 0.22 | 226 | 92 | 0.85 | 196 |
| Lesser Black-backed Gull | 1 | 0.00 | | | | |
| Great Black-backed Gull | 55 | 0.08 | 46 | 47 | 0.43 | 72 |
| Gull, large (unknown) | 3 | 0.00 | 176 | 1 | 0.01 | 104 |
| Gull, small (unknown) | | | | | | 6 |
| Gull, small/tern | | | 33 | | | |
| Common Tern | 2 | 0.00 | | | | |
| Forster's Tern | 13 | 0.02 | 95 | 11 | 0.10 | 8 |
| Royal Tern | | | 1 | | | |
| Tern, small (unknown) | 3 | 0.00 | | | | |
| Alcidae (alcids) | 6 | 0.01 | | | | |
| Dovekie | 2 | 0.00 | | | | |
| Razorbill | 4 | 0.01 | | | | |
| Columbidae (pigeons and doves) | | | 8 | | | 8 |
| Rock Pigeon | | | 8 | | | 3 |
| Mourning Dove | | | | | | 5 |
| Picidae (woodpeckers) | 2 | 0.00 | 1 | | | |
| Northern (Yellow-shafted) Flicker | 2 | 0.00 | 1 | | | |
| Corvidae (crows) | | | | 1 | 0.01 | 33 |
| Fish Crow | | | | 1 | 0.01 | 33 |
| Emberizidae (sparrows) | 2 | 0.00 | | | | 1 |
| Eastern Towhee | | | | | | 1 |
| Song Sparrow | 1 | 0.00 | | | | |
| Dark-eyed Junco (Slate-colored) | 1 | 0.00 | | | | |
| Icteridae (blackbirds and meadowlarks) | 1 | 0.00 | 2 | | | 12 |
| Red-winged Blackbird | 1 | 0.00 | 2 | | | 7 |
| Boat-tailed Grackle | | | | | | 5 |
| Other | | | | | | 1 |
| Passerine (unknown) | | | | | | 1 |
| Total | 3,428 | 4.75 | 8,182 | 866 | 8.01 | 3,146 |

¹ includes avian observations within the 300-m x 300-m survey strip transect when the ship was traveling ≥7 kts² includes avian observations within the out-zone and when the ship was traveling <7 kts (e.g., in-zone stationary water sampling stations, marine mammal chases)³ No./km

Table B-2.9. May 2008 shipboard offshore and small boat coastal surveys.

| Family Common Name | Shipboard Offshore | | Small Boat Coastal | | | |
|---|----------------------|-------------------|-------------------------|------------|-------------------------|--------------|
| | In-Zone ¹ | | Incidental ² | | Incidental ² | |
| | No. | Abun ³ | No. | No. | Abun ³ | No. |
| Anatidae (geese, swans, and ducks) | 143 | 0.25 | | | | 4 |
| Mallard | | | | | | 3 |
| Surf Scoter | | | | | | 1 |
| Black Scoter | 141 | 0.25 | | | | |
| Red-breasted Merganser | 2 | 0.00 | | | | |
| Gaviidae (loons) | 185 | 0.33 | 107 | 2 | 0.02 | 2 |
| Red-throated Loon | 24 | 0.04 | 16 | 1 | 0.01 | 1 |
| Common Loon | 161 | 0.29 | 91 | 1 | 0.01 | 1 |
| Procellariidae (petrels and shearwaters) | 2 | 0.00 | | | | |
| Manx Shearwater | 2 | 0.00 | | | | |
| Sulidae (gannets) | 531 | 0.96 | 296 | 11 | 0.10 | 20 |
| Northern Gannet | 531 | 0.96 | 296 | 11 | 0.10 | 20 |
| Phalacrocoracidae (cormorants) | 113 | 0.20 | 367 | 37 | 0.32 | 200 |
| Double-crested Cormorant | 113 | 0.20 | 367 | 37 | 0.32 | 200 |
| Ardeidae (bitterns, egrets, and herons) | 1 | 0.00 | | | | 1 |
| Great Blue Heron | | | | | | 1 |
| Yellow-crowned Night-heron | 1 | 0.00 | | | | |
| Cathartidae (vultures) | | | 1 | | | |
| Turkey Vulture | | | 1 | | | |
| Accipitridae (eagles and hawks) | 1 | 0.00 | 2 | | | 25 |
| Osprey | | | 2 | | | 25 |
| Northern Harrier | 1 | 0.00 | | | | |
| Falconidae (falcons) | | | | | | 1 |
| Merlin | | | | | | 1 |
| Scolopacidae (sandpipers) | 12 | 0.02 | | 7 | 0.06 | 79 |
| Ruddy Turnstone | | | | | | 14 |
| Sanderling | | | | 6 | 0.05 | 25 |
| Semipalmated Sandpiper | | | | 1 | 0.01 | |
| Least Sandpiper | 6 | 0.01 | | | | |
| White-rumped Sandpiper | 1 | 0.00 | | | | |
| Shorebird, small (unknown) | 5 | 0.01 | | | | 40 |
| Laridae (gulls and terns) | 665 | 1.19 | 211 | 174 | 1.53 | 1,114 |
| Laughing Gull | 123 | 0.22 | 29 | 54 | 0.47 | 506 |
| Herring Gull | 197 | 0.36 | 60 | 19 | 0.17 | 292 |
| Lesser Black-backed Gull | 1 | 0.00 | | | | |
| Great Black-backed Gull | 96 | 0.17 | 28 | 34 | 0.30 | 183 |
| Gull, large (unknown) | | | 30 | | | 43 |
| Least Tern | 1 | 0.00 | | 1 | 0.01 | |

Table B-2.9 (*continued*). May 2008 shipboard offshore and small boat coastal surveys.

| Family Common Name | Shipboard Offshore | | Small Boat Coastal | | | |
|---|----------------------|-------------------|-------------------------|------------|----------------------|--------------|
| | In-Zone ¹ | | Incidental ² | | In-Zone ¹ | |
| | No. | Abun ³ | No. | No. | Abun ³ | No. |
| Laridae (gulls and terns) | 665 | 1.19 | 211 | 174 | 1.53 | 1,114 |
| Caspian Tern | 1 | 0.00 | | | | |
| Common Tern | 151 | 0.27 | 33 | 43 | 0.38 | 33 |
| Forster's Tern | 48 | 0.09 | 8 | 22 | 0.19 | 37 |
| Royal Tern | 6 | 0.01 | | 1 | 0.01 | 1 |
| Tern, small (unknown) | 41 | 0.07 | 23 | | | 19 |
| Columbidae (pigeons and doves) | 1 | 0.00 | 1 | | | 2 |
| Rock Pigeon | | | 1 | | | |
| Mourning Dove | 1 | 0.00 | | | | 2 |
| Corvidae (crows) | | | 1 | | | 62 |
| Fish Crow | | | 1 | | | 62 |
| Hirundinidae (swallows) | 10 | 0.02 | | 9 | 0.08 | 1 |
| Tree Swallow | | | | | | 1 |
| Barn Swallow | 10 | 0.02 | | 9 | 0.08 | |
| Turdidae (thrushes) | | | 1 | | | |
| American Robin | | | 1 | | | |
| Sturnidae (starlings) | | | | | | 25 |
| European Starling | | | | | | 25 |
| Parulidae (wood-warblers) | 2 | 0.00 | 2 | | | |
| Yellow-rumped (Myrtle) Warbler | 2 | 0.00 | | | | |
| American Redstart | | | 1 | | | |
| Warbler (unknown) | | | 1 | | | |
| Emberizidae (sparrows) | 2 | 0.00 | | | | |
| Song Sparrow | 1 | 0.00 | | | | |
| White-throated Sparrow | 1 | 0.00 | | | | |
| Icteridae (blackbirds and meadowlarks) | | | | 6 | 0.05 | 3 |
| Red-winged Blackbird | | | | 6 | 0.05 | 2 |
| Boat-tailed Grackle | | | | | | 1 |
| Fringillidae (finches) | | | 1 | | | |
| American Goldfinch | | | 1 | | | |
| Other | 1 | 0.00 | | | | |
| Passerine (unknown) | 1 | 0.00 | | | | |
| Total | 1,669 | 2.97 | 990 | 246 | 2.16 | 1,539 |

¹ includes avian observations within the 300-m x 300-m survey strip transect when the ship was traveling ≥7 kts² includes avian observations within the out-zone and when the ship was traveling <7 kts (e.g., in-zone stationary water sampling stations, marine mammal chases)³ No./km

Table B-2.10. June 2008 shipboard offshore and small boat coastal surveys.

| Family Common Name | Shipboard Offshore | | Small Boat Coastal | | | |
|---|----------------------|-------------------|-------------------------|------------|-------------------------|------------|
| | In-Zone ¹ | | Incidental ² | | Incidental ² | |
| | No. | Abun ³ | No. | No. | Abun ³ | No. |
| Anatidae (geese, swans, and ducks) | 1 | 0.00 | | 13 | 0.13 | |
| Gadwall | | | | 2 | 0.02 | |
| Surf Scoter | 1 | 0.00 | | 11 | 0.11 | |
| Gaviidae (loons) | 2 | 0.00 | 1 | 1 | 0.01 | |
| Common Loon | 2 | 0.00 | 1 | 1 | 0.01 | |
| Procellariidae (petrels and shearwaters) | 62 | 0.07 | 16 | | | |
| Cory's Shearwater | 57 | 0.07 | 15 | | | |
| Greater Shearwater | 1 | 0.00 | | | | |
| Sooty Shearwater | 4 | 0.00 | 1 | | | |
| Hydrobatidae (storm-petrels) | 339 | 0.41 | 63 | | | |
| Wilson's Storm-petrel | 338 | 0.41 | 62 | | | |
| Storm-petrel (unknown) | 1 | 0.00 | 1 | | | |
| Sulidae (gannets) | 132 | 0.16 | 113 | 14 | 0.14 | 11 |
| Northern Gannet | 132 | 0.16 | 113 | 14 | 0.14 | 11 |
| Pelecanidae (pelicans) | | | | 1 | 0.01 | 2 |
| Brown Pelican | | | | 1 | 0.01 | 2 |
| Phalacrocoracidae (cormorants) | | | 1 | 7 | 0.07 | 6 |
| Double-crested Cormorant | | | 1 | 7 | 0.07 | 6 |
| Ardeidae (bitterns, egrets, and herons) | | | | | | 1 |
| Great Egret | | | | | | 1 |
| Accipitridae (eagles and hawks) | | | | 1 | 0.01 | 20 |
| Osprey | | | | 1 | 0.01 | 20 |
| Laridae (gulls and terns) | 408 | 0.49 | 222 | 336 | 3.30 | 183 |
| Laughing Gull | 174 | 0.21 | 54 | 197 | 1.94 | 106 |
| Herring Gull | 21 | 0.03 | 20 | 13 | 0.13 | 7 |
| Great Black-backed Gull | 27 | 0.03 | 24 | 44 | 0.43 | 32 |
| Gull, large (unknown) | | | 10 | | | 23 |
| Common Tern | 182 | 0.22 | 106 | 41 | 0.40 | 10 |
| Forster's Tern | 2 | 0.00 | | 32 | 0.31 | |
| Royal Tern | 1 | 0.00 | 1 | 3 | 0.03 | 3 |
| Tern, small (unknown) | 1 | 0.00 | 7 | 6 | 0.06 | 2 |
| Stercorariidae (skuas and jaegers) | | | 3 | | | |
| Parasitic Jaeger | | | 3 | | | |
| Columbidae (pigeons and doves) | | | 1 | | | |
| Rock Pigeon | | | 1 | | | |
| Hirundinidae (swallows) | 3 | 0.00 | | 1 | 0.01 | |
| Purple Martin | 2 | 0.00 | | 1 | 0.01 | |
| Barn Swallow | 1 | 0.00 | | | | |

Table B-2.10 (*continued*). June 2008 shipboard offshore and small boat coastal surveys.

| Family Common Name | Shipboard Offshore | | Small Boat Coastal | | |
|---|----------------------|-------------------|----------------------|-------------------|-------------------------|
| | In-Zone ¹ | | In-Zone ¹ | | Incidental ² |
| | No. | Abun ³ | No. | Abun ³ | No. |
| Icteridae (blackbirds and meadowlarks) | | | 1 | 0.01 | |
| Boat-tailed Grackle | | | 1 | 0.01 | |
| Total | 947 | 1.13 | 420 | 375 | 223 |

¹ includes avian observations within the 300-m x 300-m survey strip transect when the ship was traveling ≥ 7 kts

² includes avian observations within the out-zone and when the ship was traveling < 7 kts (e.g., in-zone stationary water sampling stations, marine mammal chases)

³ No./km

Table B-2.11. July 2008 shipboard offshore and small boat coastal surveys.

| Family Common Name | Shipboard Offshore | | | Small Boat Coastal | | |
|---|----------------------|-------------------|-------------------------|----------------------|-------------------|-------------------------|
| | In-Zone ¹ | | Incidental ² | In-Zone ¹ | | Incidental ² |
| | No. | Abun ³ | No. | No. | Abun ³ | No. |
| Gaviidae (loons) | 7 | 0.01 | 1 | | | |
| Common Loon | 7 | 0.01 | 1 | | | |
| Procellariidae (petrels and shearwaters) | 43 | 0.06 | 75 | | | |
| Cory's Shearwater | 42 | 0.06 | 75 | | | |
| Manx Shearwater | 1 | 0.00 | | | | |
| Hydrobatidae (storm-petrels) | 364 | 0.53 | 83 | | | |
| Wilson's Storm-petrel | 364 | 0.53 | 82 | | | |
| Storm-petrel (unknown) | | | 1 | | | |
| Sulidae (gannets) | 24 | 0.03 | 17 | 1 | 0.01 | |
| Northern Gannet | 24 | 0.03 | 17 | 1 | 0.01 | |
| Pelecanidae (pelicans) | 4 | 0.01 | 1 | | | 1 |
| Brown Pelican | 4 | 0.01 | 1 | | | 1 |
| Phalacrocoracidae (cormorants) | 1 | 0.00 | | | | |
| Double-crested Cormorant | 1 | 0.00 | | | | |
| Ardeidae (bitterns, egrets, and herons) | | | 1 | | | |
| Black-crowned Night-heron | | | 1 | | | |
| Accipitridae (eagles and hawks) | | | | | | 6 |
| Osprey | | | | | | 6 |
| Scolopacidae (sandpipers) | 15 | 0.02 | 19 | 63 | 0.68 | |
| Whimbrel | | | | 49 | 0.53 | |
| Marbled Godwit | | | 3 | | | |
| Sanderling | | | | 14 | 0.15 | |
| Least Sandpiper | 8 | 0.01 | 4 | | | |
| Pectoral Sandpiper | 7 | 0.01 | | | | |
| Shorebird, small (unknown) | | | 12 | | | |
| Laridae (gulls and terns) | 572 | 0.83 | 363 | 240 | 2.62 | 50 |
| Laughing Gull | 283 | 0.41 | 209 | 169 | 1.84 | 12 |
| Herring Gull | 8 | 0.01 | | 7 | 0.08 | 2 |
| Great Black-backed Gull | 22 | 0.03 | 8 | 14 | 0.15 | 6 |
| Gull, large (unknown) | | | | | | 6 |
| Common Tern | 245 | 0.36 | 69 | 28 | 0.31 | 24 |
| Forster's Tern | 1 | 0.00 | | 17 | 0.19 | |
| Royal Tern | 13 | 0.02 | 6 | 4 | 0.04 | |
| Tern, small (unknown) | | | 71 | 1 | 0.01 | |
| Columbidae (pigeons and doves) | | | | | | 2 |
| Rock Pigeon | | | | | | 2 |

Table B-2.11. July 2008 shipboard offshore and small boat coastal surveys.

| Family Common Name | Shipboard Offshore | | | Small Boat Coastal | | |
|--------------------------------|----------------------|-------------------|-------------------------|----------------------|-------------------|-------------------------|
| | In-Zone ¹ | | Incidental ² | In-Zone ¹ | | Incidental ² |
| | No. | Abun ³ | No. | No. | Abun ³ | No. |
| Hirundinidae (swallows) | 2 | 0.00 | | 2 | 0.02 | |
| Tree Swallow | | | | 1 | 0.01 | |
| Bank Swallow | 2 | 0.00 | | | | |
| Barn Swallow | | | | 1 | 0.01 | |
| Total | 1,032 | 1.49 | 560 | 306 | 3.33 | 59 |

¹ includes avian observations within the 300-m x 300-m survey strip transect when the ship was traveling ≥ 7 kts

² includes avian observations within the out-zone and when the ship was traveling < 7 kts (e.g., in-zone stationary water sampling stations, marine mammal chases)

³ No./km

Table B-2.12. August 2008 shipboard offshore and small boat coastal surveys.

| Family Common Name | Shipboard Offshore | | | Small Boat Coastal | | |
|---|----------------------|-------------------|-------------------------|----------------------|-------------------|-------------------------|
| | In-Zone ¹ | | Incidental ² | In-Zone ¹ | | Incidental ² |
| | No. | Abun ³ | No. | No. | Abun ³ | No. |
| Procellariidae (petrels and shearwaters) | 14 | 0.02 | 1 | | | |
| Cory's Shearwater | 14 | 0.02 | 1 | | | |
| Hydrobatidae (storm-petrels) | 1,246 | 1.55 | 6 | | | |
| Wilson's Storm-petrel | 1,245 | 1.55 | 6 | | | |
| Leach's Storm-petrel | 1 | 0.00 | | | | |
| Sulidae (gannets) | 29 | 0.04 | 18 | 17 | 0.15 | 1 |
| Northern Gannet | 29 | 0.04 | 18 | 17 | 0.15 | 1 |
| Pelecanidae (pelicans) | 3 | 0.00 | 2 | 4 | 0.03 | 2 |
| Brown Pelican | 3 | 0.00 | 2 | 4 | 0.03 | 2 |
| Phalacrocoracidae (cormorants) | | | | 6 | 0.05 | |
| Double-crested Cormorant | | | | 6 | 0.05 | |
| Ardeidae (bitterns, egrets, and herons) | | | 3 | | | |
| Great Blue Heron | | | 2 | | | |
| Yellow-crowned Night-heron | | | 1 | | | |
| Accipitridae (eagles and hawks) | 7 | 0.01 | | 1 | 0.01 | 9 |
| Osprey | 7 | 0.01 | | 1 | 0.01 | 9 |
| Charadriidae (plovers) | | | | 5 | 0.04 | |
| Semipalmated Plover | | | | 5 | 0.04 | |
| Scolopacidae (sandpipers) | 16 | 0.01 | 7 | 86 | 0.76 | 26 |
| Sanderling | | | 4 | 62 | 0.54 | 17 |
| Semipalmated Sandpiper | 3 | 0.00 | | 3 | 0.03 | |
| Least Sandpiper | 9 | 0.01 | 3 | 11 | 0.10 | |
| Peep (unknown) | 3 | 0.00 | | | | |
| Dowitcher (unknown) | | | | 3 | 0.03 | |
| Shorebird, small (unknown) | 1 | 0.00 | | 7 | 0.06 | 9 |
| Laridae (gulls and terns) | 1,142 | 1.41 | 193 | 996 | 8.66 | 243 |
| Laughing Gull | 517 | 0.64 | 94 | 579 | 5.03 | 159 |
| Ring-billed Gull | | | | | | 4 |
| Herring Gull | 2 | 0.00 | | 14 | 0.12 | 4 |
| Great Black-backed Gull | 56 | 0.07 | 12 | 73 | 0.63 | 6 |
| Gull, large (unknown) | | | 3 | 1 | 0.01 | 45 |
| Common Tern | 510 | 0.63 | 74 | 214 | 1.86 | |
| Forster's Tern | 5 | 0.01 | | 11 | 0.10 | 1 |
| Royal Tern | 34 | 0.04 | 7 | 38 | 0.33 | 3 |
| Sandwich Tern | | | | 2 | 0.02 | |
| Tern, large (unknown) | | | | 1 | 0.01 | 1 |
| Tern, small (unknown) | 18 | 0.02 | 3 | 63 | 0.55 | 20 |

Table B-2.12 (*continued*). August 2008 shipboard offshore and small boat coastal surveys.

| Family Common Name | Shipboard Offshore | | Small Boat Coastal | | | |
|---|----------------------|-------------------|-------------------------|--------------|----------------------|------------|
| | In-Zone ¹ | | Incidental ² | | In-Zone ¹ | |
| | No. | Abun ³ | No. | No. | Abun ³ | No. |
| Apodidae (swifts) | | | | 1 | 0.01 | |
| Chimney Swift | | | | 1 | 0.01 | |
| Hirundinidae (swallows) | 63 | 0.07 | 11 | 24 | 0.21 | 11 |
| Purple Martin | 47 | 0.06 | 5 | 12 | 0.10 | 11 |
| Tree Swallow | 4 | 0.00 | | 3 | 0.03 | |
| Bank Swallow | | | | 1 | 0.01 | |
| Barn Swallow | 12 | 0.01 | 6 | 8 | 0.07 | |
| Parulidae (wood-warblers) | 2 | 0.00 | | | | |
| Prothonotary Warbler | 1 | 0.00 | | | | |
| Warbler (unknown) | 1 | 0.00 | | | | |
| Icteridae (blackbirds and meadowlarks) | 2 | 0.00 | | | | |
| Red-winged Blackbird | 2 | 0.00 | | | | |
| Fringillidae (finches) | 2 | 0.00 | | | | |
| House Finch | 2 | 0.00 | | | | |
| Other | 3 | 0.00 | | | | |
| Passerine (unknown) | 3 | 0.00 | | | | |
| Total | 2,529 | 3.11 | 241 | 1,140 | 9.92 | 292 |

¹ includes avian observations within the 300-m x 300-m survey strip transect when the ship was traveling ≥ 7 kts

² includes avian observations within the out-zone and when the ship was traveling < 7 kts (e.g., in-zone stationary water sampling stations, marine mammal chases)

³ No./km

Table B-2.13. September 2008 shipboard offshore and small boat coastal surveys.

| Family Common Name | Shipboard Offshore | | | Small Boat Coastal | | |
|---|----------------------|-------------------|-------------------------|----------------------|-------------------|-------------------------|
| | In-Zone ¹ | | Incidental ² | In-Zone ¹ | | Incidental ² |
| | No. | Abun ³ | No. | No. | Abun ³ | No. |
| Anatidae (geese, swans, and ducks) | 2 | 0.00 | 20 | 38 | 0.30 | 12 |
| Canada Goose | | | 3 | | | |
| Gadwall | 2 | 0.00 | | | | |
| Green-winged Teal | | | 14 | 30 | 0.24 | 12 |
| Duck, dabbling (unknown) | | | 3 | | | |
| Surf Scoter | | | | 4 | 0.03 | |
| Scoter, dark-winged (unknown) | | | | 4 | 0.03 | |
| Gaviidae (loons) | 1 | 0.00 | | | | |
| Common Loon | 1 | 0.00 | | | | |
| Procellariidae (petrels and shearwaters) | 11 | 0.01 | 1 | | | |
| Cory's Shearwater | 9 | 0.01 | 1 | | | |
| Audubon's Shearwater | 1 | 0.00 | | | | |
| Shearwater (black-and-white), | 1 | 0.00 | | | | |
| Hydrobatidae (storm-petrels) | 5 | 0.00 | 3 | | | |
| Wilson's Storm-petrel | 3 | 0.00 | 3 | | | |
| Storm-petrel (unknown) | 2 | 0.00 | | | | |
| Sulidae (gannets) | 29 | 0.03 | 5 | 15 | 0.12 | 9 |
| Northern Gannet | 29 | 0.03 | 5 | 15 | 0.12 | 9 |
| Pelecanidae (pelicans) | | | | 4 | 0.03 | 9 |
| Brown Pelican | | | | 4 | 0.03 | 9 |
| Phalacrocoracidae (cormorants) | 6 | 0.01 | 110 | 2 | 0.02 | 100 |
| Double-crested Cormorant | 6 | 0.01 | 110 | 2 | 0.02 | 100 |
| Ardeidae (bitterns, egrets, and herons) | | | | 6 | 0.05 | 6 |
| Great Blue Heron | | | | 6 | 0.05 | 6 |
| Accipitridae (eagles and hawks) | | | | | | 1 |
| Osprey | | | | | | 1 |
| Falconidae (falcons) | 1 | 0.00 | | | | |
| Merlin | 1 | 0.00 | | | | |
| Scolopacidae (sandpipers) | 4 | 0.00 | 1 | 24 | 0.19 | 190 |
| Sanderling | | | | 6 | 0.05 | |
| Dunlin | | | | 8 | 0.06 | |
| Red-necked Phalarope | 2 | 0.00 | | | | |
| Red Phalarope | 1 | 0.00 | | | | |
| Phalarope (unknown) | 1 | 0.00 | 1 | | | |
| Shorebird, small (unknown) | | | | 10 | 0.08 | 190 |

Table B-2.13 (*continued*). September 2008 shipboard offshore and small boat coastal surveys.

| Family Common Name | Shipboard Offshore | | | Small Boat Coastal | | |
|---|----------------------|-------------------|-------------------------|----------------------|-------------------|-------------------------|
| | In-Zone ¹ | | Incidental ² | In-Zone ¹ | | Incidental ² |
| | No. | Abun ³ | No. | No. | Abun ³ | No. |
| Laridae (gulls and terns) | 907 | 1.07 | 439 | 526 | 4.26 | 62 |
| Sabine's Gull | 1 | 0.00 | | | | |
| Laughing Gull | 268 | 0.32 | 139 | 157 | 1.27 | 16 |
| Ring-billed Gull | | | | 44 | 0.36 | 1 |
| Herring Gull | 36 | 0.04 | 13 | 73 | 0.59 | 12 |
| Great Black-backed Gull | 203 | 0.24 | 53 | 110 | 0.89 | 13 |
| Gull, large (unknown) | 2 | 0.00 | 26 | 15 | 0.12 | 2 |
| Caspian Tern | | | 1 | 5 | 0.04 | |
| Black Tern | 1 | 0.00 | 3 | | | |
| Common Tern | 301 | 0.36 | 77 | 14 | 0.11 | |
| Forster's Tern | 3 | 0.00 | | 63 | 0.51 | 7 |
| Royal Tern | 14 | 0.02 | 5 | 43 | 0.35 | 11 |
| Tern, large (unknown) | | | 2 | 1 | 0.01 | |
| Tern, small (unknown) | 78 | 0.09 | 120 | 1 | 0.01 | |
| Stercorariidae (skuas and jaegers) | 5 | 0.01 | 3 | | | |
| Parasitic Jaeger | 5 | 0.01 | 2 | | | |
| Jaeger (unknown) | | | 1 | | | |
| Picidae (woodpeckers) | 3 | 0.00 | | 2 | 0.02 | |
| Northern (Yellow-shafted) Flicker | 3 | 0.00 | | 2 | 0.02 | |
| Troglodytidae (wrens) | | | 1 | | | |
| Marsh Wren | | | 1 | | | |
| Parulidae (wood-warblers) | 3 | 0.00 | 1 | | | |
| Palm Warbler, Palm Warbler (yellow) | | | 1 | | | |
| Mourning Warbler | 1 | 0.00 | | | | |
| Common Yellowthroat | 1 | 0.00 | | | | |
| Warbler (unknown) | 1 | 0.00 | | | | |
| Total | 977 | 1.13 | 584 | 617 | 4.99 | 389 |

¹ includes avian observations within the 300-m x 300-m survey strip transect when the ship was traveling ≥7 kts² includes avian observations within the out-zone and when the ship was traveling <7 kts (e.g., in-zone stationary water sampling stations, marine mammal chases)³ No./km

Table B-2.14. October 2008 shipboard offshore and small boat coastal surveys.

| Family Common Name | Shipboard Offshore | | | Small Boat Coastal | | |
|---|----------------------|-------------------|-------------------------|----------------------|-------------------|-------------------------|
| | In-Zone ¹ | | Incidental ² | In-Zone ¹ | | Incidental ² |
| | No. | Abun ³ | No. | No. | Abun ³ | No. |
| Anatidae (geese, swans, and ducks) | 200 | 0.25 | 366 | 139 | 1.09 | 367 |
| Atlantic Brant | | | 20 | 21 | 0.16 | 222 |
| Canada Goose | | | | | | 86 |
| Goose, dark (unknown) | | | 75 | | | |
| Wood Duck | | | | 1 | 0.01 | |
| Gadwall | 1 | 0.00 | | | | |
| American Black Duck | 9 | 0.01 | 9 | 20 | 0.16 | 7 |
| Mallard | | | | 1 | 0.01 | |
| Northern Pintail | 1 | 0.00 | 6 | 4 | 0.03 | 2 |
| Green-winged Teal | 15 | 0.02 | 10 | | | |
| Duck, dabbling (unknown) | | | | 5 | 0.04 | |
| Greater Scaup | | | | 13 | 0.10 | |
| Scaup (unknown), <i>Aythya</i> (unknown) | | | | 9 | 0.07 | |
| Surf Scoter | 63 | 0.08 | 15 | 26 | 0.20 | 25 |
| White-winged Scoter | 1 | 0.00 | | 1 | 0.01 | 1 |
| Black Scoter | 8 | 0.01 | 5 | | | |
| Scoter (unknown) | 13 | 0.02 | 22 | | | |
| Scoter, dark-winged (unknown) | 89 | 0.11 | 201 | 2 | 0.02 | |
| Bufflehead | | | | 34 | 0.26 | |
| Red-breasted Merganser | | | | | | 1 |
| Ruddy Duck | | | | 1 | 0.01 | |
| Duck, diving (unknown) | | | | | | 1 |
| Duck (unknown) | | | 3 | 1 | 0.01 | 22 |
| Gaviidae (loons) | 24 | 0.03 | 7 | 55 | 0.43 | 18 |
| Red-throated Loon | | | 1 | 38 | 0.30 | 14 |
| Common Loon | 24 | 0.03 | 6 | 17 | 0.13 | 4 |
| Procellariidae (petrels and shearwaters) | 4 | 0.00 | 1 | | | |
| Cory's Shearwater | 4 | 0.00 | 1 | | | |
| Sulidae (gannets) | 281 | 0.34 | 102 | 540 | 4.21 | 769 |
| Northern Gannet | 281 | 0.34 | 102 | 540 | 4.21 | 769 |
| Phalacrocoracidae (cormorants) | 962 | 1.16 | 2,229 | 94 | 0.73 | 879 |
| Double-crested Cormorant | 962 | 1.16 | 2,225 | 94 | 0.73 | 876 |
| Cormorant (unknown) | | | 4 | | | 3 |
| Ardeidae (bitterns, egrets, and herons) | 10 | 0.01 | 3 | 1 | 0.01 | 21 |
| Great Blue Heron | 10 | 0.01 | 3 | | | 7 |
| Great Egret | | | | 1 | 0.01 | 14 |
| Accipitridae (eagles and hawks) | | | 1 | | | |
| Osprey | | | 1 | | | |
| Falconidae (falcons) | 3 | 0.00 | | | | |
| Peregrine Falcon | 3 | 0.00 | | | | |
| Charadriidae (plovers) | | | | 10 | 0.08 | |
| Semipalmated Plover | | | | 10 | 0.08 | |
| Haematopodidae (oystercatchers) | | | | | | 17 |
| American Oystercatcher | | | | | | 17 |

Table B-2.14 (*continued*). October 2008 shipboard offshore and small boat coastal surveys.

| Family Common Name | Shipboard Offshore | | Small Boat Coastal | | | |
|---|----------------------|-------------------|-------------------------|--------------|----------------------|--------------|
| | In-Zone ¹ | | Incidental ² | | In-Zone ¹ | |
| | No. | Abun ³ | No. | No. | Abun ³ | No. |
| Scolopacidae (sandpipers) | 13 | 0.01 | | 25 | 0.20 | 1,180 |
| Sanderling | | | | 9 | 0.07 | 202 |
| Pectoral Sandpiper | 1 | 0.00 | | | | |
| Dunlin | 1 | 0.00 | | 4 | 0.03 | 300 |
| Shorebird, large (unknown) | 10 | 0.01 | | | | |
| Shorebird, small (unknown) | 1 | 0.00 | | 10 | 0.08 | 522 |
| Shorebird (unknown) | | | | 2 | 0.02 | 156 |
| Laridae (gulls and terns) | 1,286 | 1.53 | 683 | 554 | 4.32 | 1,031 |
| Black-legged Kittiwake | 1 | 0.00 | | | | |
| Bonaparte's Gull | | | | 10 | 0.08 | |
| Laughing Gull | 575 | 0.69 | 80 | 211 | 1.64 | 161 |
| Ring-billed Gull | 35 | 0.04 | | 38 | 0.30 | 76 |
| Herring Gull | 127 | 0.15 | 26 | 59 | 0.46 | 318 |
| Iceland Gull | 1 | 0.00 | | | | |
| Lesser Black-backed Gull | 2 | 0.00 | | | | |
| Great Black-backed Gull | 103 | 0.12 | 58 | 154 | 1.20 | 44 |
| Gull, large (unknown) | 17 | 0.02 | 110 | 15 | 0.12 | 289 |
| Caspian Tern | 1 | 0.00 | | | | |
| Common Tern | 1 | 0.00 | | | | |
| Forster's Tern | 399 | 0.48 | 219 | 26 | 0.20 | 44 |
| Royal Tern | 24 | 0.03 | 8 | 41 | 0.32 | 99 |
| Tern, small (unknown) | | | 182 | | | |
| Stercorariidae (skuas and jaegers) | 10 | 0.01 | 2 | | | |
| Parasitic Jaeger | 10 | 0.01 | 2 | | | |
| Columbidae (pigeons and doves) | 2 | 0.00 | | | | |
| Mourning Dove | 2 | 0.00 | | | | |
| Picidae (woodpeckers) | 1 | 0.00 | 1 | | | |
| Northern (Yellow-shafted) Flicker | 1 | 0.00 | 1 | | | |
| Regulidae (kinglets) | 1 | 0.00 | 1 | | | |
| Golden-crowned Kinglet | 1 | 0.00 | 1 | | | |
| Parulidae (wood-warblers) | 20 | 0.02 | | | | |
| Yellow-rumped (Myrtle) Warbler | 14 | 0.02 | | | | |
| Black-throated Green Warbler | 1 | 0.00 | | | | |
| Palm Warbler, Palm Warbler (yellow) | 4 | 0.00 | | | | |
| Warbler (unknown) | 1 | 0.00 | | | | |
| Emberizidae (sparrows) | 8 | 0.00 | | | | |
| Song Sparrow | 2 | 0.00 | | | | |
| Swamp Sparrow | 1 | 0.00 | | | | |
| White-throated Sparrow | 3 | 0.00 | | | | |
| Dark-eyed Junco (Slate-colored) | 2 | 0.00 | | | | |
| Total | 2,825 | 3.36 | 3,396 | 1,418 | 11.07 | 4,282 |

¹ includes avian observations within the 300-m x 300-m survey strip transect when the ship was traveling ≥7 kts² includes avian observations within the out-zone and when the ship was traveling <7 kts (e.g., in-zone stationary water sampling stations, marine mammal chases)³ No./km

Table B-2.15. November 2008 shipboard offshore and small boat coastal surveys.

| Family Common Name | Shipboard Offshore | | | Small Boat Coastal | | |
|---|----------------------|-------------------|-------------------------|----------------------|-------------------|-------------------------|
| | In-Zone ¹ | | Incidental ² | In-Zone ¹ | | Incidental ² |
| | No. | Abun ³ | No. | No. | Abun ³ | No. |
| Anatidae (geese, swans, and ducks) | 3,809 | 6.97 | 3,464 | 446 | 3.41 | 2,408 |
| Snow Goose | | | | | | 1 |
| Canada Goose | | | | 231 | 1.76 | 2,317 |
| Tundra Swan | 8 | 0.01 | | | | |
| Wood Duck | 47 | 0.09 | | 5 | 0.04 | |
| American Black Duck | 12 | 0.02 | 2 | 4 | 0.03 | 23 |
| Mallard | | | 12 | | | 11 |
| Northern Pintail | 7 | 0.01 | 6 | | | |
| Green-winged Teal | 17 | 0.03 | 1 | | | |
| Duck, dabbling (unknown) | | | 17 | | | |
| Greater Scaup | 12 | 0.02 | | 18 | 0.14 | 4 |
| Lesser Scaup | | | | 5 | 0.04 | |
| Scaup (unknown), <i>Aythya</i> (unknown) | 13 | 0.02 | 115 | | | |
| Common Eider | 6 | 0.01 | | | | |
| Surf Scoter | 2,101 | 3.85 | 166 | 51 | 0.39 | 30 |
| White-winged Scoter | 11 | 0.02 | 3 | | | 1 |
| Black Scoter | 1,062 | 1.95 | 7 | 105 | 0.80 | 4 |
| Scoter (unknown) | 1 | 0.00 | 656 | | | |
| Scoter, dark-winged (unknown) | 510 | 0.94 | 2,422 | | | |
| Long-tailed Duck | | | 1 | 19 | 0.15 | 15 |
| Bufflehead | | | | 7 | 0.05 | |
| Common Goldeneye | 2 | 0.00 | | | | |
| Red-breasted Merganser | | | 6 | | | 2 |
| Duck, diving (unknown) | | | | 1 | 0.01 | |
| Duck (unknown) | | | 50 | | | |
| Gaviidae (loons) | 373 | 0.68 | 178 | 702 | 5.36 | 178 |
| Red-throated Loon | 82 | 0.15 | 99 | 646 | 4.93 | 171 |
| Common Loon | 290 | 0.53 | 72 | 55 | 0.42 | 7 |
| Loon (unknown) | 1 | 0.00 | 7 | 1 | 0.01 | |
| Podicipedidae (grebes) | 1 | 0.00 | | | | |
| Pied-billed Grebe | 1 | 0.00 | | | | |
| Procellariidae (petrels and shearwaters) | 5 | 0.01 | 2 | | | |
| Cory's Shearwater | 2 | 0.00 | 2 | | | |
| Greater Shearwater | 3 | 0.01 | | | | |
| Sulidae (gannets) | 1,065 | 1.95 | 5,580 | 1,311 | 10.01 | 1,446 |
| Northern Gannet | 1,065 | 1.95 | 5,580 | 1,311 | 10.01 | 1,446 |
| Phalacrocoracidae (cormorants) | 50 | 0.09 | 786 | 22 | 0.17 | 43 |
| Double-crested Cormorant | 44 | 0.08 | 778 | 22 | 0.17 | 43 |
| Great Cormorant | 6 | 0.01 | | | | |
| Cormorant (unknown) | | | 8 | | | |

Table B-2.15 (*continued*). November 2008 shipboard offshore and small boat coastal surveys.

| Family Common Name | Shipboard Offshore | | Small Boat Coastal | | | |
|--|----------------------|-------------------|-------------------------|--------------|----------------------|--------------|
| | In-Zone ¹ | | Incidental ² | | In-Zone ¹ | |
| | No. | Abun ³ | No. | No. | Abun ³ | No. |
| Ardeidae (bitterns, egrets, and herons) | 1 | 0.00 | 4 | | | |
| Great Blue Heron | 1 | 0.00 | 4 | | | |
| Rallidae (rails) | 2 | 0.00 | | | | |
| American Coot | 2 | 0.00 | | | | |
| Scolopacidae (sandpipers) | 1 | 0.00 | | 16 | 0.12 | 251 |
| Sanderling | | | | | | 201 |
| American Woodcock | 1 | 0.00 | | | | |
| Shorebird, small (unknown) | | | | 16 | 0.12 | 50 |
| Laridae (gulls and terns) | 2,083 | 3.81 | 670 | 1,032 | 7.88 | 1,059 |
| Bonaparte's Gull | 222 | 0.41 | 29 | 339 | 2.59 | 571 |
| Little Gull | 1 | 0.00 | | | | |
| Laughing Gull | 1,323 | 2.43 | 375 | 32 | 0.24 | 8 |
| Ring-billed Gull | 56 | 0.10 | 13 | 398 | 3.04 | 219 |
| Herring Gull | 383 | 0.70 | 122 | 189 | 1.44 | 66 |
| Lesser Black-backed Gull | 1 | 0.00 | | 1 | 0.01 | |
| Great Black-backed Gull | 94 | 0.17 | 13 | 72 | 0.55 | 6 |
| Gull, large (unknown) | | | 44 | | | 188 |
| Gull, small (unknown) | | | 67 | | | |
| Forster's Tern | 2 | 0.00 | 7 | 1 | 0.01 | 1 |
| Royal Tern | 1 | 0.00 | | | | |
| Stercorariidae (skuas and jaegers) | 10 | 0.02 | 2 | | | |
| Parasitic Jaeger | 10 | 0.02 | 2 | | | |
| Sturnidae (starlings) | 1 | 0.00 | | | | |
| European Starling | 1 | 0.00 | | | | |
| Parulidae (wood-warblers) | 1 | 0.00 | 1 | | | |
| Northern Parula | 1 | 0.00 | | | | |
| Yellow-rumped (Myrtle) Warbler | | | 1 | | | |
| Icteridae (blackbirds and meadowlarks) | 3 | 0.00 | | | | |
| Red-winged Blackbird | 1 | 0.00 | | | | |
| Eastern Meadowlark | 1 | 0.00 | | | | |
| Brown-headed Cowbird | 1 | 0.00 | | | | |
| Fringillidae (finches) | 12 | 0.02 | | | | |
| Pine Siskin | 8 | 0.01 | | | | |
| American Goldfinch | 4 | 0.01 | | | | |
| Total | 7,417 | 13.55 | 10,687 | 3,529 | 26.95 | 5,385 |

¹ includes avian observations within the 300-m x 300-m survey strip transect when the ship was traveling ≥7 kts² includes avian observations within the out-zone and when the ship was traveling <7 kts (e.g., in-zone stationary water sampling stations, marine mammal chases)³ No./km

Appendix B-3

Avian Density

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Appendix B-3a

Shipboard Offshore/Small Vessel Coastal Avian Density

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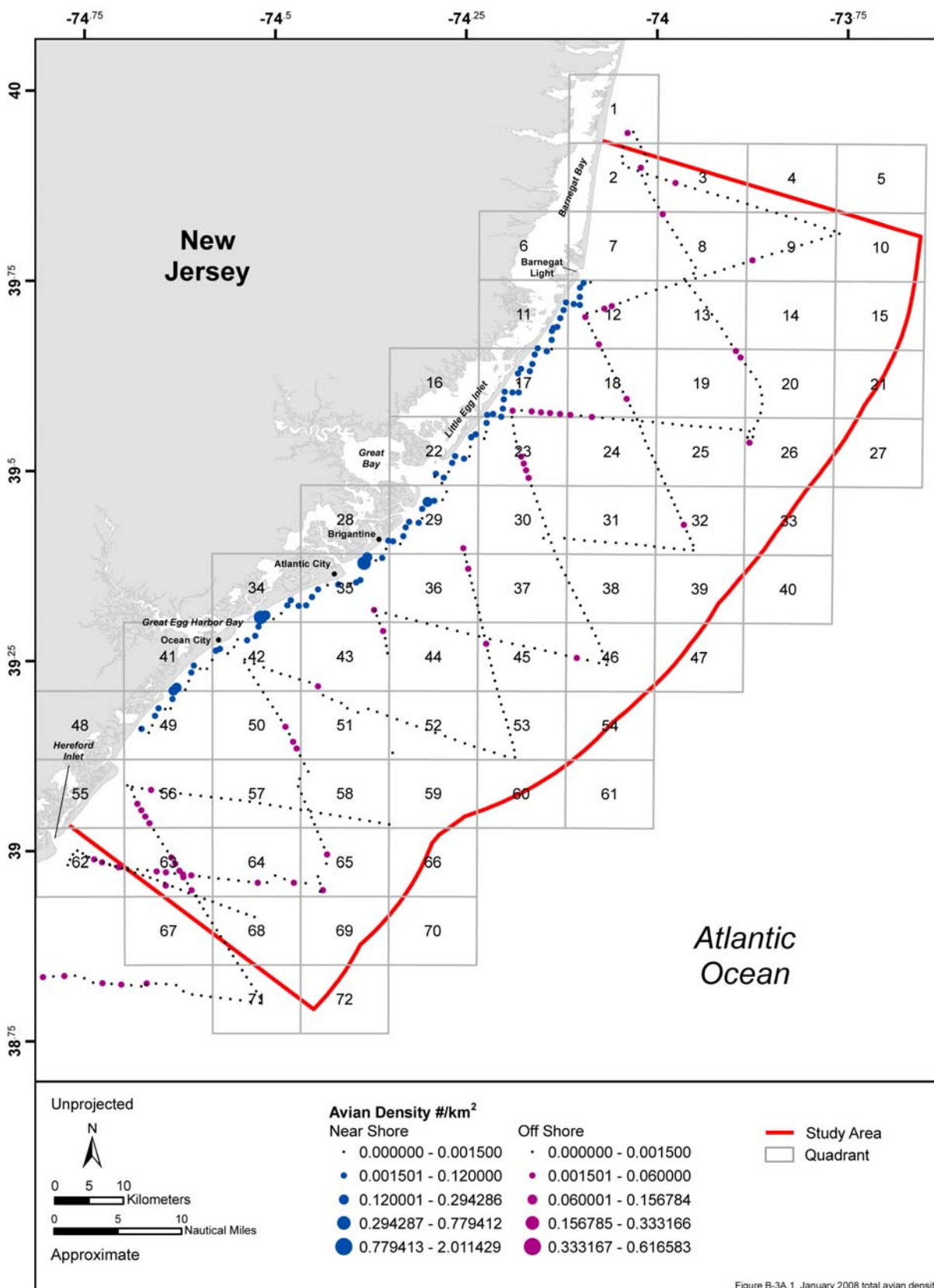


Figure B-3a.1. Total avian density (No./km²) in the New Jersey Study Area for offshore and coastal survey effort during January 2008.

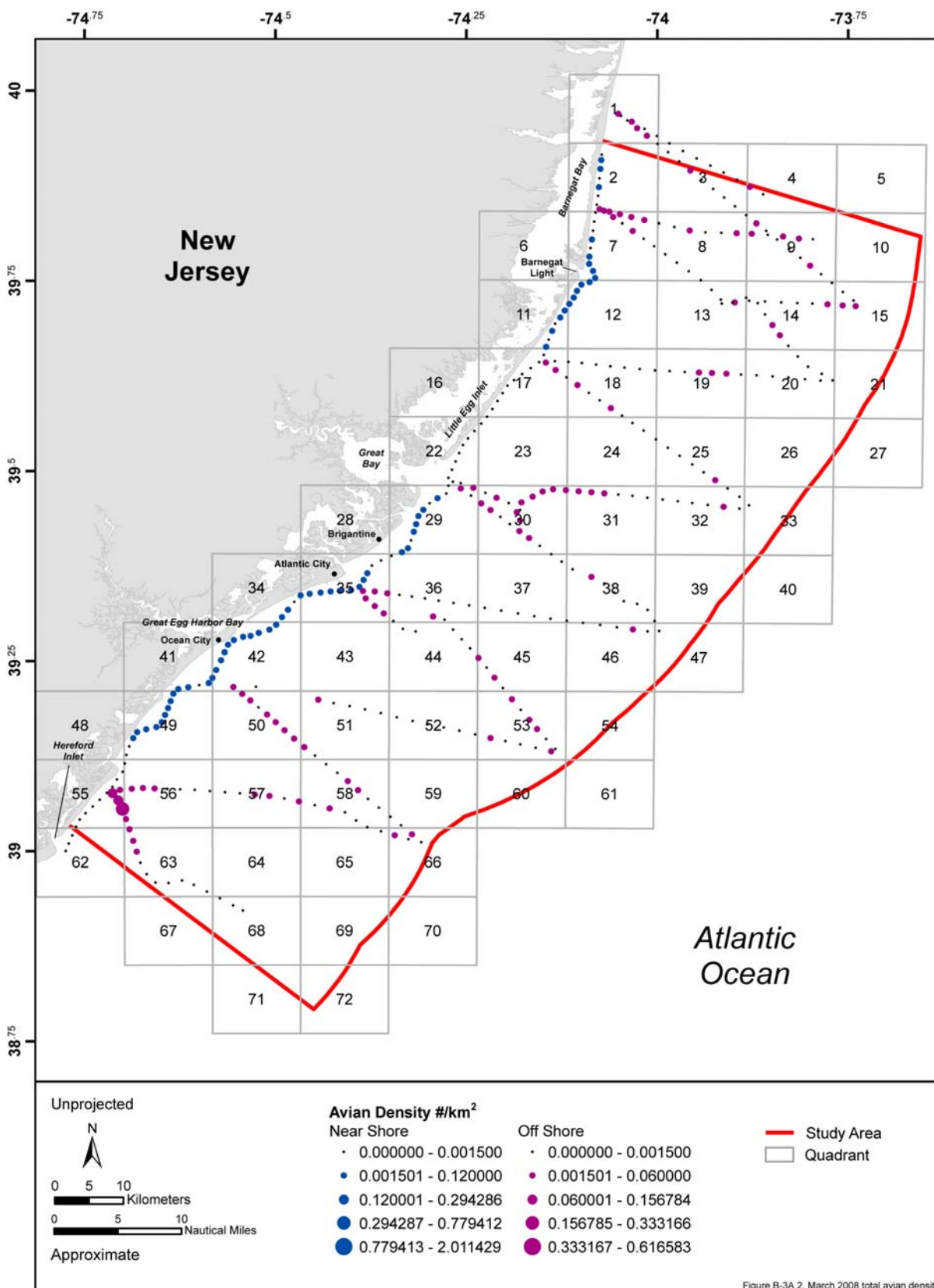


Figure B-3a.2. Total avian density (No./km²) in the New Jersey Study Area for offshore and coastal survey effort during March 2008.

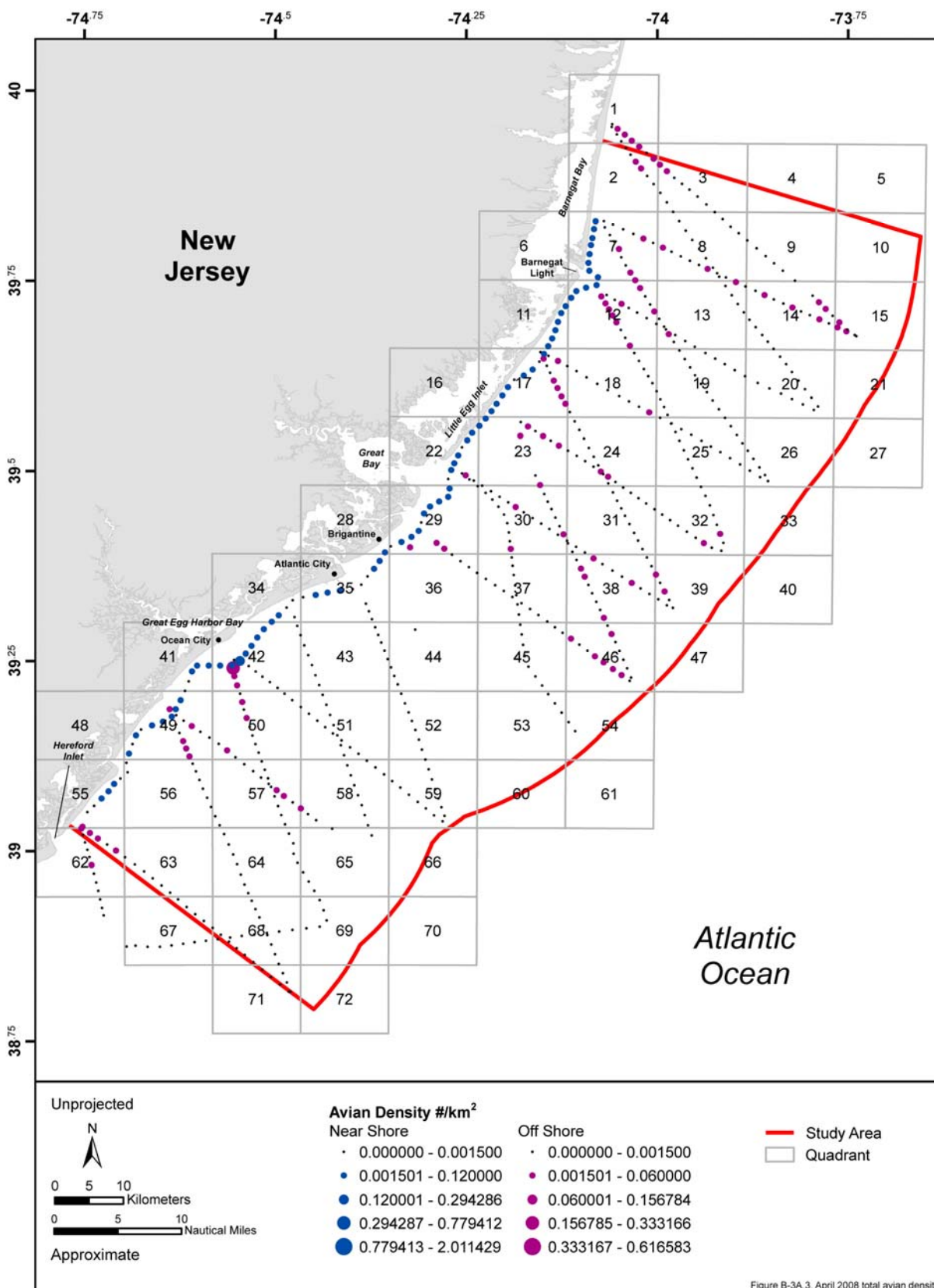


Figure B-3a.3. Total avian density (No./km²) in the New Jersey Study Area for offshore and coastal survey effort during April 2008.

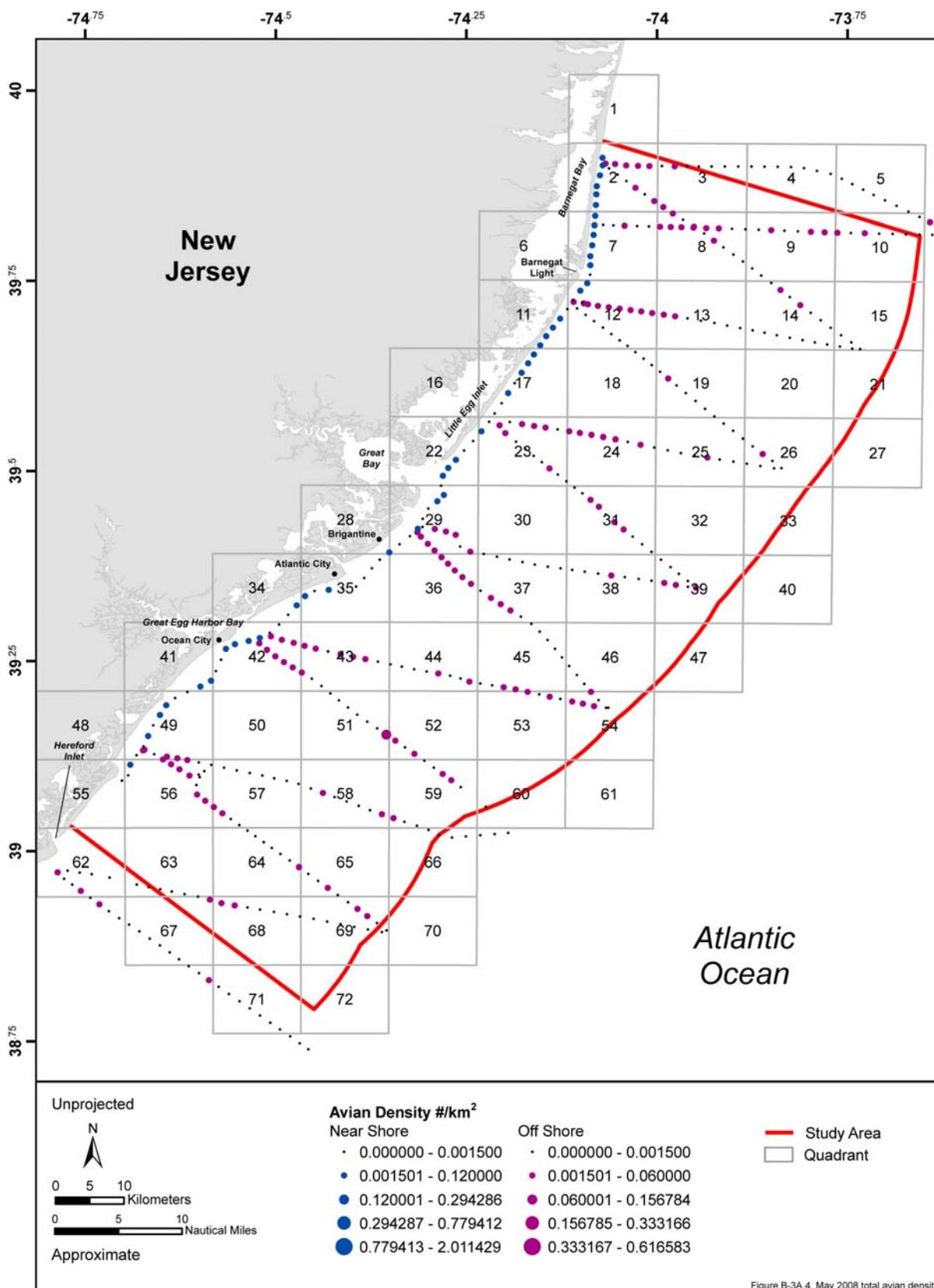


Figure B-3a.4. Total avian density (No./km²) in the New Jersey Study Area for offshore and coastal survey effort during May 2008.

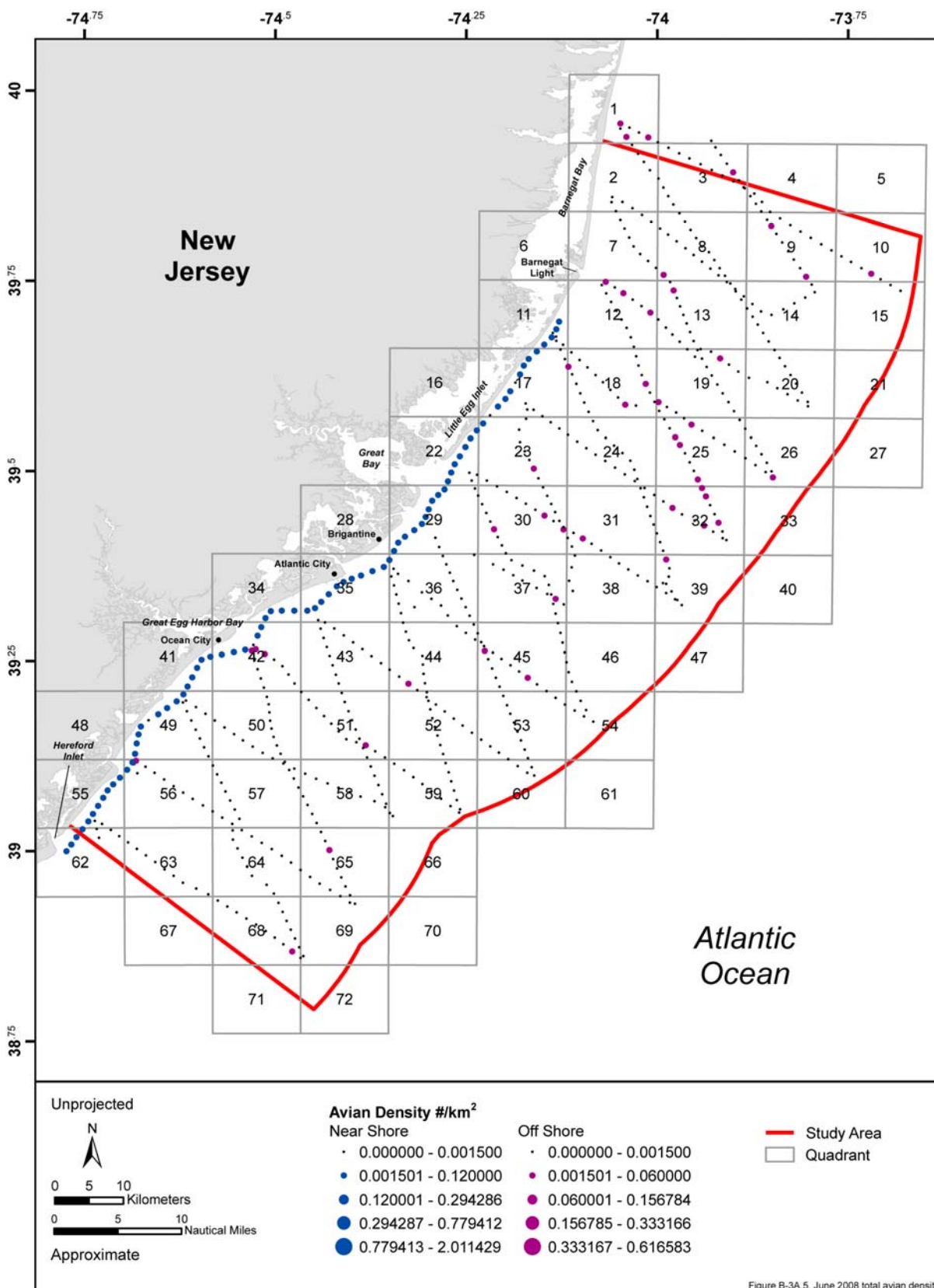


Figure B-3a.5. Total avian density (No./km²) in the New Jersey Study Area for offshore and coastal survey effort during June 2008.

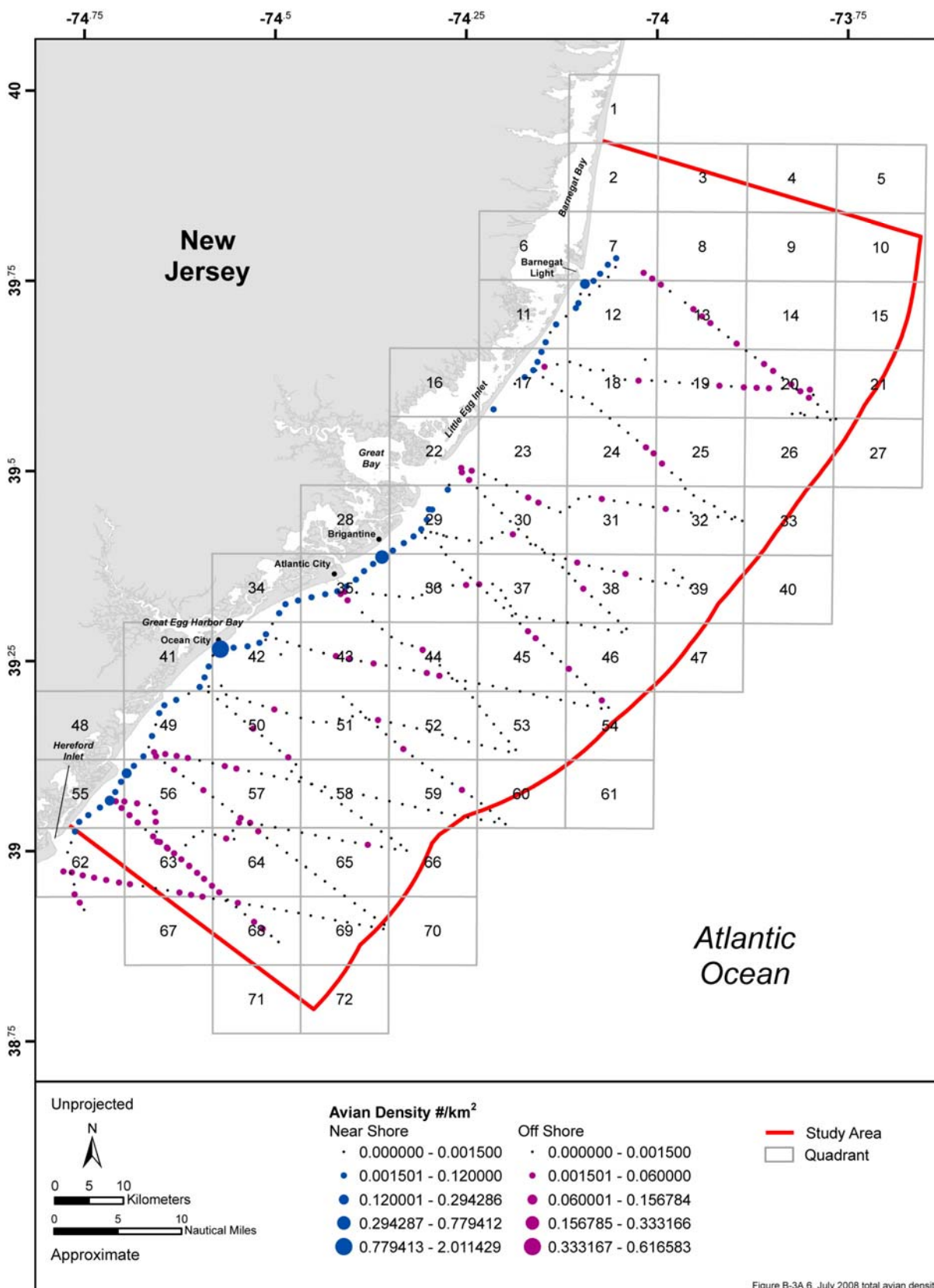


Figure B-3a.6. Total avian density (No./km²) in the New Jersey Study Area for offshore and coastal survey effort during July 2008.

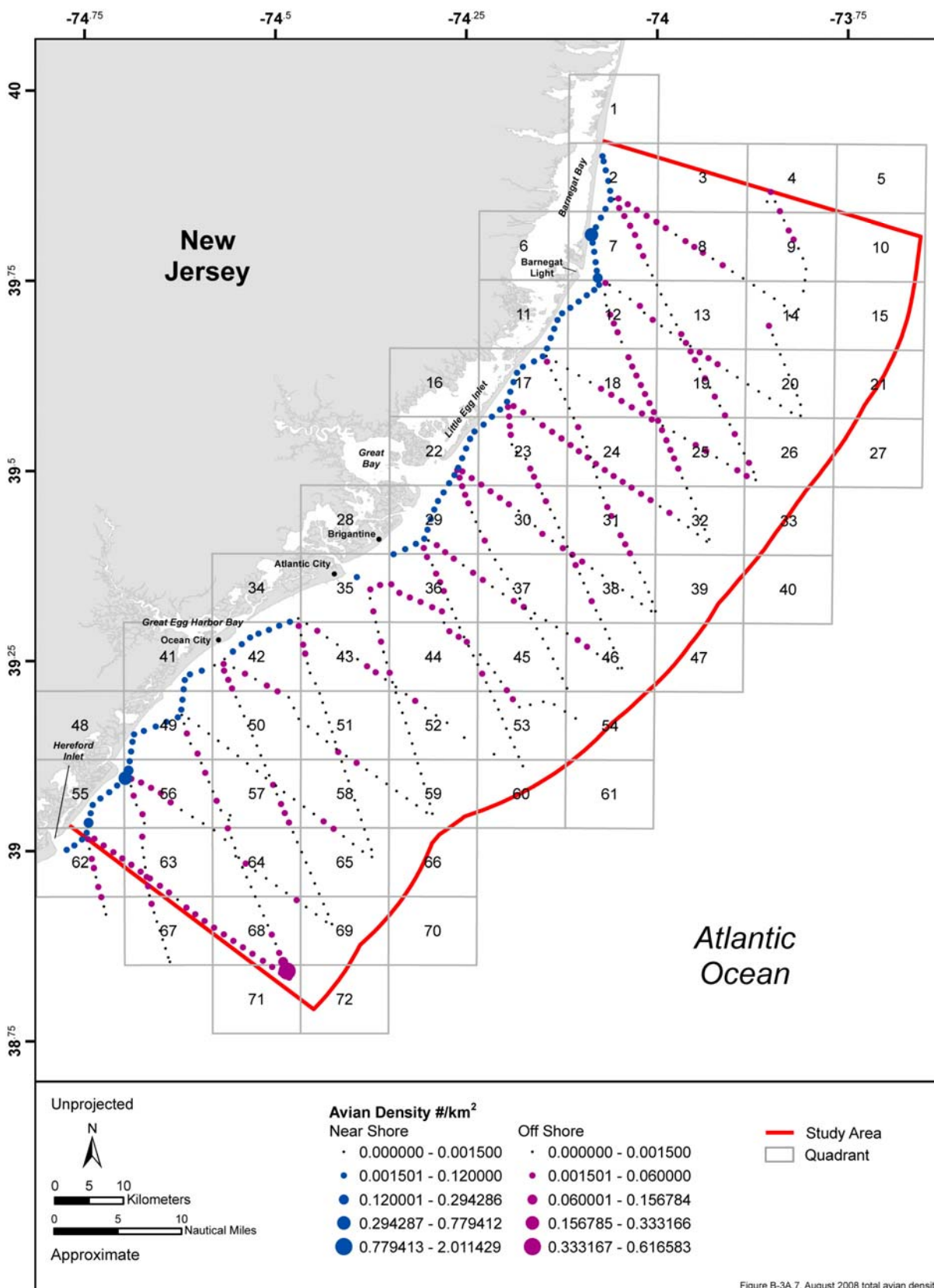


Figure B-3a.7. Total avian density (No./km²) in the New Jersey Study Area for offshore and coastal survey effort during August 2008.

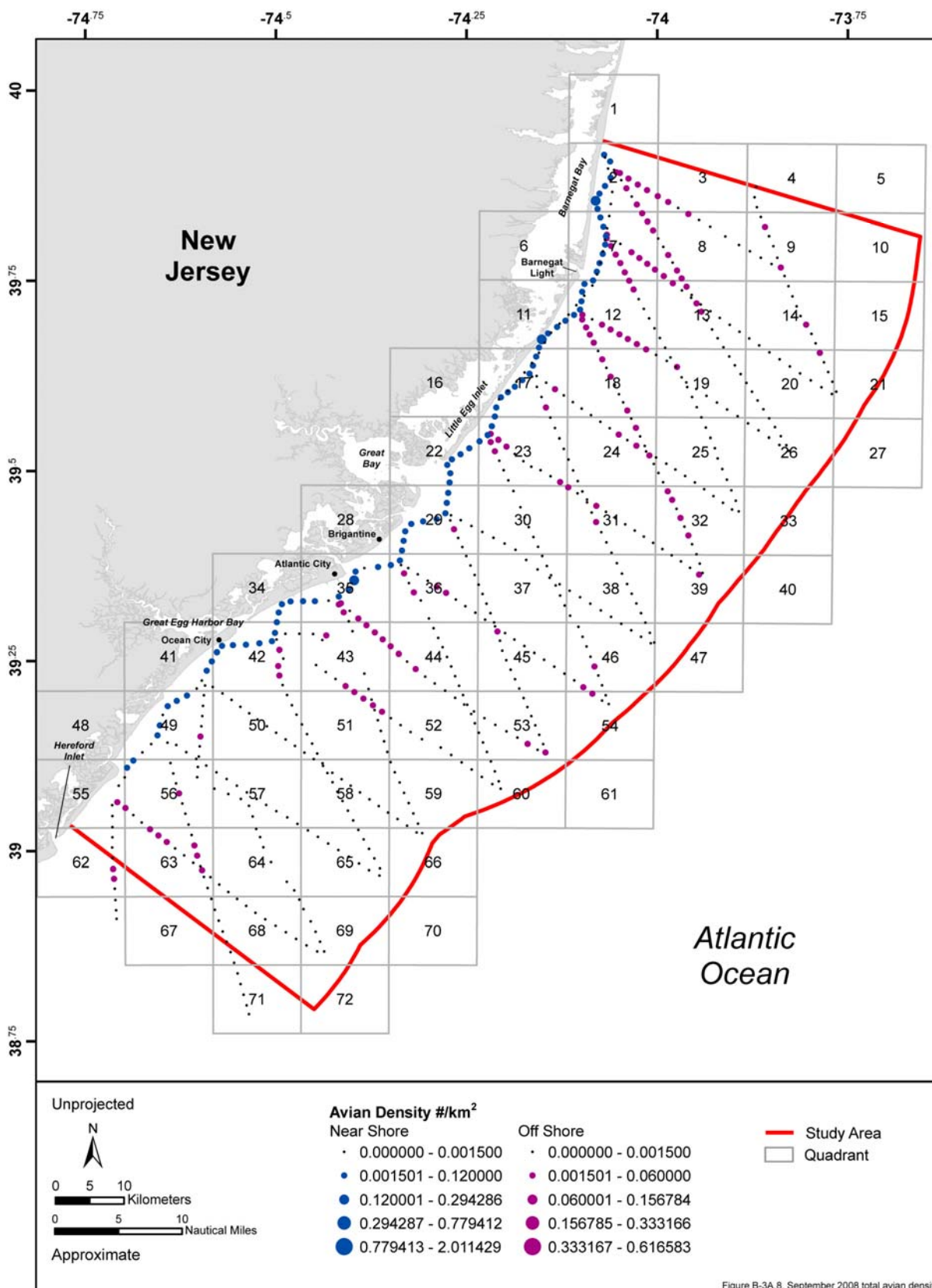


Figure B-3a.8. Total avian density (No./km²) in the New Jersey Study Area for offshore and coastal survey effort during September 2008.

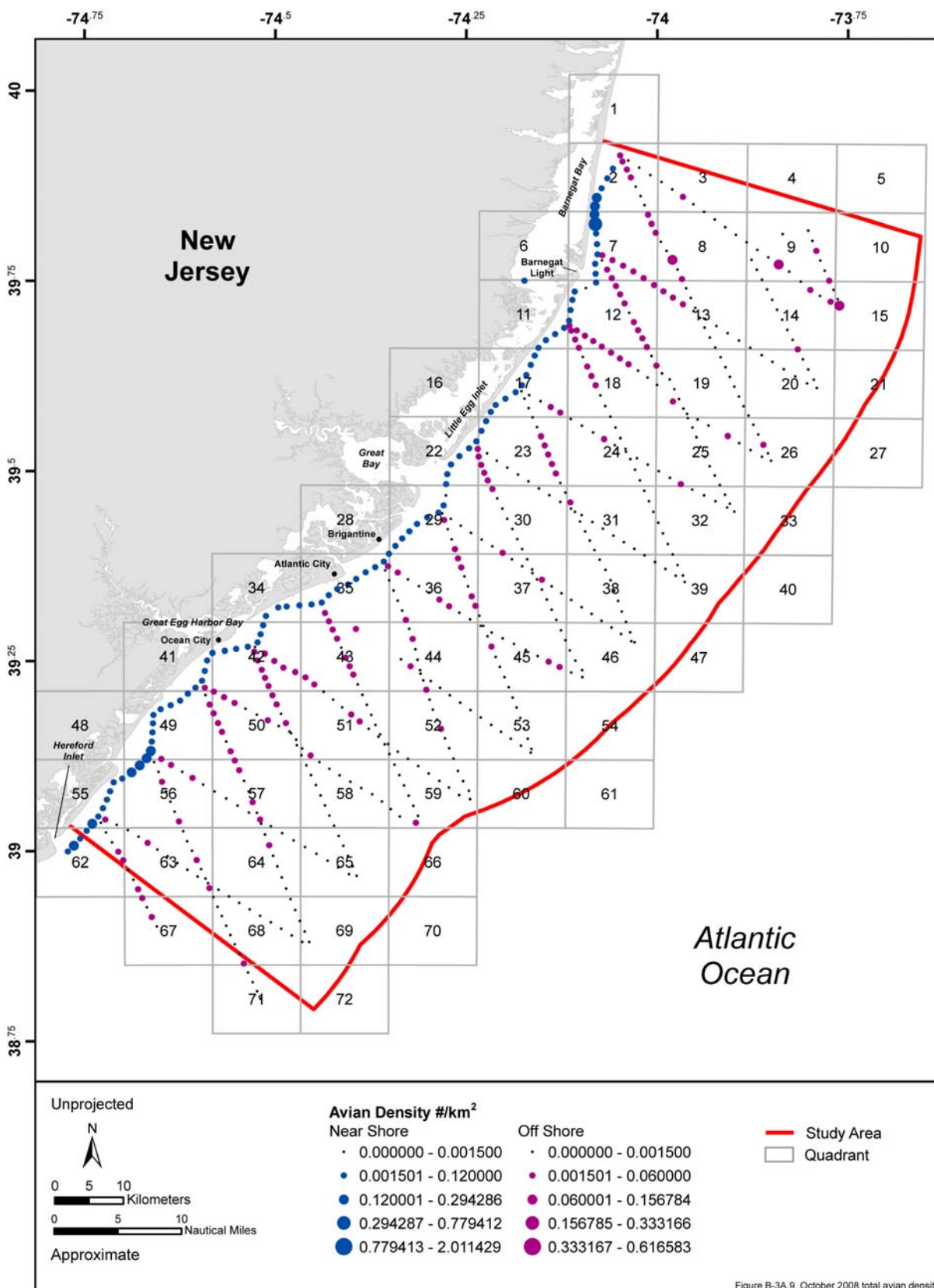


Figure B-3a.9. Total avian density (No./km²) in the New Jersey Study Area for offshore and coastal survey effort during October 2008.

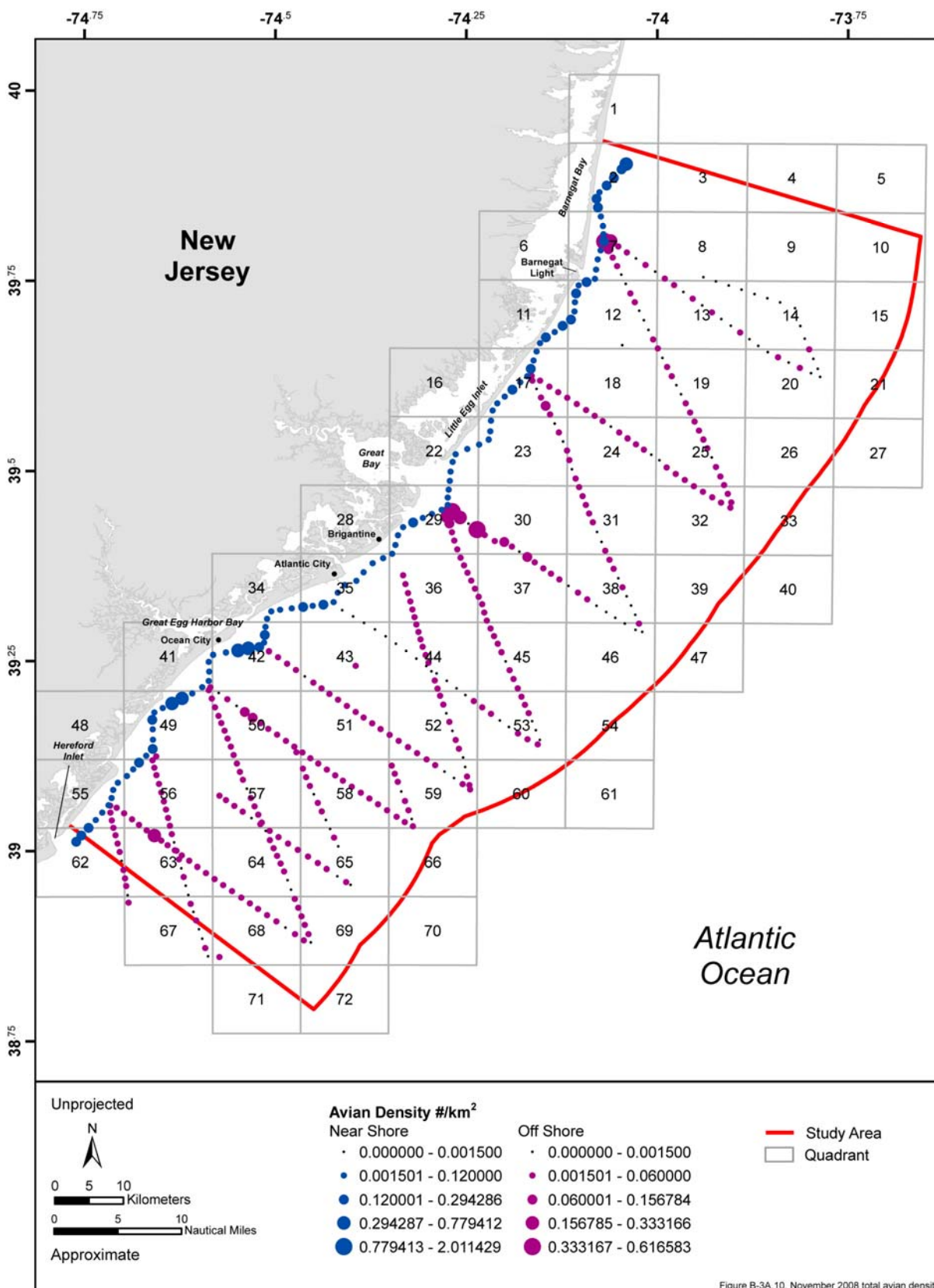


Figure B-3a.10. Total avian density (No./km²) in the New Jersey Study Area for offshore and coastal survey effort during November 2008.

Appendix B-3b

Shipboard Offshore/Small Vessel Coastal Avian Density Rank

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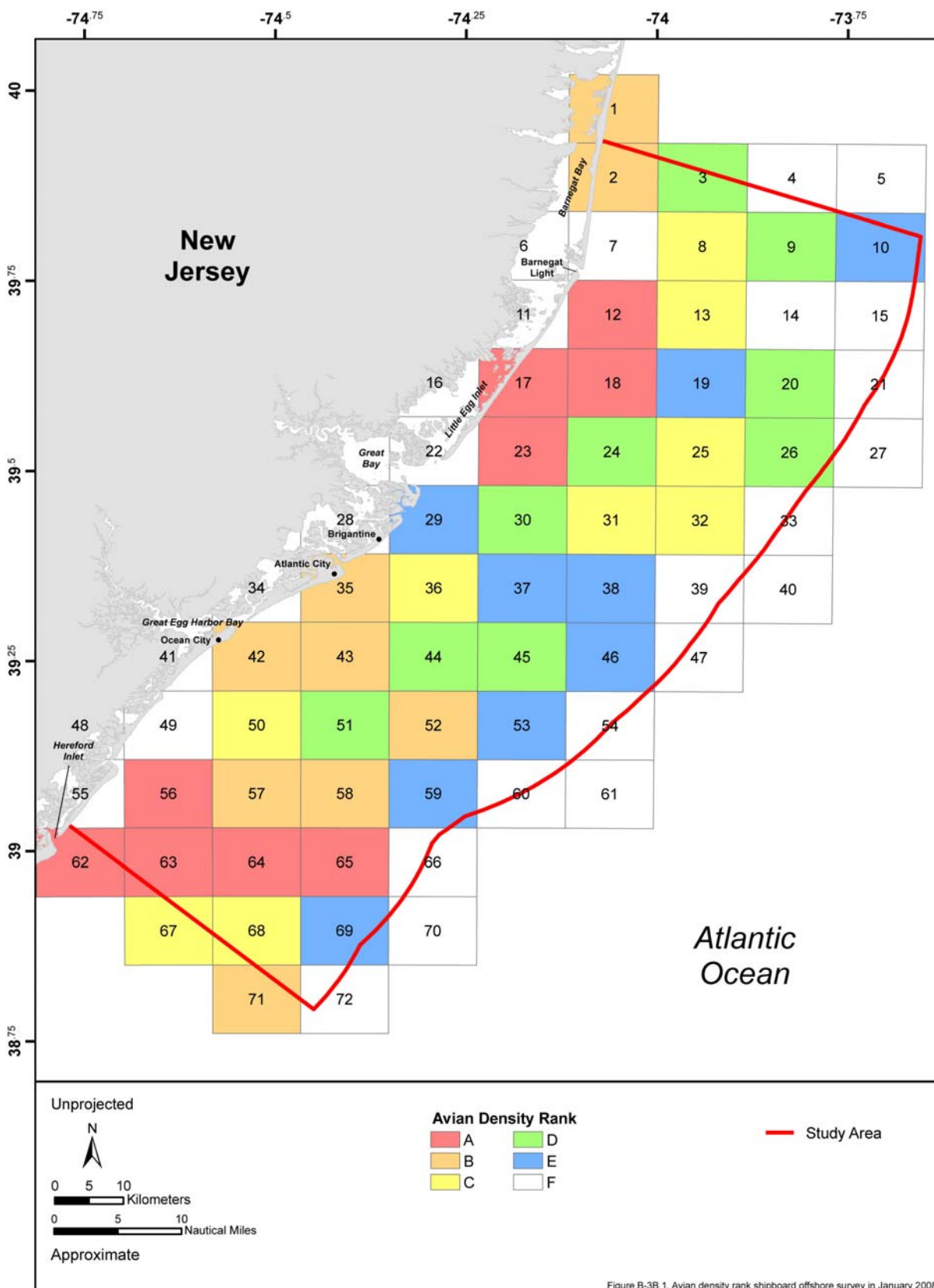


Figure B-3b.1. Avian density rank in the New Jersey Study Area during the shipboard offshore survey in January 2008.

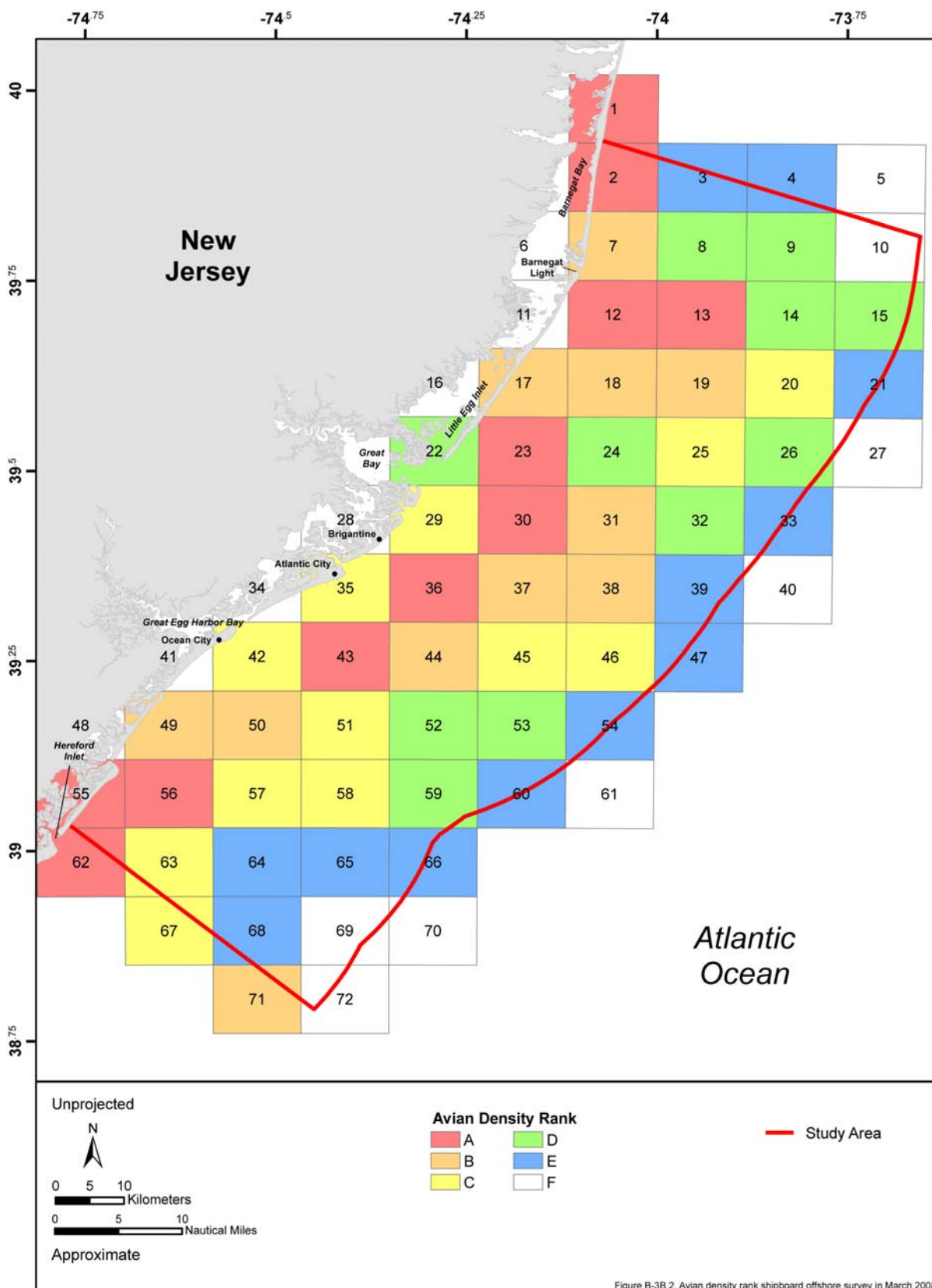


Figure B-3b.2. Avian density rank in the New Jersey Study Area during the shipboard offshore survey in March 2008.

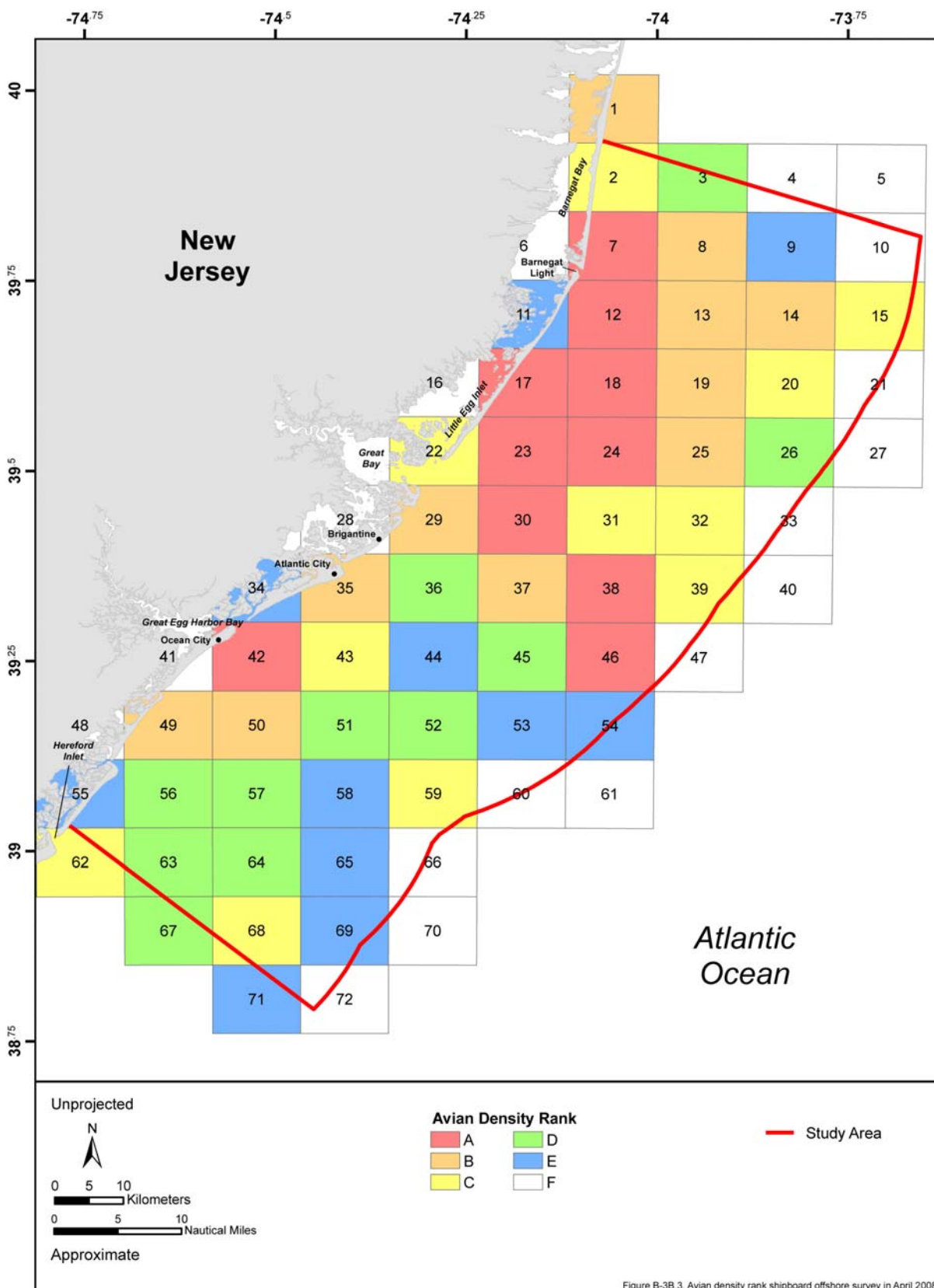


Figure B-3b.3. Avian density rank in the New Jersey Study Area during the shipboard offshore survey in April 2008.

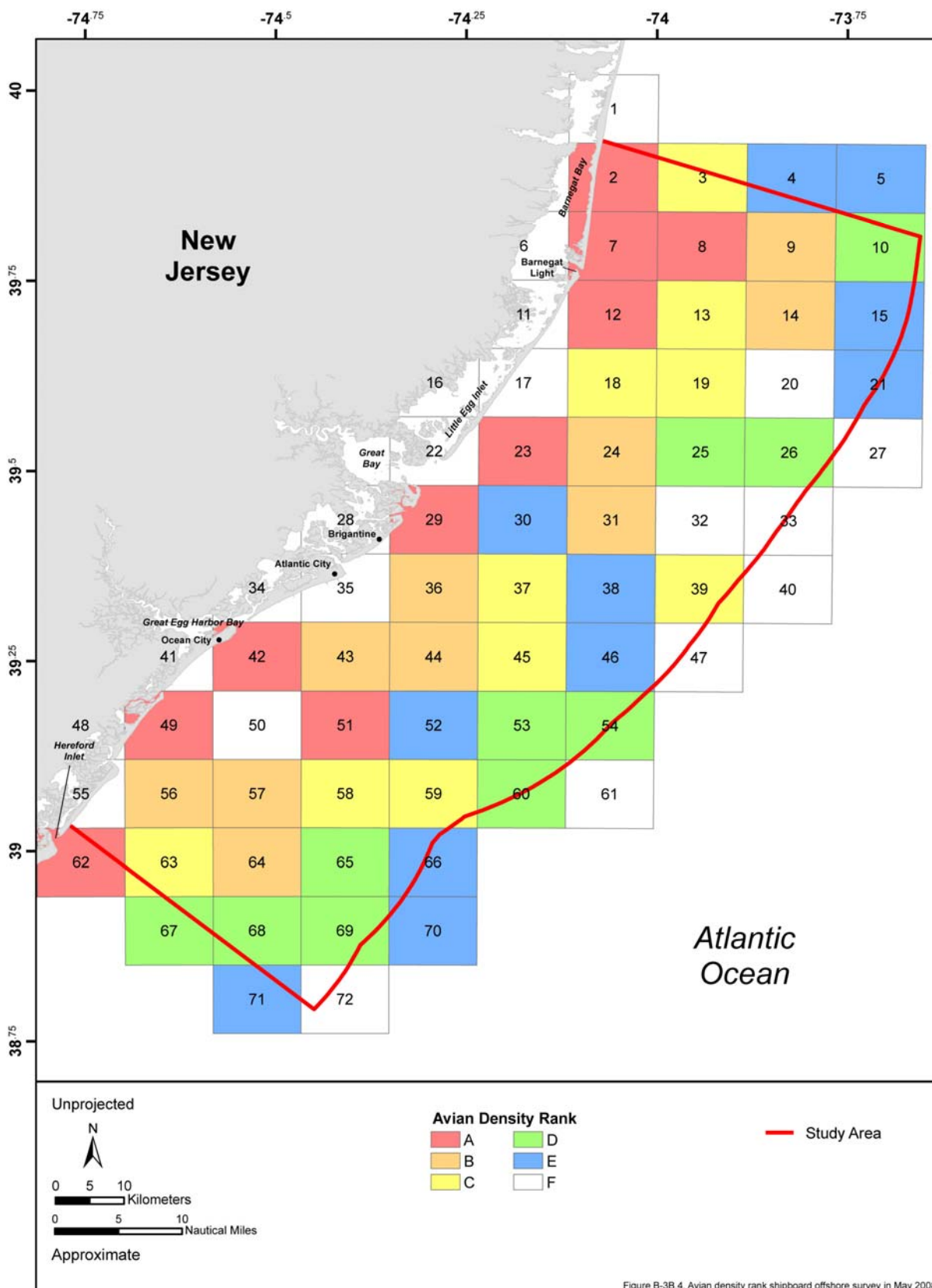


Figure B-3b.4. Avian density rank in the New Jersey Study Area during the shipboard offshore survey in May 2008.

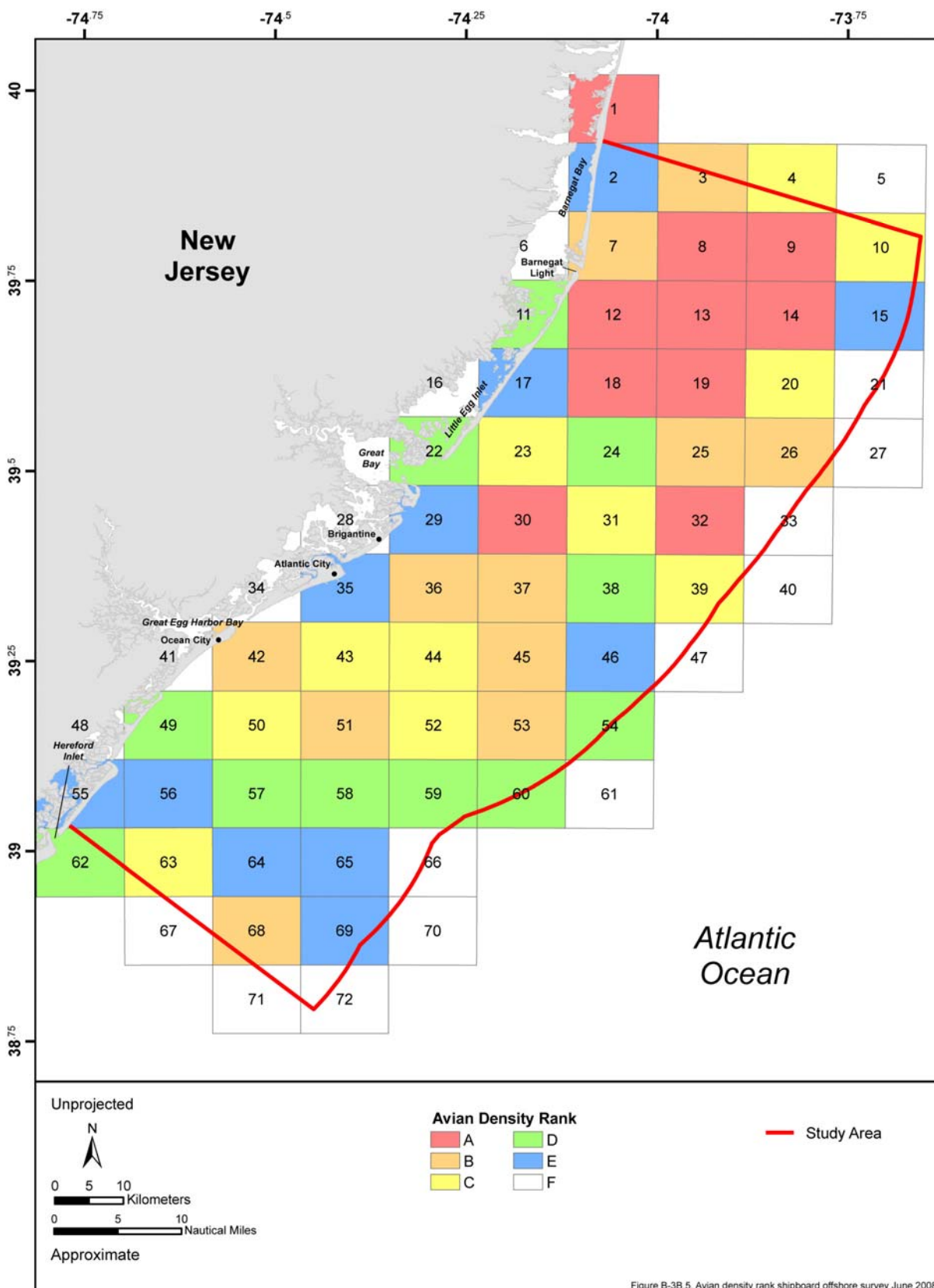


Figure B-3b.5. Avian density rank in the New Jersey Study Area during the shipboard offshore survey June 2008.

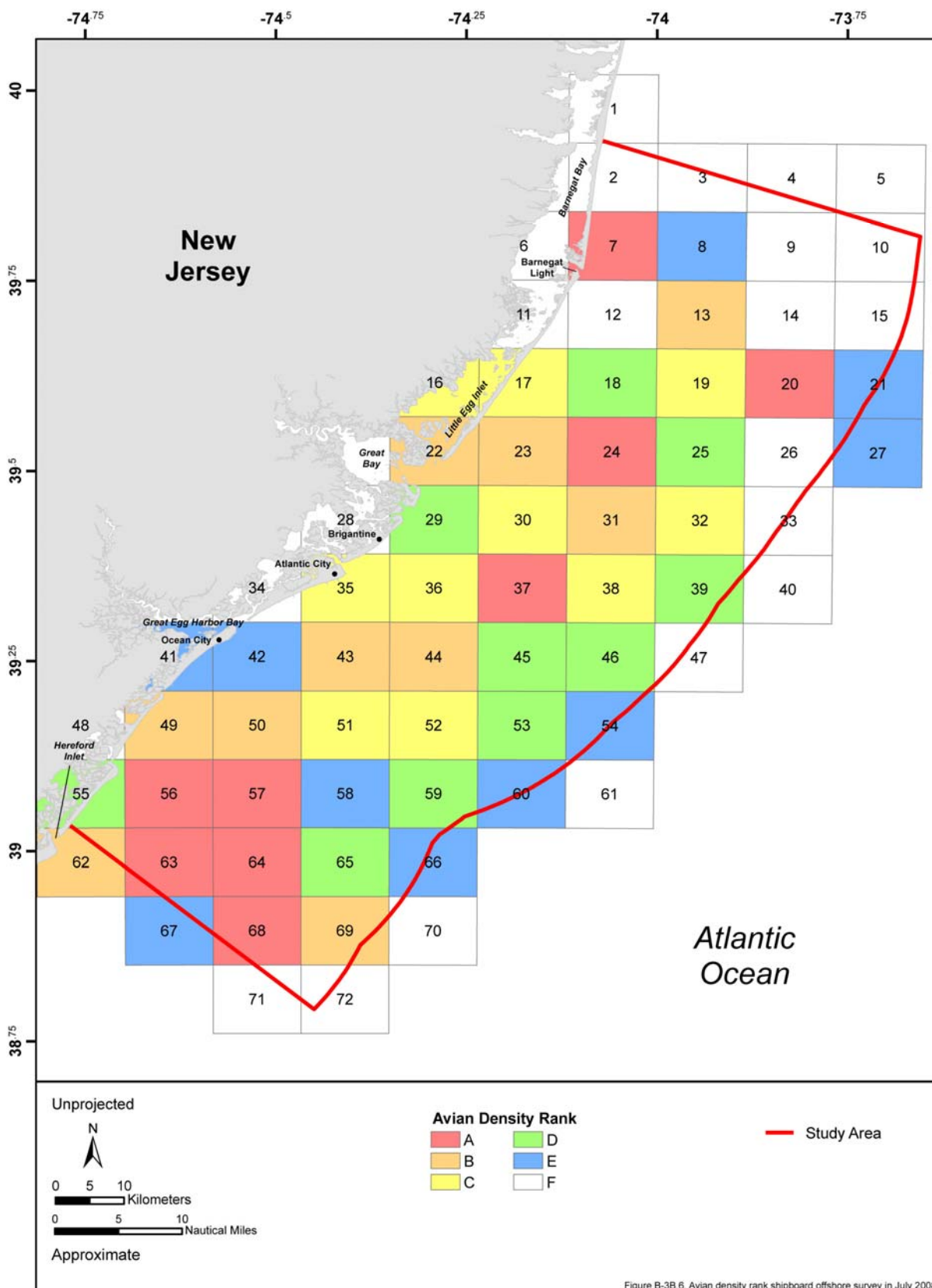


Figure B-3b.6. Avian density rank in the New Jersey Study Area during the shipboard offshore survey in July 2008.

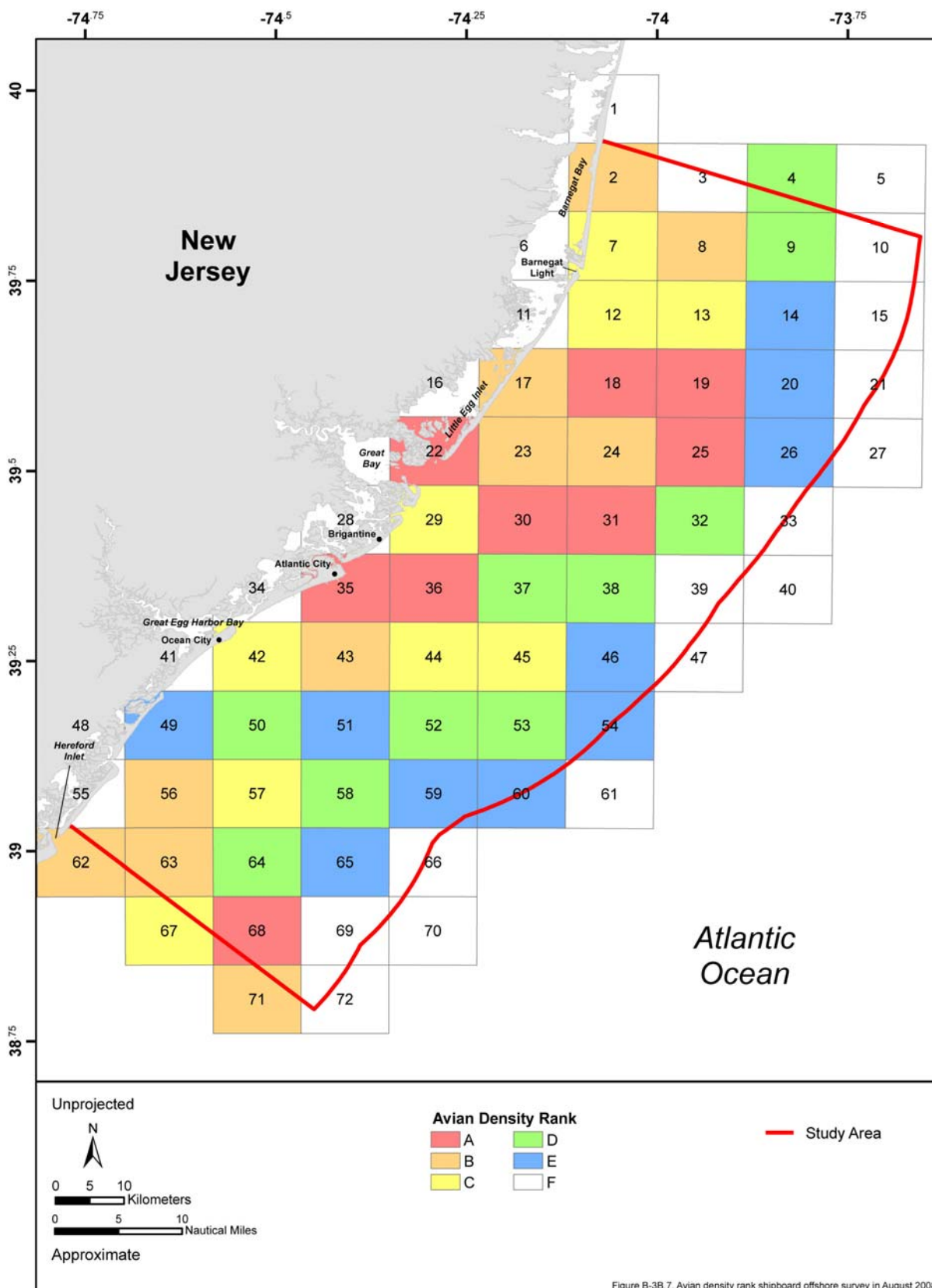


Figure B-3b.7. Avian density rank in the New Jersey Study Area during the shipboard offshore survey in August 2008.

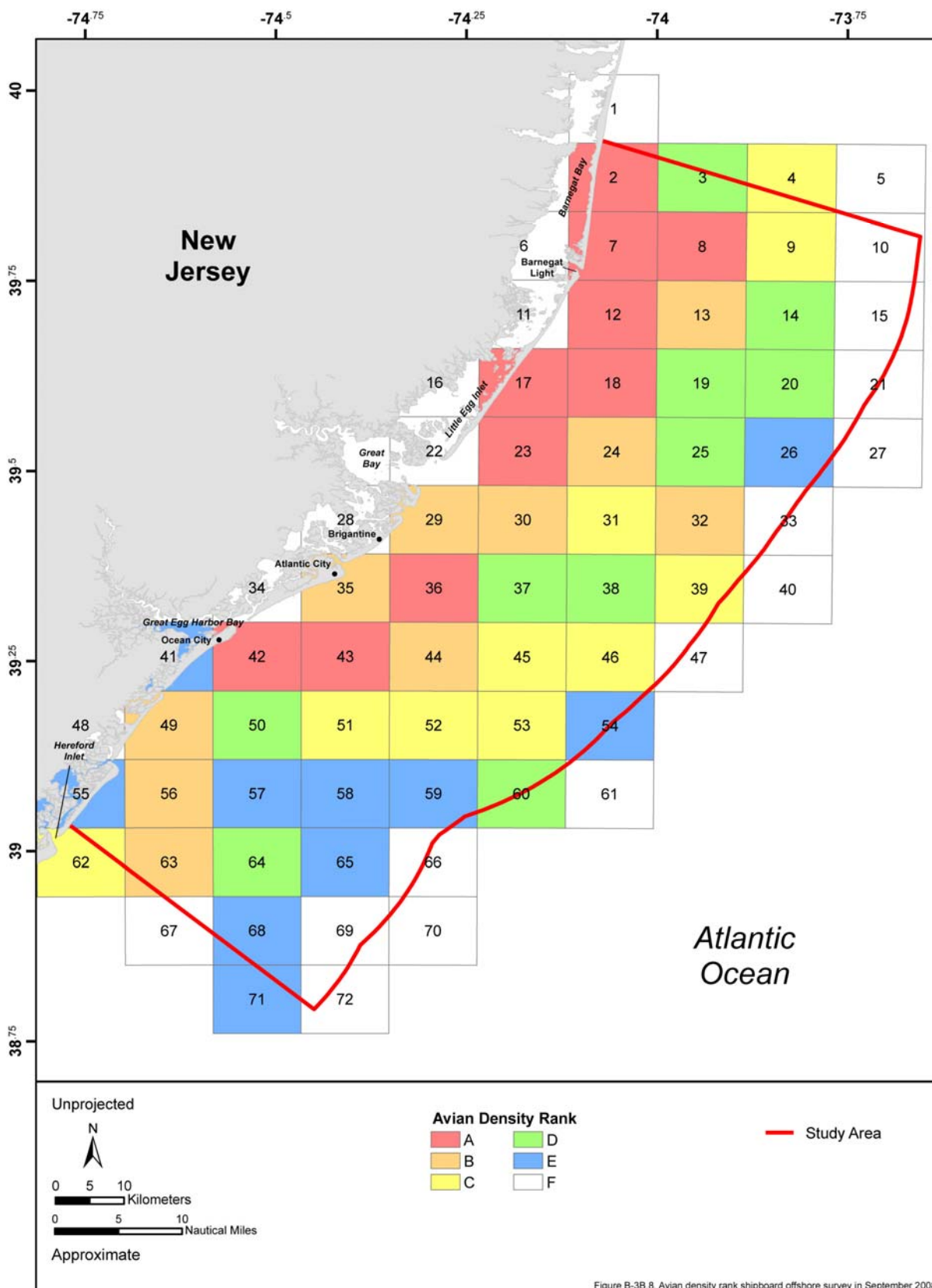


Figure B-3b.8. Avian density rank in the New Jersey Study Area during the shipboard offshore survey in September 2008.

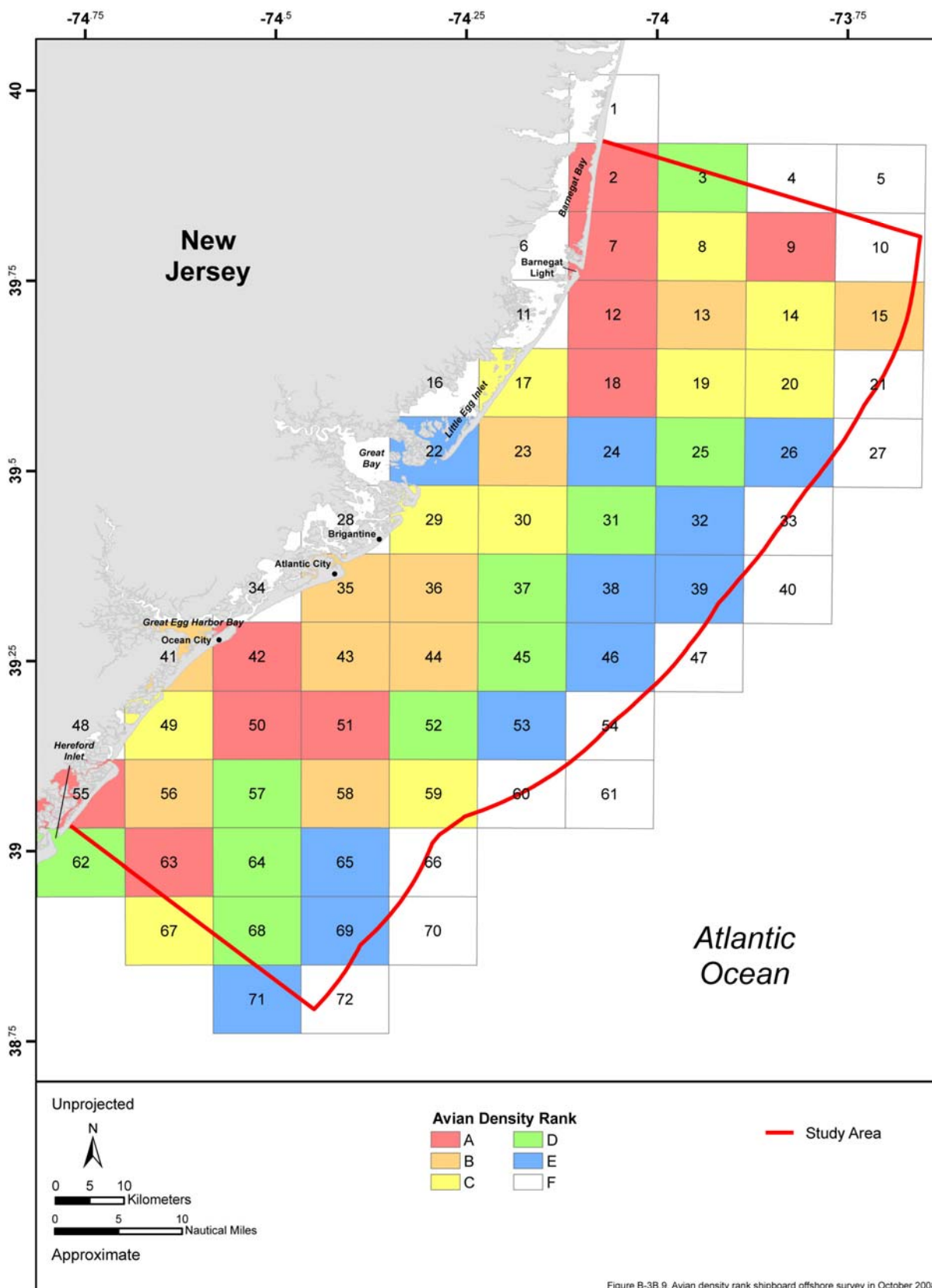


Figure B-3b.9. Avian density rank in the New Jersey Study Area during the shipboard offshore survey in October 2008.

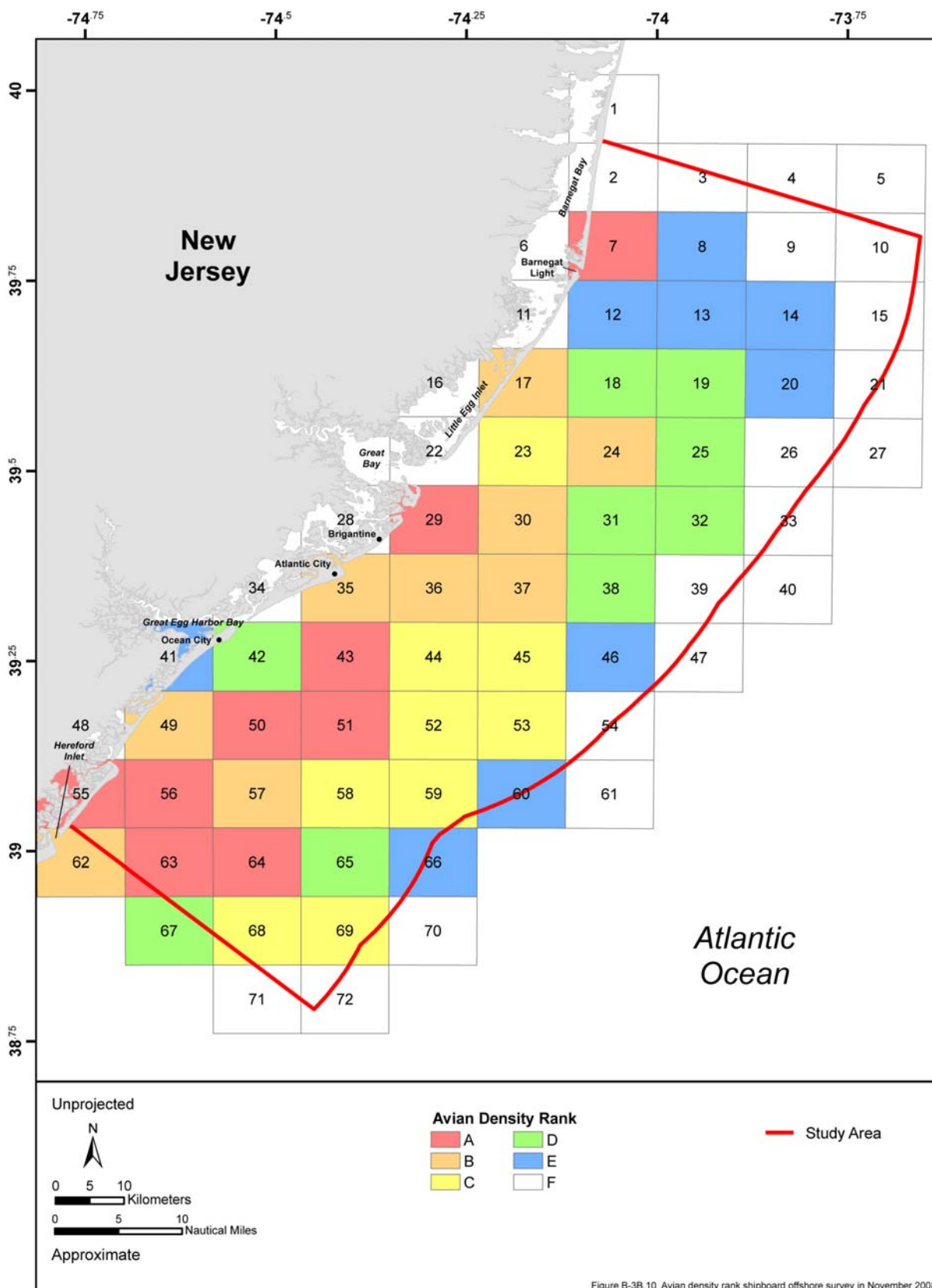


Figure B-3b.10. Avian density rank in the New Jersey Study Area during the shipboard offshore survey in November 2008.

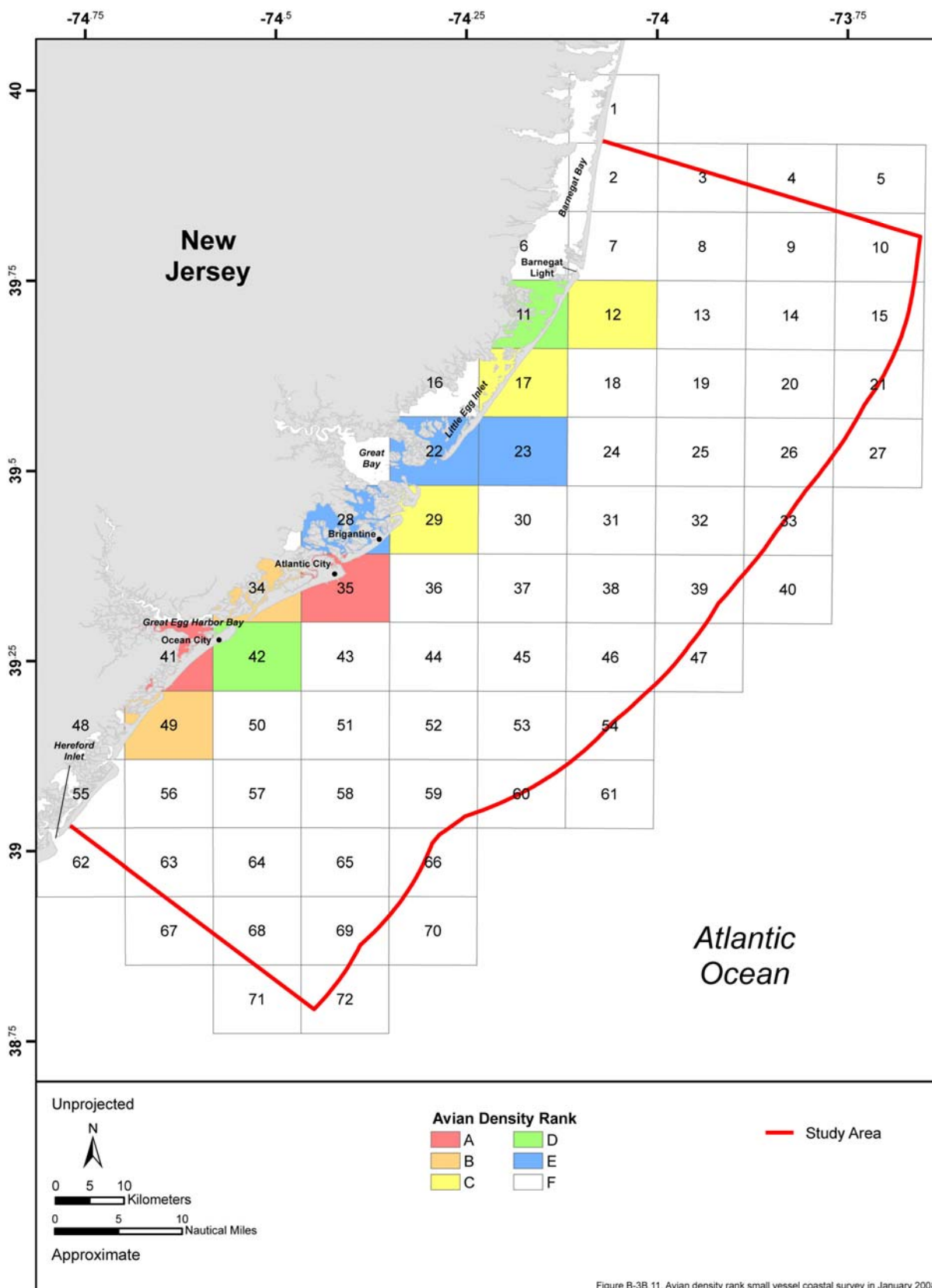


Figure B-3b.11. Avian density rank in the New Jersey Study Area during the small vessel coastal survey in January 2008.

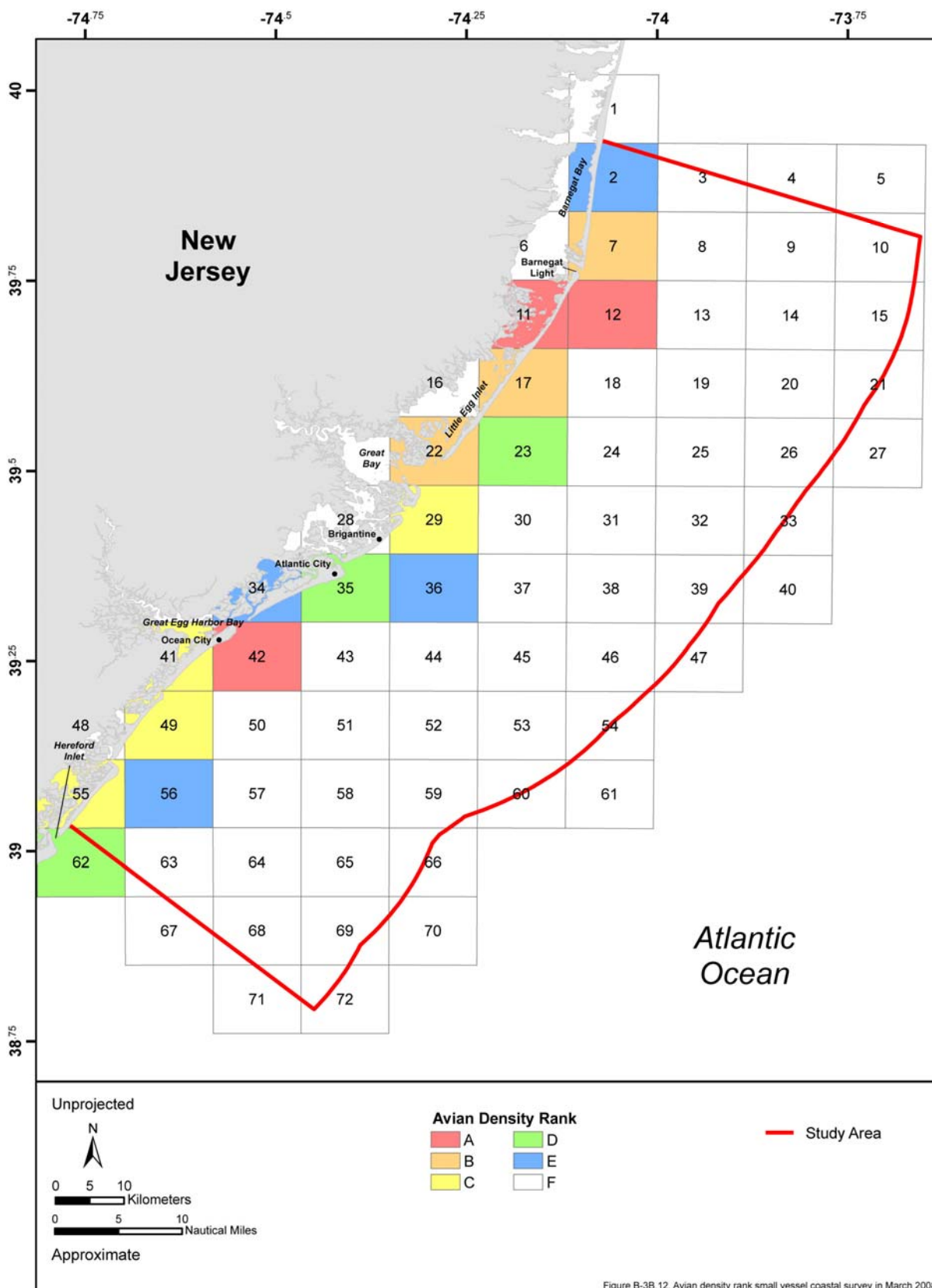


Figure B-3b.12. Avian density rank in the New Jersey Study Area during the small vessel coastal survey in March 2008.

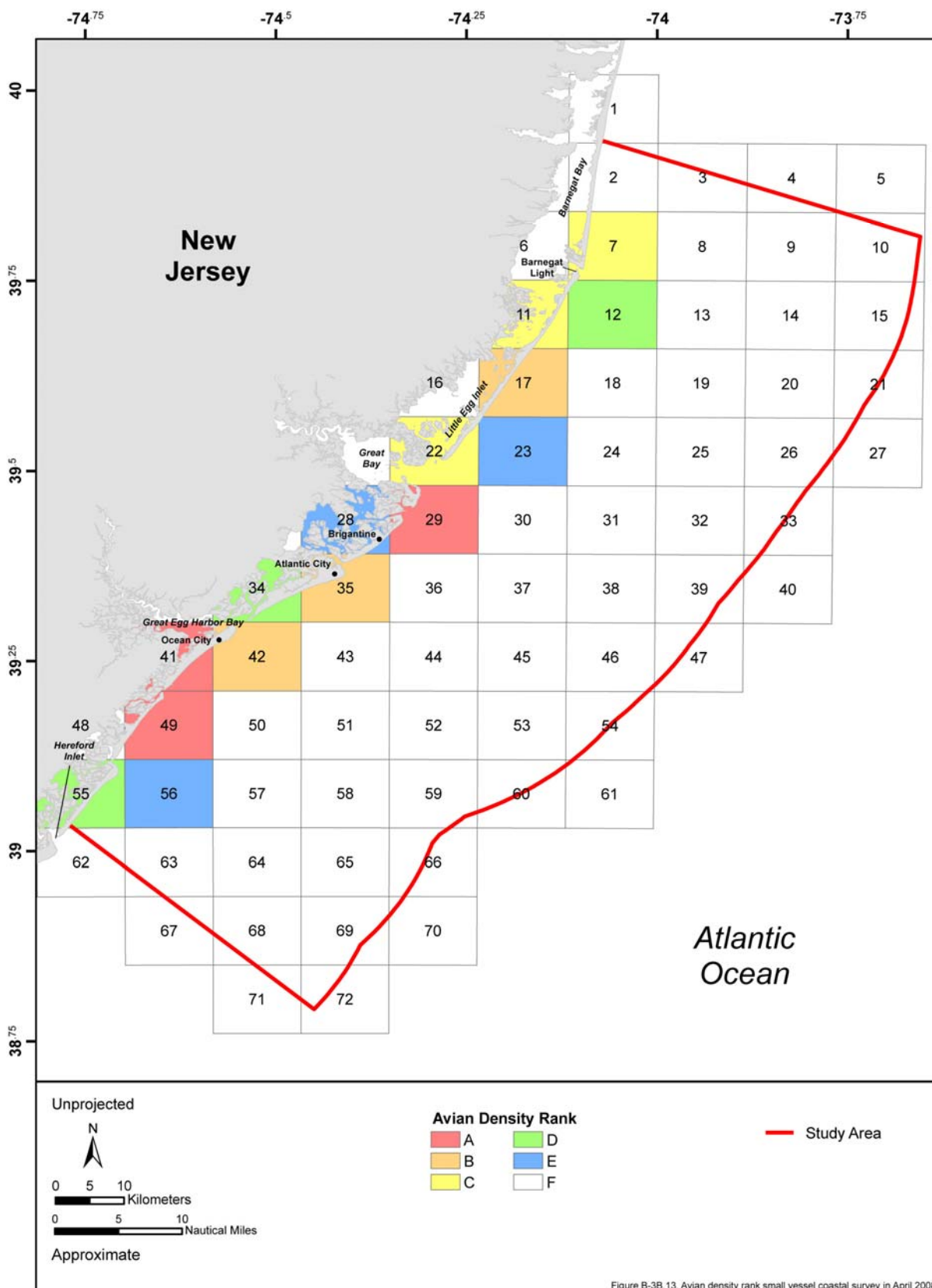


Figure B-3b.13. Avian density rank in the New Jersey Study Area during the small vessel coastal survey in April 2008.

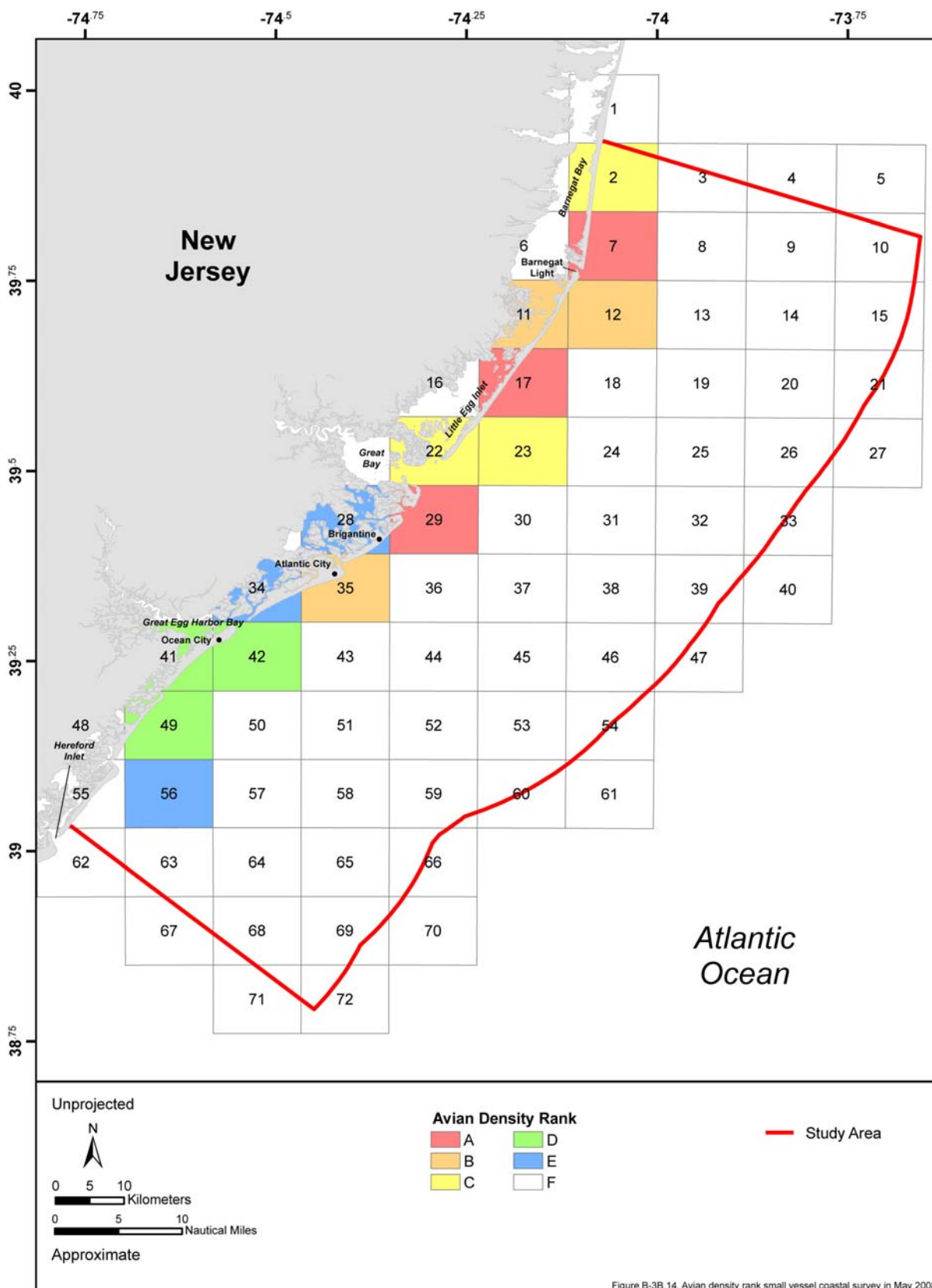


Figure B-3b.14. Avian density rank in the New Jersey Study Area during the small vessel coastal survey in May 2008.

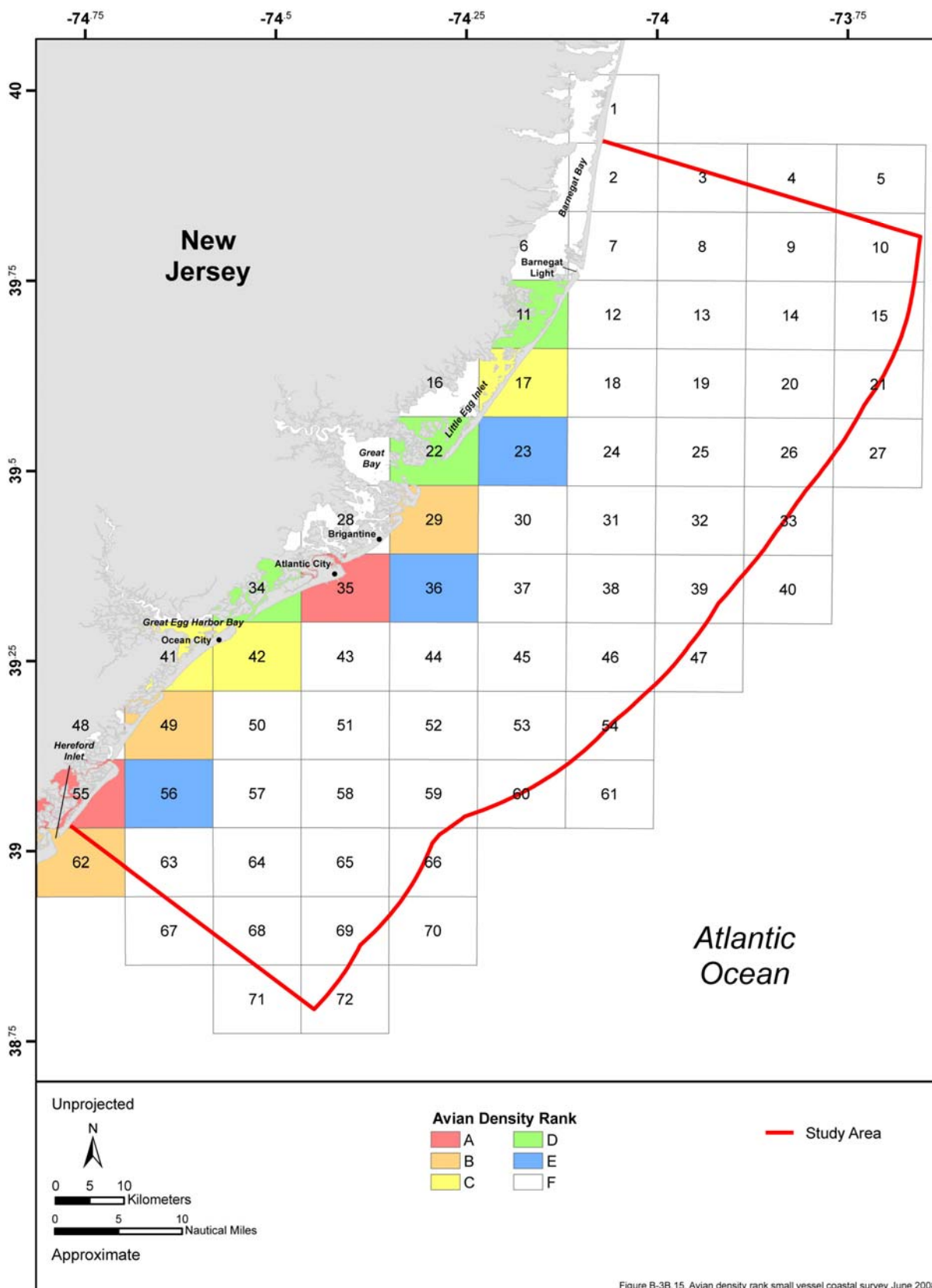


Figure B-3b.15. Avian density rank in the New Jersey Study Area during the small vessel coastal survey June 2008.

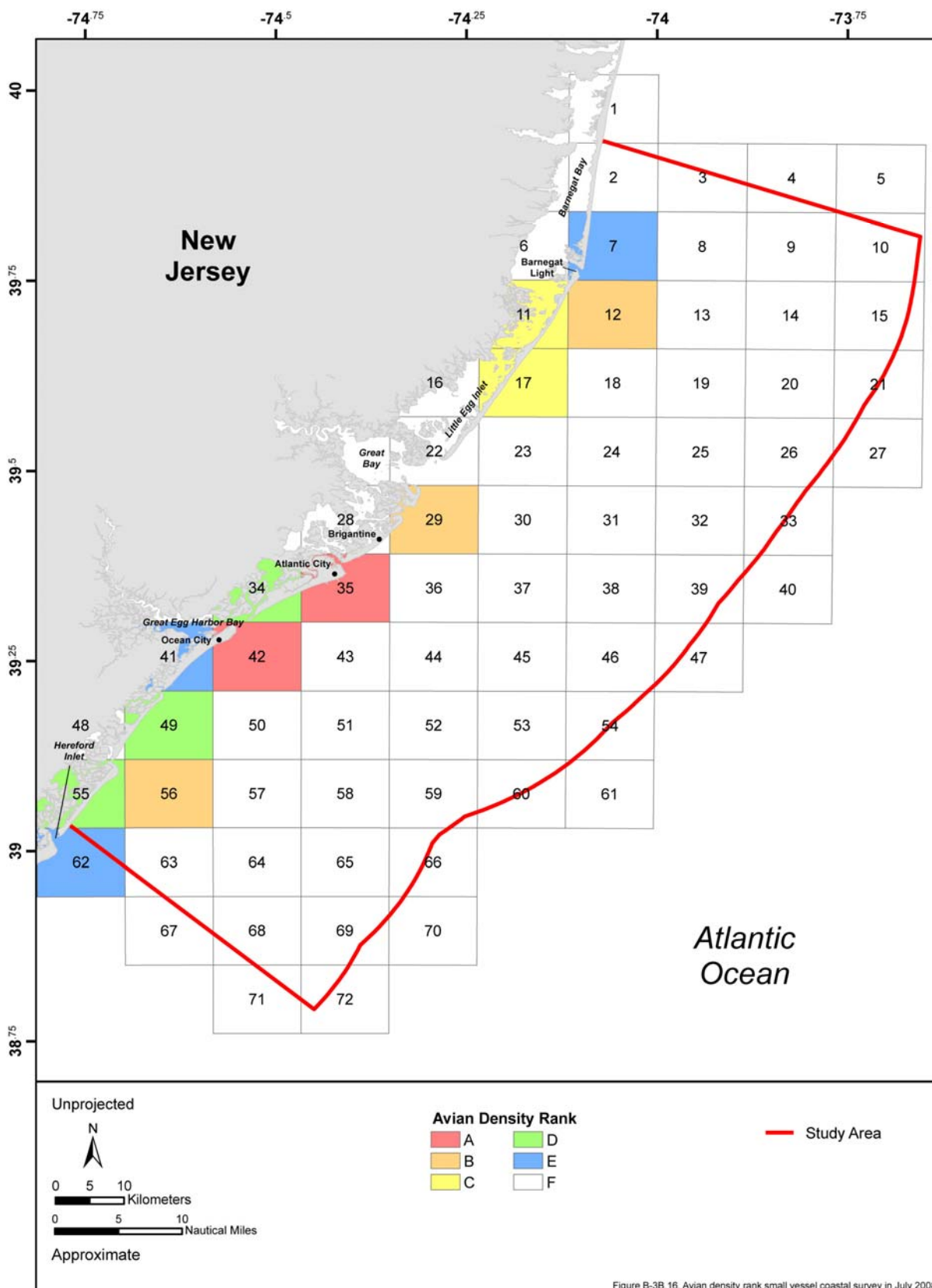


Figure B-3b.16. Avian density rank in the New Jersey Study Area during the small vessel coastal survey in July 2008.

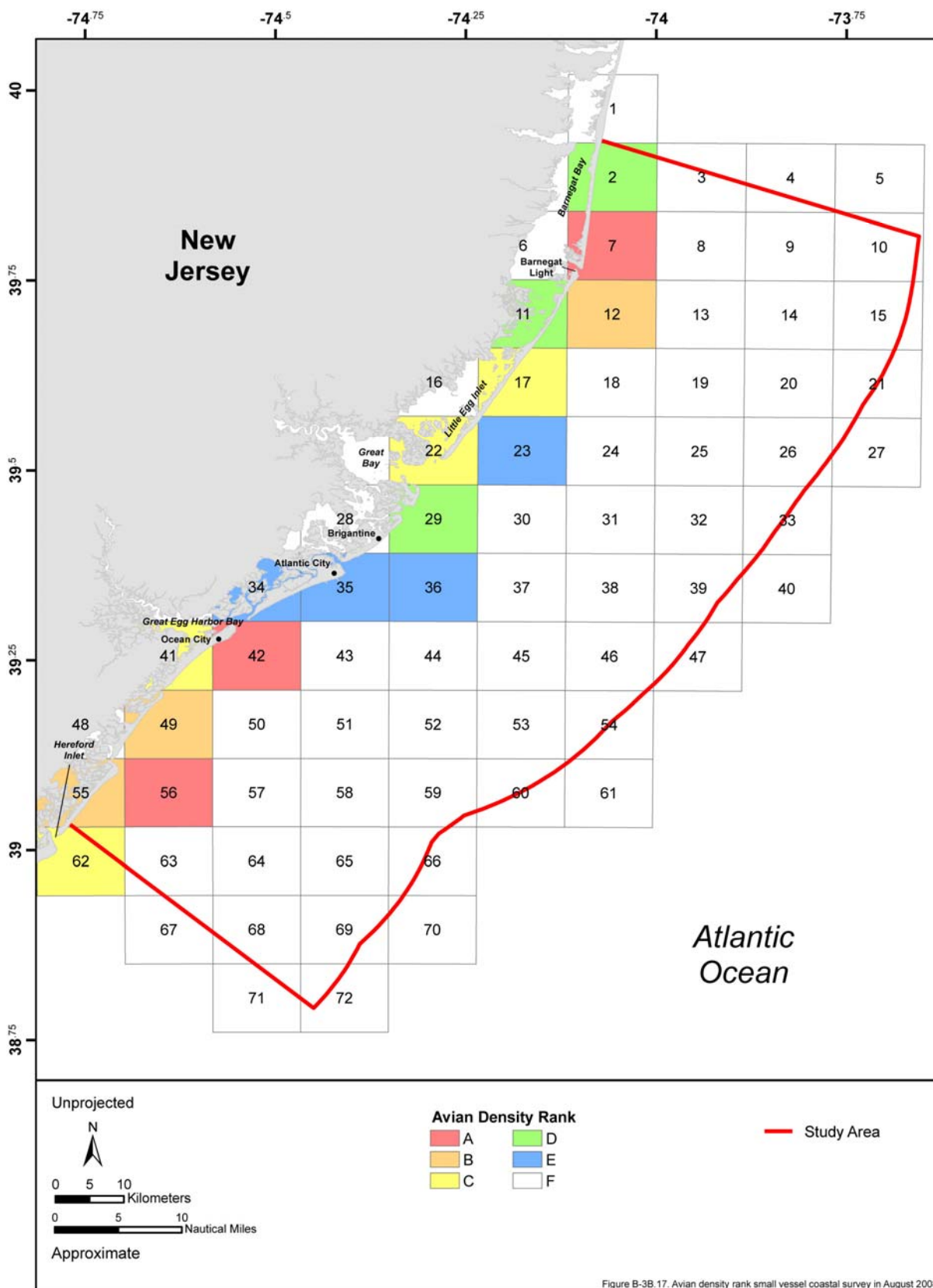


Figure B-3b.17. Avian density rank in the New Jersey Study Area during the small vessel coastal survey in August 2008.

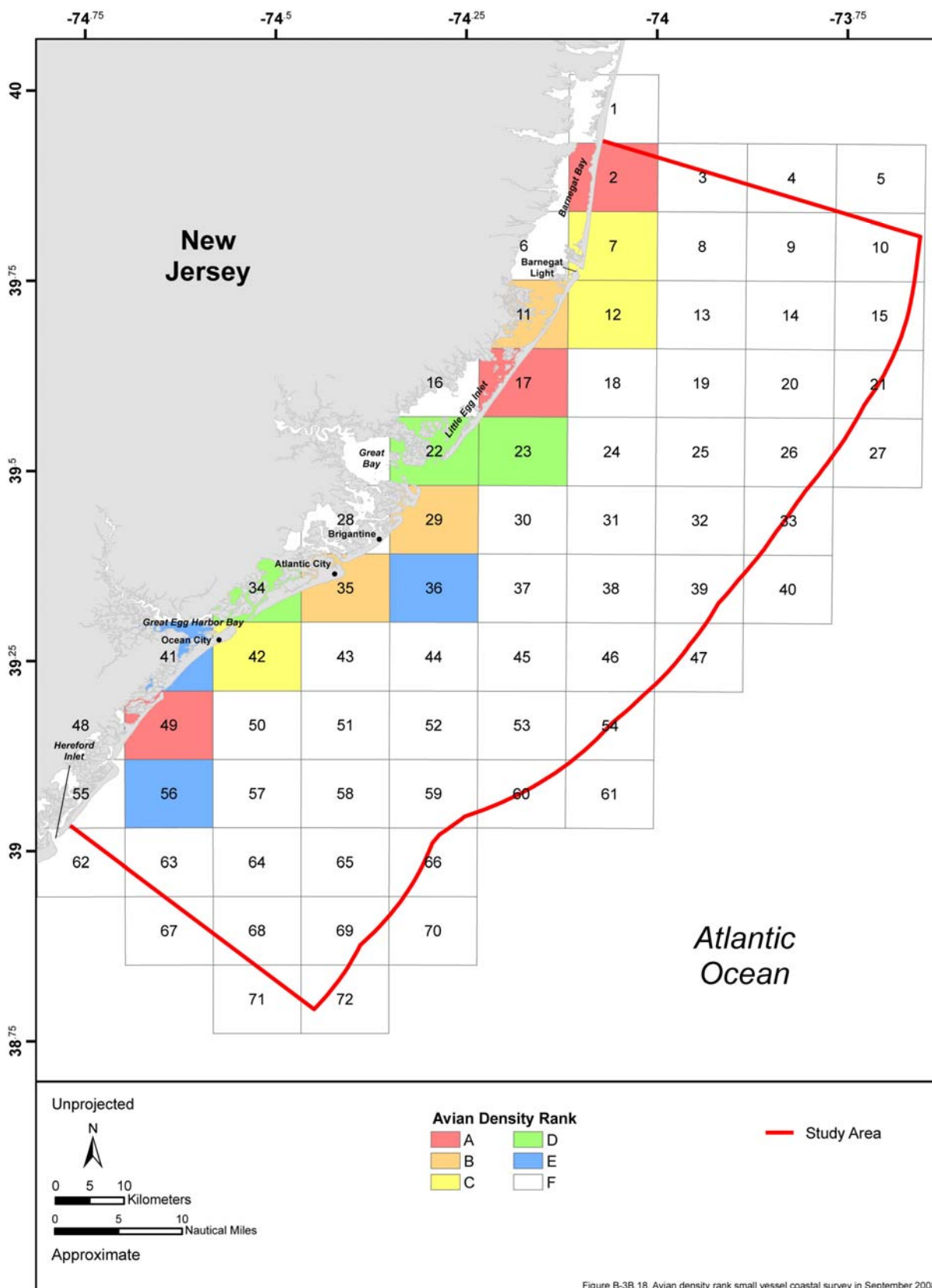


Figure B-3b.18. Avian density rank in the New Jersey Study Area during the small vessel coastal survey in September 2008.

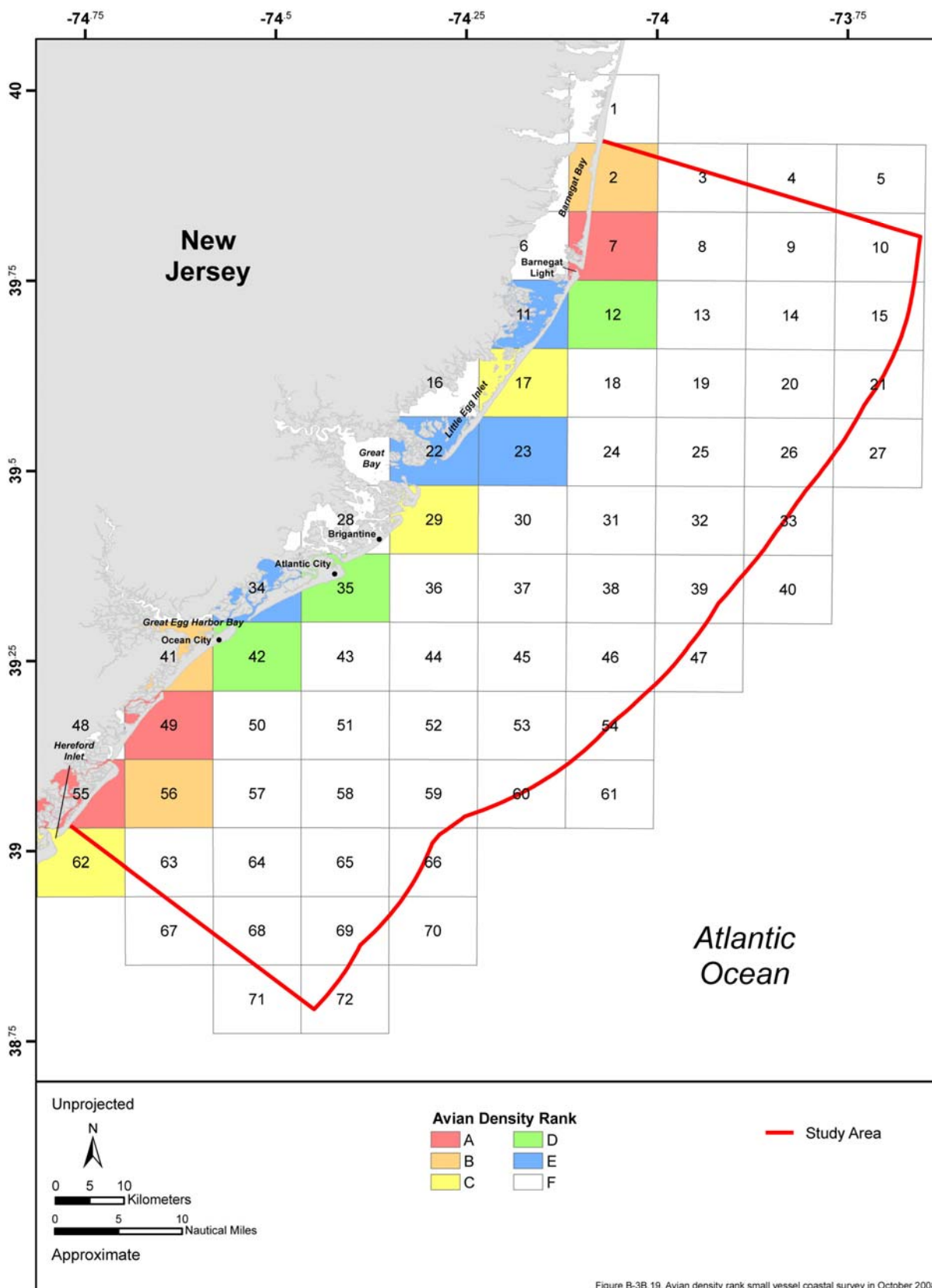


Figure B-3b.19. Avian density rank in the New Jersey Study Area during the small vessel coastal survey in October 2008.

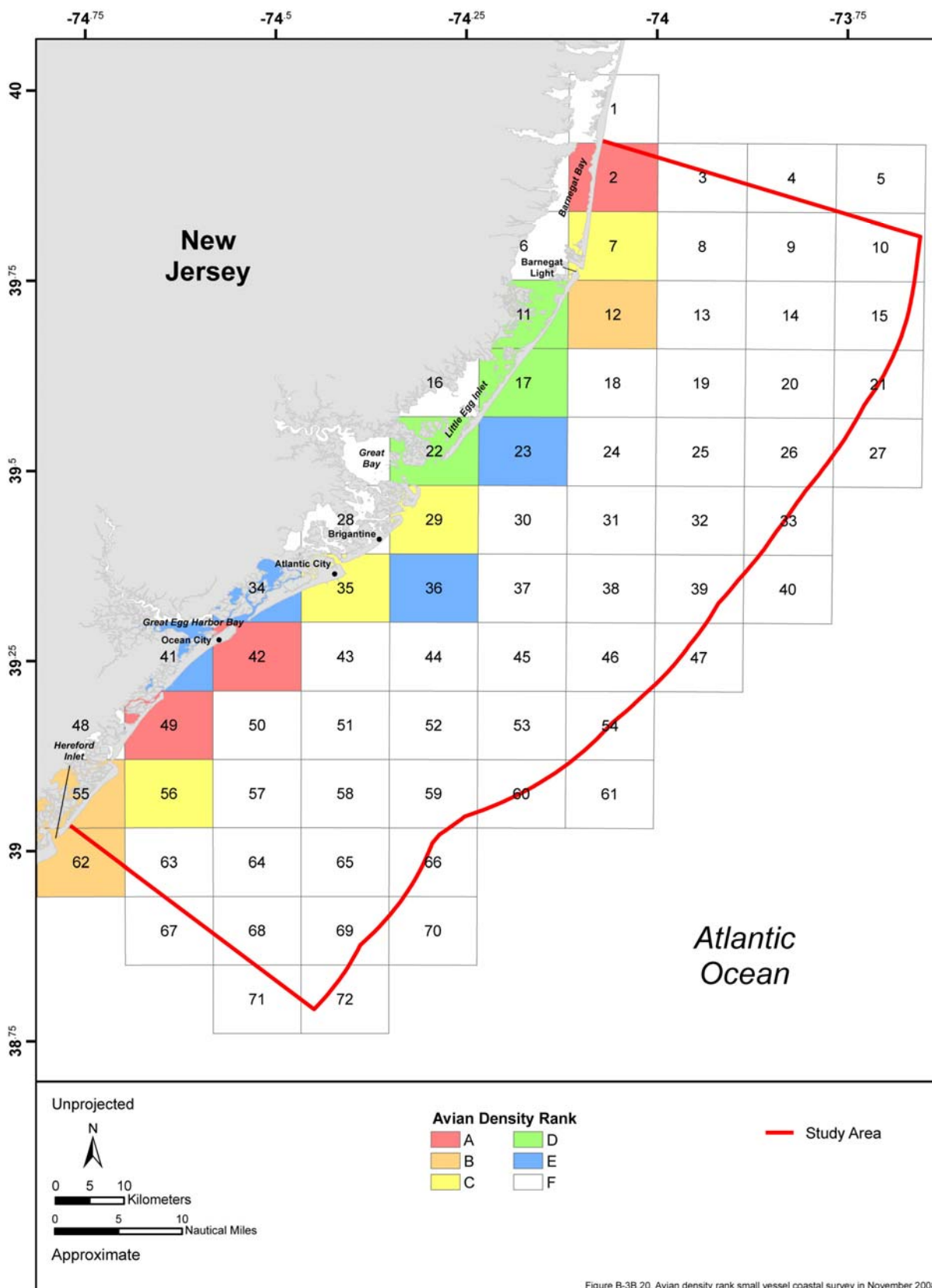


Figure B-3b.20. Avian density rank in the New Jersey Study Area during the small vessel coastal survey in November 2008.

Appendix B-4
Altitude Distribution

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Appendix B-4a

Shipboard Offshore Survey Avian Altitude Distribution

Table B-4a.1a. Avian species observed during the January 2008 shipboard offshore survey.

| Family Common Name | Total No. | No. Sitting | Sitting % | No. flying | Flying % |
|---|--------------|-------------|------------|------------|------------|
| Anatidae (geese, swans, and ducks) | 170 | 85 | 50% | 85 | 50% |
| Atlantic Brant | 9 | 0 | 0% | 9 | 100% |
| Surf Scoter | 5 | 1 | 20% | 4 | 80% |
| White-winged Scoter | 43 | 20 | 47% | 23 | 53% |
| Black Scoter | 63 | 23 | 37% | 40 | 63% |
| Scoter (unknown) | 3 | 2 | 67% | 1 | 33% |
| Scoter, dark-winged (unknown) | 7 | 6 | 86% | 1 | 14% |
| Long-tailed Duck | 40 | 33 | 82% | 7 | 18% |
| Gaviidae (loons) | 202 | 72 | 36% | 130 | 64% |
| Red-throated Loon | 118 | 8 | 7% | 110 | 93% |
| Common Loon | 83 | 63 | 76% | 20 | 24% |
| Loon (unknown) | 1 | 1 | 100% | 0 | 0% |
| Sulidae (gannets) | 776 | 194 | 25% | 582 | 75% |
| Northern Gannet | 776 | 194 | 25% | 582 | 75% |
| Laridae (gulls and terns) | 132 | 12 | 9% | 120 | 91% |
| Black-legged Kittiwake | 4 | 0 | 0% | 4 | 100% |
| Bonaparte's Gull | 7 | 0 | 0% | 7 | 100% |
| Herring Gull | 71 | 5 | 7% | 66 | 93% |
| Great Black-backed Gull | 39 | 7 | 18% | 32 | 82% |
| Gull, large (unknown) | 11 | 0 | 0% | 11 | 100% |
| Alcidae (alcids) | 70 | 12 | 17% | 58 | 83% |
| Dovekie | 16 | 3 | 19% | 13 | 81% |
| Razorbill | 36 | 9 | 25% | 27 | 75% |
| Alcid (unknown) | 18 | 0 | 0% | 18 | 100% |
| TOTAL | 1,350 | 375 | 28% | 975 | 72% |

Table B-4a.1b. Avian species observed during the January 2008 shipboard offshore survey. Altitude categories total 100% of the individuals observed flying.

| Family Common Name | Total No. flying | No. At/ below 100 ft | At/below 100 ft % | No. 101 to 500 ft (RSZ) | RSZ % | Above 500 ft No. | Above 500 ft % |
|---|---------------------|-------------------------|----------------------|----------------------------|------------|---------------------|-------------------|
| Anatidae (geese, swans, and ducks) | 85 | 83 | 98% | 2 | 2% | 0 | 0% |
| Atlantic Brant | 9 | 9 | 100% | 0 | 0% | 0 | 0% |
| Surf Scoter | 4 | 3 | 75% | 1 | 25% | 0 | 0% |
| White-winged Scoter | 23 | 23 | 100% | 0 | 0% | 0 | 0% |
| Black Scoter | 40 | 39 | 98% | 1 | 2% | 0 | 0% |
| Scoter (unknown) | 1 | 1 | 100% | 0 | 0% | 0 | 0% |
| Scoter, dark-winged (unknown) | 1 | 1 | 100% | 0 | 0% | 0 | 0% |
| Long-tailed Duck | 7 | 7 | 100% | 0 | 0% | 0 | 0% |
| Gaviidae (loons) | 130 | 123 | 95% | 7 | 5% | 0 | 0% |
| Red-throated Loon | 110 | 105 | 95% | 5 | 5% | 0 | 0% |
| Common Loon | 20 | 18 | 90% | 2 | 10% | 0 | 0% |
| Loon (unknown) | 0 | 0 | 0% | 0 | 0% | 0 | 0% |
| Sulidae (gannets) | 582 | 465 | 80% | 109 | 19% | 8 | 1% |
| Northern Gannet | 582 | 465 | 80% | 109 | 19% | 8 | 1% |
| Laridae (gulls and terns) | 120 | 74 | 62% | 42 | 35% | 4 | 3% |
| Black-legged Kittiwake | 4 | 4 | 100% | 0 | 0% | 0 | 0% |
| Bonaparte's Gull | 7 | 7 | 100% | 0 | 0% | 0 | 0% |
| Herring Gull | 66 | 30 | 45% | 33 | 50% | 3 | 5% |
| Great Black-backed Gull | 32 | 22 | 69% | 9 | 28% | 1 | 3% |
| Gull, large (unknown) | 11 | 11 | 100% | 0 | 0% | 0 | 0% |
| Alcidae (alcids) | 58 | 58 | 100% | 0 | 0% | 0 | 0% |
| Dovekie | 13 | 13 | 100% | 0 | 0% | 0 | 0% |
| Razorbill | 27 | 27 | 100% | 0 | 0% | 0 | 0% |
| Alcid (unknown) | 18 | 18 | 100% | 0 | 0% | 0 | 0% |
| TOTAL | 975 | 803 | 83% | 160 | 16% | 12 | 1% |

Table B-4a.2a. Avian species observed during the February 2008 shipboard offshore survey.

| Family Common Name | Total No. | No. Sitting | Sitting % | No. flying | Flying % |
|---|------------|-------------|------------|------------|------------|
| Anatidae (geese, swans, and ducks) | 120 | 49 | 41% | 71 | 59% |
| Surf Scoter | 3 | 3 | 100% | 0 | 0% |
| White-winged Scoter | 9 | 0 | 0% | 9 | 100% |
| Black Scoter | 32 | 17 | 53% | 15 | 47% |
| Long-tailed Duck | 76 | 29 | 38% | 47 | 62% |
| Gaviidae (loons) | 44 | 41 | 93% | 3 | 7% |
| Red-throated Loon | 3 | 1 | 33% | 2 | 67% |
| Common Loon | 41 | 40 | 98% | 1 | 2% |
| Sulidae (gannets) | 29 | 10 | 34% | 19 | 66% |
| Northern Gannet | 29 | 10 | 34% | 19 | 66% |
| Laridae (gulls and terns) | 50 | 3 | 6% | 47 | 94% |
| Herring Gull | 30 | 1 | 3% | 29 | 97% |
| Great Black-backed Gull | 14 | 2 | 14% | 12 | 86% |
| Gull, large (unknown) | 6 | 0 | 0% | 6 | 100% |
| Alcidae (alcids) | 8 | 6 | 75% | 2 | 25% |
| Razorbill | 6 | 4 | 67% | 2 | 33% |
| Alcid (unknown) | 2 | 2 | 100% | 0 | 0% |
| TOTAL | 251 | 109 | 43% | 142 | 57% |

Table B-4a.2b. Avian species observed during the February 2008 shipboard offshore survey. Altitude categories total 100% of the individuals observed flying.

| Family Common Name | Total No. flying | No. At/ below 100 ft | At/below 100 ft % | No. 101 to 500 ft (RSZ) | RSZ % | No. Above 500 ft | Above 500 ft % |
|---|---------------------|-------------------------|----------------------|----------------------------|------------|---------------------|-------------------|
| Anatidae (geese, swans, and ducks) | 71 | 71 | 100% | 0 | 0% | 0 | 0% |
| Surf Scoter | 0 | 0 | 0% | 0 | 0% | 0 | 0% |
| White-winged Scoter | 9 | 9 | 100% | 0 | 0% | 0 | 0% |
| Black Scoter | 15 | 15 | 100% | 0 | 0% | 0 | 0% |
| Long-tailed Duck | 47 | 47 | 100% | 0 | 0% | 0 | 0% |
| Gaviidae (loons) | 3 | 3 | 100% | 0 | 0% | 0 | 0% |
| Red-throated Loon | 2 | 2 | 100% | 0 | 0% | 0 | 0% |
| Common Loon | 1 | 1 | 100% | 0 | 0% | 0 | 0% |
| Sulidae (gannets) | 19 | 13 | 68% | 6 | 32% | 0 | 0% |
| Northern Gannet | 19 | 13 | 68% | 6 | 32% | 0 | 0% |
| Laridae (gulls and terns) | 47 | 36 | 77% | 11 | 23% | 0 | 0% |
| Herring Gull | 29 | 20 | 69% | 9 | 31% | 0 | 0% |
| Great Black-backed Gull | 12 | 10 | 83% | 2 | 17% | 0 | 0% |
| Gull, large (unknown) | 6 | 6 | 100% | 0 | 0% | 0 | 0% |
| Alcidae (alcids) | 2 | 2 | 100% | 0 | 0% | 0 | 0% |
| Razorbill | 2 | 2 | 100% | 0 | 0% | 0 | 0% |
| Alcid (unknown) | 0 | 0 | 0% | 0 | 0% | 0 | 0% |
| TOTAL | 142 | 125 | 88% | 17 | 12% | 0 | 0% |

Table B-4a.3a. Avian species observed during the March 2008 shipboard offshore survey.

| Family Common Name | Total No. | No. Sitting | Sitting % | No. flying | Flying % |
|---|--------------|--------------|------------|--------------|-------------|
| Anatidae (geese, swans, and ducks) | 807 | 259 | 32% | 548 | 68% |
| Canada Goose | 4 | 0 | 0% | 4 | 100% |
| American Black Duck | 1 | 0 | 0% | 1 | 100% |
| Surf Scoter | 126 | 49 | 39% | 77 | 61% |
| White-winged Scoter | 54 | 6 | 11% | 48 | 89% |
| Black Scoter | 142 | 28 | 20% | 114 | 80% |
| Scoter (unknown) | 65 | 2 | 3% | 63 | 97% |
| Scoter, dark-winged (unknown) | 109 | 0 | 0% | 109 | 100% |
| Long-tailed Duck | 306 | 174 | 57% | 132 | 43% |
| Gaviidae (loons) | 286 | 119 | 42% | 167 | 58% |
| Red-throated Loon | 180 | 16 | 9% | 164 | 91% |
| Common Loon | 105 | 102 | 97% | 3 | 3% |
| Loon (unknown) | 1 | 1 | 100% | 0 | 0% |
| Podicipedidae (grebes) | 2 | 0 | 0% | 2 | 100% |
| Red-necked Grebe | 2 | 0 | 0% | 2 | 100% |
| Sulidae (gannets) | 1,497 | 644 | 43% | 853 | 57% |
| Northern Gannet | 1,497 | 644 | 43% | 853 | 57% |
| Scolopacidae (sandpipers) | 1 | 0 | 0% | 1 | 100% |
| Red Phalarope | 1 | 0 | 0% | 1 | 100% |
| Laridae (gulls and terns) | 541 | 92 | 17% | 449 | 83% |
| Bonaparte's Gull | 9 | 1 | 11% | 8 | 89% |
| Laughing Gull | 7 | 6 | 86% | 1 | 14% |
| Ring-billed Gull | 1 | 0 | 0% | 1 | 100% |
| Herring Gull | 466 | 79 | 17% | 387 | 83% |
| Great Black-backed Gull | 52 | 6 | 12% | 46 | 88% |
| Gull, large (unknown) | 6 | 0 | 0% | 6 | 100% |
| Alcidae (alcids) | 23 | 6 | 26% | 17 | 74% |
| Thick-billed Murre | 1 | 1 | 100% | 0 | 0% |
| Razorbill | 20 | 5 | 25% | 15 | 75% |
| Black Guillemot | 1 | 0 | 0% | 1 | 100% |
| Alcid (unknown) | 1 | 0 | 0% | 1 | 100% |
| Certhiidae (creepers) | 1 | 0 | 0% | 1 | 100% |
| Brown Creeper | 1 | 0 | 0% | 1 | 100% |
| Emberizidae (sparrows) | 6 | 1 | 17% | 5 | 83% |
| Vesper Sparrow | 1 | 0 | 0% | 1 | 100% |
| Song Sparrow | 5 | 1 | 20% | 4 | 80% |
| Icteridae (blackbirds and meadowlarks) | 2 | 1 | 50% | 1 | 50% |
| Red-winged Blackbird | 1 | 1 | 100% | 0 | 0% |
| Eastern Meadowlark | 1 | 0 | 0% | 1 | 100% |
| TOTAL | 3,166 | 1,123 | 35% | 2,043 | 65% |

Table B-4a.3b. Avian species observed during the March 2008 shipboard offshore survey. Altitude categories total 100% of the individuals observed flying.

| Family Common Name | Total No. flying | No. At/ below 100 ft | At/below 100 ft % | No. 101 to 500 ft (RSZ) | RSZ % | No. Above 500 ft | Above 500 ft % |
|---|---------------------|-------------------------|----------------------|----------------------------|-----------|---------------------|-------------------|
| Anatidae (geese, swans, and ducks) | 548 | 548 | 100% | 0 | 0% | 0 | 0% |
| Canada Goose | 4 | 4 | 100% | 0 | 0% | 0 | 0% |
| American Black Duck | 1 | 1 | 100% | 0 | 0% | 0 | 0% |
| Surf Scoter | 77 | 77 | 100% | 0 | 0% | 0 | 0% |
| White-winged Scoter | 48 | 48 | 100% | 0 | 0% | 0 | 0% |
| Black Scoter | 114 | 114 | 100% | 0 | 0% | 0 | 0% |
| Scoter (unknown) | 63 | 63 | 100% | 0 | 0% | 0 | 0% |
| Scoter, dark-winged (unknown) | 109 | 109 | 100% | 0 | 0% | 0 | 0% |
| Long-tailed Duck | 132 | 132 | 100% | 0 | 0% | 0 | 0% |
| Gaviidae (loons) | 167 | 165 | 99% | 2 | 1% | 0 | 0% |
| Red-throated Loon | 164 | 162 | 99% | 2 | 1% | 0 | 0% |
| Common Loon | 3 | 3 | 100% | 0 | 0% | 0 | 0% |
| Loon (unknown) | 0 | 0 | 0% | 0 | 0% | 0 | 0% |
| Podicipedidae (grebes) | 2 | 2 | 100% | 0 | 0% | 0 | 0% |
| Red-necked Grebe | 2 | 2 | 100% | 0 | 0% | 0 | 0% |
| Sulidae (gannets) | 853 | 838 | 98% | 15 | 2% | 0 | 0% |
| Northern Gannet | 853 | 838 | 98% | 15 | 2% | 0 | 0% |
| Scolopacidae (sandpipers) | 1 | 1 | 100% | 0 | 0% | 0 | 0% |
| Red Phalarope | 1 | 1 | 100% | 0 | 0% | 0 | 0% |
| Laridae (gulls and terns) | 449 | 409 | 91% | 40 | 9% | 0 | 0% |
| Bonaparte's Gull | 8 | 8 | 100% | 0 | 0% | 0 | 0% |
| Laughing Gull | 1 | 1 | 100% | 0 | 0% | 0 | 0% |
| Ring-billed Gull | 1 | 1 | 100% | 0 | 0% | 0 | 0% |
| Herring Gull | 387 | 359 | 93% | 28 | 7% | 0 | 0% |
| Great Black-backed Gull | 46 | 36 | 78% | 10 | 22% | 0 | 0% |
| Gull, large (unknown) | 6 | 4 | 67% | 2 | 33% | 0 | 0% |

Table B-4a.3b (*continued*). Avian species observed during the March 2008 shipboard offshore survey. Altitude categories total 100% of the individuals observed flying.

| Family Common Name | Total No. flying | No. At/ below 100 ft | At/below 100 ft % | No. 101 to 500 ft (RSZ) | RSZ % | No. Above 500 ft | Above 500 ft % |
|---|---------------------|-------------------------|----------------------|----------------------------|-----------|---------------------|-------------------|
| Alcidae (alcids) | 17 | 17 | 100% | 0 | 0% | 0 | 0% |
| Thick-billed Murre | 0 | 0 | 0% | 0 | 0% | 0 | 0% |
| Razorbill | 15 | 15 | 100% | 0 | 0% | 0 | 0% |
| Black Guillemot | 1 | 1 | 100% | 0 | 0% | 0 | 0% |
| Alcid (unknown) | 1 | 1 | 100% | 0 | 0% | 0 | 0% |
| Certhiidae (creepers) | 1 | 1 | 100% | 0 | 0% | 0 | 0% |
| Brown Creeper | 1 | 1 | 100% | 0 | 0% | 0 | 0% |
| Emberizidae (sparrows) | 5 | 5 | 100% | 0 | 0% | 0 | 0% |
| Vesper Sparrow | 1 | 1 | 100% | 0 | 0% | 0 | 0% |
| Song Sparrow | 4 | 4 | 100% | 0 | 0% | 0 | 0% |
| Icteridae (blackbirds and meadowlarks) | 1 | 1 | 100% | 0 | 0% | 0 | 0% |
| Red-winged Blackbird | 0 | 0 | 0% | 0 | 0% | 0 | 0% |
| Eastern Meadowlark | 1 | 1 | 100% | 0 | 0% | 0 | 0% |
| TOTAL | 2,043 | 1,987 | 97% | 57 | 3% | 0 | 0% |

Table B-4a.4a. Avian species observed during the April 2008 shipboard offshore survey.

| Family Common Name | Total No. | No. Sitting | Sitting % | No. flying | Flying % |
|---|--------------|--------------|-------------|--------------|-------------|
| Anatidae (geese, swans, and ducks) | 1,906 | 848 | 44% | 1,058 | 56% |
| American Black Duck | 18 | 0 | 0% | 18 | 100% |
| Green-winged Teal | 1 | 0 | 0% | 1 | 100% |
| Duck, dabbling (unknown) | 4 | 0 | 0% | 4 | 100% |
| Scaup (unknown), <i>Aythya</i> (unknown) | 4 | 0 | 0% | 4 | 100% |
| Surf Scoter | 1,297 | 635 | 49% | 662 | 51% |
| White-winged Scoter | 4 | 0 | 0% | 4 | 100% |
| Black Scoter | 335 | 107 | 32% | 228 | 68% |
| Scoter (unknown) | 33 | 5 | 15% | 28 | 85% |
| Scoter, dark-winged (unknown) | 204 | 100 | 49% | 104 | 51% |
| Long-tailed Duck | 1 | 0 | 0% | 1 | 100% |
| Red-breasted Merganser | 5 | 1 | 20% | 4 | 80% |
| Gaviidae (loons) | 285 | 118 | 41% | 167 | 59% |
| Red-throated Loon | 156 | 30 | 19% | 126 | 81% |
| Common Loon | 128 | 88 | 69% | 40 | 31% |
| Loon (unknown) | 1 | 0 | 0% | 1 | 100% |
| Podicipedidae (grebes) | 1 | 1 | 100% | 0 | 0% |
| Horned Grebe | 1 | 1 | 100% | 0 | 0% |
| Sulidae (gannets) | 809 | 299 | 37% | 510 | 63% |
| Northern Gannet | 809 | 299 | 37% | 510 | 63% |
| Laridae (gulls and terns) | 416 | 83 | 20% | 333 | 80% |
| Bonaparte's Gull | 150 | 68 | 45% | 82 | 55% |
| Little Gull | 1 | 0 | 0% | 1 | 100% |
| Laughing Gull | 24 | 0 | 0% | 24 | 100% |
| Ring-billed Gull | 4 | 0 | 0% | 4 | 100% |
| Herring Gull | 160 | 10 | 6% | 150 | 94% |
| Lesser Black-backed Gull | 1 | 0 | 0% | 1 | 100% |
| Great Black-backed Gull | 55 | 5 | 9% | 50 | 91% |
| Gull, large (unknown) | 3 | 0 | 0% | 3 | 100% |
| Common Tern | 2 | 0 | 0% | 2 | 100% |
| Forster's Tern | 13 | 0 | 0% | 13 | 100% |
| Tern, small (unknown) | 3 | 0 | 0% | 3 | 100% |
| Alcidae (alcids) | 6 | 2 | 33% | 4 | 67% |
| Dovekie | 2 | 2 | 100% | 0 | 0% |
| Razorbill | 4 | 0 | 0% | 4 | 100% |
| Picidae (woodpeckers) | 2 | 0 | 0% | 2 | 100% |
| Northern (Yellow-shafted) Flicker | 2 | 0 | 0% | 2 | 100% |
| Emberizidae (sparrows) | 2 | 1 | 50% | 1 | 50% |
| Song Sparrow | 1 | 0 | 0% | 1 | 100% |
| Dark-eyed Junco (Slate-colored) | 1 | 1 | 100% | 0 | 0% |
| Icteridae (blackbirds and meadowlarks) | 1 | 0 | 0% | 1 | 100% |
| Red-winged Blackbird | 1 | 0 | 0% | 1 | 100% |
| TOTAL | 3,428 | 1,352 | 39% | 2,076 | 61% |

Table B-4a.4b. Avian species observed during the April 2008 shipboard offshore survey. Altitude categories total 100% of the individuals observed flying.

| Family Common Name | Total No. flying | No. At/ below 100 ft | At/below 100 ft % | No. 101 to 500 ft (RSZ) | RSZ % | No. Above 500 ft | Above 500 ft % |
|---|---------------------|-------------------------|----------------------|----------------------------|------------|---------------------|-------------------|
| Anatidae (geese, swans, and ducks) | 1,058 | 1,002 | 95% | 56 | 5% | 0 | 0% |
| American Black Duck | 18 | 18 | 100% | 0 | 0% | 0 | 0% |
| Green-winged Teal | 1 | 1 | 100% | 0 | 0% | 0 | 0% |
| Duck, dabbling (unknown) | 4 | 4 | 100% | 0 | 0% | 0 | 0% |
| Scaup (unknown), <i>Aythya</i> (unknown) | 4 | 4 | 100% | 0 | 0% | 0 | 0% |
| Surf Scoter | 662 | 636 | 49% | 26 | 2% | 0 | 0% |
| White-winged Scoter | 4 | 4 | 100% | 0 | 0% | 0 | 0% |
| Black Scoter | 228 | 218 | 96% | 10 | 4% | 0 | 0% |
| Scoter (unknown) | 28 | 28 | 100% | 0 | 0% | 0 | 0% |
| Scoter, dark-winged (unknown) | 104 | 84 | 81% | 20 | 19% | 0 | 0% |
| Long-tailed Duck | 1 | 1 | 100% | 0 | 0% | 0 | 0% |
| Red-breasted Merganser | 4 | 4 | 100% | 0 | 0% | 0 | 0% |
| Gaviidae (loons) | 167 | 142 | 85% | 22 | 13% | 3 | 2% |
| Red-throated Loon | 126 | 112 | 89% | 11 | 9% | 3 | 2% |
| Common Loon | 40 | 29 | 72% | 11 | 28% | 0 | 0% |
| Loon (unknown) | 1 | 1 | 100% | 0 | 0% | 0 | 0% |
| Podicipedidae (grebes) | 0 | 0 | 0% | 0 | 0% | 0 | 0% |
| Horned Grebe | 0 | 0 | 0% | 0 | 0% | 0 | 0% |
| Sulidae (gannets) | 510 | 437 | 86% | 73 | 14% | 0 | 0% |
| Northern Gannet | 510 | 437 | 86% | 73 | 14% | 0 | 0% |
| Laridae (gulls and terns) | 333 | 317 | 95% | 16 | 5% | 0 | 0% |
| Bonaparte's Gull | 82 | 82 | 100% | 0 | 0% | 0 | 0% |
| Little Gull | 1 | 1 | 100% | 0 | 0% | 0 | 0% |
| Laughing Gull | 24 | 24 | 100% | 0 | 0% | 0 | 0% |
| Ring-billed Gull | 4 | 4 | 100% | 0 | 0% | 0 | 0% |
| Herring Gull | 150 | 136 | 91% | 14 | 9% | 0 | 0% |
| Lesser Black-backed Gull | 1 | 1 | 100% | 0 | 0% | 0 | 0% |
| Great Black-backed Gull | 50 | 49 | 98% | 1 | 2% | 0 | 0% |
| Gull, large (unknown) | 3 | 2 | 67% | 1 | 33% | 0 | 0% |

Table B-4a.4b. Avian species observed during the April 2008 shipboard offshore survey. Altitude categories total 100% of the individuals observed flying.

| Family Common Name | Total No. flying | No. At/ below 100 ft | At/below 100 ft % | No. 101 to 500 ft (RSZ) | RSZ % | No. Above 500 ft | Above 500 ft % |
|---|---------------------|-------------------------|----------------------|----------------------------|-----------|---------------------|-------------------|
| Laridae (gulls and terns) | 333 | 317 | 95% | 16 | 5% | 0 | 0% |
| Common Tern | 2 | 2 | 100% | 0 | 0% | 0 | 0% |
| Forster's Tern | 13 | 13 | 100% | 0 | 0% | 0 | 0% |
| Tern, small (unknown) | 3 | 3 | 100% | 0 | 0% | 0 | 0% |
| Alcidae (alcids) | 4 | 4 | 100% | 0 | 0% | 0 | 0% |
| Dovekie | 0 | 0 | 0% | 0 | 0% | 0 | 0% |
| Razorbill | 4 | 4 | 100% | 0 | 0% | 0 | 0% |
| Picidae (woodpeckers) | 2 | 2 | 100% | 0 | 0% | 0 | 0% |
| Northern (Yellow-shafted) Flicker | 2 | 2 | 100% | 0 | 0% | 0 | 0% |
| Emberizidae (sparrows) | 1 | 1 | 100% | 0 | 0% | 0 | 0% |
| Song Sparrow | 1 | 1 | 100% | 0 | 0% | 0 | 0% |
| Dark-eyed Junco (Slate-colored) | 0 | 0 | 0% | 0 | 0% | 0 | 0% |
| Icteridae (blackbirds and meadowlarks) | 1 | 1 | 100% | 0 | 0% | 0 | 0% |
| Red-winged Blackbird | 1 | 1 | 100% | 0 | 0% | 0 | 0% |
| TOTAL | 2,076 | 1,906 | 92% | 167 | 8% | 3 | 0% |

Table B-4a.5a. Avian species observed during the May 2008 shipboard offshore survey.

| Family Common Name | Total No. | No. Sitting | Sitting % | No. flying | Flying % |
|---|--------------|-------------|------------|--------------|-------------|
| Anatidae (geese, swans, and ducks) | 143 | 1 | 1% | 142 | 99% |
| Black Scoter | 141 | 1 | 1% | 140 | 99% |
| Red-breasted Merganser | 2 | 0 | 0% | 2 | 100% |
| Gaviidae (loons) | 185 | 89 | 48% | 96 | 52% |
| Red-throated Loon | 24 | 4 | 17% | 20 | 83% |
| Common Loon | 161 | 85 | 53% | 76 | 47% |
| Procellariidae (petrels and shearwaters) | 2 | 0 | 0% | 2 | 100% |
| Manx Shearwater | 2 | 0 | 0% | 2 | 100% |
| Sulidae (gannets) | 531 | 90 | 17% | 441 | 83% |
| Northern Gannet | 531 | 90 | 17% | 441 | 83% |
| Phalacrocoracidae (cormorants) | 113 | 7 | 6% | 106 | 94% |
| Double-crested Cormorant | 113 | 7 | 6% | 106 | 94% |
| Ardeidae (bitterns, egrets, and herons) | 1 | 0 | 0% | 1 | 100% |
| Yellow-crowned Night-heron | 1 | 0 | 0% | 1 | 100% |
| Accipitridae (eagles and hawks) | 1 | 0 | 0% | 1 | 100% |
| Northern Harrier | 1 | 0 | 0% | 1 | 100% |
| Scolopacidae (sandpipers) | 12 | 0 | 0% | 12 | 100% |
| Least Sandpiper | 6 | 0 | 0% | 6 | 100% |
| White-rumped Sandpiper | 1 | 0 | 0% | 1 | 100% |
| Shorebird, small (unknown) | 5 | 0 | 0% | 5 | 100% |
| Laridae (gulls and terns) | 665 | 48 | 7% | 617 | 93% |
| Laughing Gull | 123 | 17 | 14% | 106 | 86% |
| Herring Gull | 197 | 18 | 9% | 179 | 91% |
| Lesser Black-backed Gull | 1 | 0 | 0% | 1 | 100% |
| Great Black-backed Gull | 96 | 9 | 9% | 87 | 91% |
| Least Tern | 1 | 0 | 0% | 1 | 100% |
| Caspian Tern | 1 | 0 | 0% | 1 | 100% |
| Common Tern | 151 | 0 | 0% | 151 | 100% |
| Forster's Tern | 48 | 5 | 10% | 43 | 90% |
| Royal Tern | 6 | 0 | 0% | 6 | 100% |
| Tern, small (unknown) | 41 | 0 | 0% | 41 | 100% |
| Columbidae (pigeons and doves) | 1 | 0 | 0% | 1 | 100% |
| Mourning Dove | 1 | 0 | 0% | 1 | 100% |
| Hirundinidae (swallows) | 10 | 0 | 0% | 10 | 100% |
| Barn Swallow | 10 | 0 | 0% | 10 | 100% |
| Parulidae (wood-warblers) | 2 | 0 | 0% | 2 | 100% |
| Yellow-rumped (Myrtle) Warbler | 2 | 0 | 0% | 2 | 100% |
| Emberizidae (sparrows) | 2 | 1 | 50% | 1 | 50% |
| Song Sparrow | 1 | 0 | 0% | 1 | 100% |
| White-throated Sparrow | 1 | 1 | 100% | 0 | 0% |
| Other | 1 | 0 | 0% | 1 | 100% |
| Passerine (unknown) | 1 | 0 | 0% | 1 | 100% |
| TOTAL | 1,669 | 237 | 14% | 1,432 | 86% |

Table B-4a.5b. Avian species observed during the May 2008 shipboard offshore survey. Altitude categories total 100% of the individuals observed flying.

| Family Common Name | Total No. flying | No. At/ below 100 ft. | At/below 100 ft % | No. 101 to 500 ft (RSZ) | RSZ % | No. Above 500 ft | Above 500 ft % |
|---|---------------------|--------------------------|----------------------|----------------------------|-------------|---------------------|-------------------|
| Anatidae (geese, swans, and ducks) | 142 | 2 | 1% | 140 | 99% | 0 | 0% |
| Black Scoter | 140 | 0 | 0% | 140 | 100% | 0 | 0% |
| Red-breasted Merganser | 2 | 2 | 100% | 0 | 0% | 0 | 0% |
| Gaviidae (loons) | 96 | 78 | 81% | 18 | 19% | 0 | 0% |
| Red-throated Loon | 20 | 17 | 85% | 3 | 15% | 0 | 0% |
| Common Loon | 76 | 61 | 80% | 15 | 20% | 0 | 0% |
| Procellariidae (petrels and shearwaters) | 2 | 2 | 100% | 0 | 0% | 0 | 0% |
| Manx Shearwater | 2 | 2 | 100% | 0 | 0% | 0 | 0% |
| Sulidae (gannets) | 441 | 335 | 76% | 106 | 24% | 0 | 0% |
| Northern Gannet | 441 | 335 | 76% | 106 | 24% | 0 | 0% |
| Phalacrocoracidae (cormorants) | 106 | 106 | 100% | 0 | 0% | 0 | 0% |
| Double-crested Cormorant | 106 | 106 | 100% | 0 | 0% | 0 | 0% |
| Ardeidae (bitterns, egrets, and herons) | 1 | 1 | 100% | 0 | 0% | 0 | 0% |
| Yellow-crowned Night-heron | 1 | 1 | 100% | 0 | 0% | 0 | 0% |
| Accipitridae (eagles and hawks) | 1 | 0 | 0% | 1 | 100% | 0 | 0% |
| Northern Harrier | 1 | 0 | 0% | 1 | 100% | 0 | 0% |
| Scolopacidae (sandpipers) | 12 | 12 | 100% | 0 | 0% | 0 | 0% |
| Least Sandpiper | 6 | 6 | 100% | 0 | 0% | 0 | 0% |
| White-rumped Sandpiper | 1 | 1 | 100% | 0 | 0% | 0 | 0% |
| Shorebird, small (unknown) | 5 | 5 | 100% | 0 | 0% | 0 | 0% |
| Laridae (gulls and terns) | 617 | 557 | 90% | 60 | 10% | 0 | 0% |
| Laughing Gull | 106 | 98 | 92% | 9 | 8% | 0 | 0% |
| Herring Gull | 179 | 161 | 90% | 18 | 10% | 0 | 0% |
| Lesser Black-backed Gull | 1 | 1 | 100% | 0 | 0% | 0 | 0% |
| Great Black-backed Gull | 87 | 80 | 92% | 7 | 8% | 0 | 0% |
| Least Tern | 1 | 1 | 100% | 0 | 0% | 0 | 0% |
| Caspian Tern | 1 | 1 | 100% | 0 | 0% | 0 | 0% |
| Common Tern | 151 | 146 | 97% | 5 | 3% | 0 | 0% |
| Forster's Tern | 43 | 37 | 86% | 6 | 14% | 0 | 0% |

Table B-4a.5b (*continued*). Avian species observed during the May 2008 shipboard offshore survey. Altitude categories total 100% of the individuals observed flying.

| Family Common Name | Total No. flying | No. At/below 100 ft | At/below 100 ft % | No. 101 to 500 ft (RSZ) | RSZ % | No. Above 500 ft | Above 500 ft % |
|---------------------------------------|---------------------|------------------------|----------------------|----------------------------|------------|---------------------|-------------------|
| Laridae (gulls and terns) | 617 | 557 | 90% | 60 | 10% | 0 | 0% |
| Royal Tern | 6 | 5 | 83% | 1 | 17% | 0 | 0% |
| Tern, small (unknown) | 41 | 27 | 66% | 14 | 34% | 0 | 0% |
| Columbidae (pigeons and doves) | 1 | 1 | 100% | 0 | 0% | 0 | 0% |
| Mourning Dove | 1 | 1 | 100% | 0 | 0% | 0 | 0% |
| Hirundinidae (swallows) | 10 | 9 | 90% | 1 | 10% | 0 | 0% |
| Barn Swallow | 10 | 9 | 90% | 1 | 10% | 0 | 0% |
| Parulidae (wood-warblers) | 2 | 2 | 100% | 0 | 0% | 0 | 0% |
| Yellow-rumped (Myrtle) Warbler | 2 | 2 | 100% | 0 | 0% | 0 | 0% |
| Emberizidae (sparrows) | 1 | 1 | 50% | 0 | 0% | 0 | 0% |
| Song Sparrow | 1 | 1 | 100% | 0 | 0% | 0 | 0% |
| White-throated Sparrow | 0 | 0 | 0% | 0 | 0% | 0 | 0% |
| Other | 1 | 1 | 100% | 0 | 0% | 0 | 0% |
| Passerine (unknown) | 1 | 1 | 100% | 0 | 0% | 0 | 0% |
| TOTAL | 1,432 | 1,107 | 77% | 326 | 23% | 0 | 0% |

Table B-4a.6a. Avian species observed during the June 2008 shipboard offshore survey.

| Family Common Name | Total No. | No. Sitting | Sitting % | No. flying | Flying % |
|---|------------|-------------|-------------|------------|-------------|
| Anatidae (geese, swans, and ducks) | 1 | 1 | 100% | 0 | 0% |
| Surf Scoter | 1 | 1 | 100% | 0 | 0% |
| Gaviidae (loons) | 2 | 1 | 50% | 1 | 50% |
| Common Loon | 2 | 1 | 50% | 1 | 50% |
| Procellariidae (petrels and shearwaters) | 62 | 19 | 31% | 43 | 69% |
| Cory's Shearwater | 57 | 18 | 32% | 39 | 68% |
| Greater Shearwater | 1 | 0 | 0% | 1 | 100% |
| Sooty Shearwater | 4 | 1 | 25% | 3 | 75% |
| Hydrobatidae (storm-petrels) | 339 | 0 | 0% | 339 | 100% |
| Wilson's Storm-petrel | 338 | 0 | 0% | 338 | 100% |
| Storm-petrel (unknown) | 1 | 0 | 0% | 1 | 100% |
| Sulidae (gannets) | 132 | 54 | 41% | 78 | 59% |
| Northern Gannet | 132 | 54 | 41% | 78 | 59% |
| Laridae (gulls and terns) | 408 | 34 | 8% | 374 | 92% |
| Laughing Gull | 174 | 23 | 13% | 151 | 87% |
| Herring Gull | 21 | 2 | 10% | 19 | 90% |
| Great Black-backed Gull | 27 | 6 | 22% | 21 | 78% |
| Common Tern | 182 | 2 | 1% | 180 | 99% |
| Forster's Tern | 2 | 1 | 50% | 1 | 50% |
| Royal Tern | 1 | 0 | 0% | 1 | 100% |
| Tern, small (unknown) | 1 | 0 | 0% | 1 | 100% |
| Hirundinidae (swallows) | 3 | 0 | 0% | 3 | 100% |
| Purple Martin | 2 | 0 | 0% | 2 | 100% |
| Barn Swallow | 1 | 0 | 0% | 1 | 100% |
| TOTAL | 947 | 109 | 12% | 838 | 88% |

Table B-4a.6b. Avian species observed during the June 2008 shipboard offshore survey. Altitude categories total 100% of the individuals observed flying.

| Family Common Name | Total No. flying | No. At/ below 100 ft | At/below 100 ft % | No. 101 to 500 ft (RSZ) | RSZ % | No. Above 500 ft | Above 500 ft % |
|---|---------------------|----------------------------|----------------------|----------------------------|-----------|---------------------|-------------------|
| Anatidae (geese, swans, and ducks) | 0 | 0 | 0% | 0 | 0% | 0 | 0% |
| Surf Scoter | 0 | 0 | 0% | 0 | 0% | 0 | 0% |
| Gaviidae (loons) | 1 | 1 | 100% | 0 | 0% | 0 | 0% |
| Common Loon | 1 | 1 | 100% | 0 | 0% | 0 | 0% |
| Procellariidae (petrels and shearwaters) | 43 | 43 | 100% | 0 | 0% | 0 | 0% |
| Cory's Shearwater | 39 | 39 | 100% | 0 | 0% | 0 | 0% |
| Greater Shearwater | 1 | 1 | 100% | 0 | 0% | 0 | 0% |
| Sooty Shearwater | 3 | 3 | 100% | 0 | 0% | 0 | 0% |
| Hydrobatidae (storm-petrels) | 339 | 339 | 100% | 0 | 0% | 0 | 0% |
| Wilson's Storm-petrel | 338 | 338 | 100% | 0 | 0% | 0 | 0% |
| Storm-petrel (unknown) | 1 | 1 | 100% | 0 | 0% | 0 | 0% |
| Sulidae (gannets) | 78 | 78 | 100% | 0 | 0% | 0 | 0% |
| Northern Gannet | 78 | 78 | 100% | 0 | 0% | 0 | 0% |
| Laridae (gulls and terns) | 374 | 374 | 100% | 0 | 0% | 0 | 0% |
| Laughing Gull | 151 | 151 | 100% | 0 | 0% | 0 | 0% |
| Herring Gull | 19 | 19 | 100% | 0 | 0% | 0 | 0% |
| Great Black-backed Gull | 21 | 21 | 100% | 0 | 0% | 0 | 0% |
| Common Tern | 180 | 180 | 100% | 0 | 0% | 0 | 0% |
| Forster's Tern | 1 | 1 | 100% | 0 | 0% | 0 | 0% |
| Royal Tern | 1 | 1 | 100% | 0 | 0% | 0 | 0% |
| Tern, small (unknown) | 1 | 1 | 100% | 0 | 0% | 0 | 0% |
| Hirundinidae (swallows) | 3 | 3 | 100% | 0 | 0% | 0 | 0% |
| Purple Martin | 2 | 2 | 100% | 0 | 0% | 0 | 0% |
| Barn Swallow | 1 | 1 | 100% | 0 | 0% | 0 | 0% |
| TOTAL | 838 | 838 | 100% | 0 | 0% | 0 | 0% |

Table B-4a.7a. Avian species observed during the July 2008 shipboard offshore survey.

| Family Common Name | Total No. | No. Sitting | Sitting % | No. flying | Flying % |
|---|--------------|-------------|-------------|------------|-------------|
| Gaviidae (loons) | 7 | 6 | 86% | 1 | 14% |
| Common Loon | 7 | 6 | 86% | 1 | 14% |
| Procellariidae (petrels and shearwaters) | 43 | 3 | 7% | 40 | 93% |
| Cory's Shearwater | 42 | 3 | 7% | 39 | 93% |
| Manx Shearwater | 1 | 0 | 0% | 1 | 100% |
| Hydrobatidae (storm-petrels) | 364 | 127 | 35% | 237 | 65% |
| Wilson's Storm-petrel | 364 | 127 | 35% | 237 | 65% |
| Sulidae (gannets) | 24 | 11 | 46% | 13 | 54% |
| Northern Gannet | 24 | 11 | 46% | 13 | 54% |
| Pelecanidae (pelicans) | 4 | 0 | 0% | 4 | 100% |
| Brown Pelican | 4 | 0 | 0% | 4 | 100% |
| Phalacrocoracidae (cormorants) | 1 | 1 | 100% | 0 | 0% |
| Double-crested Cormorant | 1 | 1 | 100% | 0 | 0% |
| Scolopacidae (sandpipers) | 15 | 0 | 0% | 15 | 100% |
| Least Sandpiper | 8 | 0 | 0% | 8 | 100% |
| Pectoral Sandpiper | 7 | 0 | 0% | 7 | 100% |
| Laridae (gulls and terns) | 572 | 58 | 10% | 514 | 90% |
| Laughing Gull | 283 | 45 | 16% | 238 | 84% |
| Herring Gull | 8 | 0 | 0% | 8 | 100% |
| Great Black-backed Gull | 22 | 8 | 36% | 14 | 64% |
| Common Tern | 245 | 5 | 2% | 240 | 98% |
| Forster's Tern | 1 | 0 | 0% | 1 | 100% |
| Royal Tern | 13 | 0 | 0% | 13 | 100% |
| Hirundinidae (swallows) | 2 | 0 | 0% | 2 | 100% |
| Bank Swallow | 2 | 0 | 0% | 2 | 100% |
| TOTAL | 1,032 | 206 | 20% | 826 | 80% |

Table B-4a.7b. Avian species observed during the July 2008 shipboard offshore survey. Altitude categories total 100% of the individuals observed flying.

| Family Common Name | Total No. flying | No. At/ below 100 ft | At/below 100 ft % | No. 101 to 500 ft (RSZ) | RSZ % | No. Above 500 ft | Above 500 ft % |
|---|---------------------|----------------------------|----------------------|----------------------------|-----------|---------------------|-------------------|
| Gaviidae (loons) | 1 | 1 | 100% | 0 | 0% | 0 | 0% |
| Common Loon | 1 | 1 | 100% | 0 | 0% | 0 | 0% |
| Procellariidae (petrels and shearwaters) | 40 | 40 | 100% | 0 | 0% | 0 | 0% |
| Cory's Shearwater | 39 | 39 | 100% | 0 | 0% | 0 | 0% |
| Manx Shearwater | 1 | 1 | 100% | 0 | 0% | 0 | 0% |
| Hydrobatidae (storm-petrels) | 237 | 237 | 100% | 0 | 0% | 0 | 0% |
| Wilson's Storm-petrel | 237 | 237 | 100% | 0 | 0% | 0 | 0% |
| Sulidae (gannets) | 13 | 13 | 100% | 0 | 0% | 0 | 0% |
| Northern Gannet | 13 | 13 | 100% | 0 | 0% | 0 | 0% |
| Pelecanidae (pelicans) | 4 | 4 | 100% | 0 | 0% | 0 | 0% |
| Brown Pelican | 4 | 4 | 100% | 0 | 0% | 0 | 0% |
| Phalacrocoracidae (cormorants) | 0 | 0 | 0% | 0 | 0% | 0 | 0% |
| Double-crested Cormorant | 0 | 0 | 0% | 0 | 0% | 0 | 0% |
| Scolopacidae (sandpipers) | 15 | 15 | 100% | 0 | 0% | 0 | 0% |
| Least Sandpiper | 8 | 8 | 100% | 0 | 0% | 0 | 0% |
| Pectoral Sandpiper | 7 | 7 | 100% | 0 | 0% | 0 | 0% |
| Laridae (gulls and terns) | 514 | 512 | 100% | 2 | 0% | 0 | 0% |
| Laughing Gull | 238 | 238 | 100% | 0 | 0% | 0 | 0% |
| Herring Gull | 8 | 7 | 88% | 1 | 12% | 0 | 0% |
| Great Black-backed Gull | 14 | 13 | 93% | 1 | 7% | 0 | 0% |
| Common Tern | 240 | 240 | 100% | 0 | 0% | 0 | 0% |
| Forster's Tern | 1 | 1 | 100% | 0 | 0% | 0 | 0% |
| Royal Tern | 13 | 13 | 100% | 0 | 0% | 0 | 0% |
| Hirundinidae (swallows) | 2 | 2 | 100% | 0 | 0% | 0 | 0% |
| Bank Swallow | 2 | 2 | 100% | 0 | 0% | 0 | 0% |
| TOTAL | 826 | 824 | 100% | 2 | 0% | 0 | 0% |

Table B-4a.8a. Avian species observed during the August 2008 shipboard offshore survey.

| Family Common Name | Total No. | No. Sitting | Sitting % | No. flying | Flying % |
|---|--------------|-------------|------------|--------------|-------------|
| Procellariidae (petrels and shearwaters) | 14 | 0 | 0% | 14 | 100% |
| Cory's Shearwater | 14 | 0 | 0% | 14 | 100% |
| Hydrobatidae (storm-petrels) | 1,246 | 187 | 15% | 1,059 | 85% |
| Wilson's Storm-petrel | 1,245 | 187 | 15% | 1,058 | 85% |
| Leach's Storm-petrel | 1 | 0 | 0% | 1 | 100% |
| Sulidae (gannets) | 29 | 19 | 66% | 10 | 34% |
| Northern Gannet | 29 | 19 | 66% | 10 | 34% |
| Pelecanidae (pelicans) | 3 | 0 | 0% | 3 | 100% |
| Brown Pelican | 3 | 0 | 0% | 3 | 100% |
| Accipitridae (eagles and hawks) | 7 | 0 | 0% | 7 | 100% |
| Osprey | 7 | 0 | 0% | 7 | 100% |
| Scolopacidae (sandpipers) | 16 | 0 | 0% | 16 | 100% |
| Semipalmated Sandpiper | 3 | 0 | 0% | 3 | 100% |
| Least Sandpiper | 9 | 0 | 0% | 9 | 100% |
| Peep (unknown) | 3 | 0 | 0% | 3 | 100% |
| Shorebird, small (unknown) | 1 | 0 | 0% | 1 | 100% |
| Laridae (gulls and terns) | 1,142 | 103 | 9% | 1,039 | 91% |
| Laughing Gull | 517 | 57 | 11% | 460 | 89% |
| Herring Gull | 2 | 1 | 50% | 1 | 50% |
| Great Black-backed Gull | 56 | 19 | 34% | 37 | 66% |
| Common Tern | 510 | 26 | 5% | 484 | 95% |
| Forster's Tern | 5 | 0 | 0% | 5 | 100% |
| Royal Tern | 34 | 0 | 0% | 34 | 100% |
| Tern, small (unknown) | 18 | 0 | 0% | 18 | 100% |
| Hirundinidae (swallows) | 63 | 0 | 0% | 63 | 100% |
| Purple Martin | 47 | 0 | 0% | 47 | 100% |
| Tree Swallow | 4 | 0 | 0% | 4 | 100% |
| Barn Swallow | 12 | 0 | 0% | 12 | 100% |
| Parulidae (wood-warblers) | 2 | 0 | 0% | 2 | 100% |
| Prothonotary Warbler | 1 | 0 | 0% | 1 | 100% |
| Warbler (unknown) | 1 | 0 | 0% | 1 | 100% |
| Icteridae (blackbirds and meadowlarks) | 2 | 0 | 0% | 2 | 100% |
| Red-winged Blackbird | 2 | 0 | 0% | 2 | 100% |
| Fringillidae (finches) | 2 | 0 | 0% | 2 | 100% |
| House Finch | 2 | 0 | 0% | 2 | 100% |
| Other | 3 | 0 | 0% | 3 | 100% |
| Passerine (unknown) | 3 | 0 | 0% | 3 | 100% |
| TOTAL | 2,529 | 309 | 12% | 2,220 | 88% |

Table B-4a.8b. Avian species observed during the August 2008 shipboard offshore survey. Altitude categories total 100% of the individuals observed flying.

| Family Common Name | Total No. flying | No. At/ below 100 ft | At/below 100 ft % | No. 101 to 500 ft (RSZ) | RSZ % | No. Above 500 ft | Above 500 ft % |
|---|---------------------|-------------------------|----------------------|----------------------------|-----------|---------------------|-------------------|
| Procellariidae (petrels and shearwaters) | 14 | 14 | 100% | 0 | 0% | 0 | 0% |
| Cory's Shearwater | 14 | 14 | 100% | 0 | 0% | 0 | 0% |
| Hydrobatidae (storm-petrels) | 1,059 | 1,059 | 100% | 0 | 0% | 0 | 0% |
| Wilson's Storm-petrel | 1,058 | 1,058 | 100% | 0 | 0% | 0 | 0% |
| Leach's Storm-petrel | 1 | 1 | 100% | 0 | 0% | 0 | 0% |
| Sulidae (gannets) | 10 | 10 | 100% | 0 | 0% | 0 | 0% |
| Northern Gannet | 10 | 10 | 100% | 0 | 0% | 0 | 0% |
| Pelecanidae (pelicans) | 3 | 3 | 100% | 0 | 0% | 0 | 0% |
| Brown Pelican | 3 | 3 | 100% | 0 | 0% | 0 | 0% |
| Accipitridae (eagles and hawks) | 7 | 7 | 100% | 0 | 0% | 0 | 0% |
| Osprey | 7 | 7 | 100% | 0 | 0% | 0 | 0% |
| Scolopacidae (sandpipers) | 16 | 16 | 100% | 0 | 0% | 0 | 0% |
| Semipalmated Sandpiper | 3 | 3 | 100% | 0 | 0% | 0 | 0% |
| Least Sandpiper | 9 | 9 | 100% | 0 | 0% | 0 | 0% |
| Peep (unknown) | 3 | 3 | 100% | 0 | 0% | 0 | 0% |
| Shorebird, small (unknown) | 1 | 1 | 100% | 0 | 0% | 0 | 0% |
| Laridae (gulls and terns) | 1,039 | 1,039 | 100% | 0 | 0% | 0 | 0% |
| Laughing Gull | 460 | 460 | 100% | 0 | 0% | 0 | 0% |
| Herring Gull | 1 | 1 | 100% | 0 | 0% | 0 | 0% |
| Great Black-backed Gull | 37 | 37 | 100% | 0 | 0% | 0 | 0% |
| Common Tern | 484 | 484 | 100% | 0 | 0% | 0 | 0% |
| Forster's Tern | 5 | 5 | 100% | 0 | 0% | 0 | 0% |
| Royal Tern | 34 | 34 | 100% | 0 | 0% | 0 | 0% |
| Tern, small (unknown) | 18 | 18 | 100% | 0 | 0% | 0 | 0% |
| Hirundinidae (swallows) | 63 | 63 | 100% | 0 | 0% | 0 | 0% |
| Purple Martin | 47 | 47 | 100% | 0 | 0% | 0 | 0% |
| Tree Swallow | 4 | 4 | 100% | 0 | 0% | 0 | 0% |
| Barn Swallow | 12 | 12 | 100% | 0 | 0% | 0 | 0% |

Table B-4a.8b (*continued*). Avian species observed during the August 2008 shipboard offshore survey. Altitude categories total 100% of the individuals observed flying.

| Family Common Name | Total No. flying | No. At/ below 100 ft | At/below 100 ft % | No. 101 to 500 ft (RSZ) | RSZ % | No. Above 500 ft | Above 500 ft % |
|---|---------------------|-------------------------|----------------------|----------------------------|-----------|---------------------|-------------------|
| Parulidae (wood-warblers) | 2 | 2 | 100% | 0 | 0% | 0 | 0% |
| Prothonotary Warbler | 1 | 1 | 100% | 0 | 0% | 0 | 0% |
| Warbler (unknown) | 1 | 1 | 100% | 0 | 0% | 0 | 0% |
| Icteridae (blackbirds and meadowlarks) | 2 | 2 | 100% | 0 | 0% | 0 | 0% |
| Red-winged Blackbird | 2 | 2 | 100% | 0 | 0% | 0 | 0% |
| Fringillidae (finches) | 2 | 2 | 100% | 0 | 0% | 0 | 0% |
| House Finch | 2 | 2 | 100% | 0 | 0% | 0 | 0% |
| Other | 3 | 3 | 100% | 0 | 0% | 0 | 0% |
| Passerine (unknown) | 3 | 3 | 100% | 0 | 0% | 0 | 0% |
| TOTAL | 2,220 | 2,220 | 100% | 0 | 0% | 0 | 0% |

Table B-4a.9a. Avian species observed during the September 2008 shipboard offshore survey.

| Family Common Name | Total No. | No. Sitting | Sitting % | No. flying | Flying % |
|--|--------------|----------------|-------------|---------------|-------------|
| Anatidae (geese, swans, and ducks) | 2 | 0 | 0% | 2 | 100% |
| Gadwall | 2 | 0 | 0% | 2 | 100% |
| Gaviidae (loons) | 1 | 1 | 100% | 0 | 0% |
| Common Loon | 1 | 1 | 100% | 0 | 0% |
| Procellariidae (petrels and shearwaters) | 11 | 1 | 9% | 10 | 91% |
| Cory's Shearwater | 9 | 1 | 11% | 8 | 89% |
| Audubon's Shearwater | 1 | 0 | 0% | 1 | 100% |
| Shearwater (black-and-white), shearwater (unknown) | 1 | 0 | 0% | 1 | 100% |
| Hydrobatidae (storm-petrels) | 5 | 0 | 0% | 5 | 100% |
| Wilson's Storm-petrel | 3 | 0 | 0% | 3 | 100% |
| Storm-petrel (unknown) | 2 | 0 | 0% | 2 | 100% |
| Sulidae (gannets) | 29 | 18 | 62% | 11 | 38% |
| Northern Gannet | 29 | 18 | 62% | 11 | 38% |
| Phalacrocoracidae (cormorants) | 6 | 0 | 0% | 6 | 100% |
| Double-crested Cormorant | 6 | 0 | 0% | 6 | 100% |
| Falconidae (falcons) | 1 | 0 | 0% | 1 | 100% |
| Merlin | 1 | 0 | 0% | 1 | 100% |
| Scolopacidae (sandpipers) | 4 | 3 | 75% | 1 | 25% |
| Red-necked Phalarope | 2 | 1 | 50% | 1 | 50% |
| Red Phalarope | 1 | 1 | 100% | 0 | 0% |
| Phalarope (unknown) | 1 | 1 | 100% | 0 | 0% |
| Laridae (gulls and terns) | 907 | 98 | 11% | 809 | 89% |
| Sabine's Gull | 1 | 0 | 0% | 1 | 100% |
| Laughing Gull | 268 | 27 | 10% | 241 | 90% |
| Herring Gull | 36 | 7 | 19% | 29 | 81% |
| Great Black-backed Gull | 203 | 59 | 29% | 144 | 71% |
| Gull, large (unknown) | 2 | 2 | 100% | 0 | 0% |
| Black Tern | 1 | 0 | 0% | 1 | 100% |
| Common Tern | 301 | 3 | 1% | 298 | 99% |
| Forster's Tern | 3 | 0 | 0% | 3 | 100% |
| Royal Tern | 14 | 0 | 0% | 14 | 100% |
| Tern, small (unknown) | 78 | 0 | 0% | 78 | 100% |
| Stercorariidae (skuas and jaegers) | 5 | 0 | 0% | 5 | 100% |
| Parasitic Jaeger | 5 | 0 | 0% | 5 | 100% |
| Picidae (woodpeckers) | 3 | 0 | 0% | 3 | 100% |
| Northern (Yellow-shafted) Flicker | 3 | 0 | 0% | 3 | 100% |
| Parulidae (wood-warblers) | 3 | 0 | 0% | 3 | 100% |
| Mourning Warbler | 1 | 0 | 0% | 1 | 100% |
| Common Yellowthroat | 1 | 0 | 0% | 1 | 100% |
| Warbler (unknown) | 1 | 0 | 0% | 1 | 100% |
| TOTAL | 977 | 121 | 12% | 856 | 88% |

Table B-4a.9b. Avian species observed during the September 2008 shipboard offshore survey. Altitude categories total 100% of the individuals observed flying.

| Family Common Name | Total No. flying | No. At/ below 100 ft | At/below 100 ft % | No. 101 to 500 ft (RSZ) | RSZ % | No. Above 500 ft | Above 500 ft % |
|--|---------------------|-------------------------|----------------------|----------------------------|-------------|---------------------|-------------------|
| Anatidae (geese, swans, and ducks) | 2 | 0 | 0% | 2 | 100% | 0 | 0% |
| Gadwall | 2 | 0 | 0% | 2 | 100% | 0 | 0% |
| Gaviidae (loons) | 0 | 0 | 0% | 0 | 0% | 0 | 0% |
| Common Loon | 0 | 0 | 0% | 0 | 0% | 0 | 0% |
| Procellariidae (petrels and shearwaters) | 10 | 10 | 100% | 0 | 0% | 0 | 0% |
| Cory's Shearwater | 8 | 8 | 100% | 0 | 0% | 0 | 0% |
| Audubon's Shearwater | 1 | 1 | 100% | 0 | 0% | 0 | 0% |
| Shearwater (black-and-white), shearwater (unknown) | 1 | 1 | 100% | 0 | 0% | 0 | 0% |
| Hydrobatidae (storm-petrels) | 5 | 5 | 100% | 0 | 0% | 0 | 0% |
| Wilson's Storm-petrel | 3 | 3 | 100% | 0 | 0% | 0 | 0% |
| Storm-petrel (unknown) | 2 | 2 | 100% | 0 | 0% | 0 | 0% |
| Sulidae (gannets) | 11 | 11 | 100% | 0 | 0% | 0 | 0% |
| Northern Gannet | 11 | 11 | 100% | 0 | 0% | 0 | 0% |
| Phalacrocoracidae (cormorants) | 6 | 6 | 100% | 0 | 0% | 0 | 0% |
| Double-crested Cormorant | 6 | 6 | 100% | 0 | 0% | 0 | 0% |
| Falconidae (falcons) | 1 | 1 | 100% | 0 | 0% | 0 | 0% |
| Merlin | 1 | 1 | 100% | 0 | 0% | 0 | 0% |
| Scolopacidae (sandpipers) | 1 | 1 | 100% | 0 | 0% | 0 | 0% |
| Red-necked Phalarope | 1 | 1 | 100% | 0 | 0% | 0 | 0% |
| Red Phalarope | 0 | 0 | 0% | 0 | 0% | 0 | 0% |
| Phalarope (unknown) | 0 | 0 | 0% | 0 | 0% | 0 | 0% |
| Laridae (gulls and terns) | 809 | 809 | 100% | 0 | 0% | 0 | 0% |
| Sabine's Gull | 1 | 1 | 100% | 0 | 0% | 0 | 0% |
| Laughing Gull | 241 | 241 | 100% | 0 | 0% | 0 | 0% |
| Herring Gull | 29 | 29 | 100% | 0 | 0% | 0 | 0% |
| Great Black-backed Gull | 144 | 144 | 100% | 0 | 0% | 0 | 0% |
| Gull, large (unknown) | 0 | 0 | 0% | 0 | 0% | 0 | 0% |
| Black Tern | 1 | 1 | 100% | 0 | 0% | 0 | 0% |

Table B-4a.9b (*continued*). Avian species observed during the September 2008 shipboard offshore survey. Altitude categories total 100% of the individuals observed flying.

| Family Common Name | Total No. flying | No. At/ below 100 ft | At/below 100 ft % | No. 101 to 500 ft (RSZ) | RSZ % | No. Above 500 ft | Above 500 ft % |
|---|---------------------|-------------------------|----------------------|----------------------------|-----------|---------------------|-------------------|
| Laridae (gulls and terns) | 809 | 809 | 100% | 0 | 0% | 0 | 0% |
| Common Tern | 298 | 298 | 100% | 0 | 0% | 0 | 0% |
| Forster's Tern | 3 | 3 | 100% | 0 | 0% | 0 | 0% |
| Royal Tern | 14 | 14 | 100% | 0 | 0% | 0 | 0% |
| Tern, small (unknown) | 78 | 78 | 100% | 0 | 0% | 0 | 0% |
| Stercorariidae (skuas and jaegers) | 5 | 5 | 100% | 0 | 0% | 0 | 0% |
| Parasitic Jaeger | 5 | 5 | 100% | 0 | 0% | 0 | 0% |
| Picidae (woodpeckers) | 3 | 3 | 100% | 0 | 0% | 0 | 0% |
| Northern (Yellow-shafted) Flicker | 3 | 3 | 100% | 0 | 0% | 0 | 0% |
| Parulidae (wood-warblers) | 3 | 3 | 100% | 0 | 0% | 0 | 0% |
| Mourning Warbler | 1 | 1 | 100% | 0 | 0% | 0 | 0% |
| Common Yellowthroat | 1 | 1 | 100% | 0 | 0% | 0 | 0% |
| Warbler (unknown) | 1 | 1 | 100% | 0 | 0% | 0 | 0% |
| TOTAL | 856 | 854 | 100% | 2 | 0% | 0 | 0% |

Table B-4a.10a. Avian species observed during the October 2008 shipboard offshore survey.

| Family Common Name | Total No. | No. Sitting | Sitting % | No. flying | Flying % |
|---|--------------|-------------|------------|--------------|-------------|
| Anatidae (geese, swans, and ducks) | 200 | 0 | 0% | 200 | 100% |
| Gadwall | 1 | 0 | 0% | 1 | 100% |
| American Black Duck | 9 | 0 | 0% | 9 | 100% |
| Northern Pintail | 1 | 0 | 0% | 1 | 100% |
| Green-winged Teal | 15 | 0 | 0% | 15 | 100% |
| Surf Scoter | 63 | 0 | 0% | 63 | 100% |
| White-winged Scoter | 1 | 0 | 0% | 1 | 100% |
| Black Scoter | 8 | 0 | 0% | 8 | 100% |
| Scoter (unknown) | 13 | 0 | 0% | 13 | 100% |
| Scoter, dark-winged (unknown) | 89 | 0 | 0% | 89 | 100% |
| Gaviidae (loons) | 24 | 11 | 46% | 13 | 54% |
| Common Loon | 24 | 11 | 46% | 13 | 54% |
| Procellariidae (petrels and shearwaters) | 4 | 0 | 0% | 4 | 100% |
| Cory's Shearwater | 4 | 0 | 0% | 4 | 100% |
| Sulidae (gannets) | 281 | 42 | 15% | 239 | 85% |
| Northern Gannet | 281 | 42 | 15% | 239 | 85% |
| Phalacrocoracidae (cormorants) | 962 | 0 | 0% | 962 | 100% |
| Double-crested Cormorant | 962 | 0 | 0% | 962 | 100% |
| Ardeidae (bitterns, egrets, and herons) | 10 | 0 | 0% | 10 | 100% |
| Great Blue Heron | 10 | 0 | 0% | 10 | 100% |
| Falconidae (falcons) | 3 | 0 | 0% | 3 | 100% |
| Peregrine Falcon | 3 | 0 | 0% | 3 | 100% |
| Scolopacidae (sandpipers) | 13 | 0 | 0% | 13 | 100% |
| Pectoral Sandpiper | 1 | 0 | 0% | 1 | 100% |
| Dunlin | 1 | 0 | 0% | 1 | 100% |
| Shorebird, large (unknown) | 10 | 0 | 0% | 10 | 100% |
| Shorebird, small (unknown) | 1 | 0 | 0% | 1 | 100% |
| Laridae (gulls and terns) | 1,286 | 147 | 11% | 1,139 | 89% |
| Black-legged Kittiwake | 1 | 0 | 0% | 1 | 100% |
| Laughing Gull | 575 | 92 | 16% | 483 | 84% |
| Ring-billed Gull | 35 | 9 | 26% | 26 | 74% |
| Herring Gull | 127 | 17 | 13% | 110 | 87% |
| Iceland Gull | 1 | 0 | 0% | 1 | 100% |
| Lesser Black-backed Gull | 2 | 1 | 50% | 1 | 50% |
| Great Black-backed Gull | 103 | 21 | 20% | 82 | 80% |
| Gull, large (unknown) | 17 | 7 | 41% | 10 | 59% |
| Caspian Tern | 1 | 0 | 0% | 1 | 100% |
| Common Tern | 1 | 0 | 0% | 1 | 100% |
| Forster's Tern | 399 | 0 | 0% | 399 | 100% |
| Royal Tern | 24 | 0 | 0% | 24 | 100% |
| Stercorariidae (skuas and jaegers) | 10 | 2 | 20% | 8 | 80% |
| Parasitic Jaeger | 10 | 2 | 20% | 8 | 80% |

Table B-4a.10a (*continued*). Avian species observed during the October 2008 shipboard offshore survey.

| Family Common Name | Total No. | No. Sitting | Sitting % | No. flying | Flying % |
|---------------------------------------|--------------|-------------|------------|--------------|-------------|
| Columbidae (pigeons and doves) | 2 | 0 | 0% | 2 | 100% |
| Mourning Dove | 2 | 0 | 0% | 2 | 100% |
| Picidae (woodpeckers) | 1 | 0 | 0% | 1 | 100% |
| Northern (Yellow-shafted) Flicker | 1 | 0 | 0% | 1 | 100% |
| Regulidae (kinglets) | 1 | 0 | 0% | 1 | 100% |
| Golden-crowned Kinglet | 1 | 0 | 0% | 1 | 100% |
| Parulidae (wood-warblers) | 20 | 0 | 0% | 20 | 100% |
| Yellow-rumped (Myrtle) Warbler | 14 | 0 | 0% | 14 | 100% |
| Black-throated Green Warbler | 1 | 0 | 0% | 1 | 100% |
| Palm Warbler, Palm Warbler (yellow) | 4 | 0 | 0% | 4 | 100% |
| Warbler (unknown) | 1 | 0 | 0% | 1 | 100% |
| Emberizidae (sparrows) | 8 | 1 | 12% | 7 | 88% |
| Song Sparrow | 2 | 0 | 0% | 2 | 100% |
| Swamp Sparrow | 1 | 0 | 0% | 1 | 100% |
| White-throated Sparrow | 3 | 0 | 0% | 3 | 100% |
| Dark-eyed Junco (Slate-colored) | 2 | 1 | 50% | 1 | 50% |
| TOTAL | 2,825 | 203 | 7% | 2,622 | 93% |

Table B-4a.10b. Avian species observed during the October 2008 shipboard offshore survey. Altitude categories total 100% of the individuals observed flying.

| Family Common Name | Total No. flying | No. At/ below 100 ft | At/below 100 ft % | No. 101 to 500 ft (RSZ) | RSZ % | No. Above 500 ft | Above 500 ft % |
|---|---------------------|-------------------------|----------------------|----------------------------|------------|---------------------|-------------------|
| Anatidae (geese, swans, and ducks) | 200 | 200 | 100% | 0 | 0% | 0 | 0% |
| Gadwall | 1 | 1 | 100% | 0 | 0% | 0 | 0% |
| American Black Duck | 9 | 9 | 100% | 0 | 0% | 0 | 0% |
| Northern Pintail | 1 | 1 | 100% | 0 | 0% | 0 | 0% |
| Green-winged Teal | 15 | 15 | 100% | 0 | 0% | 0 | 0% |
| Surf Scoter | 63 | 63 | 100% | 0 | 0% | 0 | 0% |
| White-winged Scoter | 1 | 1 | 100% | 0 | 0% | 0 | 0% |
| Black Scoter | 8 | 8 | 100% | 0 | 0% | 0 | 0% |
| Scoter (unknown) | 13 | 13 | 100% | 0 | 0% | 0 | 0% |
| Scoter, dark-winged (unknown) | 89 | 89 | 100% | 0 | 0% | 0 | 0% |
| Gaviidae (loons) | 13 | 13 | 100% | 0 | 0% | 0 | 0% |
| Common Loon | 13 | 13 | 100% | 0 | 0% | 0 | 0% |
| Procellariidae (petrels and shearwaters) | 4 | 4 | 100% | 0 | 0% | 0 | 0% |
| Cory's Shearwater | 4 | 4 | 100% | 0 | 0% | 0 | 0% |
| Sulidae (gannets) | 239 | 239 | 100% | 0 | 0% | 0 | 0% |
| Northern Gannet | 239 | 239 | 100% | 0 | 0% | 0 | 0% |
| Phalacrocoracidae (cormorants) | 962 | 847 | 88% | 115 | 12% | 0 | 0% |
| Double-crested Cormorant | 962 | 847 | 88% | 115 | 12% | 0 | 0% |
| Ardeidae (bitterns, egrets, and herons) | 10 | 5 | 50% | 5 | 50% | 0 | 0% |
| Great Blue Heron | 10 | 5 | 50% | 5 | 50% | 0 | 0% |
| Falconidae (falcons) | 3 | 3 | 100% | 0 | 0% | 0 | 0% |
| Peregrine Falcon | 3 | 3 | 100% | 0 | 0% | 0 | 0% |
| Scolopacidae (sandpipers) | 13 | 13 | 100% | 0 | 0% | 0 | 0% |
| Pectoral Sandpiper | 1 | 1 | 100% | 0 | 0% | 0 | 0% |
| Dunlin | 1 | 1 | 100% | 0 | 0% | 0 | 0% |
| Shorebird, large (unknown) | 10 | 10 | 100% | 0 | 0% | 0 | 0% |
| Shorebird, small (unknown) | 1 | 1 | 100% | 0 | 0% | 0 | 0% |

Table B-4a.10b (*continued*). Avian species observed during the October 2008 shipboard offshore survey. Altitude categories total 100% of the individuals observed flying.

| Family Common Name | Total No. flying | No. At/ below 100 ft | At/below 100 ft % | No. 101 to 500 ft (RSZ) | RSZ % | No. Above 500 ft | Above 500 ft % |
|---|---------------------|-------------------------|----------------------|----------------------------|-----------|---------------------|-------------------|
| Laridae (gulls and terns) | 1,139 | 1,132 | 99% | 7 | 1% | 0 | 0% |
| Black-legged Kittiwake | 1 | 1 | 100% | 0 | 0% | 0 | 0% |
| Laughing Gull | 483 | 477 | 99% | 6 | 1% | 0 | 0% |
| Ring-billed Gull | 26 | 26 | 100% | 0 | 0% | 0 | 0% |
| Herring Gull | 110 | 109 | 99% | 1 | 1% | 0 | 0% |
| Iceland Gull | 1 | 1 | 100% | 0 | 0% | 0 | 0% |
| Lesser Black-backed Gull | 1 | 1 | 100% | 0 | 0% | 0 | 0% |
| Great Black-backed Gull | 82 | 82 | 100% | 0 | 0% | 0 | 0% |
| Gull, large (unknown) | 10 | 10 | 100% | 0 | 0% | 0 | 0% |
| Caspian Tern | 1 | 1 | 100% | 0 | 0% | 0 | 0% |
| Common Tern | 1 | 1 | 100% | 0 | 0% | 0 | 0% |
| Forster's Tern | 399 | 399 | 100% | 0 | 0% | 0 | 0% |
| Royal Tern | 24 | 24 | 100% | 0 | 0% | 0 | 0% |
| Stercorariidae (skuas and jaegers) | 8 | 8 | 100% | 0 | 0% | 0 | 0% |
| Parasitic Jaeger | 8 | 8 | 100% | 0 | 0% | 0 | 0% |
| Columbidae (pigeons and doves) | 2 | 2 | 100% | 0 | 0% | 0 | 0% |
| Mourning Dove | 2 | 2 | 100% | 0 | 0% | 0 | 0% |
| Picidae (woodpeckers) | 1 | 1 | 100% | 0 | 0% | 0 | 0% |
| Northern (Yellow-shafted) Flicker | 1 | 1 | 100% | 0 | 0% | 0 | 0% |
| Regulidae (kinglets) | 1 | 1 | 100% | 0 | 0% | 0 | 0% |
| Golden-crowned Kinglet | 1 | 1 | 100% | 0 | 0% | 0 | 0% |
| Parulidae (wood-warblers) | 20 | 20 | 100% | 0 | 0% | 0 | 0% |
| Yellow-rumped (Myrtle) Warbler | 14 | 14 | 100% | 0 | 0% | 0 | 0% |
| Black-throated Green Warbler | 1 | 1 | 100% | 0 | 0% | 0 | 0% |
| Palm Warbler, Palm Warbler (yellow) | 4 | 4 | 100% | 0 | 0% | 0 | 0% |
| Warbler (unknown) | 1 | 1 | 100% | 0 | 0% | 0 | 0% |
| Emberizidae (sparrows) | 7 | 7 | 100% | 0 | 0% | 0 | 0% |
| Song Sparrow | 2 | 2 | 100% | 0 | 0% | 0 | 0% |
| Swamp Sparrow | 1 | 1 | 100% | 0 | 0% | 0 | 0% |

Table B-4a.10b (*continued*). Avian species observed during the October 2008 shipboard offshore survey. Altitude categories total 100% of the individuals observed flying.

| Family Common Name | Total No. flying | No. At/ below 100 ft | At/below 100 ft % | No. 101 to 500 ft (RSZ) | RSZ % | No. Above 500 ft | Above 500 ft % |
|---------------------------------|---------------------|-------------------------|----------------------|----------------------------|-----------|---------------------|-------------------|
| Emberizidae (sparrows) | 7 | 7 | 100% | 0 | 0% | 0 | 0% |
| White-throated Sparrow | 3 | 3 | 100% | 0 | 0% | 0 | 0% |
| Dark-eyed Junco (Slate-colored) | 1 | 1 | 100% | 0 | 0% | 0 | 0% |
| TOTAL | 2,622 | 2,495 | 95% | 127 | 5% | 0 | 0% |

Table B-4a.11a. Avian species observed during the November 2008 shipboard offshore survey.

| Family Common Name | Total No. | No. Sitting | Sitting % | No. flying | Flying % |
|---|--------------|--------------|-------------|--------------|-------------|
| Anatidae (geese, swans, and ducks) | 3,809 | 2 | 0% | 3,807 | 100% |
| Tundra Swan | 8 | 0 | 0% | 8 | 100% |
| Wood Duck | 47 | 0 | 0% | 47 | 100% |
| American Black Duck | 12 | 0 | 0% | 12 | 100% |
| Northern Pintail | 7 | 0 | 0% | 7 | 100% |
| Green-winged Teal | 17 | 0 | 0% | 17 | 100% |
| Greater Scaup | 12 | 0 | 0% | 12 | 100% |
| Scaup (unknown), <i>Aythya</i> (unknown) | 13 | 0 | 0% | 13 | 100% |
| Common Eider | 6 | 0 | 0% | 6 | 100% |
| Surf Scoter | 2,101 | 0 | 0% | 2,101 | 100% |
| White-winged Scoter | 11 | 0 | 0% | 11 | 100% |
| Black Scoter | 1,062 | 0 | 0% | 1,062 | 100% |
| Scoter (unknown) | 1 | 0 | 0% | 1 | 100% |
| Scoter, dark-winged (unknown) | 510 | 0 | 0% | 510 | 100% |
| Common Goldeneye | 2 | 2 | 100% | 0 | 0% |
| Gaviidae (loons) | 373 | 207 | 55% | 166 | 45% |
| Red-throated Loon | 82 | 1 | 1% | 81 | 99% |
| Common Loon | 290 | 206 | 71% | 84 | 29% |
| Loon (unknown) | 1 | 0 | 0% | 1 | 100% |
| Podicipedidae (grebes) | 1 | 1 | 100% | 0 | 0% |
| Pied-billed Grebe | 1 | 1 | 100% | 0 | 0% |
| Procellariidae (petrels and shearwaters) | 5 | 2 | 40% | 3 | 60% |
| Cory's Shearwater | 2 | 0 | 0% | 2 | 100% |
| Greater Shearwater | 3 | 2 | 67% | 1 | 33% |
| Sulidae (gannets) | 1,065 | 437 | 41% | 628 | 59% |
| Northern Gannet | 1,065 | 437 | 41% | 628 | 59% |
| Phalacrocoracidae (cormorants) | 50 | 0 | 0% | 50 | 100% |
| Double-crested Cormorant | 44 | 0 | 0% | 44 | 100% |
| Great Cormorant | 6 | 0 | 0% | 6 | 100% |
| Ardeidae (bitterns, egrets, and herons) | 1 | 0 | 0% | 1 | 100% |
| Great Blue Heron | 1 | 0 | 0% | 1 | 100% |
| Rallidae (rails) | 2 | 2 | 100% | 0 | 0% |
| American Coot | 2 | 2 | 100% | 0 | 0% |
| Scolopacidae (sandpipers) | 1 | 0 | 0% | 1 | 100% |
| American Woodcock | 1 | 0 | 0% | 1 | 100% |
| Laridae (gulls and terns) | 2,083 | 1,487 | 71% | 596 | 29% |
| Bonaparte's Gull | 222 | 140 | 63% | 82 | 37% |
| Little Gull | 1 | 0 | 0% | 1 | 100% |
| Laughing Gull | 1,323 | 992 | 75% | 331 | 25% |
| Ring-billed Gull | 56 | 41 | 73% | 15 | 27% |
| Herring Gull | 383 | 264 | 69% | 119 | 31% |
| Lesser Black-backed Gull | 1 | 0 | 0% | 1 | 100% |
| Great Black-backed Gull | 94 | 50 | 53% | 44 | 47% |

Table B-4a.11a (*continued*). Avian species observed during the November 2008 shipboard offshore survey.

| Family Common Name | Total No. | No. Sitting | Sitting % | No. flying | Flying % |
|---|--------------|--------------|------------|--------------|-------------|
| Laridae (gulls and terns) | 2,083 | 1,487 | 71% | 596 | 29% |
| Forster's Tern | 2 | 0 | 0% | 2 | 100% |
| Royal Tern | 1 | 0 | 0% | 1 | 100% |
| Stercorariidae (skuas and jaegers) | 10 | 3 | 30% | 7 | 70% |
| Parasitic Jaeger | 10 | 3 | 30% | 7 | 70% |
| Sturnidae (starlings) | 1 | 0 | 0% | 1 | 100% |
| European Starling | 1 | 0 | 0% | 1 | 100% |
| Parulidae (wood-warblers) | 1 | 0 | 0% | 1 | 100% |
| Northern Parula | 1 | 0 | 0% | 1 | 100% |
| Icteridae (blackbirds and meadowlarks) | 3 | 0 | 0% | 3 | 100% |
| Red-winged Blackbird | 1 | 0 | 0% | 1 | 100% |
| Eastern Meadowlark | 1 | 0 | 0% | 1 | 100% |
| Brown-headed Cowbird | 1 | 0 | 0% | 1 | 100% |
| Fringillidae (finches) | 12 | 0 | 0% | 12 | 100% |
| Pine Siskin | 8 | 0 | 0% | 8 | 100% |
| American Goldfinch | 4 | 0 | 0% | 4 | 100% |
| TOTAL | 7,417 | 2,141 | 29% | 5,276 | 71% |

Table B-4a.11b. Avian species observed during the November 2008 shipboard offshore survey. Altitude categories total 100% of the individuals observed flying.

| Family Common Name | Total No. flying | No. At/below 100 ft | At/below 100 ft % | No. 101 to 500 ft (RSZ) | RSZ % | No. Above 500 ft | Above 500 ft % |
|---|---------------------|------------------------|----------------------|----------------------------|-----------|---------------------|-------------------|
| Anatidae (geese, swans, and ducks) | 3,807 | 3,798 | 100% | 9 | 0% | 0 | 0% |
| Tundra Swan | 8 | 8 | 100% | 0 | 0% | 0 | 0% |
| Wood Duck | 47 | 47 | 100% | 0 | 0% | 0 | 0% |
| American Black Duck | 12 | 3 | 25% | 9 | 75% | 0 | 0% |
| Northern Pintail | 7 | 7 | 100% | 0 | 0% | 0 | 0% |
| Green-winged Teal | 17 | 17 | 100% | 0 | 0% | 0 | 0% |
| Greater Scaup | 12 | 12 | 100% | 0 | 0% | 0 | 0% |
| Scaup (unknown), <i>Aythya</i> (unknown) | 13 | 13 | 100% | 0 | 0% | 0 | 0% |
| Common Eider | 6 | 6 | 100% | 0 | 0% | 0 | 0% |
| Surf Scoter | 2,101 | 2,101 | 100% | 0 | 0% | 0 | 0% |
| White-winged Scoter | 11 | 11 | 100% | 0 | 0% | 0 | 0% |
| Black Scoter | 1,062 | 1,062 | 100% | 0 | 0% | 0 | 0% |
| Scoter (unknown) | 1 | 1 | 100% | 0 | 0% | 0 | 0% |
| Scoter, dark-winged (unknown) | 510 | 510 | 100% | 0 | 0% | 0 | 0% |
| Common Goldeneye | 0 | 0 | 0% | 0 | 0% | 0 | 0% |
| Gaviidae (loons) | 166 | 166 | 100% | 0 | 0% | 0 | 0% |
| Red-throated Loon | 81 | 81 | 100% | 0 | 0% | 0 | 0% |
| Common Loon | 84 | 84 | 100% | 0 | 0% | 0 | 0% |
| Loon (unknown) | 1 | 1 | 100% | 0 | 0% | 0 | 0% |
| Podicipedidae (grebes) | 0 | 0 | 0% | 0 | 0% | 0 | 0% |
| Pied-billed Grebe | 0 | 0 | 0% | 0 | 0% | 0 | 0% |
| Procellariidae (petrels and shearwaters) | 3 | 3 | 100% | 0 | 0% | 0 | 0% |
| Cory's Shearwater | 2 | 2 | 100% | 0 | 0% | 0 | 0% |
| Greater Shearwater | 1 | 1 | 100% | 0 | 0% | 0 | 0% |
| Sulidae (gannets) | 628 | 607 | 97% | 21 | 3% | 0 | 0% |
| Northern Gannet | 628 | 607 | 97% | 21 | 3% | 0 | 0% |
| Phalacrocoracidae (cormorants) | 50 | 50 | 100% | 0 | 0% | 0 | 0% |
| Double-crested Cormorant | 44 | 44 | 100% | 0 | 0% | 0 | 0% |
| Great Cormorant | 6 | 6 | 100% | 0 | 0% | 0 | 0% |

Table B-4a.11b. Avian species observed during the November 2008 shipboard offshore survey. Altitude categories total 100% of the individuals observed flying.

| Family Common Name | Total No. flying | No. At/below 100 ft | At/below 100 ft % | No. 101 to 500 ft (RSZ) | RSZ % | No. Above 500 ft | Above 500 ft % |
|--|---------------------|------------------------|----------------------|----------------------------|-----------|---------------------|-------------------|
| Ardeidae (bitterns, egrets, and herons) | 1 | 1 | 100% | 0 | 0% | 0 | 0% |
| Great Blue Heron | 1 | 1 | 100% | 0 | 0% | 0 | 0% |
| Rallidae (rails) | 0 | 0 | 0% | 0 | 0% | 0 | 0% |
| American Coot | 0 | 0 | 0% | 0 | 0% | 0 | 0% |
| Scolopacidae (sandpipers) | 1 | 1 | 100% | 0 | 0% | 0 | 0% |
| American Woodcock | 1 | 1 | 100% | 0 | 0% | 0 | 0% |
| Laridae (gulls and terns) | 596 | 596 | 100% | 0 | 0% | 0 | 0% |
| Bonaparte's Gull | 82 | 82 | 100% | 0 | 0% | 0 | 0% |
| Little Gull | 1 | 1 | 100% | 0 | 0% | 0 | 0% |
| Laughing Gull | 331 | 331 | 100% | 0 | 0% | 0 | 0% |
| Ring-billed Gull | 15 | 15 | 100% | 0 | 0% | 0 | 0% |
| Herring Gull | 119 | 119 | 100% | 0 | 0% | 0 | 0% |
| Lesser Black-backed Gull | 1 | 1 | 100% | 0 | 0% | 0 | 0% |
| Great Black-backed Gull | 44 | 44 | 100% | 0 | 0% | 0 | 0% |
| Forster's Tern | 2 | 2 | 100% | 0 | 0% | 0 | 0% |
| Royal Tern | 1 | 1 | 100% | 0 | 0% | 0 | 0% |
| Stercorariidae (skuas and jaegers) | 7 | 7 | 100% | 0 | 0% | 0 | 0% |
| Parasitic Jaeger | 7 | 7 | 100% | 0 | 0% | 0 | 0% |
| Sturnidae (starlings) | 1 | 1 | 100% | 0 | 0% | 0 | 0% |
| European Starling | 1 | 1 | 100% | 0 | 0% | 0 | 0% |
| Parulidae (wood-warblers) | 1 | 1 | 100% | 0 | 0% | 0 | 0% |
| Northern Parula | 1 | 1 | 100% | 0 | 0% | 0 | 0% |
| Icteridae (blackbirds and meadowlarks) | 3 | 3 | 100% | 0 | 0% | 0 | 0% |
| Red-winged Blackbird | 1 | 1 | 100% | 0 | 0% | 0 | 0% |
| Eastern Meadowlark | 1 | 1 | 100% | 0 | 0% | 0 | 0% |
| Brown-headed Cowbird | 1 | 1 | 100% | 0 | 0% | 0 | 0% |
| Fringillidae (finches) | 12 | 12 | 100% | 0 | 0% | 0 | 0% |
| Pine Siskin | 8 | 8 | 100% | 0 | 0% | 0 | 0% |
| American Goldfinch | 4 | 4 | 100% | 0 | 0% | 0 | 0% |
| TOTAL | 5,276 | 5,246 | 99% | 30 | 1% | 0 | 0% |

Appendix B-4b

Small Vessel Coastal Survey Avian Altitude Distribution

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Table B-4b.1a. Avian species observed during the January 2008 small boat coastal survey.

| Family Common Name | Total No. | No. Sitting | Sitting % | No. flying | Flying % |
|---|--------------|--------------|-------------|------------|------------|
| Anatidae (geese, swans, and ducks) | 2,507 | 1,920 | 77% | 587 | 23% |
| Scaup (unknown), <i>Aythya</i> (unknown) | 750 | 750 | 100% | 0 | 0% |
| Surf Scoter | 52 | 50 | 96% | 2 | 4% |
| White-winged Scoter | 22 | 12 | 55% | 10 | 45% |
| Black Scoter | 1,245 | 735 | 59% | 510 | 41% |
| Long-tailed Duck | 427 | 371 | 87% | 56 | 13% |
| Bufflehead | 4 | 0 | 0% | 4 | 100% |
| Common Goldeneye | 6 | 2 | 33% | 4 | 67% |
| Red-breasted Merganser | 1 | 0 | 0% | 1 | 100% |
| Gaviidae (loons) | 151 | 90 | 60% | 61 | 40% |
| Red-throated Loon | 100 | 45 | 45% | 55 | 55% |
| Common Loon | 51 | 45 | 88% | 6 | 12% |
| Sulidae (gannets) | 11 | 6 | 55% | 5 | 45% |
| Northern Gannet | 11 | 6 | 55% | 5 | 45% |
| Haematopodidae (oystercatchers) | 10 | 5 | 50% | 5 | 50% |
| American Oystercatcher | 10 | 5 | 50% | 5 | 50% |
| Scolopacidae (sandpipers) | 219 | 218 | 100% | 1 | 0% |
| Sanderling | 206 | 206 | 100% | 0 | 0% |
| Shorebird, small (unknown) | 13 | 12 | 92% | 1 | 8% |
| Laridae (gulls and terns) | 1,275 | 1,138 | 89% | 137 | 11% |
| Bonaparte's Gull | 22 | 7 | 32% | 15 | 68% |
| Ring-billed Gull | 400 | 400 | 100% | 0 | 0% |
| Herring Gull | 782 | 665 | 85% | 117 | 15% |
| Great Black-backed Gull | 71 | 66 | 93% | 5 | 7% |
| Alcidae (alcids) | 15 | 1 | 7% | 14 | 93% |
| Razorbill | 15 | 1 | 7% | 14 | 93% |
| TOTAL | 4,188 | 3,378 | 81% | 810 | 19% |

Table B-4b.1b. Avian species observed during the January 2008 small boat coastal survey. Altitude categories total 100% of the individuals observed flying.

| Family Common Name | Total No. flying | No. At/ below 100 ft | At/below 100 ft % | No. 101 to 500 ft (RSZ) | RSZ % | No. Above 500 ft | Above 500 ft % |
|---|---------------------|-------------------------|----------------------|----------------------------|-----------|---------------------|-------------------|
| Anatidae (geese, swans, and ducks) | 587 | 587 | 100% | 0 | 0% | 0 | 0% |
| Scaup (unknown), <i>Aythya</i> (unknown) | 0 | 0 | 0% | 0 | 0% | 0 | 0% |
| Surf Scoter | 2 | 2 | 100% | 0 | 0% | 0 | 0% |
| White-winged Scoter | 10 | 10 | 100% | 0 | 0% | 0 | 0% |
| Black Scoter | 510 | 510 | 100% | 0 | 0% | 0 | 0% |
| Long-tailed Duck | 56 | 56 | 100% | 0 | 0% | 0 | 0% |
| Bufflehead | 4 | 4 | 100% | 0 | 0% | 0 | 0% |
| Common Goldeneye | 4 | 4 | 100% | 0 | 0% | 0 | 0% |
| Red-breasted Merganser | 1 | 1 | 100% | 0 | 0% | 0 | 0% |
| Gaviidae (loons) | 61 | 61 | 100% | 0 | 0% | 0 | 0% |
| Red-throated Loon | 55 | 55 | 100% | 0 | 0% | 0 | 0% |
| Common Loon | 6 | 6 | 100% | 0 | 0% | 0 | 0% |
| Sulidae (gannets) | 5 | 5 | 100% | 0 | 0% | 0 | 0% |
| Northern Gannet | 5 | 5 | 100% | 0 | 0% | 0 | 0% |
| Haematopodidae (oystercatchers) | 5 | 5 | 100% | 0 | 0% | 0 | 0% |
| American Oystercatcher | 5 | 5 | 100% | 0 | 0% | 0 | 0% |
| Scolopacidae (sandpipers) | 1 | 1 | 100% | 0 | 0% | 0 | 0% |
| Sanderling | 0 | 0 | 0% | 0 | 0% | 0 | 0% |
| Shorebird, small (unknown) | 1 | 1 | 100% | 0 | 0% | 0 | 0% |
| Laridae (gulls and terns) | 137 | 137 | 100% | 0 | 0% | 0 | 0% |
| Bonaparte's Gull | 15 | 15 | 100% | 0 | 0% | 0 | 0% |
| Ring-billed Gull | 0 | 0 | 0% | 0 | 0% | 0 | 0% |
| Herring Gull | 117 | 117 | 100% | 0 | 0% | 0 | 0% |
| Great Black-backed Gull | 5 | 5 | 100% | 0 | 0% | 0 | 0% |
| Alcidae (alcids) | 14 | 14 | 100% | 0 | 0% | 0 | 0% |
| Razorbill | 14 | 14 | 100% | 0 | 0% | 0 | 0% |
| TOTAL | 810 | 810 | 100% | 0 | 0% | 0 | 0% |

Table B-4b.2a. Avian species observed during the March 2008 small boat coastal survey.

| Family Common Name | Total No. | No. Sitting | Sitting % | No. flying | Flying % |
|---|--------------|--------------|-------------|------------|-------------|
| Anatidae (geese, swans, and ducks) | 1,166 | 633 | 54% | 533 | 46% |
| Surf Scoter | 1,014 | 527 | 52% | 487 | 48% |
| Black Scoter | 33 | 28 | 85% | 5 | 15% |
| Scoter, dark-winged (unknown) | 6 | 0 | 0% | 6 | 100% |
| Long-tailed Duck | 113 | 78 | 69% | 35 | 31% |
| Gaviidae (loons) | 72 | 44 | 61% | 28 | 39% |
| Red-throated Loon | 46 | 20 | 43% | 26 | 57% |
| Common Loon | 26 | 24 | 92% | 2 | 8% |
| Podicipedidae (grebes) | 8 | 3 | 38% | 5 | 62% |
| Horned Grebe | 8 | 3 | 38% | 5 | 62% |
| Sulidae (gannets) | 256 | 56 | 22% | 200 | 78% |
| Northern Gannet | 256 | 56 | 22% | 200 | 78% |
| Phalacrocoracidae (cormorants) | 1 | 1 | 100% | 0 | 0% |
| Great Cormorant | 1 | 1 | 100% | 0 | 0% |
| Scolopacidae (sandpipers) | 35 | 0 | 0% | 35 | 100% |
| Sanderling | 35 | 0 | 0% | 35 | 100% |
| Laridae (gulls and terns) | 1,106 | 1,040 | 94% | 66 | 6% |
| Laughing Gull | 19 | 15 | 79% | 4 | 21% |
| Ring-billed Gull | 14 | 14 | 100% | 0 | 0% |
| Herring Gull | 947 | 928 | 98% | 19 | 2% |
| Lesser Black-backed Gull | 1 | 0 | 0% | 1 | 100% |
| Great Black-backed Gull | 117 | 83 | 71% | 34 | 29% |
| Gull, large (unknown) | 8 | 0 | 0% | 8 | 100% |
| TOTAL | 2,644 | 1,777 | 67% | 867 | 33% |

Table B-4b.2b. Avian species observed during the March 2008 small boat coastal survey. Altitude categories total 100% of the individuals observed flying.

| Family Common Name | Total No. flying | No. At/ below 100 ft | At/below 100 ft % | No. 101 to 500 ft (RSZ) | RSZ % | No. Above 500 ft | Above 500 ft % |
|---|---------------------|-------------------------|----------------------|----------------------------|------------|---------------------|-------------------|
| Anatidae (geese, swans, and ducks) | 533 | 533 | 100% | 0 | 0% | 0 | 0% |
| Surf Scoter | 487 | 487 | 100% | 0 | 0% | 0 | 0% |
| Black Scoter | 5 | 5 | 100% | 0 | 0% | 0 | 0% |
| Scoter, dark-winged (unknown) | 6 | 6 | 100% | 0 | 0% | 0 | 0% |
| Long-tailed Duck | 35 | 35 | 100% | 0 | 0% | 0 | 0% |
| Gaviidae (loons) | 28 | 28 | 100% | 0 | 0% | 0 | 0% |
| Red-throated Loon | 26 | 26 | 100% | 0 | 0% | 0 | 0% |
| Common Loon | 2 | 2 | 100% | 0 | 0% | 0 | 0% |
| Podicipedidae (grebes) | 5 | 5 | 100% | 0 | 0% | 0 | 0% |
| Horned Grebe | 5 | 5 | 100% | 0 | 0% | 0 | 0% |
| Sulidae (gannets) | 200 | 174 | 86% | 23 | 12% | 3 | 2% |
| Northern Gannet | 200 | 174 | 86% | 23 | 12% | 3 | 2% |
| Phalacrocoracidae (cormorants) | 0 | 0 | 0% | 0 | 0% | 0 | 0% |
| Great Cormorant | 0 | 0 | 0% | 0 | 0% | 0 | 0% |
| Scolopacidae (sandpipers) | 35 | 35 | 100% | 0 | 0% | 0 | 0% |
| Sanderling | 35 | 35 | 100% | 0 | 0% | 0 | 0% |
| Laridae (gulls and terns) | 66 | 64 | 97% | 2 | 3% | 0 | 0% |
| Laughing Gull | 4 | 4 | 100% | 0 | 0% | 0 | 0% |
| Ring-billed Gull | 0 | 0 | 0% | 0 | 0% | 0 | 0% |
| Herring Gull | 19 | 19 | 100% | 0 | 0% | 0 | 0% |
| Lesser Black-backed Gull | 1 | 1 | 100% | 0 | 0% | 0 | 0% |
| Great Black-backed Gull | 34 | 32 | 94% | 2 | 6% | 0 | 0% |
| Gull, large (unknown) | 8 | 8 | 100% | 0 | 0% | 0 | 0% |
| TOTAL | 867 | 839 | 97% | 25 | 3% | 3 | 0% |

Table B-4b.3a. Avian species observed during the April 2008 small boat coastal survey.

| Family Common Name | Total No. | No. Sitting | Sitting % | No. flying | Flying % |
|---|------------|-------------|-------------|------------|-------------|
| Anatidae (geese, swans, and ducks) | 395 | 222 | 56% | 173 | 44% |
| Surf Scoter | 301 | 157 | 52% | 144 | 48% |
| White-winged Scoter | 35 | 35 | 100% | 0 | 0% |
| Black Scoter | 58 | 30 | 52% | 28 | 48% |
| Scoter, dark-winged (unknown) | 1 | 0 | 0% | 1 | 100% |
| Gaviidae (loons) | 54 | 17 | 31% | 37 | 69% |
| Red-throated Loon | 25 | 4 | 16% | 21 | 84% |
| Common Loon | 29 | 13 | 45% | 16 | 55% |
| Sulidae (gannets) | 176 | 104 | 59% | 72 | 41% |
| Northern Gannet | 176 | 104 | 59% | 72 | 41% |
| Phalacrocoracidae (cormorants) | 29 | 6 | 21% | 23 | 79% |
| Double-crested Cormorant | 28 | 5 | 18% | 23 | 82% |
| Cormorant (unknown) | 1 | 1 | 100% | 0 | 0% |
| Scolopacidae (sandpipers) | 35 | 35 | 100% | 0 | 0% |
| Sanderling | 35 | 35 | 100% | 0 | 0% |
| Laridae (gulls and terns) | 176 | 100 | 57% | 76 | 43% |
| Bonaparte's Gull | 5 | 5 | 100% | 0 | 0% |
| Laughing Gull | 14 | 1 | 7% | 13 | 93% |
| Ring-billed Gull | 6 | 5 | 83% | 1 | 17% |
| Herring Gull | 92 | 64 | 70% | 28 | 30% |
| Great Black-backed Gull | 47 | 25 | 53% | 22 | 47% |
| Gull, large (unknown) | 1 | 0 | 0% | 1 | 100% |
| Forster's Tern | 11 | 0 | 0% | 11 | 100% |
| Corvidae (crows) | 1 | 0 | 0% | 1 | 100% |
| Fish Crow | 1 | 0 | 0% | 1 | 100% |
| TOTAL | 866 | 484 | 56% | 382 | 44% |

Table B-4b.3b. Avian species observed during the April 2008 small boat coastal survey. Altitude categories total 100% of the individuals observed flying.

| Family Common Name | Total No. flying | No. At/ below 100 ft | At/below 100 ft % | No. 101 to 500 ft (RSZ) | RSZ % | No. Above 500 ft | Above 500 ft % |
|---|---------------------|-------------------------|----------------------|----------------------------|------------|---------------------|-------------------|
| Anatidae (geese, swans, and ducks) | 173 | 172 | 99% | 1 | 1% | 0 | 0% |
| Surf Scoter | 144 | 144 | 100% | 0 | 0% | 0 | 0% |
| White-winged Scoter | 0 | 0 | 0% | 0 | 0% | 0 | 0% |
| Black Scoter | 28 | 27 | 96% | 1 | 4% | 0 | 0% |
| Scoter, dark-winged (unknown) | 1 | 1 | 100% | 0 | 0% | 0 | 0% |
| Gaviidae (loons) | 37 | 35 | 95% | 2 | 5% | 0 | 0% |
| Red-throated Loon | 21 | 21 | 100% | 0 | 0% | 0 | 0% |
| Common Loon | 16 | 14 | 88% | 2 | 12% | 0 | 0% |
| Sulidae (gannets) | 72 | 63 | 88% | 9 | 12% | 0 | 0% |
| Northern Gannet | 72 | 63 | 88% | 9 | 12% | 0 | 0% |
| Phalacrocoracidae (cormorants) | 23 | 23 | 100% | 0 | 0% | 0 | 0% |
| Double-crested Cormorant | 23 | 23 | 100% | 0 | 0% | 0 | 0% |
| Cormorant (unknown) | 0 | 0 | 0% | 0 | 0% | 0 | 0% |
| Scolopacidae (sandpipers) | 0 | 0 | 0% | 0 | 0% | 0 | 0% |
| Sanderling | 0 | 0 | 0% | 0 | 0% | 0 | 0% |
| Laridae (gulls and terns) | 76 | 73 | 96% | 3 | 4% | 0 | 0% |
| Bonaparte's Gull | 0 | 0 | 0% | 0 | 0% | 0 | 0% |
| Laughing Gull | 13 | 13 | 100% | 0 | 0% | 0 | 0% |
| Ring-billed Gull | 1 | 1 | 100% | 0 | 0% | 0 | 0% |
| Herring Gull | 28 | 26 | 93% | 2 | 7% | 0 | 0% |
| Great Black-backed Gull | 22 | 22 | 100% | 0 | 0% | 0 | 0% |
| Gull, large (unknown) | 1 | 0 | 0% | 1 | 100% | 0 | 0% |
| Forster's Tern | 11 | 11 | 100% | 0 | 0% | 0 | 0% |
| Corvidae (crows) | 1 | 1 | 100% | 0 | 0% | 0 | 0% |
| Fish Crow | 1 | 1 | 100% | 0 | 0% | 0 | 0% |
| TOTAL | 382 | 367 | 96% | 15 | 4% | 0 | 0% |

Table B-4b.4a. Avian species observed during the May 2008 small boat coastal survey.

| Family Common Name | Total No. | No. Sitting | Sitting % | No. flying | Flying % |
|---|------------|-------------|------------|------------|-------------|
| Gaviidae (loons) | 2 | 0 | 0% | 2 | 100% |
| Red-throated Loon | 1 | 0 | 0% | 1 | 100% |
| Common Loon | 1 | 0 | 0% | 1 | 100% |
| Sulidae (gannets) | 11 | 2 | 18% | 9 | 82% |
| Northern Gannet | 11 | 2 | 18% | 9 | 82% |
| Phalacrocoracidae (cormorants) | 37 | 13 | 35% | 24 | 65% |
| Double-crested Cormorant | 37 | 13 | 35% | 24 | 65% |
| Scolopacidae (sandpipers) | 7 | 0 | 0% | 7 | 100% |
| Sanderling | 6 | 0 | 0% | 6 | 100% |
| Semipalmated Sandpiper | 1 | 0 | 0% | 1 | 100% |
| Laridae (gulls and terns) | 174 | 16 | 9% | 158 | 91% |
| Laughing Gull | 54 | 1 | 2% | 53 | 98% |
| Herring Gull | 19 | 1 | 5% | 18 | 95% |
| Great Black-backed Gull | 34 | 12 | 35% | 22 | 65% |
| Least Tern | 1 | 0 | 0% | 1 | 100% |
| Common Tern | 43 | 0 | 0% | 43 | 100% |
| Forster's Tern | 22 | 2 | 9% | 20 | 91% |
| Royal Tern | 1 | 0 | 0% | 1 | 100% |
| Hirundinidae (swallows) | 9 | 0 | 0% | 9 | 100% |
| Barn Swallow | 9 | 0 | 0% | 9 | 100% |
| Icteridae (blackbirds and meadowlarks) | 6 | 0 | 0% | 6 | 100% |
| Red-winged Blackbird | 6 | 0 | 0% | 6 | 100% |
| TOTAL | 246 | 31 | 13% | 215 | 87% |

Table B-4b.4b. Avian species observed during the May 2008 small boat coastal survey. Altitude categories total 100% of the individuals observed flying.

| Family Common Name | Total No. flying | No. At/ below 100 ft | At/below 100 ft % | No. 101 to 500 ft (RSZ) | RSZ % | No. Above 500 ft | Above 500 ft % |
|---|---------------------|----------------------------|----------------------|----------------------------|-----------|---------------------|-------------------|
| Gaviidae (loons) | 2 | 2 | 100% | 0 | 0% | 0 | 0% |
| Red-throated Loon | 1 | 1 | 100% | 0 | 0% | 0 | 0% |
| Common Loon | 1 | 1 | 100% | 0 | 0% | 0 | 0% |
| Sulidae (gannets) | 9 | 9 | 100% | 0 | 0% | 0 | 0% |
| Northern Gannet | 9 | 9 | 100% | 0 | 0% | 0 | 0% |
| Phalacrocoracidae (cormorants) | 24 | 24 | 100% | 0 | 0% | 0 | 0% |
| Double-crested Cormorant | 24 | 24 | 100% | 0 | 0% | 0 | 0% |
| Scolopacidae (sandpipers) | 7 | 7 | 100% | 0 | 0% | 0 | 0% |
| Sanderling | 6 | 6 | 100% | 0 | 0% | 0 | 0% |
| Semipalmated Sandpiper | 1 | 1 | 100% | 0 | 0% | 0 | 0% |
| Laridae (gulls and terns) | 158 | 156 | 99% | 2 | 1% | 0 | 0% |
| Laughing Gull | 53 | 53 | 100% | 0 | 0% | 0 | 0% |
| Herring Gull | 18 | 18 | 100% | 0 | 0% | 0 | 0% |
| Great Black-backed Gull | 22 | 20 | 91% | 2 | 9% | 0 | 0% |
| Least Tern | 1 | 1 | 100% | 0 | 0% | 0 | 0% |
| Common Tern | 43 | 43 | 100% | 0 | 0% | 0 | 0% |
| Forster's Tern | 20 | 20 | 100% | 0 | 0% | 0 | 0% |
| Royal Tern | 1 | 1 | 100% | 0 | 0% | 0 | 0% |
| Hirundinidae (swallows) | 9 | 9 | 100% | 0 | 0% | 0 | 0% |
| Barn Swallow | 9 | 9 | 100% | 0 | 0% | 0 | 0% |
| Icteridae (blackbirds and meadowlarks) | 6 | 6 | 100% | 0 | 0% | 0 | 0% |
| Red-winged Blackbird | 6 | 6 | 100% | 0 | 0% | 0 | 0% |
| TOTAL | 215 | 213 | 99% | 2 | 1% | 0 | 0% |

Table B-4b.5a. Avian species observed during the June 2008 small boat coastal survey.

| Family Common Name | Total No. | No. Sitting | Sitting % | No. flying | Flying % |
|---|------------|-------------|-------------|------------|-------------|
| Anatidae (geese, swans, and ducks) | 13 | 11 | 85% | 2 | 15% |
| Gadwall | 2 | 0 | 0% | 2 | 100% |
| Surf Scoter | 11 | 11 | 100% | 0 | 0% |
| Gaviidae (loons) | 1 | 1 | 100% | 0 | 0% |
| Common Loon | 1 | 1 | 100% | 0 | 0% |
| Sulidae (gannets) | 14 | 1 | 7% | 13 | 93% |
| Northern Gannet | 14 | 1 | 7% | 13 | 93% |
| Pelecanidae (pelicans) | 1 | 0 | 0% | 1 | 100% |
| Brown Pelican | 1 | 0 | 0% | 1 | 100% |
| Phalacrocoracidae (cormorants) | 7 | 5 | 71% | 2 | 29% |
| Double-crested Cormorant | 7 | 5 | 71% | 2 | 29% |
| Accipitridae (eagles and hawks) | 1 | 0 | 0% | 1 | 100% |
| Osprey | 1 | 0 | 0% | 1 | 100% |
| Laridae (gulls and terns) | 336 | 64 | 19% | 272 | 81% |
| Laughing Gull | 197 | 51 | 26% | 146 | 74% |
| Herring Gull | 13 | 1 | 8% | 12 | 92% |
| Great Black-backed Gull | 44 | 12 | 27% | 32 | 73% |
| Common Tern | 41 | 0 | 0% | 41 | 100% |
| Forster's Tern | 32 | 0 | 0% | 32 | 100% |
| Royal Tern | 3 | 0 | 0% | 3 | 100% |
| Tern, small (unknown) | 6 | 0 | 0% | 6 | 100% |
| Hirundinidae (swallows) | 1 | 0 | 0% | 1 | 100% |
| Purple Martin | 1 | 0 | 0% | 1 | 100% |
| Icteridae (blackbirds and meadowlarks) | 1 | 0 | 0% | 1 | 100% |
| Boat-tailed Grackle | 1 | 0 | 0% | 1 | 100% |
| TOTAL | 375 | 82 | 22% | 293 | 78% |

Table B-4b.5b. Avian species observed during the June 2008 small boat coastal survey. Altitude categories total 100% of the individuals observed flying.

| Family Common Name | Total No. flying | No. At/ below 100 ft | At/below 100 ft % | No. 101 to 500 ft (RSZ) | RSZ % | No. Above 500 ft | Above 500 ft % |
|---|---------------------|----------------------------|----------------------|----------------------------|-----------|---------------------|-------------------|
| Anatidae (geese, swans, and ducks) | 2 | 2 | 100% | 0 | 0% | 0 | 0% |
| Gadwall | 2 | 2 | 100% | 0 | 0% | 0 | 0% |
| Surf Scoter | 0 | 0 | 0% | 0 | 0% | 0 | 0% |
| Gaviidae (loons) | 0 | 0 | 0% | 0 | 0% | 0 | 0% |
| Common Loon | 0 | 0 | 0% | 0 | 0% | 0 | 0% |
| Sulidae (gannets) | 13 | 13 | 100% | 0 | 0% | 0 | 0% |
| Northern Gannet | 13 | 13 | 100% | 0 | 0% | 0 | 0% |
| Pelecanidae (pelicans) | 1 | 1 | 100% | 0 | 0% | 0 | 0% |
| Brown Pelican | 1 | 1 | 100% | 0 | 0% | 0 | 0% |
| Phalacrocoracidae (cormorants) | 2 | 2 | 100% | 0 | 0% | 0 | 0% |
| Double-crested Cormorant | 2 | 2 | 100% | 0 | 0% | 0 | 0% |
| Accipitridae (eagles and hawks) | 1 | 1 | 100% | 0 | 0% | 0 | 0% |
| Osprey | 1 | 1 | 100% | 0 | 0% | 0 | 0% |
| Laridae (gulls and terns) | 272 | 272 | 100% | 0 | 0% | 0 | 0% |
| Laughing Gull | 146 | 146 | 100% | 0 | 0% | 0 | 0% |
| Herring Gull | 12 | 12 | 100% | 0 | 0% | 0 | 0% |
| Great Black-backed Gull | 32 | 32 | 100% | 0 | 0% | 0 | 0% |
| Common Tern | 41 | 41 | 100% | 0 | 0% | 0 | 0% |
| Forster's Tern | 32 | 32 | 100% | 0 | 0% | 0 | 0% |
| Royal Tern | 3 | 3 | 100% | 0 | 0% | 0 | 0% |
| Tern, small (unknown) | 6 | 6 | 100% | 0 | 0% | 0 | 0% |
| Hirundinidae (swallows) | 1 | 1 | 100% | 0 | 0% | 0 | 0% |
| Purple Martin | 1 | 1 | 100% | 0 | 0% | 0 | 0% |
| Icteridae (blackbirds and meadowlarks) | 1 | 1 | 100% | 0 | 0% | 0 | 0% |
| Boat-tailed Grackle | 1 | 1 | 100% | 0 | 0% | 0 | 0% |
| TOTAL | 293 | 293 | 100% | 0 | 0% | 0 | 0% |

Table B-4b.6a. Avian species observed during the July 2008 small boat coastal survey.

| Family Common Name | Total No. | No. Sitting | Sitting % | No. flying | Flying % |
|----------------------------------|------------|-------------|-----------|------------|-------------|
| Sulidae (gannets) | 1 | 0 | 0% | 1 | 100% |
| Northern Gannet | 1 | 0 | 0% | 1 | 100% |
| Scolopacidae (sandpipers) | 63 | 0 | 0% | 63 | 100% |
| Whimbrel | 49 | 0 | 0% | 49 | 100% |
| Sanderling | 14 | 0 | 0% | 14 | 100% |
| Laridae (gulls and terns) | 240 | 11 | 5% | 229 | 95% |
| Laughing Gull | 169 | 8 | 5% | 161 | 95% |
| Herring Gull | 7 | 1 | 14% | 6 | 86% |
| Great Black-backed Gull | 14 | 2 | 14% | 12 | 86% |
| Common Tern | 28 | 0 | 0% | 28 | 100% |
| Forster's Tern | 17 | 0 | 0% | 17 | 100% |
| Royal Tern | 4 | 0 | 0% | 4 | 100% |
| Tern, small (unknown) | 1 | 0 | 0% | 1 | 100% |
| Hirundinidae (swallows) | 2 | 0 | 0% | 2 | 100% |
| Tree Swallow | 1 | 0 | 0% | 1 | 100% |
| Barn Swallow | 1 | 0 | 0% | 1 | 100% |
| TOTAL | 306 | 11 | 4% | 295 | 96% |

Table B-4b.6b. Avian species observed during the July 2008 small boat coastal survey. Altitude categories total 100% of the individuals observed flying.

| Family Common Name | Total No. flying | No. At/ below 100 ft | At/below 100 ft % | No. 101 to 500 ft (RSZ) | RSZ % | No. Above 500 ft | Above 500 ft % |
|----------------------------------|---------------------|-------------------------|----------------------|----------------------------|-----------|---------------------|-------------------|
| Sulidae (gannets) | 1 | 1 | 100% | 0 | 0% | 0 | 0% |
| Northern Gannet | 1 | 1 | 100% | 0 | 0% | 0 | 0% |
| Scolopacidae (sandpipers) | 63 | 63 | 100% | 0 | 0% | 0 | 0% |
| Whimbrel | 49 | 49 | 100% | 0 | 0% | 0 | 0% |
| Sanderling | 14 | 14 | 100% | 0 | 0% | 0 | 0% |
| Laridae (gulls and terns) | 229 | 227 | 99% | 2 | 1% | 0 | 0% |
| Laughing Gull | 161 | 159 | 99% | 2 | 1% | 0 | 0% |
| Herring Gull | 6 | 6 | 100% | 0 | 0% | 0 | 0% |
| Great Black-backed Gull | 12 | 12 | 100% | 0 | 0% | 0 | 0% |
| Common Tern | 28 | 28 | 100% | 0 | 0% | 0 | 0% |
| Forster's Tern | 17 | 17 | 100% | 0 | 0% | 0 | 0% |
| Royal Tern | 4 | 4 | 100% | 0 | 0% | 0 | 0% |
| Tern, small (unknown) | 1 | 1 | 100% | 0 | 0% | 0 | 0% |
| Hirundinidae (swallows) | 2 | 2 | 100% | 0 | 0% | 0 | 0% |
| Tree Swallow | 1 | 1 | 100% | 0 | 0% | 0 | 0% |
| Barn Swallow | 1 | 1 | 100% | 0 | 0% | 0 | 0% |
| TOTAL | 295 | 293 | 99% | 2 | 1% | 0 | 0% |

Table B-4b.7a. Avian species observed during the August 2008 small boat coastal survey.

| Family Common Name | Total No. | No. Sitting | Sitting % | No. flying | Flying % |
|--|--------------|-------------|------------|------------|-------------|
| Sulidae (gannets) | 17 | 6 | 35% | 11 | 65% |
| Northern Gannet | 17 | 6 | 35% | 11 | 65% |
| Pelecanidae (pelicans) | 4 | 0 | 0% | 4 | 100% |
| Brown Pelican | 4 | 0 | 0% | 4 | 100% |
| Phalacrocoracidae (cormorants) | 6 | 0 | 0% | 6 | 100% |
| Double-crested Cormorant | 6 | 0 | 0% | 6 | 100% |
| Accipitridae (eagles and hawks) | 1 | 0 | 0% | 1 | 100% |
| Osprey | 1 | 0 | 0% | 1 | 100% |
| Charadriidae (plovers) | 5 | 0 | 0% | 5 | 100% |
| Semipalmated Plover | 5 | 0 | 0% | 5 | 100% |
| Scolopacidae (sandpipers) | 86 | 55 | 64% | 31 | 36% |
| Sanderling | 62 | 55 | 89% | 7 | 11% |
| Semipalmated Sandpiper | 3 | 0 | 0% | 3 | 100% |
| Least Sandpiper | 11 | 0 | 0% | 11 | 100% |
| Dowitcher (unknown) | 3 | 0 | 0% | 3 | 100% |
| Shorebird, small (unknown) | 7 | 0 | 0% | 7 | 100% |
| Laridae (gulls and terns) | 996 | 368 | 37% | 628 | 63% |
| Laughing Gull | 579 | 266 | 46% | 313 | 54% |
| Herring Gull | 14 | 2 | 14% | 12 | 86% |
| Great Black-backed Gull | 73 | 37 | 51% | 36 | 49% |
| Gull, large (unknown) | 1 | 0 | 0% | 1 | 100% |
| Common Tern | 214 | 0 | 0% | 214 | 100% |
| Forster's Tern | 11 | 0 | 0% | 11 | 100% |
| Royal Tern | 38 | 0 | 0% | 38 | 100% |
| Sandwich Tern | 2 | 0 | 0% | 2 | 100% |
| Tern, large (unknown) | 1 | 0 | 0% | 1 | 100% |
| Tern, small (unknown) | 63 | 63 | 100% | 0 | 0% |
| Apodidae (swifts) | 1 | 0 | 0% | 1 | 100% |
| Chimney Swift | 1 | 0 | 0% | 1 | 100% |
| Hirundinidae (swallows) | 24 | 0 | 0% | 24 | 100% |
| Purple Martin | 12 | 0 | 0% | 12 | 100% |
| Tree Swallow | 3 | 0 | 0% | 3 | 100% |
| Bank Swallow | 1 | 0 | 0% | 1 | 100% |
| Barn Swallow | 8 | 0 | 0% | 8 | 100% |
| TOTAL | 1,140 | 429 | 38% | 711 | 62% |

Table B-4b.7b. Avian species observed during the August 2008 small boat coastal survey. Altitude categories total 100% of the individuals observed flying.

| Family Common Name | Total No. flying | No. At/ below 100 ft | At/below 100 ft % | No. 101 to 500 ft (RSZ) | RSZ % | No. Above 500 ft | Above 500 ft % |
|--|---------------------|-------------------------|----------------------|----------------------------|------------|---------------------|-------------------|
| Sulidae (gannets) | 11 | 11 | 100% | 0 | 0% | 0 | 0% |
| Northern Gannet | 11 | 11 | 100% | 0 | 0% | 0 | 0% |
| Pelecanidae (pelicans) | 4 | 2 | 50% | 2 | 50% | 0 | 0% |
| Brown Pelican | 4 | 2 | 50% | 2 | 50% | 0 | 0% |
| Phalacrocoracidae (cormorants) | 6 | 6 | 100% | 0 | 0% | 0 | 0% |
| Double-crested Cormorant | 6 | 6 | 100% | 0 | 0% | 0 | 0% |
| Accipitridae (eagles and hawks) | 1 | 1 | 100% | 0 | 0% | 0 | 0% |
| Osprey | 1 | 1 | 100% | 0 | 0% | 0 | 0% |
| Charadriidae (plovers) | 5 | 5 | 100% | 0 | 0% | 0 | 0% |
| Semipalmated Plover | 5 | 5 | 100% | 0 | 0% | 0 | 0% |
| Scolopacidae (sandpipers) | 31 | 31 | 100% | 0 | 0% | 0 | 0% |
| Sanderling | 7 | 7 | 100% | 0 | 0% | 0 | 0% |
| Semipalmated Sandpiper | 3 | 3 | 100% | 0 | 0% | 0 | 0% |
| Least Sandpiper | 11 | 11 | 100% | 0 | 0% | 0 | 0% |
| Dowitcher (unknown) | 3 | 3 | 100% | 0 | 0% | 0 | 0% |
| Shorebird, small (unknown) | 7 | 7 | 100% | 0 | 0% | 0 | 0% |
| Laridae (gulls and terns) | 628 | 622 | 99% | 6 | 1% | 0 | 0% |
| Laughing Gull | 313 | 307 | 98% | 6 | 2% | 0 | 0% |
| Herring Gull | 12 | 12 | 100% | 0 | 0% | 0 | 0% |
| Great Black-backed Gull | 36 | 36 | 100% | 0 | 0% | 0 | 0% |
| Gull, large (unknown) | 1 | 1 | 100% | 0 | 0% | 0 | 0% |
| Common Tern | 214 | 214 | 100% | 0 | 0% | 0 | 0% |
| Forster's Tern | 11 | 11 | 100% | 0 | 0% | 0 | 0% |
| Royal Tern | 38 | 38 | 100% | 0 | 0% | 0 | 0% |
| Sandwich Tern | 2 | 2 | 100% | 0 | 0% | 0 | 0% |
| Tern, large (unknown) | 1 | 1 | 100% | 0 | 0% | 0 | 0% |
| Tern, small (unknown) | 0 | 0 | 0% | 0 | 0% | 0 | 0% |
| Apodidae (swifts) | 1 | 1 | 100% | 0 | 0% | 0 | 0% |
| Chimney Swift | 1 | 1 | 100% | 0 | 0% | 0 | 0% |

Table B-4b.7b (*continued*). Avian species observed during the August 2008 small boat coastal survey. Altitude categories total 100% of the individuals observed flying.

| Family Common Name | Total No. flying | No. At/ below 100 ft | At/below 100 ft % | No. 101 to 500 ft (RSZ) | RSZ % | No. Above 500 ft | Above 500 ft % |
|--------------------------------|---------------------|-------------------------|----------------------|----------------------------|-----------|---------------------|-------------------|
| Hirundinidae (swallows) | 24 | 24 | 100% | 0 | 0% | 0 | 0% |
| Purple Martin | 12 | 12 | 100% | 0 | 0% | 0 | 0% |
| Tree Swallow | 3 | 3 | 100% | 0 | 0% | 0 | 0% |
| Bank Swallow | 1 | 1 | 100% | 0 | 0% | 0 | 0% |
| Barn Swallow | 8 | 8 | 100% | 0 | 0% | 0 | 0% |
| TOTAL | 711 | 703 | 99% | 8 | 1% | 0 | 0% |

Table B-4b.8a. Avian species observed during the September 2008 small boat coastal survey.

| Family Common Name | Total No. | No. Sitting | Sitting % | No. flying | Flying % |
|--|------------|-------------|------------|------------|-------------|
| Anatidae (geese, swans, and ducks) | 38 | 3 | 8% | 35 | 92% |
| Green-winged Teal | 30 | 0 | 0% | 30 | 100% |
| Surf Scoter | 4 | 3 | 75% | 1 | 25% |
| Scoter, dark-winged (unknown) | 4 | 0 | 0% | 4 | 100% |
| Sulidae (gannets) | 15 | 2 | 13% | 13 | 87% |
| Northern Gannet | 15 | 2 | 13% | 13 | 87% |
| Pelecanidae (pelicans) | 4 | 0 | 0% | 4 | 100% |
| Brown Pelican | 4 | 0 | 0% | 4 | 100% |
| Phalacrocoracidae (cormorants) | 2 | 0 | 0% | 2 | 100% |
| Double-crested Cormorant | 2 | 0 | 0% | 2 | 100% |
| Ardeidae (bitterns, egrets, and herons) | 6 | 0 | 0% | 6 | 100% |
| Great Blue Heron | 6 | 0 | 0% | 6 | 100% |
| Scolopacidae (sandpipers) | 24 | 6 | 25% | 18 | 75% |
| Sanderling | 6 | 6 | 100% | 0 | 0% |
| Dunlin | 8 | 0 | 0% | 8 | 100% |
| Shorebird, small (unknown) | 10 | 0 | 0% | 10 | 100% |
| Laridae (gulls and terns) | 526 | 240 | 45% | 286 | 55% |
| Laughing Gull | 157 | 57 | 36% | 100 | 64% |
| Ring-billed Gull | 44 | 43 | 98% | 1 | 2% |
| Herring Gull | 73 | 52 | 71% | 21 | 29% |
| Great Black-backed Gull | 110 | 72 | 65% | 39 | 35% |
| Gull, large (unknown) | 15 | 15 | 100% | 0 | 0% |
| Caspian Tern | 5 | 0 | 0% | 5 | 100% |
| Common Tern | 14 | 2 | 14% | 12 | 86% |
| Forster's Tern | 63 | 0 | 0% | 63 | 100% |
| Royal Tern | 43 | 0 | 0% | 43 | 100% |
| Tern, large (unknown) | 1 | 0 | 0% | 1 | 100% |
| Tern, small (unknown) | 1 | 0 | 0% | 1 | 100% |
| Picidae (woodpeckers) | 2 | 0 | 0% | 2 | 100% |
| Northern (Yellow-shafted) Flicker | 2 | 0 | 0% | 2 | 100% |
| TOTAL | 617 | 251 | 41% | 366 | 59% |

Table B-4b.8b. Avian species observed during the September 2008 small boat coastal survey. Altitude categories total 100% of the individuals observed flying.

| Family Common Name | Total No. flying | No. At/ below 100 ft | At/below 100 ft % | No. 101 to 500 ft (RSZ) | RSZ % | No. Above 500 ft | Above 500 ft % |
|--|---------------------|----------------------------|----------------------|----------------------------|-----------|---------------------|-------------------|
| Anatidae (geese, swans, and ducks) | 35 | 35 | 100% | 0 | 0% | 0 | 0% |
| Green-winged Teal | 30 | 30 | 100% | 0 | 0% | 0 | 0% |
| Surf Scoter | 1 | 1 | 100% | 0 | 0% | 0 | 0% |
| Scoter, dark-winged (unknown) | 4 | 4 | 100% | 0 | 0% | 0 | 0% |
| Sulidae (gannets) | 13 | 13 | 100% | 0 | 0% | 0 | 0% |
| Northern Gannet | 13 | 13 | 100% | 0 | 0% | 0 | 0% |
| Pelecanidae (pelicans) | 4 | 4 | 100% | 0 | 0% | 0 | 0% |
| Brown Pelican | 4 | 4 | 100% | 0 | 0% | 0 | 0% |
| Phalacrocoracidae (cormorants) | 2 | 2 | 100% | 0 | 0% | 0 | 0% |
| Double-crested Cormorant | 2 | 2 | 100% | 0 | 0% | 0 | 0% |
| Ardeidae (bitterns, egrets, and herons) | 6 | 6 | 100% | 0 | 0% | 0 | 0% |
| Great Blue Heron | 6 | 6 | 100% | 0 | 0% | 0 | 0% |
| Scolopacidae (sandpipers) | 18 | 18 | 100% | 0 | 0% | 0 | 0% |
| Sanderling | 0 | 0 | 0% | 0 | 0% | 0 | 0% |
| Dunlin | 8 | 8 | 100% | 0 | 0% | 0 | 0% |
| Shorebird, small (unknown) | 10 | 10 | 100% | 0 | 0% | 0 | 0% |
| Laridae (gulls and terns) | 286 | 285 | 100% | 1 | 0% | 0 | 0% |
| Laughing Gull | 100 | 99 | 99% | 1 | 1% | 0 | 0% |
| Ring-billed Gull | 1 | 1 | 100% | 0 | 0% | 0 | 0% |
| Herring Gull | 21 | 21 | 100% | 0 | 0% | 0 | 0% |
| Great Black-backed Gull | 39 | 39 | 100% | 0 | 0% | 0 | 0% |
| Gull, large (unknown) | 0 | 0 | 0% | 0 | 0% | 0 | 0% |
| Caspian Tern | 5 | 5 | 100% | 0 | 0% | 0 | 0% |
| Common Tern | 12 | 12 | 100% | 0 | 0% | 0 | 0% |
| Forster's Tern | 63 | 63 | 100% | 0 | 0% | 0 | 0% |
| Royal Tern | 43 | 43 | 100% | 0 | 0% | 0 | 0% |
| Tern, large (unknown) | 1 | 1 | 100% | 0 | 0% | 0 | 0% |
| Tern, small (unknown) | 1 | 1 | 100% | 0 | 0% | 0 | 0% |

Table B-4b.8b (*continued*). Avian species observed during the September 2008 small boat coastal survey. Altitude categories total 100% of the individuals observed flying.

| Family Common Name | Total No. flying | No. At/ below 100 ft | At/below 100 ft % | No. 101 to 500 ft (RSZ) | RSZ % | No. Above 500 ft | Above 500 ft % |
|-----------------------------------|---------------------|----------------------------|----------------------|-------------------------------|-----------|---------------------|-------------------|
| Picidae (woodpeckers) | 2 | 2 | 100% | 0 | 0% | 0 | 0% |
| Northern (Yellow-shafted) Flicker | 2 | 2 | 100% | 0 | 0% | 0 | 0% |
| TOTAL | 366 | 365 | 100% | 1 | 0% | 0 | 0% |

Table B-4b.9a. Avian species observed during the October 2008 small boat coastal survey.

| Family Common Name | Total No. | No. Sitting | Sitting % | No. flying | Flying % |
|--|--------------|-------------|-------------|--------------|-------------|
| Anatidae (geese, swans, and ducks) | 139 | 4 | 3% | 135 | 97% |
| Atlantic Brant | 21 | 0 | 0% | 21 | 100% |
| Wood Duck | 1 | 0 | 0% | 1 | 100% |
| American Black Duck | 20 | 0 | 0% | 20 | 100% |
| Mallard | 1 | 0 | 0% | 1 | 100% |
| Northern Pintail | 4 | 0 | 0% | 4 | 100% |
| Duck, dabbling (unknown) | 5 | 0 | 0% | 5 | 100% |
| Greater Scaup | 13 | 0 | 0% | 13 | 100% |
| Scaup (unknown), <i>Aythya</i> (unknown) | 9 | 0 | 0% | 9 | 100% |
| Surf Scoter | 26 | 3 | 12% | 23 | 88% |
| White-winged Scoter | 1 | 0 | 0% | 1 | 100% |
| Scoter, dark-winged (unknown) | 2 | 0 | 0% | 2 | 100% |
| Bufflehead | 34 | 0 | 0% | 34 | 100% |
| Ruddy Duck | 1 | 1 | 100% | 0 | 0% |
| Duck (unknown) | 1 | 0 | 0% | 1 | 100% |
| Gaviidae (loons) | 55 | 19 | 35% | 36 | 65% |
| Red-throated Loon | 38 | 17 | 45% | 21 | 55% |
| Common Loon | 17 | 2 | 12% | 15 | 88% |
| Sulidae (gannets) | 540 | 92 | 17% | 448 | 83% |
| Northern Gannet | 540 | 92 | 17% | 448 | 83% |
| Phalacrocoracidae (cormorants) | 96 | 2 | 2% | 94 | 98% |
| Double-crested Cormorant | 94 | 1 | 1% | 93 | 99% |
| Great Cormorant | 2 | 1 | 50% | 1 | 50% |
| Ardeidae (bitterns, egrets, and herons) | 1 | 0 | 0% | 1 | 100% |
| Great Egret | 1 | 0 | 0% | 1 | 100% |
| Charadriidae (plovers) | 10 | 10 | 100% | 0 | 0% |
| Semipalmated Plover | 10 | 10 | 100% | 0 | 0% |
| Scolopacidae (sandpipers) | 25 | 7 | 28% | 18 | 72% |
| Sanderling | 9 | 7 | 78% | 2 | 22% |
| Dunlin | 4 | 0 | 0% | 4 | 100% |
| Shorebird, small (unknown) | 10 | 0 | 0% | 10 | 100% |
| Shorebird (unknown) | 2 | 0 | 0% | 2 | 100% |
| Laridae (gulls and terns) | 554 | 278 | 50% | 276 | 50% |
| Bonaparte's Gull | 10 | 0 | 0% | 10 | 100% |
| Laughing Gull | 211 | 152 | 72% | 59 | 28% |
| Ring-billed Gull | 38 | 9 | 24% | 29 | 76% |
| Herring Gull | 59 | 32 | 54% | 27 | 46% |
| Great Black-backed Gull | 154 | 85 | 55% | 69 | 45% |
| Gull, large (unknown) | 15 | 0 | 0% | 15 | 100% |
| Forster's Tern | 26 | 0 | 0% | 26 | 100% |
| Royal Tern | 41 | 1 | 2% | 40 | 98% |
| TOTAL | 1,420 | 412 | 29% | 1,008 | 71% |

Table B-4b.9b. Avian species observed during the October 2008 small boat coastal survey. Altitude categories total 100% of the individuals observed flying.

| Family Common Name | Total No. flying | No. At/ below 100 ft | At/below 100 ft % | No. 101 to 500 ft (RSZ) | RSZ % | No. Above 500 ft | Above 500 ft % |
|--|---------------------|-------------------------|----------------------|----------------------------|------------|---------------------|-------------------|
| Anatidae (geese, swans, and ducks) | 135 | 117 | 87% | 18 | 13% | 0 | 0% |
| Atlantic Brant | 21 | 21 | 100% | 0 | 0% | 0 | 0% |
| Wood Duck | 1 | 1 | 100% | 0 | 0% | 0 | 0% |
| American Black Duck | 20 | 8 | 40% | 12 | 60% | 0 | 0% |
| Mallard | 1 | 0 | 0% | 1 | 100% | 0 | 0% |
| Northern Pintail | 4 | 3 | 75% | 1 | 25% | 0 | 0% |
| Duck, dabbling (unknown) | 5 | 5 | 100% | 0 | 0% | 0 | 0% |
| Greater Scaup | 13 | 10 | 77% | 3 | 23% | 0 | 0% |
| Scaup (unknown), <i>Aythya</i> (unknown) | 9 | 9 | 100% | 0 | 0% | 0 | 0% |
| Surf Scoter | 23 | 23 | 100% | 0 | 0% | 0 | 0% |
| White-winged Scoter | 1 | 1 | 100% | 0 | 0% | 0 | 0% |
| Scoter, dark-winged (unknown) | 2 | 2 | 100% | 0 | 0% | 0 | 0% |
| Bufflehead | 34 | 34 | 100% | 0 | 0% | 0 | 0% |
| Ruddy Duck | 0 | 0 | 0% | 0 | 0% | 0 | 0% |
| Duck (unknown) | 1 | 0 | 0% | 1 | 100% | 0 | 0% |
| Gaviidae (loons) | 36 | 25 | 69% | 11 | 31% | 0 | 0% |
| Red-throated Loon | 21 | 12 | 57% | 9 | 43% | 0 | 0% |
| Common Loon | 15 | 13 | 87% | 2 | 13% | 0 | 0% |
| Sulidae (gannets) | 448 | 432 | 96% | 16 | 4% | 0 | 0% |
| Northern Gannet | 448 | 432 | 96% | 16 | 4% | 0 | 0% |
| Phalacrocoracidae (cormorants) | 94 | 77 | 82% | 17 | 18% | 0 | 0% |
| Double-crested Cormorant | 93 | 76 | 82% | 17 | 18% | 0 | 0% |
| Great Cormorant | 1 | 1 | 100% | 0 | 0% | 0 | 0% |
| Ardeidae (bitterns, egrets, and herons) | 1 | 1 | 100% | 0 | 0% | 0 | 0% |
| Great Egret | 1 | 1 | 100% | 0 | 0% | 0 | 0% |
| Charadriidae (plovers) | 0 | 0 | 0% | 0 | 0% | 0 | 0% |
| Semipalmated Plover | 0 | 0 | 0% | 0 | 0% | 0 | 0% |

Table B-4b.9b (*continued*). Avian species observed during the October 2008 small boat coastal survey. Altitude categories total 100% of the individuals observed flying.

| Family Common Name | Total No. flying | No. At/ below 100 ft | At/below 100 ft % | No. 101 to 500 ft (RSZ) | RSZ % | No. Above 500 ft | Above 500 ft % |
|----------------------------------|---------------------|----------------------------|----------------------|----------------------------|-----------|---------------------|-------------------|
| Scolopacidae (sandpipers) | 18 | 18 | 100% | 0 | 0% | 0 | 0% |
| Sanderling | 2 | 2 | 100% | 0 | 0% | 0 | 0% |
| Dunlin | 4 | 4 | 100% | 0 | 0% | 0 | 0% |
| Shorebird, small (unknown) | 10 | 10 | 100% | 0 | 0% | 0 | 0% |
| Shorebird (unknown) | 2 | 2 | 100% | 0 | 0% | 0 | 0% |
| Laridae (gulls and terns) | 276 | 276 | 100% | 0 | 0% | 0 | 0% |
| Bonaparte's Gull | 10 | 10 | 100% | 0 | 0% | 0 | 0% |
| Laughing Gull | 59 | 59 | 100% | 0 | 0% | 0 | 0% |
| Ring-billed Gull | 29 | 29 | 100% | 0 | 0% | 0 | 0% |
| Herring Gull | 27 | 27 | 100% | 0 | 0% | 0 | 0% |
| Great Black-backed Gull | 69 | 69 | 100% | 0 | 0% | 0 | 0% |
| Gull, large (unknown) | 15 | 15 | 100% | 0 | 0% | 0 | 0% |
| Forster's Tern | 26 | 26 | 100% | 0 | 0% | 0 | 0% |
| Royal Tern | 40 | 40 | 100% | 0 | 0% | 0 | 0% |
| TOTAL | 1,008 | 946 | 94% | 62 | 6% | 0 | 0% |

Table B-4b.10a. Avian species observed during the November 2008 small boat coastal survey.

| Family Common Name | Total No. | No. Sitting | Sitting % | No. flying | Flying % |
|---|--------------|-------------|------------|--------------|-------------|
| Anatidae (geese, swans, and ducks) | 446 | 14 | 3% | 432 | 97% |
| Canada Goose | 231 | 0 | 0% | 231 | 100% |
| Wood Duck | 5 | 0 | 0% | 5 | 100% |
| American Black Duck | 4 | 0 | 0% | 4 | 100% |
| Greater Scaup | 18 | 0 | 0% | 18 | 100% |
| Lesser Scaup | 5 | 0 | 0% | 5 | 100% |
| Surf Scoter | 51 | 0 | 0% | 51 | 100% |
| Black Scoter | 105 | 0 | 0% | 105 | 100% |
| Long-tailed Duck | 19 | 14 | 74% | 5 | 26% |
| Bufflehead | 7 | 0 | 0% | 7 | 100% |
| Duck, diving (unknown) | 1 | 0 | 0% | 1 | 100% |
| Gaviidae (loons) | 702 | 158 | 23% | 544 | 77% |
| Red-throated Loon | 646 | 123 | 19% | 523 | 81% |
| Common Loon | 55 | 35 | 64% | 20 | 36% |
| Loon (unknown) | 1 | 0 | 0% | 1 | 100% |
| Sulidae (gannets) | 1,311 | 92 | 7% | 1,219 | 93% |
| Northern Gannet | 1,311 | 92 | 7% | 1,219 | 93% |
| Phalacrocoracidae (cormorants) | 22 | 0 | 0% | 22 | 100% |
| Double-crested Cormorant | 22 | 0 | 0% | 22 | 100% |
| Scolopacidae (sandpipers) | 16 | 0 | 0% | 16 | 100% |
| Shorebird, small (unknown) | 16 | 0 | 0% | 16 | 100% |
| Laridae (gulls and terns) | 1,032 | 321 | 31% | 711 | 69% |
| Bonaparte's Gull | 339 | 112 | 33% | 227 | 67% |
| Laughing Gull | 32 | 3 | 9% | 29 | 91% |
| Ring-billed Gull | 398 | 44 | 11% | 354 | 89% |
| Herring Gull | 189 | 108 | 57% | 81 | 43% |
| Lesser Black-backed Gull | 1 | 0 | 0% | 1 | 100% |
| Great Black-backed Gull | 72 | 55 | 76% | 17 | 24% |
| Forster's Tern | 1 | 0 | 0% | 1 | 100% |
| TOTAL | 3,529 | 585 | 17% | 2,944 | 83% |

Table B-4b.10b. Avian species observed during the November 2008 small boat coastal survey. Altitude categories total 100% of the individuals observed flying.

| Family Common Name | Total No. flying | No. At/ below 100 ft | At/below 100 ft % | No. 101 to 500 ft (RSZ) | RSZ % | No. Above 500 ft | Above 500 ft % |
|---|---------------------|-------------------------|----------------------|----------------------------|------------|---------------------|-------------------|
| Anatidae (geese, swans, and ducks) | 432 | 201 | 47% | 231 | 53% | 0 | 0% |
| Canada Goose | 231 | 0 | 0% | 231 | 100% | 0 | 0% |
| Wood Duck | 5 | 5 | 100% | 0 | 0% | 0 | 0% |
| American Black Duck | 4 | 4 | 100% | 0 | 0% | 0 | 0% |
| Greater Scaup | 18 | 18 | 100% | 0 | 0% | 0 | 0% |
| Lesser Scaup | 5 | 5 | 100% | 0 | 0% | 0 | 0% |
| Surf Scoter | 51 | 51 | 100% | 0 | 0% | 0 | 0% |
| Black Scoter | 105 | 105 | 100% | 0 | 0% | 0 | 0% |
| Long-tailed Duck | 5 | 5 | 100% | 0 | 0% | 0 | 0% |
| Bufflehead | 7 | 7 | 100% | 0 | 0% | 0 | 0% |
| Duck, diving (unknown) | 1 | 1 | 100% | 0 | 0% | 0 | 0% |
| Gaviidae (loons) | 544 | 544 | 100% | 0 | 0% | 0 | 0% |
| Red-throated Loon | 523 | 523 | 100% | 0 | 0% | 0 | 0% |
| Common Loon | 20 | 20 | 100% | 0 | 0% | 0 | 0% |
| Loon (unknown) | 1 | 1 | 100% | 0 | 0% | 0 | 0% |
| Sulidae (gannets) | 1,219 | 1,219 | 100% | 0 | 0% | 0 | 0% |
| Northern Gannet | 1,219 | 1,219 | 100% | 0 | 0% | 0 | 0% |
| Phalacrocoracidae (cormorants) | 22 | 22 | 100% | 0 | 0% | 0 | 0% |
| Double-crested Cormorant | 22 | 22 | 100% | 0 | 0% | 0 | 0% |
| Scolopacidae (sandpipers) | 16 | 16 | 100% | 0 | 0% | 0 | 0% |
| Shorebird, small (unknown) | 16 | 16 | 100% | 0 | 0% | 0 | 0% |
| Laridae (gulls and terns) | 711 | 711 | 100% | 0 | 0% | 0 | 0% |
| Bonaparte's Gull | 227 | 227 | 100% | 0 | 0% | 0 | 0% |
| Laughing Gull | 29 | 29 | 100% | 0 | 0% | 0 | 0% |
| Ring-billed Gull | 354 | 354 | 100% | 0 | 0% | 0 | 0% |
| Herring Gull | 81 | 81 | 100% | 0 | 0% | 0 | 0% |

Table B-4b.10b (*continued*). Avian species observed during the November 2008 small boat coastal survey. Altitude categories total 100% of the individuals observed flying.

| Family Common Name | Total No. flying | No. At/ below 100 ft | At/below 100 ft % | No. 101 to 500 ft (RSZ) | RSZ % | No. Above 500 ft | Above 500 ft % |
|----------------------------------|---------------------|----------------------------|----------------------|----------------------------|-----------|---------------------|-------------------|
| Laridae (gulls and terns) | 711 | 711 | 100% | 0 | 0% | 0 | 0% |
| Lesser Black-backed Gull | 1 | 1 | 100% | 0 | 0% | 0 | 0% |
| Great Black-backed Gull | 17 | 17 | 100% | 0 | 0% | 0 | 0% |
| Forster's Tern | 1 | 1 | 100% | 0 | 0% | 0 | 0% |
| TOTAL | 2,944 | 2,713 | 92% | 231 | 8% | 0 | 0% |

Appendix B-5
Circular Statistics

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Appendix B-5a
Shipboard Offshore

Table B-5a.1. Descriptive circular statistics of avian offshore (ship) surveys off the New Jersey coast.

| Species | n | X | Y | r | R | Z | Dev | AngDev | CircSD | Mean Angle | | |
|---------|------|---------|---------|--------|---------|--------|-------|--------|--------|------------|--------|-----------|
| | | | | | | | | | | CI95_low | Mean | CI95_high |
| NOGA | 6254 | -0.0553 | -0.0793 | 0.0966 | 604.37 | 58.40 | 10.42 | 77.01 | 123.86 | 224.68 | 235.10 | 245.53 |
| GBBG | 694 | 0.0301 | -0.0267 | 0.0402 | 27.92 | 1.12 | 32.54 | 79.38 | 145.24 | 285.92 | 318.46 | 351.00 |
| BLSC | 1864 | -0.0054 | 0.2905 | 0.2906 | 541.64 | 157.39 | 6.21 | 68.25 | 90.08 | 84.85 | 91.06 | 97.27 |
| RTLO | 1532 | -0.0408 | 0.0117 | 0.0424 | 64.98 | 2.76 | 56.58 | 79.29 | 144.05 | 107.43 | 164.02 | 220.60 |
| COLO | 399 | -0.0225 | 0.0172 | 0.0283 | 11.31 | 0.32 | 0.00 | 79.87 | 152.95 | 142.55 | 142.55 | 142.55 |
| HERG | 1458 | -0.1819 | 0.0203 | 0.1830 | 266.81 | 48.83 | 11.35 | 73.24 | 105.59 | 162.27 | 173.62 | 184.97 |
| SUSC | 3737 | -0.0357 | 0.3897 | 0.3913 | 1462.31 | 572.21 | 3.19 | 63.22 | 78.49 | 92.05 | 95.24 | 98.43 |
| BOGU | 390 | -0.0546 | 0.0601 | 0.0812 | 31.65 | 2.57 | 59.79 | 77.67 | 128.41 | 72.48 | 132.27 | 192.07 |
| LTDU | 295 | -0.4634 | -0.0442 | 0.4655 | 137.31 | 63.91 | 9.44 | 59.24 | 70.86 | 176.02 | 185.45 | 194.89 |
| WWSC | 130 | 0.0326 | 0.1141 | 0.1186 | 15.42 | 1.83 | 77.09 | 76.07 | 118.30 | 356.94 | 74.03 | 151.13 |
| RAZO | 57 | -0.0711 | -0.1147 | 0.1349 | 7.69 | 1.04 | 21.45 | 75.37 | 114.69 | 216.76 | 238.21 | 259.66 |
| DOVE | 17 | 0.2008 | 0.0588 | 0.2093 | 3.56 | 0.74 | 0.00 | 72.05 | 101.34 | 16.32 | 16.32 | 16.32 |
| ALCI | 21 | 0.6061 | -0.4238 | 0.7396 | 15.53 | 11.49 | 20.90 | 41.35 | 44.51 | 304.13 | 325.04 | 345.94 |
| LOON | 28 | 0.2125 | -0.0967 | 0.2335 | 6.54 | 1.53 | 58.84 | 70.94 | 97.73 | 276.69 | 335.53 | 34.38 |
| GULG | 167 | -0.0860 | 0.3918 | 0.4012 | 66.99 | 26.87 | 14.90 | 62.70 | 77.44 | 87.48 | 102.38 | 117.28 |
| BLKI | 50 | 0.0341 | -0.8541 | 0.8548 | 42.74 | 36.54 | 10.63 | 30.87 | 32.09 | 261.66 | 272.29 | 282.92 |
| UNKK | 7 | -0.4286 | 0.5714 | 0.7143 | 5.00 | 3.57 | 42.95 | 43.31 | 47.00 | 83.92 | 126.87 | 169.82 |
| SCOT | 1993 | -0.0127 | 0.0512 | 0.0528 | 105.16 | 5.55 | 36.02 | 78.86 | 138.98 | 67.88 | 103.90 | 139.92 |
| SCDW | 5938 | 0.0216 | 0.0090 | 0.0234 | 138.95 | 3.25 | 50.22 | 80.07 | 157.02 | 332.43 | 22.65 | 72.87 |
| ATBR | 53 | 0.2401 | -0.3741 | 0.4446 | 23.56 | 10.47 | 24.22 | 60.39 | 72.96 | 278.48 | 302.70 | 326.91 |
| RNGR | 2 | -0.3536 | -0.8536 | 0.9239 | 1.85 | 1.71 | 88.49 | 22.36 | 22.80 | 159.01 | 247.50 | 335.99 |
| LAGU | 2210 | -0.1712 | -0.0144 | 0.1718 | 379.71 | 65.24 | 9.81 | 73.74 | 107.54 | 175.00 | 184.81 | 194.61 |
| UOTH | 105 | 0.0314 | 0.1480 | 0.1512 | 15.88 | 2.40 | 63.27 | 74.65 | 111.36 | 14.76 | 78.03 | 141.31 |
| ABDU | 135 | 0.3824 | 0.3557 | 0.5222 | 70.50 | 36.82 | 12.30 | 56.01 | 65.31 | 30.63 | 42.93 | 55.23 |
| RBGU | 57 | -0.5339 | -0.0650 | 0.5379 | 30.66 | 16.49 | 18.56 | 55.08 | 63.81 | 168.38 | 186.94 | 205.50 |
| RBME | 33 | 0.0643 | -0.4885 | 0.4927 | 16.26 | 8.01 | 27.76 | 57.71 | 68.17 | 249.74 | 277.50 | 305.25 |
| AMOY | 2 | -0.7071 | 0.7071 | 1.0000 | 2.00 | 2.00 | 0.00 | 0.00 | 0.00 | 135.00 | 135.00 | 135.00 |
| CANG | 11 | -0.2305 | -0.5188 | 0.5677 | 6.25 | 3.55 | 44.88 | 53.27 | 60.97 | 201.17 | 246.05 | 290.92 |
| REPH | 1 | -1.0000 | 0.0000 | 1.0000 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 180.00 | 180.00 | 180.00 |
| DUNL | 1 | -0.7071 | -0.7071 | 1.0000 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 225.00 | 225.00 | 225.00 |
| FOTE | 586 | 0.0016 | 0.2582 | 0.2582 | 151.29 | 39.06 | 12.60 | 69.79 | 94.29 | 77.04 | 89.65 | 102.25 |
| HOGH | 1 | -1.0000 | 0.0000 | 1.0000 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 180.00 | 180.00 | 180.00 |
| LBBG | 3 | 0.5690 | 0.0976 | 0.5774 | 1.73 | 1.00 | 0.00 | 52.68 | 60.05 | 9.74 | 9.74 | 9.74 |
| PASS | 96 | -0.0722 | -0.1423 | 0.1595 | 15.31 | 2.44 | 62.30 | 74.29 | 109.78 | 180.79 | 243.10 | 305.40 |
| DUCK | 155 | 0.0469 | 0.1677 | 0.1741 | 26.99 | 4.70 | 39.53 | 73.64 | 107.13 | 34.86 | 74.39 | 113.91 |
| DCCO | 4877 | -0.1375 | -0.1220 | 0.1838 | 896.37 | 164.75 | 6.15 | 73.20 | 105.46 | 215.43 | 221.58 | 227.73 |
| SCAU | 132 | -0.5857 | -0.7145 | 0.9239 | 121.96 | 112.68 | 4.08 | 22.35 | 22.79 | 226.58 | 230.66 | 234.74 |
| DUDA | 54 | 0.1526 | -0.7362 | 0.7519 | 40.60 | 30.53 | 12.38 | 40.36 | 43.27 | 269.34 | 281.71 | 294.09 |

Table B-5a.1 (continued). Descriptive circular statistics of avian offshore (ship) surveys off the New Jersey coast.

| Species | n | X | Y | r | R | Z | Dev | AngDev | CircSD | Mean Angle | | |
|---------|------|---------|---------|--------|--------|-------|-------|--------|--------|------------|--------|-----------|
| | | | | | | | | | | CI95_low | Mean | CI95_high |
| DUDI | 6 | -0.7071 | -0.7071 | 1.0000 | 6.00 | 6.00 | 0.00 | 0.00 | 0.00 | 225.00 | 225.00 | 225.00 |
| NOPI | 45 | 0.5028 | 0.4936 | 0.7046 | 31.71 | 22.34 | 14.89 | 44.04 | 47.94 | 29.58 | 44.47 | 59.36 |
| GBHE | 38 | 0.1116 | 0.4120 | 0.4269 | 16.22 | 6.92 | 30.57 | 61.34 | 74.76 | 44.27 | 74.84 | 105.40 |
| LIGU | 2 | -0.8536 | -0.3536 | 0.9239 | 1.85 | 1.71 | 88.49 | 22.36 | 22.80 | 114.01 | 202.50 | 290.99 |
| OSPR | 11 | 0.2084 | -0.1552 | 0.2599 | 2.86 | 0.74 | 0.00 | 69.71 | 94.06 | 323.33 | 323.33 | 323.33 |
| AGWT | 58 | -0.1317 | 0.0538 | 0.1422 | 8.25 | 1.17 | 36.42 | 75.05 | 113.16 | 121.35 | 157.77 | 194.19 |
| BUFF | 2 | 0.0000 | -1.0000 | 1.0000 | 2.00 | 2.00 | 0.00 | 0.00 | 0.00 | 270.00 | 270.00 | 270.00 |
| GUTE | 33 | -0.3725 | 0.4154 | 0.5579 | 18.41 | 10.27 | 23.78 | 53.87 | 61.90 | 108.11 | 131.89 | 155.67 |
| COTE | 1313 | -0.1290 | 0.0843 | 0.1541 | 202.31 | 31.17 | 14.29 | 74.52 | 110.81 | 132.52 | 146.81 | 161.10 |
| TESM | 338 | -0.3965 | 0.1618 | 0.4283 | 144.76 | 62.00 | 9.67 | 61.27 | 74.61 | 148.13 | 157.80 | 167.47 |
| SNGO | 10 | 0.0000 | -1.0000 | 1.0000 | 10.00 | 10.00 | 0.00 | 0.00 | 0.00 | 270.00 | 270.00 | 270.00 |
| GADW | 4 | -0.5000 | -0.3536 | 0.6124 | 2.45 | 1.50 | 52.60 | 50.45 | 56.74 | 162.66 | 215.26 | 267.87 |
| ROYT | 112 | -0.1940 | -0.0089 | 0.1942 | 21.75 | 4.22 | 42.13 | 72.74 | 103.73 | 140.51 | 182.64 | 224.76 |
| MASH | 3 | 0.1381 | 0.4714 | 0.4912 | 1.47 | 0.72 | 0.00 | 57.80 | 68.32 | 73.68 | 73.68 | 73.68 |
| YCNH | 2 | -0.8536 | -0.3536 | 0.9239 | 1.85 | 1.71 | 88.49 | 22.36 | 22.80 | 114.01 | 202.50 | 290.99 |
| NONP | 4 | -0.1768 | 0.0732 | 0.1913 | 0.77 | 0.15 | 0.00 | 72.87 | 104.20 | 157.50 | 157.50 | 157.50 |
| LESA | 30 | 0.0040 | 0.1431 | 0.1432 | 4.29 | 0.61 | 0.00 | 75.00 | 112.97 | 88.38 | 88.38 | 88.38 |
| LETE | 1 | -0.7071 | -0.7071 | 1.0000 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 225.00 | 225.00 | 225.00 |
| SHSM | 19 | -0.1334 | 0.8703 | 0.8805 | 16.73 | 14.73 | 16.86 | 28.01 | 28.91 | 81.86 | 98.72 | 115.58 |
| CATE | 3 | -0.6667 | -0.3333 | 0.7454 | 2.24 | 1.67 | 61.75 | 40.89 | 43.93 | 144.81 | 206.57 | 268.32 |
| NOHA | 1 | 0.7071 | 0.7071 | 1.0000 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 45.00 | 45.00 | 45.00 |
| SOSH | 4 | -0.2500 | 0.2500 | 0.3536 | 1.41 | 0.50 | 0.00 | 65.15 | 82.62 | 135.00 | 135.00 | 135.00 |
| WISP | 623 | 0.1789 | 0.0960 | 0.2030 | 126.50 | 25.69 | 15.71 | 72.34 | 102.31 | 12.51 | 28.23 | 43.94 |
| PAJA | 19 | -0.1207 | -0.1951 | 0.2294 | 4.36 | 1.00 | 10.06 | 71.13 | 98.32 | 228.20 | 238.26 | 248.32 |
| COSH | 111 | 0.0833 | 0.1665 | 0.1862 | 20.67 | 3.85 | 44.70 | 73.10 | 105.06 | 18.74 | 63.43 | 108.13 |
| SPSP | 4 | 0.4268 | 0.3232 | 0.5354 | 2.14 | 1.15 | 19.51 | 55.23 | 64.05 | 17.63 | 37.14 | 56.65 |
| GRSH | 2 | 0.5000 | 0.5000 | 0.7071 | 1.41 | 1.00 | 0.00 | 43.85 | 47.70 | 45.00 | 45.00 | 45.00 |
| MAGO | 3 | 0.0000 | -1.0000 | 1.0000 | 3.00 | 3.00 | 0.00 | 0.00 | 0.00 | 270.00 | 270.00 | 270.00 |
| BRPE | 8 | -0.5152 | 0.3902 | 0.6462 | 5.17 | 3.34 | 45.96 | 48.19 | 53.54 | 96.90 | 142.86 | 188.83 |
| BCNH | 1 | 0.0000 | 1.0000 | 1.0000 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 90.00 | 90.00 | 90.00 |
| PEEP | 3 | 0.0000 | -1.0000 | 1.0000 | 3.00 | 3.00 | 0.00 | 0.00 | 0.00 | 270.00 | 270.00 | 270.00 |
| SESA | 3 | 0.0000 | -1.0000 | 1.0000 | 3.00 | 3.00 | 0.00 | 0.00 | 0.00 | 270.00 | 270.00 | 270.00 |
| SAND | 4 | 0.0000 | -1.0000 | 1.0000 | 4.00 | 4.00 | 0.00 | 0.00 | 0.00 | 270.00 | 270.00 | 270.00 |
| RNPH | 1 | 0.0000 | 1.0000 | 1.0000 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 90.00 | 90.00 | 90.00 |
| OTHE | 36 | -0.1063 | 0.1552 | 0.1881 | 6.77 | 1.27 | 43.76 | 73.01 | 104.74 | 80.66 | 124.43 | 168.19 |
| BLTE | 4 | -0.2500 | -0.7500 | 0.7906 | 3.16 | 2.50 | 56.48 | 37.08 | 39.28 | 195.09 | 251.57 | 308.04 |
| JAEG | 1 | -1.0000 | 0.0000 | 1.0000 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 180.00 | 180.00 | 180.00 |
| SAGU | 1 | 0.7071 | -0.7071 | 1.0000 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 315.00 | 315.00 | 315.00 |
| TELG | 2 | -1.0000 | 0.0000 | 1.0000 | 2.00 | 2.00 | 0.00 | 0.00 | 0.00 | 180.00 | 180.00 | 180.00 |
| PHAL | 1 | -1.0000 | 0.0000 | 1.0000 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 180.00 | 180.00 | 180.00 |
| WARB | 2 | -0.1464 | 0.3536 | 0.3827 | 0.77 | 0.29 | 0.00 | 63.66 | 79.41 | 112.50 | 112.50 | 112.50 |
| YSFL | 5 | 0.8000 | 0.2000 | 0.8246 | 4.12 | 3.40 | 42.79 | 33.93 | 35.58 | 331.25 | 14.04 | 56.82 |

Table B-5a.1 (continued). Descriptive circular statistics of avian offshore (ship) surveys off the New Jersey coast.

| Species | n | X | Y | r | R | Z | Dev | AngDev | CircSD | Mean Angle | | |
|-----------------|--------------|----------------|---------------|---------------|----------------|---------------|-------------|--------------|---------------|---------------|---------------|---------------|
| | | | | | | | | | | CI95_low | Mean | CI95_high |
| YPWA | 1 | 0.7071 | 0.7071 | 1.0000 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 45.00 | 45.00 | 45.00 |
| MERL | 1 | 0.0000 | -1.0000 | 1.0000 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 270.00 | 270.00 | 270.00 |
| POJA | 1 | 0.0000 | -1.0000 | 1.0000 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 270.00 | 270.00 | 270.00 |
| MYWA | 10 | 0.4586 | 0.1414 | 0.4799 | 4.80 | 2.30 | 64.62 | 58.44 | 69.43 | 312.52 | 17.14 | 81.76 |
| PAWA | 1 | 1.0000 | 0.0000 | 1.0000 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| MONA | 41 | -0.2772 | -0.5294 | 0.5976 | 24.50 | 14.64 | 19.40 | 51.40 | 58.14 | 222.97 | 242.37 | 261.77 |
| DRAG | 1 | -1.0000 | 0.0000 | 1.0000 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 180.00 | 180.00 | 180.00 |
| GRDA | 1 | -1.0000 | 0.0000 | 1.0000 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 180.00 | 180.00 | 180.00 |
| CORM | 12 | -0.4714 | -0.6381 | 0.7933 | 9.52 | 7.55 | 25.80 | 36.84 | 38.99 | 207.74 | 233.54 | 259.34 |
| ORSU | 4 | -0.4268 | -0.1768 | 0.4619 | 1.85 | 0.85 | 0.00 | 59.44 | 71.21 | 202.50 | 202.50 | 202.50 |
| MODO | 1 | 1.0000 | 0.0000 | 1.0000 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| SOSP | 1 | 0.0000 | -1.0000 | 1.0000 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 270.00 | 270.00 | 270.00 |
| ICGU | 1 | 0.7071 | -0.7071 | 1.0000 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 315.00 | 315.00 | 315.00 |
| SHLG | 10 | 0.0000 | 1.0000 | 1.0000 | 10.00 | 10.00 | 0.00 | 0.00 | 0.00 | 90.00 | 90.00 | 90.00 |
| GODA | 75 | 0.7071 | -0.7071 | 1.0000 | 75.00 | 75.00 | 0.00 | 0.00 | 0.00 | 315.00 | 315.00 | 315.00 |
| PESA | 1 | 0.0000 | 1.0000 | 1.0000 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 90.00 | 90.00 | 90.00 |
| PEFA | 1 | 0.7071 | 0.7071 | 1.0000 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 45.00 | 45.00 | 45.00 |
| WTSP | 1 | 1.0000 | 0.0000 | 1.0000 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| WODU | 47 | 0.0000 | -1.0000 | 1.0000 | 47.00 | 47.00 | 0.00 | 0.00 | 0.00 | 270.00 | 270.00 | 270.00 |
| AMGO | 2 | 1.0000 | 0.0000 | 1.0000 | 2.00 | 2.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| MALL | 12 | -0.7071 | -0.7071 | 1.0000 | 12.00 | 12.00 | 0.00 | 0.00 | 0.00 | 225.00 | 225.00 | 225.00 |
| RWBL | 1 | 1.0000 | 0.0000 | 1.0000 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| GUSM | 8 | 0.7071 | -0.7071 | 1.0000 | 8.00 | 8.00 | 0.00 | 0.00 | 0.00 | 315.00 | 315.00 | 315.00 |
| GRCO | 6 | -0.1179 | -0.9512 | 0.9585 | 5.75 | 5.51 | 16.37 | 16.52 | 16.69 | 246.57 | 262.94 | 279.31 |
| GRSC | 12 | 0.7071 | 0.7071 | 1.0000 | 12.00 | 12.00 | 0.00 | 0.00 | 0.00 | 45.00 | 45.00 | 45.00 |
| PISI | 8 | -0.2652 | -0.3598 | 0.4470 | 3.58 | 1.60 | 61.41 | 60.26 | 72.71 | 172.21 | 233.61 | 295.02 |
| EAME | 1 | 1.0000 | 0.0000 | 1.0000 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| COEI | 6 | 0.1179 | 0.9512 | 0.9585 | 5.75 | 5.51 | 16.37 | 16.52 | 16.69 | 66.57 | 82.94 | 99.31 |
| NOPA | 1 | 1.0000 | 0.0000 | 1.0000 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| AMWO | 1 | -1.0000 | 0.0000 | 1.0000 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 180.00 | 180.00 | 180.00 |
| TUSW | 8 | 0.0000 | -1.0000 | 1.0000 | 8.00 | 8.00 | 0.00 | 0.00 | 0.00 | 270.00 | 270.00 | 270.00 |
| TOTAL | 36695 | -0.0574 | 0.0356 | 0.0675 | 2477.43 | 167.26 | 6.14 | 78.25 | 133.03 | 142.05 | 148.20 | 154.34 |
| | | | | | | | | | | | | |
| Taxonomic Group | n | X | Y | r | R | Z | Dev | AngDev | CircSD | Mean Angle | | |
| | | | | | | | | | | CI95_low | Mean | CI95_high |
| Accipitridae | 14 | 0.2648 | -0.0923 | 0.2804 | 3.93 | 1.10 | 26.63 | 68.73 | 91.37 | 314.14 | 340.77 | 7.40 |
| Alcidae | 95 | 0.1273 | -0.1519 | 0.1982 | 18.83 | 3.73 | 45.55 | 72.55 | 103.08 | 264.40 | 309.95 | 355.50 |
| Anatidae | 14815 | -0.0073 | 0.1322 | 0.1324 | 1961.74 | 259.77 | 4.91 | 75.47 | 115.21 | 88.26 | 93.17 | 98.08 |
| Ardeidae | 41 | 0.0618 | 0.3890 | 0.3939 | 16.15 | 6.36 | 32.28 | 63.08 | 78.21 | 48.69 | 80.97 | 113.24 |
| Columbidae | 1 | 1.0000 | 0.0000 | 1.0000 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Emberizidae | 2 | 0.5000 | -0.5000 | 0.7071 | 1.41 | 1.00 | 0.00 | 43.85 | 47.70 | 315.00 | 315.00 | 315.00 |
| Fringillidae | 10 | -0.0121 | -0.2879 | 0.2881 | 2.88 | 0.83 | 0.00 | 68.37 | 90.39 | 267.59 | 267.59 | 267.59 |

Table B-5a.1 (continued). Descriptive circular statistics of avian offshore (ship) surveys off the New Jersey coast.

| Taxonomic Group | n | X | Y | r | R | Z | Dev | AngDev | CircSD | Mean Angle | | |
|-------------------|--------------|----------------|---------------|---------------|----------------|---------------|-------------|--------------|---------------|---------------|---------------|---------------|
| | | | | | | | | | | CI95_low | Mean | CI95_high |
| Gaviidae | 1959 | -0.0334 | 0.0113 | 0.0353 | 69.11 | 2.44 | 62.56 | 79.59 | 148.18 | 98.83 | 161.38 | 223.94 |
| Hydrobatidae | 627 | 0.1805 | 0.0975 | 0.2051 | 128.61 | 26.38 | 15.50 | 72.24 | 101.98 | 12.88 | 28.37 | 43.87 |
| Icteridae | 2 | 1.0000 | 0.0000 | 1.0000 | 2.00 | 2.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Laridae | 7454 | -0.1376 | 0.0448 | 0.1447 | 1078.50 | 156.04 | 6.34 | 74.94 | 112.66 | 155.61 | 161.94 | 168.28 |
| Parulidae | 13 | 0.5610 | 0.1632 | 0.5842 | 7.60 | 4.44 | 38.50 | 52.25 | 59.40 | 337.72 | 16.22 | 54.72 |
| Pelecanidae | 8 | -0.5152 | 0.3902 | 0.6462 | 5.17 | 3.34 | 45.96 | 48.19 | 53.54 | 96.90 | 142.86 | 188.83 |
| Phalacrocoracidae | 4895 | -0.1383 | -0.1243 | 0.1859 | 910.01 | 169.18 | 6.06 | 73.11 | 105.10 | 215.88 | 221.94 | 228.01 |
| Picidae | 5 | 0.8000 | 0.2000 | 0.8246 | 4.12 | 3.40 | 42.79 | 33.93 | 35.58 | 331.25 | 14.04 | 56.82 |
| Podicipedidae | 3 | -0.5690 | -0.5690 | 0.8047 | 2.41 | 1.94 | 82.53 | 35.81 | 37.77 | 142.47 | 225.00 | 307.53 |
| Procellariidae | 120 | 0.0805 | 0.1825 | 0.1995 | 23.93 | 4.77 | 39.08 | 72.50 | 102.88 | 27.12 | 66.20 | 105.29 |
| Scolopacidae | 80 | -0.0942 | 0.2567 | 0.2734 | 21.87 | 5.98 | 34.01 | 69.07 | 92.27 | 76.14 | 110.15 | 144.16 |
| Sulidae | 6254 | -0.0553 | -0.0793 | 0.0966 | 604.37 | 58.40 | 10.42 | 77.01 | 123.86 | 224.68 | 235.10 | 245.53 |
| Tityridae | 96 | -0.0722 | -0.1423 | 0.1595 | 15.31 | 2.44 | 62.30 | 74.29 | 109.78 | 180.79 | 243.10 | 305.40 |
| Other | 141 | -0.0038 | 0.1498 | 0.1498 | 21.13 | 3.17 | 51.00 | 74.71 | 111.64 | 40.45 | 91.45 | 142.45 |
| Unknown | 60 | -0.3179 | -0.2902 | 0.4304 | 25.83 | 11.12 | 23.52 | 61.15 | 74.40 | 198.88 | 222.40 | 245.92 |
| TOTAL | 36695 | -0.0574 | 0.0356 | 0.0675 | 2477.43 | 167.26 | 6.14 | 78.25 | 133.03 | 142.05 | 148.20 | 154.34 |

| Month | n | X | Y | r | R | Z | Dev | AngDev | CircSD | Mean Angle | | |
|--------------|--------------|----------------|---------------|---------------|----------------|---------------|-------------|--------------|---------------|---------------|---------------|---------------|
| | | | | | | | | | | CI95_low | Mean | CI95_high |
| Jan | 963 | -0.0763 | -0.1570 | 0.1746 | 168.12 | 29.35 | 14.71 | 73.62 | 107.05 | 229.36 | 244.07 | 258.79 |
| Feb | 287 | 0.1129 | 0.2337 | 0.2596 | 74.50 | 19.34 | 18.08 | 69.72 | 94.10 | 46.14 | 64.22 | 82.30 |
| Mar | 5659 | 0.0220 | -0.0961 | 0.0986 | 558.08 | 55.04 | 10.74 | 76.93 | 123.33 | 272.15 | 282.89 | 293.63 |
| Apr | 7477 | 0.0112 | 0.0196 | 0.0225 | 168.48 | 3.80 | 45.33 | 80.11 | 157.80 | 14.96 | 60.29 | 105.62 |
| May | 2095 | 0.0692 | 0.1574 | 0.1720 | 360.32 | 61.97 | 10.07 | 73.73 | 107.51 | 56.20 | 66.27 | 76.34 |
| Jun | 841 | 0.0089 | 0.0221 | 0.0238 | 20.04 | 0.48 | 0.00 | 80.06 | 156.64 | 68.00 | 68.00 | 68.00 |
| Jul | 1001 | -0.0203 | 0.1015 | 0.1035 | 103.63 | 10.73 | 24.97 | 76.72 | 122.03 | 76.35 | 101.32 | 126.29 |
| Aug | 1446 | -0.0981 | 0.0134 | 0.0990 | 143.21 | 14.18 | 21.54 | 76.91 | 123.21 | 150.67 | 172.22 | 193.76 |
| Sep | 1167 | -0.1557 | 0.0802 | 0.1751 | 204.36 | 35.79 | 13.30 | 73.59 | 106.95 | 139.45 | 152.74 | 166.04 |
| Oct | 5397 | -0.1356 | -0.2716 | 0.3036 | 1638.62 | 497.52 | 3.48 | 67.62 | 88.47 | 239.99 | 243.47 | 246.95 |
| Nov | 10362 | -0.1302 | 0.2596 | 0.2905 | 3009.71 | 874.19 | 2.63 | 68.25 | 90.09 | 114.00 | 116.63 | 119.26 |
| TOTAL | 36695 | -0.0574 | 0.0356 | 0.0675 | 2477.43 | 167.26 | 6.14 | 78.25 | 133.03 | 142.05 | 148.20 | 154.34 |

| Season | n | X | Y | r | R | Z | Dev | AngDev | CircSD | Mean Angle | | |
|--------------|--------------|----------------|---------------|---------------|----------------|---------------|-------------|--------------|---------------|---------------|---------------|---------------|
| | | | | | | | | | | CI95_low | Mean | CI95_high |
| Winter | 1250 | -0.0329 | -0.0673 | 0.0749 | 93.63 | 7.01 | 31.52 | 77.93 | 130.44 | 212.44 | 243.96 | 275.48 |
| Spring | 15231 | 0.0232 | -0.0045 | 0.0236 | 359.47 | 8.48 | 28.41 | 80.07 | 156.84 | 320.72 | 349.12 | 17.53 |
| Summer | 3288 | -0.0471 | 0.0425 | 0.0634 | 208.38 | 13.21 | 22.40 | 78.42 | 134.58 | 115.55 | 137.95 | 160.34 |
| Autumn | 16926 | -0.1337 | 0.0779 | 0.1547 | 2618.53 | 405.10 | 3.92 | 74.50 | 110.69 | 145.85 | 149.78 | 153.70 |
| TOTAL | 36695 | -0.0574 | 0.0356 | 0.0675 | 2477.43 | 167.26 | 6.14 | 78.25 | 133.03 | 142.05 | 148.20 | 154.34 |

CI Level: 0.05

X2crit: 3.841

******* 1-SAMPLE SECOND-ORDER ANALYSIS OF ANGLES: Mean of Mean Angles Across SPECIES, GROUP, MONTH, SEASON *******

Table B-5a.2. Parametric 1-sample second-order analysis (Hotelling test) for testing the significance of the mean of the sample means.

| Category | n | r | Mean Angle | | | #Tails | DF1 | DF2 | CI Level | Fstat | Fcrit | Reject Ho? | Plow | Phigh | Pint |
|----------|-----|--------|------------|--------|-----------|--------|-----|-----|----------|--------|-------|------------|------|-------|--------|
| | | | CI95_low | Mean | CI95_high | | | | | | | | | | |
| SPECIES | 111 | 0.0978 | 213.14 | 250.52 | 321.05 | 1 | 2 | 109 | 0.05 | 1.745 | 3.081 | n | 0.1 | 0.25 | 0.1964 |
| GROUP | 22 | 0.1195 | 218.15 | 355.20 | 331.04 | 1 | 2 | 20 | 0.05 | 0.8829 | 3.49 | n | 0.25 | 0.5 | 0.3328 |
| MONTH | 11 | 0.0486 | 69.35 | 137.22 | 142.59 | 1 | 2 | 9 | 0.05 | 1.4188 | 4.26 | n | 0.25 | 0.5 | 0.2717 |
| SEASON | 4 | 0.0491 | 125.74 | 165.69 | 185.49 | 1 | 2 | 2 | 0.05 | 0.9076 | 19 | n | 0.25 | 0.5 | 0.3023 |

Ho: There is NO mean population direction.

Ha: There is a mean population direction.

Table B-5a.3. Non-parametric 1-sample second-order analysis (Moore test) for testing the significance of the direction in the sample of means.

| Category | n | CI Level | X | Y | Rp | Rcrit | Reject Ho? | Plow | Phigh | Pint |
|----------|-----|----------|---------|---------|--------|-------|------------|------|-------|--------|
| SPECIES | 111 | 0.05 | -0.8467 | -8.1354 | 0.7763 | 1.109 | n | 0.2 | 0.4 | 0.281 |
| GROUP | 22 | 0.05 | 2.9582 | -0.2156 | 0.6324 | 1.126 | n | 0.4 | 0.6 | 0.4274 |
| MONTH | 11 | 0.05 | -1.4791 | 1.3915 | 0.6123 | 1.142 | n | 0.4 | 0.6 | 0.4763 |
| SEASON | 4 | 0.05 | -1.3191 | 0.1172 | 0.6622 | 1.146 | n | 0.6 | 0.8 | 0.6218 |

Ho: The sample means came from a population with a uniform circular distribution.

Ha: The sample means did NOT come from a population with a uniform circular distribution.

******* 2-SAMPLE SECOND-ORDER ANALYSIS OF ANGLES: SPECIES, GROUP, MONTH, SEASON *******

Table B-5a.4. Descriptive circular statistics.

| Category | n | X | Y | r | R | Z | Dev | AngDev | CircSD | Mean Angle | | |
|----------|-----|---------|---------|--------|---------|--------|---------|---------|----------|------------|--------|-----------|
| | | | | | | | | | | CI95_low | Mean | CI95_high |
| SPECIES | 111 | -0.094 | -0.0235 | 0.0969 | 10.7577 | 1.0426 | 22.835 | 77.0019 | 123.7884 | 171.23 | 194.06 | 216.90 |
| GROUP | 22 | 0.0585 | 0.023 | 0.0629 | 1.3832 | 0.087 | 0 | 78.4399 | 134.7765 | 21.44 | 21.44 | 21.44 |
| MONTH | 11 | -0.1343 | 0.301 | 0.3296 | 3.6254 | 1.1948 | 35.3409 | 66.3455 | 85.3664 | 78.71 | 114.05 | 149.39 |
| SEASON | 4 | -0.2659 | 0.0215 | 0.2668 | 1.0671 | 0.2847 | 0 | 69.384 | 93.1436 | 175.38 | 175.38 | 175.38 |

CI Level: 0.05

X2crit: 3.841

Table B-5a.5. Rayleigh test for a uniform circular distribution.

| Category | n | CI Level | Zstat | Zcrit | Reject Ho? | Plow | Phigh | Pint | Papprox |
|----------|-----|----------|--------|--------|------------|------|-------|--------|---------|
| SPECIES | 111 | 0.05 | 1.0426 | 2.9891 | n | 0.2 | 0.5 | 0.3862 | 0.3533 |
| GROUP | 22 | 0.05 | 0.087 | 2.961 | n | 0.5 | 1 | 0.7027 | 0.9184 |
| MONTH | 11 | 0.05 | 1.1948 | 2.926 | n | 0.2 | 0.5 | 0.3418 | 0.3095 |
| SEASON | 4 | 0.05 | 0.2847 | 2.865 | n | 0.5 | 1 | 0.649 | 0.7736 |

Ho: The population has a uniform circular distribution, with no mean direction.

Ha: The population has a nonuniform circular distribution, with a mean direction.

Table B-5a.6. V-test for a uniform circular distribution.

| Category | n | CI Level | ExpAngle | V | u | ucrit | Reject Ho? | Plow | Phigh | Pint |
|----------|-----|----------|----------|---------|--------|-------|------------|------|-------|--------|
| SPECIES | 111 | 0.05 | 194.06 | 10.7577 | 1.444 | 1.645 | n | 0.05 | 0.1 | 0.0777 |
| GROUP | 22 | 0.05 | 21.44 | 1.3832 | 0.417 | 1.646 | n | 0.25 | 0.5 | 0.3146 |
| MONTH | 11 | 0.05 | 114.05 | 3.6254 | 1.5459 | 1.648 | n | 0.05 | 0.1 | 0.0643 |
| SEASON | 4 | 0.05 | 175.38 | 1.067 | 0.7545 | 1.649 | n | 0.1 | 0.25 | 0.2336 |

Ho: The population has a uniform circular distribution with no mean direction, OR has a nonuniform circular distribution with a mean direction that is different from the expected direction.

Ha: The population has a nonuniform circular distribution with a mean direction equal to the expected direction.

Table B-5a.7. Hodges-Ajne test for a uniform circular distribution.

| Category | n1 | n2 | LowAngle | HighAngle | m | n | C | P |
|----------|----|----|----------|-----------|----|-----|--------|--------|
| SPECIES | 65 | 46 | 102.38 | 282.38 | 46 | 111 | 111 | 0 |
| GROUP | 8 | 14 | 41.94 | 221.94 | 8 | 22 | 319770 | 0.1525 |
| MONTH | 9 | 2 | 64.21 | 244.21 | 2 | 11 | 55 | 0.0537 |
| SEASON | 1 | 3 | 169.12 | 349.12 | 1 | 4 | 4 | 0.5 |

| Category | m | n | CI Level | A | P | Accuracy |
|----------|----|-----|----------|-------|-------|----------|
| SPECIES | 46 | 111 | 0.05 | 0.871 | 0.566 | -0.0026 |

| Category | n | CI Level | mstat | mcrit | Reject Ho? | Plow | Phigh | Pint |
|----------|----|----------|-------|-------|------------|------|-------|------|
| GROUP | 22 | 0.05 | 8 | 4 | n | 1 | 1 | 1 |
| MONTH | 11 | 0.05 | 2 | 0 | n | 0.2 | 0.5 | 0.5 |
| SEASON | 4 | 0.05 | 1 | -9999 | n | 0.5 | 1 | 0.5 |

Ho: The population has a uniform circular distribution.

Ha: The population has a nonuniform circular distribution.

Table B-5a.8. Batschelet test for a uniform circular distribution.

| Category | LowAngle | MidAngle | HighAngle | Binomial p | mp | n | Cstat |
|----------|----------|----------|-----------|------------|----|-----|-------|
| SPECIES | 104.06 | 194.06 | 284.06 | 0.5 | 63 | 111 | 48 |
| GROUP | 291.44 | 21.44 | 111.44 | 0.5 | 13 | 22 | 9 |
| MONTH | 24.05 | 114.05 | 204.05 | 0.5 | 8 | 11 | 3 |
| SEASON | 85.38 | 175.38 | 265.38 | 0.5 | 3 | 4 | 1 |

| Category | #Tails | Run Test | n | CI Level | Stat1 | Stat2 | Crit1 | Crit2 | Reject Ho? | Plow | Phigh | Pint |
|----------|--------|------------|-----|----------|-------|-------|-------|-------|------------|------|-------|------|
| SPECIES | 2 | Randomness | 111 | 0.05 | 48 | 48 | 44 | 67 | n | 0.1 | 0.2 | 0.2 |
| GROUP | 2 | Randomness | 22 | 0.05 | 9 | 9 | 5 | 17 | n | 0.5 | 1 | 0.8 |
| MONTH | 2 | Randomness | 11 | 0.05 | 3 | 3 | 1 | 10 | n | 0.2 | 0.5 | 0.5 |
| SEASON | 2 | Randomness | 4 | 0.05 | 1 | 1 | 0 | 4 | n | 0 | 0.001 | 0 |

Ho: The population has a uniform circular distribution, OR has a nonuniform circular distribution that is concentrated around an angle that is different from the expected angle.

Ha: The population has a nonuniform circular distribution that is concentrated around an angle equal to the expected angle.

Table B-5a.9. Binomial test for the determination of binomial probabilities.

| Category | n | p_binom | q_binom | Xbar | Xsp | n-Xsp | p_hat | q_hat |
|----------|-----|---------|---------|------|-----|-------|--------|--------|
| SPECIES | 111 | 0.5 | 0.5 | 55.5 | 63 | 48 | 0.5676 | 0.4324 |
| GROUP | 22 | 0.5 | 0.5 | 11 | 13 | 9 | 0.5909 | 0.4091 |
| MONTH | 11 | 0.5 | 0.5 | 5.5 | 8 | 3 | 0.7273 | 0.2727 |
| SEASON | 4 | 0.5 | 0.5 | 2 | 3 | 1 | 0.75 | 0.25 |

| Category | p_binom | q_binom | CI Level | 1-tailed | | 2-tailed | |
|----------|---------|---------|----------|----------|------------|----------|------------|
| | | | | P | Reject Ho? | P | Reject Ho? |
| SPECIES | 0.5 | 0.5 | 0.05 | 0.0918 | n | 0.1837 | n |
| GROUP | 0.5 | 0.5 | 0.05 | 0.2617 | n | 0.5235 | n |
| MONTH | 0.5 | 0.5 | 0.05 | 0.1133 | n | 0.2266 | n |
| SEASON | 0.5 | 0.5 | 0.05 | 0.3125 | n | 0.625 | n |

Ho (1-tailed): Probability $p \geq p_o$ (or $p \leq p_o$).

Ha (1-tailed): Probability $p < p_o$ (or $p > p_o$).

Ho (2-tailed): Probability $p = p_o$.

Ha (2-tailed): Probability p is NOT equal to p_o .

Table B-5a.10. Wilcoxon non-parametric paired-sample (signed-rank) test to assess differences between means.

| Category | #Tails | Run Test | n | CI Level | Stat1 | Stat2 | Crit | Reject Ho? | Plow | Phigh | Pint |
|----------|--------|------------|-----|----------|-------|-------|------|------------|------|-------|--------|
| SPECIES | 2 | Randomness | 111 | 0.05 | 2538 | 3642 | 1955 | n | 0.5 | 1 | 0.8597 |
| SPECIES | 1 | Contagion | 111 | 0.05 | 3642 | 3642 | 2045 | n | 0.25 | 1 | 1 |
| SPECIES | 1 | Uniformity | 111 | 0.05 | 2538 | 2538 | 2045 | n | 0.25 | 0.5 | 0.4298 |
| | | | | | | | | | | | |
| GROUP | 2 | Randomness | 22 | 0.05 | 122.5 | 130.5 | 65 | n | 0.5 | 1 | 0.8083 |
| GROUP | 1 | Contagion | 22 | 0.05 | 122.5 | 122.5 | 75 | n | 0.25 | 0.5 | 0.4042 |
| GROUP | 1 | Uniformity | 22 | 0.05 | 130.5 | 130.5 | 75 | n | 0.25 | 0.5 | 0.4708 |
| | | | | | | | | | | | |
| MONTH | 2 | Randomness | 11 | 0.05 | 25 | 40 | 10 | n | 0.5 | 1 | 0.5429 |
| MONTH | 1 | Contagion | 11 | 0.05 | 25 | 25 | 13 | n | 0.25 | 0.5 | 0.2714 |
| MONTH | 1 | Uniformity | 11 | 0.05 | 40 | 40 | 13 | n | 0.5 | 0.75 | 0.5929 |
| | | | | | | | | | | | |
| SEASON | 2 | Randomness | 4 | 0.05 | 4.5 | 5.5 | -999 | n | 0.5 | 1 | 0.875 |
| SEASON | 1 | Contagion | 4 | 0.05 | 4.5 | 4.5 | -999 | n | 0.25 | 0.5 | 0.4375 |
| SEASON | 1 | Uniformity | 4 | 0.05 | 5.5 | 5.5 | -999 | n | 0.5 | 0.75 | 0.5125 |

Ho (2-tailed): The sample came from a population with a symmetric distribution around its median (i.e., mean=median).

Ha (2-tailed): The sample did NOT come from a population with a symmetric distribution around its median (i.e., mean NOT equal to median).

Ho (1-tailed, Contagion): Population mean \leq median.

Ha (1-tailed, Contagion): Population mean $>$ median.

Ho (1-tailed, Uniformity): Population mean \geq median.

Ha (1-tailed, Uniformity): Population mean $<$ median.

Table B-5a.11. Watson 1-sample U2 non-parametric goodness-of-fit (GOF) test for a uniform circular distribution.

| Category | n1 | n2 | CI Level | ubar | U2 | U2crit | Reject Ho? | Plow | Phigh | Pint |
|----------|-----|-----|----------|--------|--------|--------|------------|------|-------|--------|
| SPECIES | 111 | 111 | 0.05 | 0.4517 | 0.1107 | 0.1869 | n | 0.2 | 0.5 | 0.2394 |
| GROUP | 22 | 22 | 0.05 | 0.4227 | 0.0331 | 0.185 | n | 0.5 | 1 | 0.7974 |
| MONTH | 11 | 11 | 0.05 | 0.397 | 0.1148 | 0.1857 | n | 0.2 | 0.5 | 0.2417 |
| SEASON | 4 | 4 | 0.05 | 0.6117 | 0.0511 | 9.9999 | n | 0.5 | 1 | 0.7823 |

Ho: The sample data came from a population with a uniform circular distribution.

Ha: The sample data did NOT come from a population with a uniform circular distribution.

Table B-5a.12. Chi-square non-parametric goodness-of-fit (GOF) test for a uniform circular distribution.

| Category | n | DF | CI Level | Uncorrected | | | | | | Yates Continuity-Corrected | | | | | | Log-Likelihood (G) | | | | | | Corrected Log-Likelihood (Gc) | | | | | |
|----------|-----|-----|----------|-------------|---------|------------|-------|--------|-------|----------------------------|---------|------------|-------|--------|-------|--------------------|---------|------------|-------|--------|-------|-------------------------------|---------|------------|-------|--------|-------|
| | | | | X2 stat | X2 crit | Reject Ho? | P low | P high | P int | X2 stat | X2 crit | Reject Ho? | P low | P high | P int | X2 stat | X2 crit | Reject Ho? | P low | P high | P int | X2 stat | X2 crit | Reject Ho? | P low | P high | P int |
| SPECIES | 111 | 110 | 0.05 | 0 | 135.48 | n | 0.999 | 1 | 1 | 0 | 135.48 | n | 0.999 | 1 | 1 | 0 | 135.48 | n | 0.999 | 1 | 1 | 0 | 135.48 | n | 0.999 | 1 | 1 |
| GROUP | 22 | 21 | 0.05 | 0 | 32.671 | n | 0.999 | 1 | 1 | 0 | 32.671 | n | 0.999 | 1 | 1 | 0 | 32.671 | n | 0.999 | 1 | 1 | 0 | 32.671 | n | 0.999 | 1 | 1 |
| MONTH | 11 | 10 | 0.05 | 0 | 18.307 | n | 0.999 | 1 | 1 | 0 | 18.307 | n | 0.999 | 1 | 1 | 0 | 18.307 | n | 0.999 | 1 | 1 | 0 | 18.307 | n | 0.999 | 1 | 1 |
| SEASON | 4 | 3 | 0.05 | 0 | 7.815 | n | 0.999 | 1 | 1 | 0 | 7.815 | n | 0.999 | 1 | 1 | 0 | 7.815 | n | 0.999 | 1 | 1 | 0 | 7.815 | n | 0.999 | 1 | 1 |

Ho: The samples are homogeneous.

Ha: The samples are NOT homogeneous.

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Appendix B-5b
Small Vessel Coastal

Table B-5b.1. Descriptive circular statistics of avian coastal (boat) surveys off the New Jersey coast.

| Species | n | X | Y | r | R | Z | Dev | AngDev | CircSD | Mean Angle | | |
|---------|------|---------|---------|--------|---------|---------|-------|--------|--------|------------|--------|-----------|
| | | | | | | | | | | CI95_low | Mean | CI95_high |
| LTDU | 122 | -0.2029 | -0.3129 | 0.3729 | 45.50 | 16.97 | 19.01 | 64.16 | 80.47 | 218.02 | 237.03 | 256.05 |
| RTLO | 793 | -0.6041 | -0.1056 | 0.6133 | 486.33 | 298.25 | 4.15 | 50.39 | 56.66 | 185.77 | 189.92 | 194.07 |
| HERG | 570 | -0.2364 | -0.1843 | 0.2997 | 170.86 | 51.21 | 10.92 | 67.81 | 88.94 | 207.02 | 217.94 | 228.86 |
| GBBG | 371 | -0.3237 | -0.1288 | 0.3484 | 129.26 | 45.03 | 11.56 | 65.41 | 83.20 | 190.13 | 201.69 | 213.25 |
| COGO | 4 | 0.9268 | 0.1768 | 0.9435 | 3.77 | 3.56 | 26.49 | 19.26 | 19.54 | 344.31 | 10.80 | 37.29 |
| RAZO | 14 | 0.7071 | -0.7071 | 1.0000 | 14.00 | 14.00 | 0.00 | 0.00 | 0.00 | 315.00 | 315.00 | 315.00 |
| COLO | 92 | -0.6091 | -0.0615 | 0.6122 | 56.33 | 34.49 | 12.35 | 50.46 | 56.76 | 173.42 | 185.76 | 198.11 |
| NOGA | 4068 | -0.6998 | -0.2507 | 0.7434 | 3024.12 | 2248.11 | 1.42 | 41.05 | 44.12 | 198.28 | 199.71 | 201.13 |
| SSHO | 6 | -0.6667 | 0.0000 | 0.6667 | 4.00 | 2.67 | 54.75 | 46.78 | 51.60 | 125.25 | 180.00 | 234.75 |
| SUSC | 987 | -0.0650 | -0.6738 | 0.6769 | 668.09 | 452.22 | 3.28 | 46.06 | 50.62 | 261.21 | 264.49 | 267.77 |
| BLSC | 587 | 0.5128 | -0.4233 | 0.6649 | 390.30 | 259.51 | 4.36 | 46.91 | 51.76 | 316.10 | 320.46 | 324.82 |
| WWSC | 17 | -0.2769 | -0.5466 | 0.6128 | 10.42 | 6.38 | 30.59 | 50.42 | 56.71 | 212.54 | 243.14 | 273.73 |
| BOGU | 576 | -0.7248 | -0.2971 | 0.7833 | 451.16 | 353.38 | 3.52 | 37.72 | 40.05 | 198.77 | 202.29 | 205.81 |
| SAND | 778 | -0.3282 | 0.0002 | 0.3282 | 255.36 | 83.82 | 8.47 | 66.41 | 85.52 | 171.50 | 179.97 | 188.44 |
| AMOY | 7 | 1.0000 | 0.0000 | 1.0000 | 7.00 | 7.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| RBGU | 532 | -0.6850 | -0.3155 | 0.7542 | 401.23 | 302.60 | 3.87 | 40.17 | 43.04 | 200.86 | 204.73 | 208.60 |
| RBME | 4 | -1.0000 | 0.0000 | 1.0000 | 4.00 | 4.00 | 0.00 | 0.00 | 0.00 | 180.00 | 180.00 | 180.00 |
| UOTH | 13 | -0.7242 | -0.0769 | 0.7282 | 9.47 | 6.89 | 28.04 | 42.24 | 45.63 | 158.02 | 186.06 | 214.11 |
| SCAU | 9 | 0.0000 | -1.0000 | 1.0000 | 9.00 | 9.00 | 0.00 | 0.00 | 0.00 | 270.00 | 270.00 | 270.00 |
| BUFF | 41 | 0.0887 | -0.4657 | 0.4740 | 19.44 | 9.21 | 25.80 | 58.77 | 70.01 | 254.98 | 280.78 | 306.59 |
| LAGU | 972 | -0.2525 | 0.0167 | 0.2530 | 245.95 | 62.23 | 9.96 | 70.03 | 94.99 | 166.25 | 176.21 | 186.16 |
| DUNL | 12 | -0.9024 | -0.2357 | 0.9326 | 11.19 | 10.44 | 13.75 | 21.03 | 21.40 | 180.89 | 194.64 | 208.38 |
| NSHO | 7 | -1.0000 | 0.0000 | 1.0000 | 7.00 | 7.00 | 0.00 | 0.00 | 0.00 | 180.00 | 180.00 | 180.00 |
| LBBG | 2 | -1.0000 | 0.0000 | 1.0000 | 2.00 | 2.00 | 0.00 | 0.00 | 0.00 | 180.00 | 180.00 | 180.00 |
| HOGH | 5 | -0.8000 | -0.2000 | 0.8246 | 4.12 | 3.40 | 42.79 | 33.93 | 35.58 | 151.25 | 194.04 | 236.82 |
| CORM | 4 | -0.5303 | 0.7803 | 0.9435 | 3.77 | 3.56 | 26.49 | 19.26 | 19.54 | 97.71 | 124.20 | 150.69 |
| LOON | 2 | 0.5000 | -0.5000 | 0.7071 | 1.41 | 1.00 | 0.00 | 43.85 | 47.70 | 315.00 | 315.00 | 315.00 |
| GULG | 135 | -0.5722 | -0.5408 | 0.7873 | 106.29 | 83.68 | 7.26 | 37.37 | 39.63 | 216.13 | 223.38 | 230.64 |
| SCDW | 302 | -0.5129 | -0.3115 | 0.6001 | 181.23 | 108.75 | 6.92 | 51.24 | 57.90 | 204.35 | 211.27 | 218.19 |
| NOPI | 7 | 0.0000 | -0.7489 | 0.7489 | 5.24 | 3.93 | 39.69 | 40.60 | 43.57 | 230.31 | 270.00 | 309.69 |
| SCOT | 139 | -0.0216 | -0.9209 | 0.9211 | 128.04 | 117.94 | 4.06 | 22.76 | 23.23 | 264.60 | 268.66 | 272.71 |
| ATBR | 242 | -0.4062 | -0.2895 | 0.4988 | 120.71 | 60.21 | 9.64 | 57.37 | 67.58 | 205.84 | 215.48 | 225.12 |
| CANG | 2634 | -0.9487 | -0.1205 | 0.9564 | 2519.06 | 2409.14 | 0.67 | 16.93 | 17.12 | 186.57 | 187.24 | 187.91 |
| GRCO | 6 | -0.7559 | -0.5893 | 0.9585 | 5.75 | 5.51 | 16.37 | 16.52 | 16.69 | 201.57 | 217.94 | 234.31 |
| DCCO | 2891 | -0.6353 | -0.1335 | 0.6492 | 1876.89 | 1218.51 | 2.02 | 47.99 | 53.26 | 189.84 | 191.87 | 193.89 |
| PASS | 153 | 0.0098 | -0.0166 | 0.0193 | 2.95 | 0.06 | 0.00 | 80.24 | 161.02 | 300.71 | 300.71 | 300.71 |
| FOTE | 180 | -0.5496 | -0.0557 | 0.5524 | 99.43 | 54.92 | 9.94 | 54.21 | 62.43 | 175.85 | 185.78 | 195.72 |
| ABDU | 53 | -0.3796 | -0.3980 | 0.5500 | 29.15 | 16.03 | 18.77 | 54.36 | 62.65 | 207.58 | 226.35 | 245.12 |

Table B-5b.1 (continued). Descriptive circular statistics of avian coastal (boat) surveys off the New Jersey coast.

| Species | n | X | Y | r | R | Z | Dev | AngDev | CircSD | Mean Angle | | |
|--------------|--------------|----------------|----------------|---------------|-----------------|----------------|-------------|--------------|--------------|---------------|---------------|---------------|
| | | | | | | | | | | CI95_low | Mean | CI95_high |
| NOHA | 2 | 1.0000 | 0.0000 | 1.0000 | 2.00 | 2.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| HADU | 1 | -0.7071 | 0.7071 | 1.0000 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 135.00 | 135.00 | 135.00 |
| DUCK | 23 | -0.7962 | -0.4919 | 0.9359 | 21.53 | 20.15 | 9.23 | 20.51 | 20.85 | 202.48 | 211.71 | 220.94 |
| DUDI | 3 | -0.4310 | -0.2357 | 0.4912 | 1.47 | 0.72 | 0.00 | 57.80 | 68.32 | 208.68 | 208.68 | 208.68 |
| GBHE | 14 | -0.0418 | 0.1010 | 0.1093 | 1.53 | 0.17 | 0.00 | 76.47 | 120.55 | 112.50 | 112.50 | 112.50 |
| OSPR | 42 | -0.2648 | 0.1179 | 0.2898 | 12.17 | 3.53 | 46.93 | 68.28 | 90.17 | 109.08 | 156.01 | 202.94 |
| TESM | 8 | -0.4634 | 0.0884 | 0.4717 | 3.77 | 1.78 | 72.60 | 58.89 | 70.23 | 96.61 | 169.20 | 241.80 |
| COTE | 287 | -0.4366 | -0.0282 | 0.4375 | 125.57 | 54.94 | 10.26 | 60.77 | 73.67 | 173.44 | 183.69 | 193.95 |
| NONP | 5 | -0.2000 | 0.0000 | 0.2000 | 1.00 | 0.20 | 0.00 | 72.47 | 102.80 | 180.00 | 180.00 | 180.00 |
| RUTU | 14 | -0.4286 | 0.5714 | 0.7143 | 10.00 | 7.14 | 27.63 | 43.31 | 47.00 | 99.24 | 126.87 | 154.50 |
| ROYT | 149 | -0.1660 | 0.1308 | 0.2113 | 31.48 | 6.65 | 32.21 | 71.96 | 101.03 | 109.55 | 141.76 | 173.97 |
| LETE | 1 | -1.0000 | 0.0000 | 1.0000 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 180.00 | 180.00 | 180.00 |
| SHSM | 262 | -0.7667 | -0.4460 | 0.8870 | 232.39 | 206.12 | 4.32 | 27.24 | 28.06 | 205.87 | 210.19 | 214.51 |
| MALL | 15 | -0.5805 | -0.0471 | 0.5824 | 8.74 | 5.09 | 35.36 | 52.36 | 59.58 | 149.28 | 184.64 | 220.00 |
| SESA | 4 | -0.7803 | -0.5303 | 0.9435 | 3.77 | 3.56 | 26.49 | 19.26 | 19.54 | 187.71 | 214.20 | 240.69 |
| BRPE | 17 | 0.2353 | -0.1420 | 0.2748 | 4.67 | 1.28 | 43.55 | 69.00 | 92.09 | 285.34 | 328.89 | 12.43 |
| GREG | 15 | -0.7852 | 0.4243 | 0.8925 | 13.39 | 11.95 | 18.75 | 26.57 | 27.33 | 132.87 | 151.62 | 170.37 |
| GADW | 2 | 0.7071 | 0.7071 | 1.0000 | 2.00 | 2.00 | 0.00 | 0.00 | 0.00 | 45.00 | 45.00 | 45.00 |
| WHIM | 49 | 0.7489 | -0.6061 | 0.9635 | 47.21 | 45.49 | 4.55 | 15.49 | 15.63 | 316.47 | 321.02 | 325.57 |
| UNDO | 3 | -0.9024 | -0.2357 | 0.9326 | 2.80 | 2.61 | 38.57 | 21.03 | 21.40 | 156.06 | 194.64 | 233.21 |
| SEPL | 5 | -0.8243 | -0.4243 | 0.9270 | 4.64 | 4.30 | 25.78 | 21.89 | 22.30 | 181.46 | 207.24 | 233.01 |
| TELG | 3 | -0.2357 | 0.2357 | 0.3333 | 1.00 | 0.33 | 0.00 | 66.16 | 84.93 | 135.00 | 135.00 | 135.00 |
| LESA | 11 | -0.7071 | -0.7071 | 1.0000 | 11.00 | 11.00 | 0.00 | 0.00 | 0.00 | 225.00 | 225.00 | 225.00 |
| SATE | 2 | -1.0000 | 0.0000 | 1.0000 | 2.00 | 2.00 | 0.00 | 0.00 | 0.00 | 180.00 | 180.00 | 180.00 |
| YSFL | 2 | 0.3536 | -0.1464 | 0.3827 | 0.77 | 0.29 | 0.00 | 63.66 | 79.41 | 337.50 | 337.50 | 337.50 |
| CATE | 4 | 0.8536 | 0.0000 | 0.8536 | 3.41 | 2.91 | 47.94 | 31.01 | 32.24 | 312.06 | 0.00 | 47.94 |
| AGWT | 42 | -0.9187 | 0.0337 | 0.9193 | 38.61 | 35.50 | 7.61 | 23.01 | 23.50 | 170.29 | 177.90 | 185.51 |
| DUDA | 5 | -0.7071 | -0.7071 | 1.0000 | 5.00 | 5.00 | 0.00 | 0.00 | 0.00 | 225.00 | 225.00 | 225.00 |
| SHUN | 158 | -0.9944 | -0.0045 | 0.9944 | 157.12 | 156.25 | 0.95 | 6.04 | 6.05 | 179.31 | 180.26 | 181.21 |
| WODU | 6 | -0.5893 | 0.4226 | 0.7251 | 4.35 | 3.15 | 46.96 | 42.48 | 45.94 | 97.39 | 144.35 | 191.31 |
| GRSC | 35 | -0.4035 | -0.0606 | 0.4080 | 14.28 | 5.83 | 33.88 | 62.34 | 76.72 | 154.66 | 188.54 | 222.42 |
| LESC | 5 | -1.0000 | 0.0000 | 1.0000 | 5.00 | 5.00 | 0.00 | 0.00 | 0.00 | 180.00 | 180.00 | 180.00 |
| SNGO | 1 | -1.0000 | 0.0000 | 1.0000 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 180.00 | 180.00 | 180.00 |
| TOTAL | 18532 | -0.5467 | -0.2071 | 0.5846 | 10834.39 | 6334.12 | 0.91 | 52.22 | 59.37 | 199.84 | 200.75 | 201.66 |

Table B-5b.1 (continued). Descriptive circular statistics of avian coastal (boat) surveys off the New Jersey coast.

| Taxonomic Group | n | X | Y | r | R | Z | Dev | AngDev | CircSD | Mean Angle | | |
|-------------------|-------|---------|---------|--------|----------|---------|-------|--------|--------|------------|--------|-----------|
| | | | | | | | | | | CI95_low | Mean | CI95_high |
| Accipitridae | 44 | -0.2073 | 0.1125 | 0.2359 | 10.38 | 2.45 | 62.01 | 70.83 | 97.39 | 89.50 | 151.51 | 213.53 |
| Alcidae | 14 | 0.7071 | -0.7071 | 1.0000 | 14.00 | 14.00 | 0.00 | 0.00 | 0.00 | 315.00 | 315.00 | 315.00 |
| Anatidae | 5293 | -0.5035 | -0.3092 | 0.5908 | 3127.35 | 1847.79 | 1.68 | 51.83 | 58.78 | 209.88 | 211.55 | 213.23 |
| Ardeidae | 29 | -0.4263 | 0.2682 | 0.5037 | 14.61 | 7.36 | 29.05 | 57.08 | 67.10 | 118.78 | 147.83 | 176.87 |
| Gaviidae | 887 | -0.6021 | -0.1019 | 0.6107 | 541.70 | 330.82 | 3.94 | 50.56 | 56.90 | 185.66 | 189.61 | 193.55 |
| Laridae | 3792 | -0.4257 | -0.1439 | 0.4494 | 1704.10 | 765.81 | 2.72 | 60.13 | 72.47 | 195.96 | 198.68 | 201.40 |
| Pelecanidae | 17 | 0.2353 | -0.1420 | 0.2748 | 4.67 | 1.28 | 43.55 | 69.00 | 92.09 | 285.34 | 328.89 | 12.43 |
| Phalacrocoracidae | 2901 | -0.6355 | -0.1332 | 0.6493 | 1883.49 | 1222.87 | 2.02 | 47.99 | 53.25 | 189.82 | 191.84 | 193.85 |
| Picidae | 2 | 0.3536 | -0.1464 | 0.3827 | 0.77 | 0.29 | 0.00 | 63.66 | 79.41 | 337.50 | 337.50 | 337.50 |
| Podicipedidae | 5 | -0.8000 | -0.2000 | 0.8246 | 4.12 | 3.40 | 42.79 | 33.93 | 35.58 | 151.25 | 194.04 | 236.82 |
| Scolopacidae | 1309 | -0.4646 | -0.1182 | 0.4794 | 627.58 | 300.88 | 4.31 | 58.46 | 69.47 | 189.96 | 194.27 | 198.58 |
| Sulidae | 4068 | -0.6998 | -0.2507 | 0.7434 | 3024.12 | 2248.11 | 1.42 | 41.05 | 44.12 | 198.28 | 199.71 | 201.13 |
| Tityridae | 153 | 0.0098 | -0.0166 | 0.0193 | 2.95 | 0.06 | 0.00 | 80.24 | 161.02 | 300.71 | 300.71 | 300.71 |
| Other | 13 | -0.7242 | -0.0769 | 0.7282 | 9.47 | 6.89 | 28.04 | 42.24 | 45.63 | 158.02 | 186.06 | 214.11 |
| Unknown | 5 | -0.2000 | 0.0000 | 0.2000 | 1.00 | 0.20 | 0.00 | 72.47 | 102.80 | 180.00 | 180.00 | 180.00 |
| TOTAL | 18532 | -0.5467 | -0.2071 | 0.5846 | 10834.39 | 6334.12 | 0.91 | 52.22 | 59.37 | 199.84 | 200.75 | 201.66 |

| Month | n | X | Y | r | R | Z | Dev | AngDev | CircSD | Mean Angle | | |
|--------------|-------|---------|---------|--------|----------|---------|-------|--------|--------|------------|--------|-----------|
| | | | | | | | | | | CI95_low | Mean | CI95_high |
| Jan | 759 | 0.4384 | -0.3954 | 0.5904 | 448.12 | 264.58 | 4.44 | 51.86 | 58.82 | 313.51 | 317.95 | 322.39 |
| Mar | 1960 | -0.1860 | -0.5665 | 0.5962 | 1168.57 | 696.71 | 2.73 | 51.49 | 58.27 | 249.09 | 251.82 | 254.55 |
| Apr | 2581 | -0.7429 | -0.0703 | 0.7462 | 1926.00 | 1437.22 | 1.78 | 40.82 | 43.84 | 183.62 | 185.40 | 187.18 |
| May | 881 | -0.3568 | 0.1107 | 0.3736 | 329.14 | 122.97 | 6.93 | 64.13 | 80.40 | 155.84 | 162.76 | 169.69 |
| Jun | 343 | -0.2486 | 0.0472 | 0.2530 | 86.79 | 21.96 | 16.94 | 70.03 | 94.99 | 152.31 | 169.25 | 186.19 |
| Jul | 209 | 0.2426 | -0.1624 | 0.2919 | 61.01 | 17.81 | 18.79 | 68.18 | 89.91 | 307.41 | 326.20 | 344.99 |
| Aug | 557 | -0.4373 | -0.0046 | 0.4373 | 243.57 | 106.51 | 7.34 | 60.78 | 73.69 | 173.26 | 180.60 | 187.94 |
| Sep | 483 | -0.3099 | -0.0001 | 0.3099 | 149.70 | 46.40 | 11.46 | 67.31 | 87.70 | 168.57 | 180.03 | 191.49 |
| Oct | 3418 | -0.3515 | -0.3622 | 0.5047 | 1725.21 | 870.79 | 2.51 | 57.02 | 67.00 | 223.34 | 225.85 | 228.37 |
| Nov | 7341 | -0.8499 | -0.1479 | 0.8626 | 6332.57 | 5462.66 | 0.85 | 30.03 | 31.15 | 189.02 | 189.87 | 190.72 |
| TOTAL | 18532 | -0.5467 | -0.2071 | 0.5846 | 10834.39 | 6334.12 | 0.91 | 52.22 | 59.37 | 199.84 | 200.75 | 201.66 |

| Season | n | X | Y | r | R | Z | Dev | AngDev | CircSD | Mean Angle | | |
|--------------|-------|---------|---------|--------|----------|---------|------|--------|--------|------------|--------|-----------|
| | | | | | | | | | | CI95_low | Mean | CI95_high |
| Winter | 759 | 0.4384 | -0.3954 | 0.5904 | 448.12 | 264.58 | 4.44 | 51.86 | 58.82 | 313.51 | 317.95 | 322.39 |
| Spring | 5422 | -0.4788 | -0.2202 | 0.5271 | 2857.76 | 1506.23 | 1.90 | 55.72 | 64.84 | 202.80 | 204.70 | 206.60 |
| Summer | 1109 | -0.2508 | -0.0183 | 0.2515 | 278.86 | 70.12 | 9.38 | 70.10 | 95.20 | 174.80 | 184.17 | 193.55 |
| Autumn | 11242 | -0.6752 | -0.2067 | 0.7061 | 7937.79 | 5604.74 | 0.92 | 43.93 | 47.80 | 196.10 | 197.02 | 197.94 |
| TOTAL | 18532 | -0.5467 | -0.2071 | 0.5846 | 10834.39 | 6334.12 | 0.91 | 52.22 | 59.37 | 199.84 | 200.75 | 201.66 |

CI Level: 0.05
X2crit: 3.841

***** 1-SAMPLE SECOND-ORDER ANALYSIS OF ANGLES: Mean of Mean Angles Across SPECIES, GROUP, MONTH, SEASON *****

Table B-5b.2. Parametric 1-sample second-order analysis (Hotelling test) for testing the significance of the mean of the sample means.

| Category | n | r | Mean Angle | | | #Tails | DF1 | DF2 | CI Level | Fstat | Fcrit | Reject Ho? | Plow | Phigh | Pint |
|----------|----|--------|------------|--------|-----------|--------|-----|-----|----------|---------|-------|------------|--------|--------|--------|
| | | | CI95_low | Mean | CI95_high | | | | | | | | | | |
| SPECIES | 71 | 0.3958 | 186.75 | 202.84 | 223.84 | 1 | 2 | 69 | 0.05 | 23.5503 | 3.132 | y | 0 | 0.0005 | 0 |
| GROUP | 15 | 0.3203 | 176.12 | 204.15 | 280.75 | 1 | 2 | 13 | 0.05 | 9.0047 | 3.81 | y | 0.0025 | 0.005 | 0.0038 |
| MONTH | 10 | 0.3203 | 169.90 | 208.97 | 298.55 | 1 | 2 | 8 | 0.05 | 7.1329 | 4.46 | y | 0.01 | 0.025 | 0.0188 |
| SEASON | 4 | 0.3202 | 157.14 | 221.02 | 181.46 | 1 | 2 | 2 | 0.05 | 5.6343 | 19 | n | 0.1 | 0.25 | 0.1841 |

Ho: There is NO mean population direction.

Ha: There is a mean population direction.

Table B-5b.3. Non-parametric 1-sample second-order analysis (Moore test) for testing the significance of the direction in the sample of means.

| Category | n | CI Level | X | Y | Rp | Rcrit | Reject Ho? | Plow | Phigh | Pint |
|----------|----|----------|----------|---------|--------|--------|------------|-------|-------|--------|
| SPECIES | 71 | 0.05 | -17.9346 | -7.5116 | 2.3076 | 1.1136 | y | 0 | 0.002 | 0 |
| GROUP | 15 | 0.05 | -4.7176 | -2.0723 | 1.3304 | 1.134 | y | 0.002 | 0.01 | 0.0098 |
| MONTH | 10 | 0.05 | -3.1429 | -1.8951 | 1.1606 | 1.144 | y | 0.02 | 0.05 | 0.0452 |
| SEASON | 4 | 0.05 | -1.1029 | -1.0222 | 0.7518 | 1.146 | n | 0.4 | 0.6 | 0.5124 |

Ho: The sample means came from a population with a uniform circular distribution.

Ha: The sample means did NOT come from a population with a uniform circular distribution.

*****2-SAMPLE SECOND-ORDER ANALYSIS OF ANGLES: SPECIES, GROUP, MONTH, SEASON*****

Table B-5b.4. Descriptive circular statistics.

| Category | n | X | Y | r | R | Z | Dev | AngDev | CircSD | Mean Angle | | |
|----------|----|---------|---------|--------|---------|---------|---------|---------|---------|------------|--------|-----------|
| | | | | | | | | | | CI95_low | Mean | CI95_high |
| SPECIES | 71 | -0.5244 | -0.2107 | 0.5652 | 40.1264 | 22.6779 | 15.58 | 53.432 | 61.2097 | 186.31 | 201.89 | 217.47 |
| GROUP | 15 | -0.4911 | -0.2403 | 0.5468 | 8.2013 | 4.4841 | 38.5979 | 54.5513 | 62.9606 | 167.47 | 206.07 | 244.67 |
| MONTH | 10 | -0.5353 | -0.2687 | 0.599 | 5.9898 | 3.5878 | 44.1937 | 51.3123 | 58.0092 | 162.46 | 206.66 | 250.85 |
| SEASON | 4 | -0.5299 | -0.3633 | 0.6424 | 2.5698 | 1.6509 | 62.3852 | 48.4517 | 53.8991 | 152.05 | 214.43 | 276.82 |

CI Level: 0.05

X2crit: 3.841

Table B-5b.5. Rayleigh test for a uniform circular distribution.

| Category | n | CI Level | Zstat | Zcrit | Reject Ho? | Plow | Phigh | Pint | Papprox |
|----------|----|----------|---------|--------|------------|-------|-------|--------|---------|
| SPECIES | 71 | 0.05 | 22.6779 | 2.9852 | y | 0 | 0.001 | 0 | 0 |
| GROUP | 15 | 0.05 | 4.4841 | 2.945 | y | 0.005 | 0.01 | 0.0093 | 0.0091 |
| MONTH | 10 | 0.05 | 3.5878 | 2.919 | y | 0.02 | 0.05 | 0.0248 | 0.0235 |
| SEASON | 4 | 0.05 | 1.6509 | 2.865 | n | 0.1 | 0.2 | 0.1981 | 0.1995 |

Ho: The population has a uniform circular distribution, with no mean direction.

Ha: The population has a nonuniform circular distribution, with a mean direction.

Table B-5b.6. V-test for a uniform circular distribution.

| Category | n | CI Level | ExpAngle | V | u | ucrit | Reject Ho? | Plow | Phigh | Pint |
|----------|----|----------|----------|---------|--------|-------|------------|--------|--------|--------|
| SPECIES | 71 | 0.05 | 201.89 | 40.1264 | 6.7347 | 1.645 | y | 0 | 0.0005 | 0 |
| GROUP | 15 | 0.05 | 206.07 | 8.2013 | 2.9947 | 1.647 | y | 0.001 | 0.0025 | 0.001 |
| MONTH | 10 | 0.05 | 206.66 | 5.9897 | 2.6787 | 1.648 | y | 0.0025 | 0.005 | 0.003 |
| SEASON | 4 | 0.05 | 214.43 | 2.5697 | 1.8171 | 1.649 | y | 0.025 | 0.05 | 0.0359 |

Ho: The population has a uniform circular distribution with no mean direction, OR has a nonuniform circular distribution with a mean direction that is different from the expected direction.

Ha: The population has a nonuniform circular distribution with a mean direction equal to the expected direction.

Table B-5b.7. Hodges-Ajne test for a uniform circular distribution.

| Category | n1 | n2 | LowAngle | HighAngle | m | n | C | P |
|----------|----|----|----------|-----------|----|----|-----|--------|
| SPECIES | 59 | 12 | 141.76 | 321.76 | 12 | 71 | 71 | 0 |
| GROUP | 13 | 2 | 179.99 | 359.99 | 2 | 15 | 105 | 0.0064 |
| MONTH | 10 | 0 | 162.76 | 342.76 | 0 | 10 | 1 | 0.002 |
| SEASON | 4 | 0 | 179.99 | 359.99 | 0 | 4 | 1 | 0.125 |

| Category | m | n | CI Level | A | P | Accuracy |
|----------|----|----|----------|--------|---|----------|
| SPECIES | 12 | 71 | 0.05 | 0.2816 | 0 | -0.0026 |

| Category | n | CI Level | mstat | mcrit | Reject Ho? | Plow | Phigh | Pint |
|----------|----|----------|-------|-------|------------|------|-------|------|
| GROUP | 15 | 0.05 | 2 | 1 | n | 0.1 | 0.2 | 0.2 |
| MONTH | 10 | 0.05 | 0 | 0 | y | 0.01 | 0.02 | 0.02 |
| SEASON | 4 | 0.05 | 0 | -9999 | n | 0.2 | 0.5 | 0.5 |

Ho: The population has a uniform circular distribution.

Ha: The population has a nonuniform circular distribution.

Table B-5b.8. Batschelet test for a uniform circular distribution.

| Category | LowAngle | MidAngle | HighAngle | Binomial p | mp | n | Cstat |
|----------|----------|----------|-----------|------------|----|----|-------|
| SPECIES | 111.89 | 201.89 | 291.89 | 0.5 | 59 | 71 | 12 |
| GROUP | 116.07 | 206.07 | 296.07 | 0.5 | 11 | 15 | 4 |
| MONTH | 116.66 | 206.66 | 296.66 | 0.5 | 8 | 10 | 2 |
| SEASON | 124.43 | 214.43 | 304.43 | 0.5 | 3 | 4 | 1 |

| Category | #Tails | Run Test | n | CI Level | Stat1 | Stat2 | Crit1 | Crit2 | Reject Ho? | Plow | Phigh | Pint |
|----------|--------|------------|----|----------|-------|-------|-------|-------|------------|------|-------|------|
| SPECIES | 2 | Randomness | 71 | 0.05 | 12 | 12 | 26 | 45 | y | 0 | 0.001 | 0 |
| GROUP | 2 | Randomness | 15 | 0.05 | 4 | 4 | 3 | 12 | n | 0.1 | 0.2 | 0.2 |
| MONTH | 2 | Randomness | 10 | 0.05 | 2 | 2 | 1 | 9 | n | 0.1 | 0.2 | 0.2 |
| SEASON | 2 | Randomness | 4 | 0.05 | 1 | 1 | 0 | 4 | n | 0.5 | 1 | 1 |

Ho: The population has a uniform circular distribution, OR has a nonuniform circular distribution that is concentrated around an angle that is different from the expected angle.

Ha: The population has a nonuniform circular distribution that is concentrated around an angle equal to the expected angle.

Table B-5b.9. Binomial test for the determination of binomial probabilities.

| Category | n | p_binom | q_binom | Xbar | Xsp | n-Xsp | p_hat | q_hat |
|----------|----|---------|---------|------|-----|-------|--------|--------|
| SPECIES | 71 | 0.5 | 0.5 | 35.5 | 59 | 12 | 0.831 | 0.169 |
| GROUP | 15 | 0.5 | 0.5 | 7.5 | 11 | 4 | 0.7333 | 0.2667 |
| MONTH | 10 | 0.5 | 0.5 | 5 | 8 | 2 | 0.8 | 0.2 |
| SEASON | 4 | 0.5 | 0.5 | 2 | 3 | 1 | 0.75 | 0.25 |

| Category | p_binom | q_binom | CI Level | 1-tailed | | 2-tailed | |
|----------|---------|---------|----------|----------|------------|----------|------------|
| | | | | P | Reject Ho? | P | Reject Ho? |
| SPECIES | 0.5 | 0.5 | 0.05 | 0 | y | 0 | y |
| GROUP | 0.5 | 0.5 | 0.05 | 0.0592 | n | 0.1185 | n |
| MONTH | 0.5 | 0.5 | 0.05 | 0.0547 | n | 0.1094 | n |
| SEASON | 0.5 | 0.5 | 0.05 | 0.3125 | n | 0.625 | n |

Ho (1-tailed): Probability $p \geq p_o$ (or $p \leq p_o$).

Ha (1-tailed): Probability $p < p_o$ (or $p > p_o$).

Ho (2-tailed): Probability $p = p_o$.

Ha (2-tailed): Probability p is NOT equal to p_o .

Table B-5b.10. Wilcoxon non-parametric paired-sample (signed-rank) test to assess differences between means.

| Category | #Tails | Run Test | n | CI Level | Stat1 | Stat2 | Crit | Reject Ho? | Plow | Phigh | Pint |
|----------|--------|------------|----|----------|-------|-------|------|------------|------|-------|--------|
| SPECIES | 2 | Randomness | 71 | 0.05 | 1129 | 1426 | 936 | n | 0.2 | 0.5 | 0.4151 |
| SPECIES | 1 | Contagion | 71 | 0.05 | 1129 | 1129 | 990 | n | 0.1 | 0.25 | 0.2075 |
| SPECIES | 1 | Uniformity | 71 | 0.05 | 1426 | 1426 | 990 | n | 0.5 | 0.75 | 0.6278 |
| | | | | | | | | | | | |
| GROUP | 2 | Randomness | 15 | 0.05 | 46 | 73 | 25 | n | 0.2 | 0.5 | 0.4727 |
| GROUP | 1 | Contagion | 15 | 0.05 | 46 | 46 | 30 | n | 0.1 | 0.25 | 0.2364 |
| GROUP | 1 | Uniformity | 15 | 0.05 | 73 | 73 | 30 | n | 0.5 | 0.75 | 0.6045 |
| | | | | | | | | | | | |
| MONTH | 2 | Randomness | 10 | 0.05 | 19.5 | 35.5 | 8 | n | 0.2 | 0.5 | 0.475 |
| MONTH | 1 | Contagion | 10 | 0.05 | 19.5 | 19.5 | 10 | n | 0.1 | 0.25 | 0.2375 |
| MONTH | 1 | Uniformity | 10 | 0.05 | 35.5 | 35.5 | 10 | n | 0.5 | 0.75 | 0.6375 |
| | | | | | | | | | | | |
| SEASON | 2 | Randomness | 4 | 0.05 | 5 | 5 | -999 | n | 0.5 | 1 | 0.95 |
| SEASON | 1 | Contagion | 4 | 0.05 | 5 | 5 | -999 | n | 0.25 | 0.5 | 0.475 |
| SEASON | 1 | Uniformity | 4 | 0.05 | 5 | 5 | -999 | n | 0.25 | 0.5 | 0.475 |

Ho (2-tailed): The sample came from a population with a symmetric distribution around its median (i.e., mean=median).

Ha (2-tailed): The sample did NOT come from a population with a symmetric distribution around its median (i.e., mean NOT equal to median).

Ho (1-tailed, Contagion): Population mean \leq median.

Ha (1-tailed, Contagion): Population mean $>$ median.

Ho (1-tailed, Uniformity): Population mean \geq median.

Ha (1-tailed, Uniformity): Population mean $<$ median.

Table B-5b.11. Chi-square non-parametric goodness-of-fit (GOF) test for a uniform circular distribution.

| Category | n | DF | CI Level | Uncorrected | | | | | | Yates Continuity-Corrected | | | | | | Log-Likelihood (G) | | | | | | Corrected Log-Likelihood (Gc) | | | | | |
|----------|----|----|----------|-------------|---------|------------|-------|--------|-------|----------------------------|---------|------------|-------|--------|-------|--------------------|---------|------------|-------|--------|-------|-------------------------------|---------|------------|-------|--------|-------|
| | | | | X2 stat | X2 crit | Reject Ho? | P low | P high | P int | X2 stat | X2 crit | Reject Ho? | P low | P high | P int | X2 stat | X2 crit | Reject Ho? | P low | P high | P int | X2 stat | X2 crit | Reject Ho? | P low | P high | P int |
| SPECIES | 71 | 70 | 0.05 | 0 | 90.531 | n | 0.999 | 1 | 1 | 0 | 90.531 | n | 0.999 | 1 | 1 | 0 | 90.531 | n | 0.999 | 1 | 1 | 0 | 90.531 | n | 0.999 | 1 | 1 |
| GROUP | 15 | 14 | 0.05 | 0 | 23.685 | n | 0.999 | 1 | 1 | 0 | 23.685 | n | 0.999 | 1 | 1 | 0 | 23.685 | n | 0.999 | 1 | 1 | 0 | 23.685 | n | 0.999 | 1 | 1 |
| MONTH | 10 | 9 | 0.05 | 0 | 16.919 | n | 0.999 | 1 | 1 | 0 | 16.919 | n | 0.999 | 1 | 1 | 0 | 16.919 | n | 0.999 | 1 | 1 | 0 | 16.919 | n | 0.999 | 1 | 1 |
| SEASON | 4 | 3 | 0.05 | 0 | 7.815 | n | 0.999 | 1 | 1 | 0 | 7.815 | n | 0.999 | 1 | 1 | 0 | 7.815 | n | 0.999 | 1 | 1 | 0 | 7.815 | n | 0.999 | 1 | 1 |

Ho: The samples are homogeneous.

Ha: The samples are NOT homogeneous.

Table B-5b.12. Watson 1-sample U2 non-parametric goodness-of-fit (GOF) test for a uniform circular distribution.

| Category | n1 | n2 | CI Level | ubar | U2 | U2crit | Reject Ho? | Plow | Phigh | Pint |
|----------|----|----|----------|--------|--------|--------|------------|-------|-------|--------|
| SPECIES | 71 | 71 | 0.05 | 0.5379 | 1.4073 | 0.187 | y | 0 | 0.001 | 0 |
| GROUP | 15 | 15 | 0.05 | 0.6161 | 0.3582 | 0.1835 | y | 0.001 | 0.002 | 0.0011 |
| MONTH | 10 | 10 | 0.05 | 0.6083 | 0.2517 | 0.185 | y | 0.01 | 0.02 | 0.011 |
| SEASON | 4 | 4 | 0.05 | 0.6277 | 0.138 | 9.9999 | n | 0.2 | 0.5 | 0.4112 |

Ho: The sample data came from a population with a uniform circular distribution.

Ha: The sample data did NOT come from a population with a uniform circular distribution.

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APPENDIX C
AVIAN RADAR

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Appendix C-1

VerCat Altitude Data Tables

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Appendix C-1a

Offshore Radar

Table C-1a.1. Grid 1, Altitudinal Distribution (Clear Weather), 14 to 22 March 2008.

| Date | Diurnal ¹ | | | | Nocturnal ² | | | |
|----------------------|----------------------|---------------|------------|----------------|------------------------|---------------|--------------|----------------|
| | 25% Alt | Median Alt | 75% Alt | Total Count | 25% Alt | Median Alt | 75% Alt | Total Count |
| 3/14/2008 | | | | | 1,189 | 1,529 | 2,535 | 4 |
| 3/15/2008 | 93 | 171 | 959 | 367 | 374 | 1,807 | 3,055 | 73 |
| 3/16/2008 | 68 | 109 | 158 | 771 | 109 | 162 | 4,635 | 152 |
| 3/17/2008 | 103 | 160 | 262 | 1,395 | 123 | 247 | 2,125 | 284 |
| 3/18/2008 | 69 | 103 | 153 | 627 | 1,260 | 2,985 | 3,726 | 213 |
| 3/19/2008 | 114 | 399 | 846 | 468 | 62 | 162 | 2,012 | 45 |
| 3/20/2008 | 64 | 117 | 199 | 130 | 77 | 180 | 390 | 408 |
| 3/21/2008 | 82 | 164 | 269 | 920 | 310 | 1,063 | 2,193 | 884 |
| 3/22/2008 | | | | | 424 | 1,946 | 3,790 | 554 |
| Total Dataset | 84 | 144 | 255 | 4,678 | 182 | 783 | 2,805 | 2,617 |

Alt = altitude, ft AMSL

¹ Diurnal runs from civil sunrise to civil sunset² Nocturnal runs from civil sunset to civil sunrise

Note: numbers in smaller font and italics indicate limited survey duration (10 to 39 minutes)

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Appendix C-1b

Onshore Radar

Table C-1b.1. Island Beach State Park, Altitudinal Distribution (Clear Weather), 15 to 23 May 2008.

| Date | Diurnal ¹ | | | | Nocturnal ² | | | |
|----------------------|----------------------|------------|------------|--------------|------------------------|------------|------------|---------------|
| | 25% Alt | Median Alt | 75% Alt | Total Count | 25% Alt | Median Alt | 75% Alt | Total Count |
| 5/15/2008 | 386 | 669 | 917 | 234 | 409 | 641 | 908 | 4,149 |
| 5/16/2008 | 89 | 290 | 584 | 271 | 365 | 596 | 869 | 1,563 |
| 5/17/2008 | 57 | 126 | 312 | 1082 | 89 | 267 | 721 | 295 |
| 5/18/2008 | 82 | 178 | 506 | 795 | 189 | 354 | 587 | 5,540 |
| 5/19/2008 | 52 | 82 | 160 | 442 | 135 | 285 | 475 | 1,874 |
| 5/20/2008 | 71 | 249 | 669 | 305 | 196 | 379 | 660 | 3,811 |
| 5/21/2008 | 87 | 217 | 641 | 1217 | 150 | 303 | 525 | 2,459 |
| 5/22/2008 | 68 | 135 | 612 | 778 | 100 | 196 | 344 | 1,731 |
| 5/23/2008 | 46 | 80 | 162 | 449 | 64 | 132 | 196 | 153 |
| Total Dataset | 68 | 155 | 461 | 5,573 | 198 | 386 | 669 | 21,564 |

Alt = altitude, ft AMSL

¹ Diurnal runs from civil sunrise to civil sunset² Nocturnal runs from civil sunset to civil sunrise

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Appendix C-2

VerCat Mean Traffic Rate Data

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Appendix C-2a
Offshore Radar Surveys

Table C-2a.1. Grid 1, VerCat MTR¹, 14 to 22 March 2008.

| Date | Diurnal² | Nocturnal³ |
|----------------------|----------------------------|------------------------------|
| 03/14/2008 | | 0.7 |
| 03/15/2008 | 6.2 | 5.5 |
| 03/16/2008 | 25.2 | 5.0 |
| 03/17/2008 | 19.5 | 4.6 |
| 03/18/2008 | 15.7 | 7.1 |
| 03/19/2008 | 35.1 | <i>40.5</i> |
| 03/20/2008 | 10.6 | 30.6 |
| 03/21/2008 | 14.9 | 30.0 |
| 03/22/2008 | | 76.7 |
| Total Dataset | 16.2 | 13.6 |

¹ Number of tracks per kilometer per hour

² Diurnal runs from civil sunrise to civil sunset

³ Nocturnal runs from civil sunset to civil sunrise

Note: numbers in smaller font and italics indicate limited survey duration (10 to 39 minutes)

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Appendix C-2b
Onshore Radar Surveys

Table C-2b.1. Island Beach State Park, VerCat MTR¹, 15 to 23 May 2008.

| Date | Diurnal² | Nocturnal³ |
|----------------------|----------------------------|------------------------------|
| 5/15/2008 | 10.8 | 169.7 |
| 5/16/2008 | 6.8 | 68.6 |
| 5/17/2008 | 14.4 | 13.6 |
| 5/18/2008 | 14.3 | 140.4 |
| 5/19/2008 | 5.4 | 40.2 |
| 5/20/2008 | 10.2 | 83.6 |
| 5/21/2008 | 15.1 | 60.6 |
| 5/22/2008 | 9.5 | 37.1 |
| 5/23/2008 | 8.1 | 6.7 |
| Total Dataset | 10.7 | 69.4 |

¹ Number of tracks per kilometer per hour

² Diurnal runs from civil sunrise to civil sunset

³ Nocturnal runs from civil sunset to civil sunrise

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Appendix C-3
TracScan Flight Directions

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Appendix C-3a

Offshore Radar Survey Flight Compass Roses

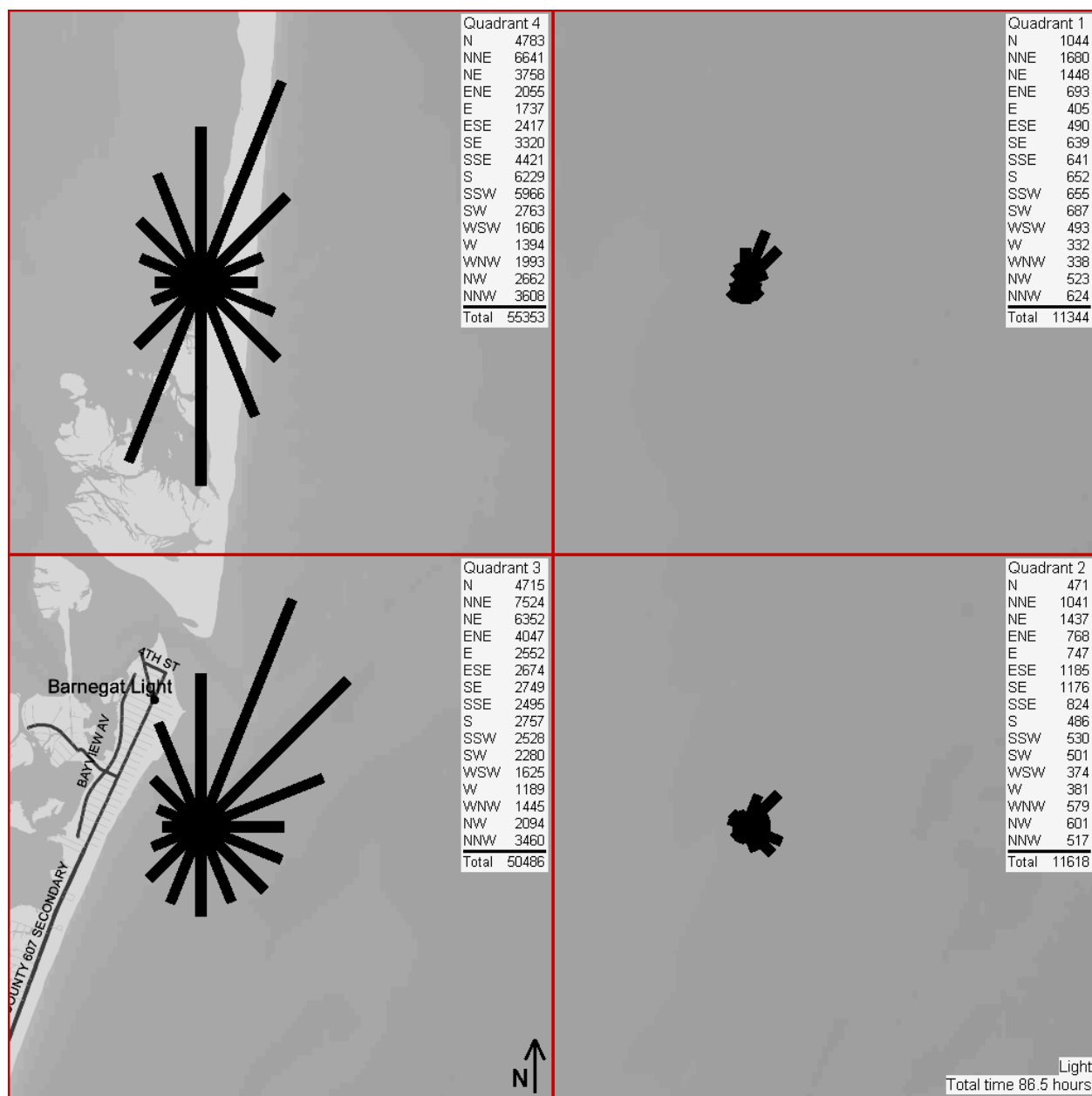


Figure C-3a.1. Diurnal flight compass roses for Grid 1 from 14 to 22 March 2008. Each rose represents one quadrant of the survey area.

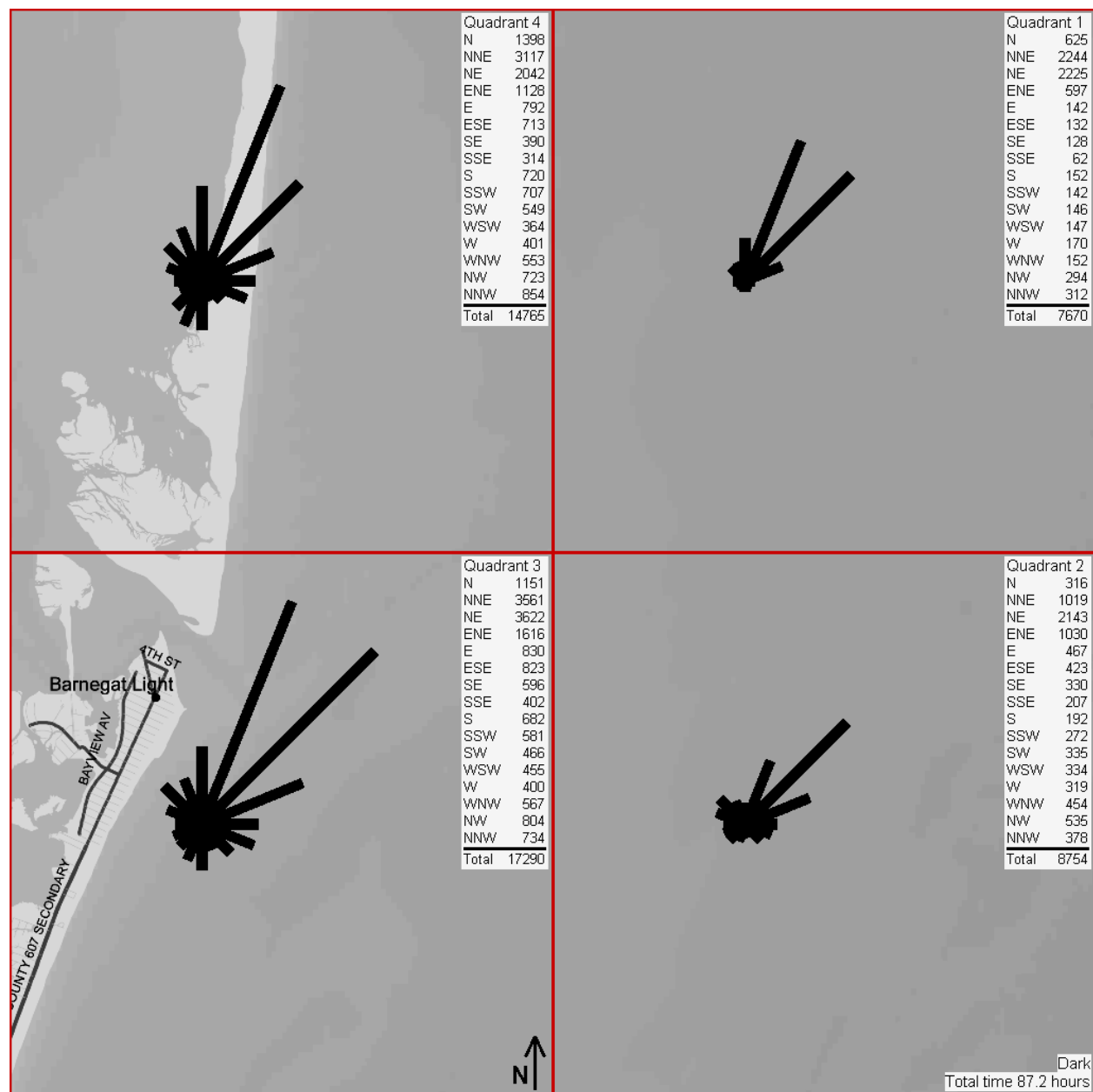


Figure C-3a.2. Nocturnal flight compass roses for Grid 1 from 14 to 22 March 2008. Each rose represents one quadrant of the survey area.

Appendix C-3b

Onshore Radar Survey Flight Compass Roses

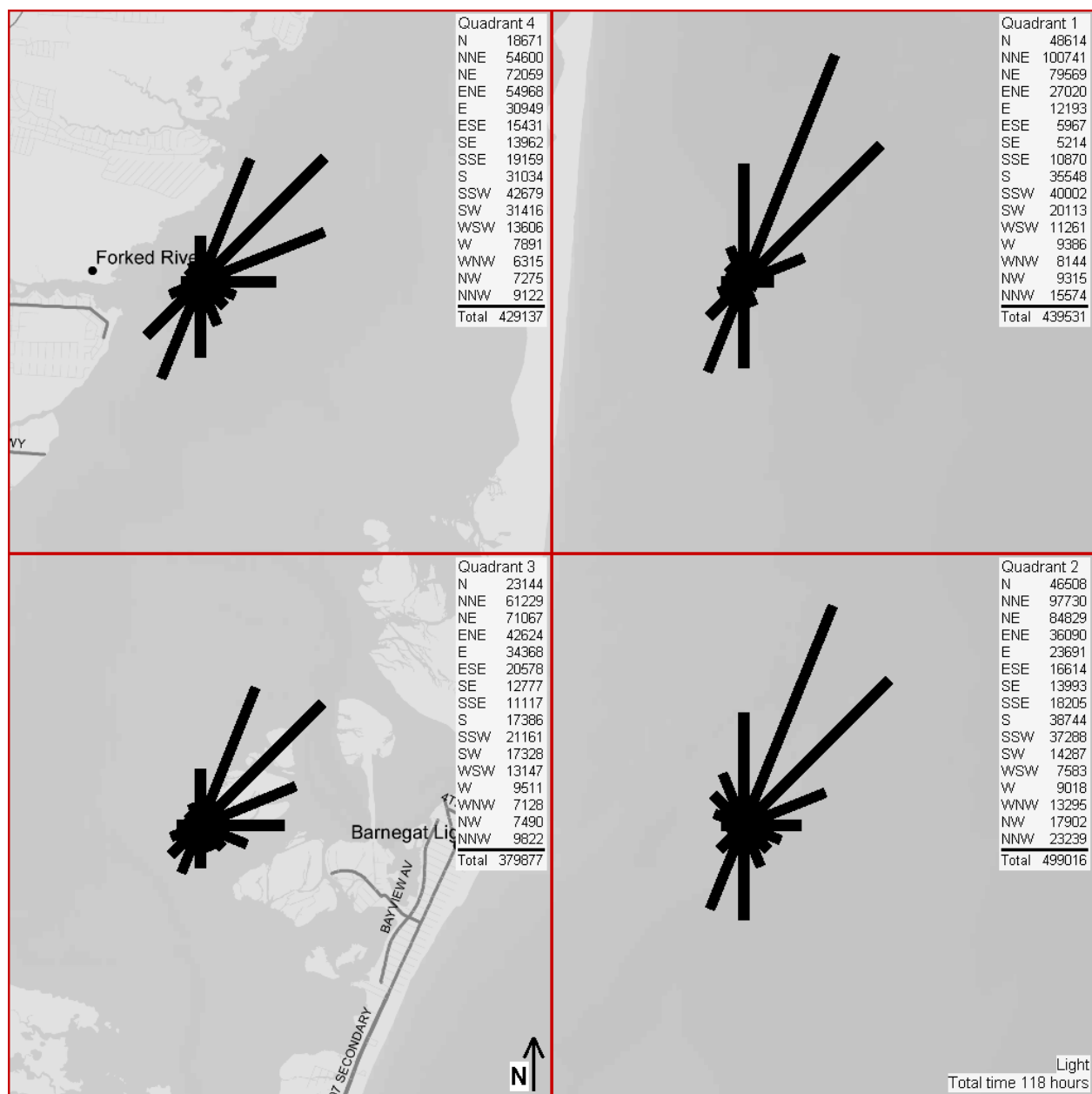


Figure C-3b.1. Diurnal flight compass roses for Island Beach State Park from 15 to 23 May 2008. Each rose represents one quadrant of the survey area.

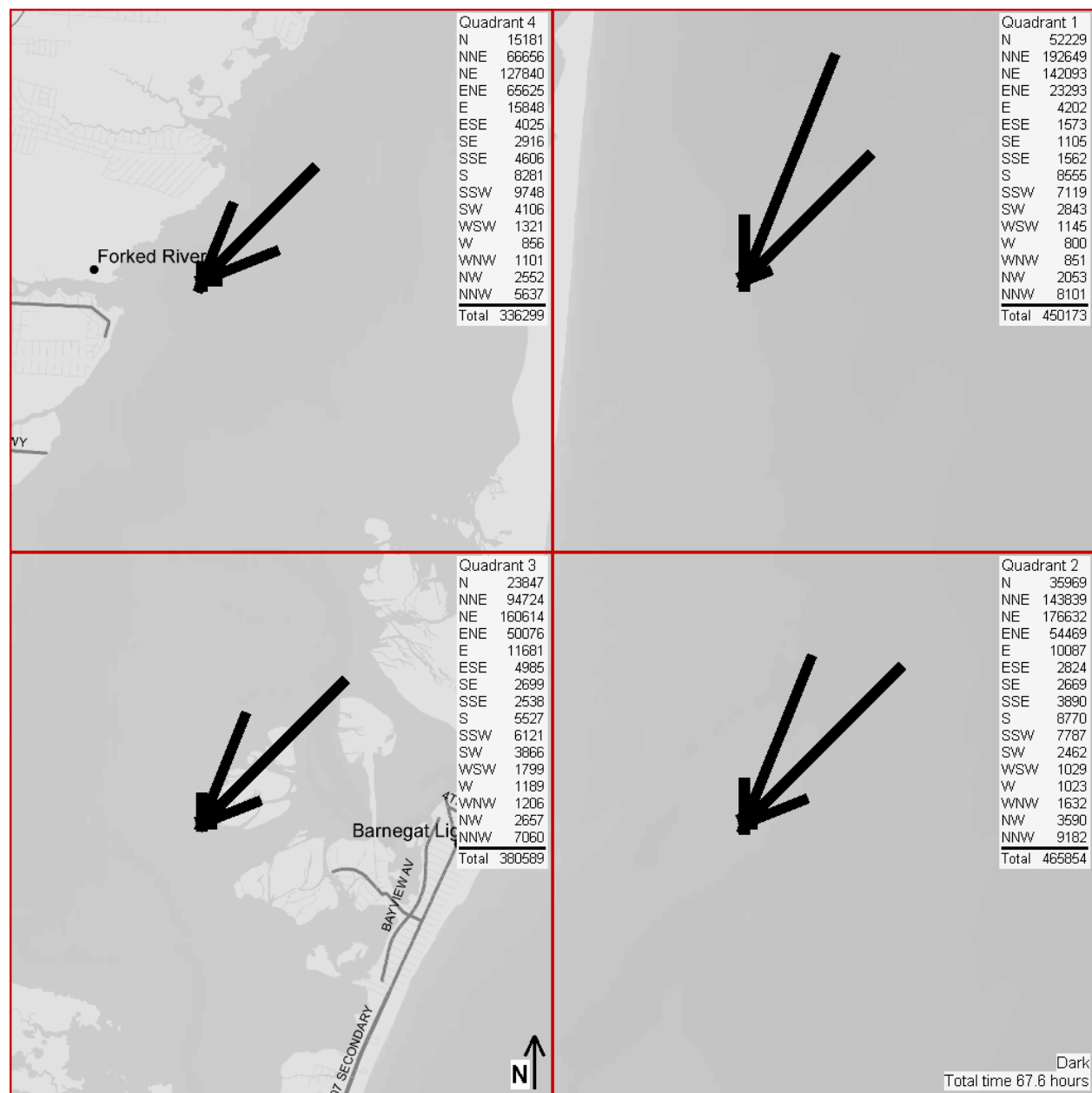


Figure C-3b.2. Nocturnal flight compass roses for Island Beach State Park from 15 to 23 May 2008. Each rose represents one quadrant of the survey area.

Appendix C-4

TI-VPR

Table C-4.1. TI-VPR preliminary analysis.

| Date | Time | ID | Raw Count | Time Corrected Count | Direction | Altitude | Comments |
|-----------|---------|----|-----------|----------------------|-----------|----------|---|
| 5/11/2008 | 0:44:51 | BD | 1 | 3 | 185 | - | Slow and very high bird |
| | 1:38:26 | BD | 1 | 3 | 65 | 750 | |
| | 1:57:39 | BD | 1 | 3 | 25 | 400 | |
| | 1:27:38 | I | 1 | 3 | 230 | - | |
| | 2:20:10 | BD | 1 | 3 | 85 | 550 | |
| | 3:40:16 | BD | 1 | 3 | 100 | 700 | |
| | 2:20:54 | BT | 1 | 3 | 10 | 500 | |
| | 2:03:57 | I | 1 | 3 | 80 | 100 | |
| | 2:43:34 | I | 1 | 3 | 60 | - | |
| | 3:14:40 | I | 1 | 3 | 0 | - | |
| | 3:42:27 | I | 1 | 3 | 95 | - | |
| | 3:45:38 | I | 1 | 3 | 40 | - | |
| | 3:48:05 | I | 1 | 3 | 55 | - | |
| | 4:04:15 | BD | 1 | 3 | 70 | 600 | fast target moving N |
| | 4:18:19 | BD | 1 | 3 | 20 | 400 | fast target moving N |
| | 4:15:50 | I | 1 | 3 | 75 | <100 | low, dull, fast target |
| | 4:19:25 | I | 1 | 3 | 30 | 100 | dull, little modulation |
| | 4:38:09 | I | 1 | 3 | 50 | - | very low, dull and fast through TI screen |
| | 4:50:21 | I | 1 | 3 | 20 | - | very low, dull and fast through TI screen |
| | 5:30:51 | BD | 1 | 3 | 115 | 450 | |
| | 5:34:38 | I | 1 | 3 | 110 | 50 | |
| | 5:49:29 | I | 1 | 3 | 30 | 100 | |
| | 6:03:54 | BD | 1 | 3 | 0 | 50 | very low bird |
| | 6:04:29 | BD | 1 | 3 | 0 | 50 | very low and fast bird |
| | 6:04:50 | BD | 1 | 3 | 240 | 500 | |
| | 6:16:09 | BD | 1 | 3 | 220 | 300 | |
| | 6:17:12 | BD | 1 | 3 | 250 | 250 | |
| | 6:17:39 | BD | 1 | 3 | 30 | 275 | |
| | 6:02:29 | I | 1 | 3 | 210 | - | faint signal, fast across screen |
| | 6:04:46 | I | 1 | 3 | 270 | - | very fast and low insect |
| | 6:04:59 | I | 1 | 3 | 260 | - | |

Table C-4.1 (*continued*). TI-VPR preliminary analysis.

| Date | Time | ID | Raw Count | Time Corrected Count | Direction | Altitude | Comments |
|------|---------|----|-----------|----------------------|-----------|----------|-------------------------------------|
| | 6:17:21 | I | 1 | 3 | 185 | - | |
| | 6:19:31 | I | 1 | 3 | 225 | - | |
| | 6:45:28 | I | 1 | 3 | 255 | 100 | bright, fast and minimal modulation |
| | 6:47:24 | I | 1 | 3 | 230 | 160 | dull low altitude |
| | 6:45:01 | U | 1 | 3 | 355 | 275 | |
| | 7:01:18 | BD | 1 | 3 | 285 | 550 | |
| | 7:02:57 | BD | 1 | 3 | 45 | 300 | |
| | 7:03:29 | BD | 1 | 3 | 180 | 500 | |
| | 7:30:18 | BD | 1 | 3 | 305 | 500 | |
| | 7:45:10 | BD | 1 | 3 | 305 | 550 | |
| | 7:34:14 | I | 1 | 3 | 15 | 200 | |
| | 8:04:52 | BD | 1 | 3 | 60 | 600 | |
| | 8:16:50 | BD | 1 | 3 | 70 | 625 | |
| | 8:31:23 | BD | 1 | 3 | 270 | 475 | |
| | 8:34:19 | BD | 1 | 3 | 140 | 700 | |
| | 8:45:49 | BD | 1 | 3 | 90 | 600 | |
| | 8:47:21 | BD | 1 | 3 | 10 | 400 | |
| | 8:47:56 | BD | 1 | 3 | 355 | 500 | |
| | 8:48:48 | BD | 1 | 3 | 70 | 400 | |
| | 8:49:31 | BD | 1 | 3 | 50 | 500 | |
| | 8:46:21 | I | 1 | 3 | 80 | 100 | |
| | 8:46:49 | I | 1 | 3 | 100 | 125 | |
| | 8:47:19 | I | 1 | 3 | 180 | 150 | |
| | 8:49:19 | I | 1 | 3 | 115 | | |
| | 9:02:54 | BD | 1 | 3 | 160 | 475 | |

APPENDIX D
AVIAN RADAR GROUND TRUTH SURVEY DATA

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Appendix D-1

Offshore Avian Radar Ground Truth Survey Data

Table D-1.1. Offshore ground truth survey data at Station 01, 15 March 2008.

| Radar Type | Dist. (NM) | Time | Species (Common Name) | No. | C/U | Qdrt | Range (m) | Heading (cardinal) | Altitude (ft ASL) |
|------------|------------|------|--------------------------|-----|-----|------|-----------|--------------------|-------------------|
| TS | 2.00 | 1314 | Northern Gannet | 2 | C | 2 | 200 | North | 150 |
| TS | 2.00 | 1318 | Northern Gannet | 2 | C | 2 | 150 | Northeast | 150 |
| TS | 2.00 | 1324 | Northern Gannet | 1 | U | 2 | 300 | North | 100 |
| TS | 2.00 | 1336 | Northern Gannet | 1 | U | 1 | 500 | North | 100 |
| TS | 2.00 | 1338 | Black Scoter | 2 | C | 2 | 100 | South | 100 |
| TS | 2.00 | 1339 | Northern Gannet | 1 | C | 1 | 500 | North | 100 |
| TS | 2.00 | 1340 | Northern Gannet | 1 | C | 1 | 400 | North | 100 |
| TS | 2.00 | 1342 | Black Scoter | 2 | C | 2 | 200 | South | 50 |
| TS | 2.00 | 1348 | Herring Gull | 2 | C | 2 | 150 | East | 75 |
| TS | 2.00 | 1349 | Scoter (unknown) | 1 | U | 1 | 150 | South | 75 |
| TS | 2.00 | 1353 | Northern Gannet | 1 | U | 1 | 200 | North | 100 |
| TS | 2.00 | 1502 | Herring Gull | 2 | U | 2 | 250 | North | 200 |
| TS | 2.00 | 1512 | Gull (unknown) | 2 | U | 2 | 800 | North | 150 |
| VC | 1.00 | 1603 | Herring Gull | 1 | C | NA | 100 | Northeast | 100 |
| VC | 1.00 | 1604 | Herring Gull | 1 | C | NA | 600 | North | 100 |
| VC | 1.00 | 1608 | Herring Gull | 4 | U | NA | 250 | Northeast | 50 |
| VC | 1.00 | 1609 | Herring Gull | 1 | C | NA | 100 | North | 125 |
| VC | 1.00 | 1613 | Great Black-backed Gull | 4 | C | NA | 25 | East | 150 |
| VC | 1.00 | 1615 | Double-crested Cormorant | 18 | C | NA | . | North | 2,000 |
| VC | 1.00 | 1621 | Herring Gull | 1 | C | NA | 350 | East | 100 |

NM = nautical mile(s)

ft ASL = feet above sea level

No. = number

TS = TracScan

C/U = Confirmed/Unconfirmed

VC = VerCat

Qdrt = Observation quadrant

. = missing data

m = meters

Table D-1.2. Offshore ground truth survey data at Station 07, 22 March 2008.

| Radar Type | Dist. (NM) | Time | Species (Common Name) | No. | C/U | Qdrt | Range (m) | Heading (cardinal) | Altitude (ft ASL) |
|------------|------------|------|-------------------------|-----|-----|------|-----------|--------------------|-------------------|
| TS | 2.00 | 1537 | Northern Gannet | 1 | C | 3 | 725 | East | 25 |
| TS | 2.00 | 1544 | Northern Gannet | 1 | C | 2 | 500 | South | 25 |
| TS | 2.00 | 1547 | Great Black-backed Gull | 1 | U | 2 | 725 | South | 15 |
| TS | 2.00 | 1547 | Scoter (unknown) | 22 | C | 1 | 500 | Southwest | 25 |
| TS | 2.00 | 1549 | Northern Gannet | 1 | U | 3 | 400 | Southeast | 10 |
| TS | 2.00 | 155 | Northern Gannet | 2 | C | 2 | 200 | Southeast | 100 |
| TS | 2.00 | 1557 | Northern Gannet | 1 | C | 1 | 200 | Northeast | 60 |
| TS | 2.00 | 1559 | Northern Gannet | 1 | C | 1 | 200 | East | 150 |
| TS | 2.00 | 1602 | Northern Gannet | 5 | U | 4 | 700 | Southeast | 150 |
| TS | 2.00 | 1606 | Scoter (unknown) | 5 | U | 3 | 500 | South | 5 |
| TS | 2.00 | 1614 | Northern Gannet | 1 | C | 3 | 800 | Northwest | 100 |
| TS | 2.00 | 1702 | Northern Gannet | 1 | C | 2 | 500 | Southwest | 75 |
| TS | 2.00 | 1709 | Great Black-backed Gull | 1 | C | 3 | 700 | Southwest | 50 |
| TS | 2.00 | 1711 | Northern Gannet | 1 | U | 2 | 100 | Northeast | 50 |
| TS | 2.00 | 1717 | Northern Gannet | 1 | C | 1 | 200 | North | 150 |
| TS | 2.00 | 1721 | Northern Gannet | 1 | U | 1 | 200 | North | 50 |
| TS | 2.00 | 1723 | Northern Gannet | 1 | C | 2 | 700 | South | 75 |
| TS | 1.00 | 1819 | Northern Gannet | 1 | C | 1 | 200 | South | 100 |
| TS | 1.00 | 1820 | Northern Gannet | 1 | C | 2 | 150 | South | 100 |
| TS | 1.00 | 1821 | Northern Gannet | 1 | C | 1 | 100 | South | 50 |
| TS | 1.00 | 1822 | Northern Gannet | 1 | C | 1 | 100 | East | 75 |
| TS | 1.00 | 1823 | Northern Gannet | 1 | C | 4 | 200 | South | 150 |
| TS | 1.00 | 1825 | Northern Gannet | 1 | C | 4 | 400 | Northeast | 50 |
| TS | 1.00 | 1825 | Northern Gannet | 1 | C | 2 | 100 | Southwest | 75 |
| TS | 1.00 | 1826 | Northern Gannet | 1 | C | 3 | 200 | South | 75 |
| TS | 1.00 | 1828 | Surf Scoter | 7 | C | 4 | 100 | South | 5 |
| TS | 1.00 | 1829 | Northern Gannet | 1 | U | 1 | 750 | South | 5 |
| TS | 1.00 | 1830 | Northern Gannet | 1 | C | 1 | 250 | South | 100 |
| TS | 1.00 | 1831 | Northern Gannet | 3 | C | 1 | 100 | North | 200 |
| TS | 1.00 | 1833 | Northern Gannet | 1 | C | 2 | 100 | Northwest | 100 |
| TS | 1.00 | 1834 | Northern Gannet | 1 | C | 1 | 100 | Northwest | 75 |
| TS | 1.00 | 1835 | Northern Gannet | 1 | U | 1 | 100 | Northeast | 2 |
| TS | 1.00 | 1837 | Northern Gannet | 1 | C | 4 | 50 | South | 50 |
| VC | 0.50 | 1902 | Northern Gannet | 1 | C | 1 | 100 | South | 75 |
| VC | 0.50 | 1910 | Northern Gannet | 1 | C | 1 | 25 | North | 75 |
| VC | 0.50 | 1915 | Northern Gannet | 1 | C | 2 | 75 | South | 100 |
| VC | 0.50 | 1920 | Northern Gannet | 1 | C | 1 | 300 | North | 50 |
| VC | 0.50 | 1923 | Northern Gannet | 1 | C | 1 | 100 | South | 75 |

NM = nautical mile(s)

ft ASL = feet above sea level

No. = number

TS = TracScan

C/U = Confirmed/Unconfirmed

VC = VerCat

Qdrt = Observation quadrant

m = meters

Table D-1.3. Offshore ground truth survey data at Station 19, 19 April 2008.

| Radar Type | Dist. (NM) | Time | Species (Common Name) | No. | C/U | Qdrt | Range (m) | Heading (cardinal) | Altitude (ft ASL) |
|------------|------------|------|-------------------------|-----|-----|------|-----------|--------------------|-------------------|
| TS | 2.00 | 1212 | Northern Gannet | 1 | U | 1 | 50 | West | 50 |
| TS | 2.00 | 1213 | Northern Gannet | 4 | C | 1 | 300 | East | 10 |
| TS | 2.00 | 1214 | Northern Gannet | 1 | C | 2 | 200 | North | 75 |
| TS | 2.00 | 1215 | Northern Gannet | 1 | C | 2 | 200 | Northeast | 50 |
| TS | 2.00 | 1216 | Northern Gannet | 1 | U | 2 | 250 | South | 75 |
| TS | 2.00 | 1217 | Scoter (unknown) | 40 | C | 1 | 250 | East | 15 |
| TS | 2.00 | 1218 | Northern Gannet | 1 | U | 2 | 100 | West | 75 |
| TS | 2.00 | 1220 | Northern Gannet | 1 | C | 2 | 100 | East | 160 |
| TS | 2.00 | 1222 | Scoter (unknown) | 10 | C | 4 | 500 | East | 10 |
| TS | 2.00 | 1229 | Gull (unknown) | 1 | C | 1 | 250 | Northeast | 150 |
| TS | 2.00 | 1231 | Northern Gannet | 1 | U | 1 | 100 | Northeast | 75 |
| TS | 2.00 | 1235 | Northern Gannet | 1 | C | 2 | 75 | West | 75 |
| TS | 2.00 | 1237 | Gull (unknown) | 1 | C | 2 | 100 | East | 60 |
| TS | 2.00 | 1238 | Scoter (unknown) | 6 | C | 1 | 250 | Northeast | 2 |
| TS | 2.00 | 1241 | Great Black-backed Gull | 6 | C | 4 | 100 | Northeast | 75 |
| TS | 1.00 | 1303 | Loon (unknown) | 1 | C | 2 | 100 | Northeast | 75 |
| TS | 1.00 | 1304 | Gull (unknown) | 1 | C | 2 | 100 | East | 50 |
| TS | 1.00 | 1305 | Northern Gannet | 1 | C | 4 | 450 | West | 75 |
| TS | 1.00 | 1306 | Cormorant (unknown) | 1 | C | 2 | 100 | Northeast | 75 |
| TS | 1.00 | 1308 | Herring Gull | 1 | C | 3 | 200 | North | 25 |
| TS | 1.00 | 1309 | Cormorant (unknown) | 1 | C | 1 | 400 | Northeast | 75 |
| TS | 1.00 | 1312 | Gull (unknown) | 2 | C | 1 | 500 | East | 15 |
| TS | 1.00 | 1313 | Gull (unknown) | 1 | C | 2 | 300 | Northeast | 20 |
| TS | 1.00 | 1315 | Loon (unknown) | 1 | C | 1 | 400 | East | 150 |
| TS | 1.00 | 1318 | Scoter (unknown) | 12 | U | 4 | 150 | South | 5 |
| TS | 1.00 | 1322 | Loon (unknown) | 1 | C | 2 | 50 | East | 20 |
| TS | 1.00 | 1325 | Common Loon | 1 | C | 2 | 100 | East | 2 |
| TS | 1.00 | 1327 | Northern Gannet | 1 | C | 1 | 100 | North | 50 |
| TS | 1.00 | 1328 | Common Loon | 1 | C | 4 | 350 | North | 10 |
| TS | 1.00 | 1330 | Common Loon | 1 | U | 3 | 35 | North | 75 |

NM = nautical mile(s)

m = meters

No. = number

ASL = feet above sea level

C/U = Confirmed/Unconfirmed

TS = TracScan

Qdrt = Observation quadrant

Table D-1.4. Offshore ground truth survey data at Station 23, 03 May 2008.

| Radar Type | Dist. (NM) | Time | Species (Common Name) | No. | C/U | Qdrt | Range (m) | Heading (cardinal) | Altitude (ft ASL) |
|------------|------------|------|-----------------------|-----|-----|------|-----------|--------------------|-------------------|
| TS | 1.75 | 1642 | Northern Gannet | 2 | C | . | 250 | Southwest | 5 |
| TS | 1.75 | 1643 | Herring Gull | 1 | C | . | 100 | Southwest | 25 |
| TS | 1.75 | 1647 | Herring Gull | 1 | U | . | 100 | Northeast | 2 |
| TS | 1.75 | 1651 | Herring Gull | 1 | C | . | 50 | Southwest | 25 |
| TS | 1.75 | 1736 | Northern Gannet | 1 | C | . | 150 | Northeast | 50 |
| TS | 1.75 | 1738 | Northern Gannet | 1 | C | . | 50 | Southeast | 20 |
| TS | 1.75 | 1741 | Laughing Gull | 1 | C | . | 100 | East | 25 |
| TS | 1.75 | 1754 | Common Tern | 1 | C | . | 175 | Southeast | 20 |
| TS | 1.75 | 1758 | Northern Gannet | 1 | U | . | 200 | Southeast | 20 |
| TS | 3.00 | 1840 | Northern Gannet | 1 | U | . | 30 | Northeast | 2 |
| TS | 3.00 | 1849 | Northern Gannet | 1 | U | . | 150 | Southeast | 50 |
| TS | 3.00 | 1849 | Northern Gannet | 2 | C | . | 150 | East | 75 |
| TS | 3.00 | 1851 | Northern Gannet | 1 | C | . | 150 | East | 25 |
| TS | 3.00 | 1856 | Northern Gannet | 1 | U | . | 50 | East | 1 |
| TS | 3.00 | 1857 | Northern Gannet | 2 | U | . | 15 | variable | 10 |
| TS | 3.00 | 1901 | Northern Gannet | 2 | U | . | 20 | diving | 10 |

NM = nautical mile(s)

m = meters

No. = number

ft ASL = feet above sea level

C/U = Confirmed/Unconfirmed

TS = TracScan

Qdrt = Observation quadrant

. = missing data

Appendix D-2

Onshore Avian Radar Ground Truth Survey Data

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Table D-2.1. Onshore ground truth survey data at Island Beach State Park, New Jersey, on 18 May 2008. All radar data are TracScan.

| Date | Dist. (NM) | Time | Species (Common Name) | No. | C/U | Qdrt | Range (m) | Heading (cardinal) | Altitude (ft ASL) |
|-----------|------------|------|------------------------|-----|-----|------|-----------|--------------------|-------------------|
| 5/18/2008 | 1.00 | 1905 | Great Black-black Gull | 1 | C | 4 | 300 | South | 75 |
| 5/18/2008 | 1.00 | 1907 | Tern (unknown) | 1 | C | 1 | 100 | South | 100 |
| 5/18/2008 | 1.00 | 1908 | Great Black-black Gull | 1 | C | 4 | 100 | South | 75 |
| 5/18/2008 | 1.00 | 1909 | Great Black-black Gull | 1 | C | 2 | 50 | South | 50 |
| 5/18/2008 | 1.00 | 1911 | Barn Swallow | 4 | C | 2 | 600 | variable | 75 |
| 5/18/2008 | 1.00 | 1914 | Great Black-black Gull | 1 | C | 3 | 150 | North | 125 |
| 5/18/2008 | 1.00 | 1916 | Laughing Gull | 1 | U | 1 | 50 | South | 100 |
| 5/18/2008 | 1.00 | 1918 | Gull (unknown) | 1 | C | 4 | 800 | North | 150 |
| 5/18/2008 | 1.00 | 1921 | . | . | U | . | 400 | . | . |
| 5/18/2008 | 1.00 | 1924 | Herring Gull | 1 | C | 3 | 400 | South | 50 |
| 5/18/2008 | 1.00 | 1928 | Osprey | 1 | U | 4 | 300 | West | 50 |

NM = nautical mile(s)

m = meters

No. = number

ft ASL = feet above sea level

C/U = Confirmed/Unconfirmed

. = missing data

Qdrt = Observation quadrant

Table D-2.2. Onshore ground truth survey data at Brigantine, New Jersey, on 05 June 2008. All radar data are TracScan.

| Date | Dist. (NM) | Time | Species (Common Name) | No. | C/U | Qdrt | Range (m) | Heading (cardinal) | Altitude (ft ASL) |
|----------|------------|------|-------------------------|-----|-----|------|-----------|--------------------|-------------------|
| 6/5/2008 | 1.00 | 1437 | Great Black-backed Gull | 1 | C | 3 | 240 | West | 75 |
| 6/5/2008 | 1.00 | 1439 | Laughing Gull | 1 | C | 2 | 1152 | South | 100 |
| 6/5/2008 | 1.00 | 1443 | Great Black-backed Gull | 1 | C | 2 | 467 | South | 50 |
| 6/5/2008 | 1.00 | 1445 | Great Black-backed Gull | 1 | C | 1 | 878 | East | 100 |
| 6/5/2008 | 1.00 | 1447 | Laughing Gull | 1 | C | 4 | 909 | Northwest | 50 |
| 6/5/2008 | 1.00 | 1451 | Great Black-backed Gull | 1 | C | 4 | 137 | Southwest | 50 |
| 6/5/2008 | 1.00 | 1453 | Great Black-backed Gull | 1 | C | 1 | 539 | South | 75 |
| 6/5/2008 | 1.00 | 1454 | Herring Gull | 1 | C | 1 | 512 | South | 100 |
| 6/5/2008 | 1.00 | 1456 | Great Black-backed Gull | 1 | C | 1 | 362 | West | 35 |
| 6/5/2008 | 1.00 | 1457 | Great Black-backed Gull | 1 | C | 2 | 253 | South | 40 |
| 6/5/2008 | 1.00 | 1458 | Tern (unknown) | 1 | C | 4 | 142 | South | 45 |

NM = nautical mile(s)

m = meters

No. = number

ft ASL = feet above sea level

C/U = Confirmed/Unconfirmed

. = missing data

Qdrt = Observation quadrant

Table D-2.3. Onshore ground truth survey data at Corson's Inlet, New Jersey, on 10 June 2008. All radar data are TracScan.

| Date | Dist. (NM) | Time | Species (Common Name) | No. | C/U | Qdrt | Range (m) | Heading (cardinal) | Altitude (ft ASL) |
|-----------|------------|------|--------------------------|-----|-----|------|-----------|--------------------|-------------------|
| 6/10/2008 | 1.00 | 1452 | Great Black-backed Gull | 1 | C | 3 | 1,211 | North | 75 |
| 6/10/2008 | 1.00 | 1455 | . | . | U | 3 | 946 | North | . |
| 6/10/2008 | 1.00 | 1456 | Purple Martin | 1 | C | 3 | 565 | South | 100 |
| 6/10/2008 | 1.00 | 1503 | Double-crested Cormorant | 4 | C | 3 | 1,008 | East | 75 |
| 6/10/2008 | 1.00 | 1504 | Herring Gull | 1 | C | 3 | 1,244 | East | 80 |
| 6/10/2008 | 1.00 | 1505 | Gull, large (unknown) | 2 | C | 2 | 916 | East | 80 |
| 6/10/2008 | 1.00 | 1507 | Great Black-backed Gull | 1 | C | 3 | 1,660 | East | 50 |
| 6/10/2008 | 1.00 | 1509 | Herring Gull | 1 | C | 3 | 783 | North | 45 |
| 6/10/2008 | 1.00 | 1515 | Common Tern | 1 | C | 3 | 1,318 | Northeast | 75 |
| 6/10/2008 | 1.00 | 1516 | Gull, large (unknown) | 2 | C | 2 | 1,010 | East | 80 |
| 6/10/2008 | 1.00 | 1522 | Bat (unknown) | 1 | C | 3 | 1,111 | North | 45 |
| 6/10/2008 | 1.00 | 1549 | Herring Gull | 1 | C | 3 | 3,250 | South | 60 |
| 6/10/2008 | 1.00 | 1550 | Snowy Egret | 1 | C | 3 | 2,591 | North | 25 |
| 6/10/2008 | 1.00 | 1552 | Herring Gull | 1 | C | 3 | 2,497 | North | 50 |
| 6/10/2008 | 1.00 | 1558 | Common Tern | 1 | C | 3 | 2,547 | West | 35 |
| 6/10/2008 | 1.00 | 1600 | Gull, large (unknown) | 1 | C | 3 | 2,757 | East | 70 |
| 6/10/2008 | 1.00 | 1602 | Herring Gull | 1 | C | 3 | 2,407 | Northwest | 120 |
| 6/10/2008 | 1.00 | 1605 | Great Egret | 1 | C | 3 | 2,018 | Northeast | 100 |
| 6/10/2008 | 1.00 | 1605 | Great Egret | 1 | C | 3 | 2,355 | Northeast | 70 |
| 6/10/2008 | 1.00 | 1607 | Herring Gull | 5 | C | 3 | 2,669 | North | 40 |
| 6/10/2008 | 1.00 | 1611 | Herring Gull | 1 | C | 3 | 2,445 | Northeast | 150 |
| 6/10/2008 | 1.00 | 1613 | Herring Gull | 1 | C | 3 | 2,590 | South | 10 |
| 6/10/2008 | 1.00 | 1614 | Herring Gull | 1 | C | 3 | 3,171 | Northwest | 100 |
| 6/10/2008 | 1.00 | 1615 | Herring Gull | 1 | C | 3 | 2,409 | Northwest | 15 |
| 6/10/2008 | 1.00 | 1658 | Double-crested Cormorant | 2 | C | 4 | 3,737 | West | 70 |
| 6/10/2008 | 1.00 | 1659 | Glossy Ibis | 1 | C | 1 | 2,387 | North | 150 |
| 6/10/2008 | 1.00 | 1700 | Glossy Ibis | 1 | C | 1 | 2,414 | South | 150 |
| 6/10/2008 | 1.00 | 1704 | Glossy Ibis | 1 | C | 1 | 3,343 | North | 70 |
| 6/10/2008 | 1.00 | 1714 | Snowy Egret | 1 | C | 1 | 2,885 | Northeast | 120 |
| 6/10/2008 | 1.00 | 1716 | Snowy Egret | 1 | C | 1 | 3,155 | West | 60 |
| 6/10/2008 | 1.00 | 1718 | Glossy Ibis | 1 | C | 4 | 2,426 | North | 100 |
| 6/10/2008 | 1.00 | 1719 | Fish Crow | 1 | C | 1 | 3,052 | East | 70 |
| 6/10/2008 | 1.00 | 1722 | Gull, large (unknown) | 1 | C | 4 | 2,622 | Northeast | 150 |

NM = nautical mile(s)

m = meters

No. = number

ft ASL = feet above sea level

C/U = Confirmed/Unconfirmed

. = missing data

Qdrt = Observation quadrant

Table D-2.4. Onshore ground truth survey data at Island Beach State Park, New Jersey, in fall 2008. All radar data are TracScan.

| Date | Dist. (NM) | Time | Species (Common Name) | No. | C/U | Qdrt | Range (m) | Heading (cardinal) | Altitude (ft ASL) |
|-----------|------------|------|-------------------------|-----|-----|------|-----------|--------------------|-------------------|
| 9/15/2008 | 1.00 | 1951 | Great Black-backed Gull | 1 | C | 4 | 100 | Northeast | 100 |
| 9/15/2008 | 1.00 | 1954 | Great Black-backed Gull | 1 | C | 4 | 400 | South | 100 |
| 9/15/2008 | 1.00 | 1958 | Great Black-backed Gull | 1 | C | 3 | 550 | South | 200 |
| 9/15/2008 | 1.00 | 2003 | Great Black-backed Gull | 1 | C | 3 | 345 | North | 200 |
| 9/15/2008 | 1.00 | 2012 | Great Black-backed Gull | 1 | C | 3 | 400 | South | 200 |
| 9/15/2008 | 1.00 | 2014 | Great Black-backed Gull | 1 | C | 4 | 500 | East | 125 |
| 9/15/2008 | 1.00 | 2017 | Great Black-backed Gull | 1 | C | 4 | 25 | East | 100 |
| 9/15/2008 | 0.03 | 2125 | Great Black-backed Gull | 1 | C | 1 | 805 | East | 200 |
| 9/15/2008 | 0.03 | 2127 | Great Black-backed Gull | 1 | C | 1 | 322 | South | 150 |
| 9/15/2008 | 0.03 | 2128 | Tern (unknown) | 2 | C | 1 | 1207 | South | 150 |
| 9/15/2008 | 0.03 | 2129 | Tern (unknown) | 1 | C | 1 | 402 | South | 100 |
| 9/15/2008 | 0.03 | 2130 | Laughing Gull | 1 | C | 1 | 965 | South | 150 |
| 9/15/2008 | 0.03 | 2131 | Tern (unknown) | 1 | C | 1 | 965 | North | 150 |
| 9/15/2008 | 0.03 | 2132 | Common Tern | 1 | C | 1 | 402 | North | 100 |
| 9/15/2008 | 0.03 | 2134 | Caspian Tern | 2 | C | 1 | 805 | South | 50 |
| 9/15/2008 | 0.03 | 2134 | Common Tern | 10 | C | 1 | 402 | South | 75 |
| 9/15/2008 | 0.03 | 2137 | Great Black-backed Gull | 1 | C | 1 | 805 | North | 50 |
| 9/15/2008 | 0.03 | 2138 | Common Tern | 2 | C | 1 | 644 | North | 100 |
| 9/15/2008 | 0.03 | 2140 | Forster's Tern | 3 | C | 1 | 322 | North | 200 |
| 9/15/2008 | 0.03 | 2141 | Tern, small (unknown) | 7 | C | 1 | 483 | variable | 100 |
| 9/15/2008 | 0.03 | 2143 | Great Blue Heron | 1 | C | 1 | 805 | South | 300 |
| 9/15/2008 | 0.03 | 2146 | Laughing Gull | 1 | C | 1 | 483 | North | 200 |
| 9/15/2008 | 0.03 | 2146 | Tern (unknown) | . | C | 1 | 644 | variable | 150 |
| 9/15/2008 | 0.03 | 2148 | Gull, large (unknown) | 2 | C | 1 | 322 | South | 150 |
| 9/15/2008 | 0.03 | 2148 | Tern (unknown) | 1 | C | 1 | 322 | South | 150 |
| 9/15/2008 | 0.03 | 2149 | Laughing Gull | 1 | C | 1 | 483 | South | 200 |
| 9/15/2008 | 0.03 | 2150 | Tern (unknown) | 7 | C | 1 | 1126 | South | 350 |
| 9/15/2008 | 0.03 | 2153 | Tern (unknown) | 1 | C | 1 | 322 | North | 200 |
| 9/15/2008 | 0.03 | 2154 | Osprey | 1 | C | 1 | 483 | North | 250 |
| 9/15/2008 | 0.03 | 2156 | Tern (unknown) | 2 | C | 1 | 483 | South | 125 |

Table D-2.4 (*continued*). Onshore ground truth survey data at Island Beach State Park, New Jersey, in fall 2008. All radar data are TracScan.

| Date | Dist. (NM) | Time | Species (Common Name) | No. | C/U | Qdrt | Range (m) | Heading (cardinal) | Altitude (ft ASL) |
|-----------|------------|------|-------------------------|-----|-----|------|-----------|--------------------|-------------------|
| 9/15/2008 | 0.03 | 2157 | Common Tern | 3 | C | 1 | 322 | South | 200 |
| 9/15/2008 | 0.03 | 2158 | Gull (unknown) | 3 | C | 1 | 483 | South | 200 |
| 9/15/2008 | 0.03 | 2200 | Tern (unknown) | 6 | C | 1 | 644 | South | 175 |
| 9/15/2008 | 0.03 | 2202 | Great Black-backed Gull | 1 | C | 1 | 1126 | South | 250 |
| 9/21/2008 | 0.03 | 1853 | Gull (unknown) | 1 | C | 1 | 483 | North | 100 |
| 9/21/2008 | 0.03 | 1857 | Gull (unknown) | 1 | C | 1 | 805 | North | 75 |
| 9/21/2008 | 0.03 | 1858 | Great Black-backed Gull | 1 | C | 1 | 644 | North | 150 |
| 9/21/2008 | 0.03 | 1900 | Gull (unknown) | 1 | C | 1 | 1126 | North | 150 |
| 9/21/2008 | 0.03 | 1900 | Gull (unknown) | 2 | C | 1 | 805 | South | 150 |
| 9/21/2008 | 0.03 | 1901 | Gull (unknown) | 1 | C | 1 | 644 | South | 150 |
| 9/21/2008 | 0.03 | 1902 | Great Black-backed Gull | 1 | C | 1 | 1207 | North | 300 |
| 9/21/2008 | 0.03 | 1905 | Gull (unknown) | 1 | C | 1 | 483 | South | 75 |
| 9/21/2008 | 0.03 | 1906 | Gull (unknown) | 1 | C | 1 | 805 | Southwest | 100 |
| 9/21/2008 | 0.03 | 1908 | Gull (unknown) | 1 | C | 1 | 805 | North | 110 |
| 9/21/2008 | 0.03 | 1909 | Gull (unknown) | 2 | C | 1 | 965 | North | 150 |
| 9/21/2008 | 0.03 | 1910 | Gull (unknown) | 1 | C | 1 | 1287 | Northwest | 150 |
| 9/21/2008 | 0.03 | 1912 | Gull (unknown) | 1 | C | 1 | 965 | Northeast | 100 |
| 9/21/2008 | 0.03 | 1913 | Gull (unknown) | 1 | C | 1 | 644 | South | 100 |
| 9/21/2008 | 0.03 | 1914 | Tern (unknown) | 2 | C | 1 | 644 | North | 50 |
| 9/21/2008 | 0.03 | 1916 | Gull (unknown) | 1 | C | 1 | 1287 | Northeast | 200 |
| 9/21/2008 | 0.03 | 1917 | Gull (unknown) | 1 | C | 1 | 1207 | Southwest | 150 |
| 9/21/2008 | 0.03 | 1919 | Gull (unknown) | 1 | C | 1 | 644 | South | 200 |
| 9/21/2008 | 0.03 | 1921 | Gull (unknown) | 3 | C | 1 | 805 | East | 110 |
| 9/21/2008 | 0.03 | 1923 | Gull (unknown) | 1 | C | 1 | 1287 | North | 100 |
| 9/21/2008 | 0.03 | 1927 | Gull (unknown) | 1 | C | 1 | 1207 | Northeast | 200 |
| 9/21/2008 | 0.03 | 1929 | Tern (unknown) | 2 | C | 1 | 483 | . | 75 |
| 9/21/2008 | 0.03 | 1931 | Tern (unknown) | 1 | C | 1 | 805 | South | 100 |
| 10/2/2008 | 0.03 | 1727 | Herring Gull | 1 | C | 1 | 322 | West | 30 |
| 10/2/2008 | 0.03 | 1730 | Gull (unknown) | 1 | C | 1 | 322 | South | 100 |

Table D-2.4 (*continued*). Onshore ground truth survey data at Island Beach State Park, New Jersey, in fall 2008. All radar data are TracScan.

| Date | Dist. (NM) | Time | Species (Common Name) | No. | C/U | Qdrt | Range (m) | Heading (cardinal) | Altitude (ft ASL) |
|-----------|------------|------|-------------------------------|-----|-----|------|-----------|--------------------|-------------------|
| 10/2/2008 | 0.03 | 1732 | Gull, small/tern | 2 | C | 1 | 322 | Southeast | 120 |
| 10/2/2008 | 0.03 | 1736 | Gull (unknown) | 2 | C | 1 | 644 | North | 50 |
| 10/2/2008 | 0.03 | 1737 | Gull (unknown) | 1 | C | 1 | 644 | South | 50 |
| 10/2/2008 | 0.03 | 1740 | Gull, small/tern | 2 | C | 1 | 805 | Southeast | 50 |
| 10/2/2008 | 0.03 | 1743 | Tern (unknown) | 3 | C | 1 | 322 | South | 40 |
| 10/2/2008 | 0.03 | 1748 | Scoter, dark-winged (unknown) | 7 | C | 1 | 644 | East | 3 |
| 10/2/2008 | 0.03 | 1750 | Great Black-backed Gull | 1 | C | 1 | 483 | South | 25 |
| 10/2/2008 | 0.03 | 1751 | Scoter (unknown) | 25 | C | 1 | 1609 | Southwest | 200 |
| 10/2/2008 | 0.03 | 1751 | Northern Gannet | 1 | C | 1 | 1609 | South | 125 |
| 10/2/2008 | 0.03 | 1754 | . | 4 | C | 1 | 1609 | South | 150 |
| 10/2/2008 | 0.03 | 1755 | Tern (unknown) | 25 | C | 1 | 1207 | South | 200 |
| 10/2/2008 | 0.03 | 1758 | Great Black-backed Gull | 1 | C | 1 | 483 | East | 50 |
| 10/2/2008 | 0.03 | 1759 | Forster's Tern | 1 | C | 1 | 965 | Northwest | 20 |
| 10/2/2008 | 0.03 | 1801 | Gull, large (unknown) | 1 | C | 1 | 1207 | North | 50 |
| 10/2/2008 | 0.03 | 1802 | Tern (unknown) | 1 | C | 1 | 322 | North | 50 |
| 10/2/2008 | 0.03 | 1804 | . | 1 | U | 1 | 644 | Northeast | . |
| 10/2/2008 | 0.03 | 1806 | Scoter/Atlantic Brant | 13 | C | 1 | 1609 | South | 20 |
| 10/2/2008 | 0.03 | 1808 | Gull, large (unknown) | 1 | C | 1 | 1207 | Northeast | 30 |
| 10/2/2008 | 0.03 | 1809 | Gull, large (unknown) | 1 | C | 1 | 1207 | North | 200 |
| 10/2/2008 | 0.03 | 1810 | Gull, large (unknown) | 3 | C | 1 | 1207 | North | 300 |
| 10/2/2008 | 0.03 | 1813 | Gull, small/tern | 3 | C | 1 | 1126 | South | 10 |
| 10/2/2008 | 0.03 | 1815 | Tern (unknown) | 8 | C | 1 | 483 | South | 25 |
| 10/2/2008 | 0.03 | 1818 | Gull (unknown) | 1 | C | 1 | 805 | West | 30 |
| 10/2/2008 | 0.03 | 1818 | Scoter (unknown) | 6 | C | 1 | 1609 | South | 50 |
| 10/2/2008 | 0.03 | 1820 | Northern Gannet | 1 | C | 1 | 805 | South | 60 |
| 10/2/2008 | 0.03 | 1822 | Tern (unknown) | 6 | C | 1 | 483 | South | 100 |
| 10/2/2008 | 0.03 | 1823 | Great Black-backed Gull | 1 | C | 1 | 805 | North | 20 |
| 10/2/2008 | 0.03 | 1825 | Tern (unknown) | 6 | C | 1 | 483 | South | 100 |
| 10/2/2008 | 0.03 | 1826 | Northern Gannet | 3 | C | 1 | 1609 | variable | 500 |

Table D-2.4 (*continued*). Onshore ground truth survey data at Island Beach State Park, New Jersey, in fall 2008. All radar data are TracScan.

| Date | Dist. (NM) | Time | Species (Common Name) | No. | C/U | Qdrt | Range (m) | Heading (cardinal) | Altitude (ft ASL) |
|-----------|------------|------|-------------------------|-----|-----|------|-----------|--------------------|-------------------|
| 10/2/2008 | 0.03 | 1924 | Gull, large (unknown) | 1 | C | 1 | 965 | North | 50 |
| 10/2/2008 | 0.03 | 1926 | Gull, large (unknown) | 1 | C | 1 | 1287 | North | 150 |
| 10/2/2008 | 0.03 | 1926 | Herring Gull | 1 | C | 1 | 644 | South | 100 |
| 10/2/2008 | 0.03 | 1928 | Herring Gull | 1 | C | 1 | 805 | North | 20 |
| 10/2/2008 | 0.03 | 1929 | Northern Gannet | 1 | C | 1 | 483 | South | 100 |
| 10/2/2008 | 0.03 | 1936 | Tern, large (unknown) | 1 | C | 1 | 644 | North | 100 |
| 10/2/2008 | 0.03 | 1937 | Gull, large (unknown) | 2 | C | 1 | 805 | North | 75 |
| 10/2/2008 | 0.03 | 1939 | Tern (unknown) | 1 | C | 1 | 483 | South | 50 |
| 10/2/2008 | 0.03 | 1942 | Northern Gannet | 1 | C | 1 | 1207 | South | 50 |
| 10/2/2008 | 0.03 | 1943 | Gull, large (unknown) | 1 | C | 1 | 1287 | North | 50 |
| 10/2/2008 | 0.03 | 1943 | Northern Gannet | 1 | C | 1 | 805 | South | 10 |
| 10/2/2008 | 0.03 | 1945 | Gull, large (unknown) | 1 | C | 1 | 1207 | North | 5 |
| 10/2/2008 | 0.03 | 1947 | Tern (unknown) | 5 | C | 1 | 1931 | North | 50 |
| 10/2/2008 | 0.03 | 1950 | Northern Gannet | 1 | U | 1 | 1287 | South | 100 |
| 10/2/2008 | 0.03 | 1952 | Northern Gannet | 1 | C | 1 | 1287 | North | 50 |
| 10/2/2008 | 0.03 | 1955 | Northern Gannet | 1 | C | 1 | 1609 | South | 100 |
| 10/2/2008 | 0.03 | 1957 | Northern Gannet | 2 | C | 1 | 2735 | South | 10 |
| 10/2/2008 | 0.03 | 2000 | Tern, large (unknown) | 1 | C | 1 | 805 | North | 40 |
| 10/2/2008 | 0.03 | 2001 | Herring Gull | 1 | C | 1 | 1207 | North | 25 |
| 10/2/2008 | 0.03 | 2003 | Gull, large (unknown) | 1 | C | 1 | 402 | South | 30 |
| 10/2/2008 | 0.03 | 2003 | Gull, large (unknown) | 1 | C | 1 | 805 | South | 60 |
| 10/2/2008 | 0.03 | 2005 | Northern Gannet | 1 | C | 1 | 1126 | North | 100 |
| 10/2/2008 | 0.03 | 2007 | Great Black-backed Gull | 1 | C | 1 | 483 | North | 30 |
| 10/2/2008 | 0.03 | 2009 | Great Black-backed Gull | 1 | C | 1 | 483 | South | 30 |
| 10/2/2008 | 0.03 | 2010 | Tern, large (unknown) | 1 | C | 1 | 965 | North | 50 |
| 10/2/2008 | 0.03 | 2013 | Gull, small (unknown) | 1 | C | 1 | 1609 | North | 20 |
| 10/2/2008 | 0.03 | 2014 | Northern Gannet | 1 | C | 1 | 1207 | South | 25 |
| 10/2/2008 | 0.03 | 2019 | Gull (unknown) | 3 | C | 1 | 1207 | North | 100 |
| 10/2/2008 | 0.03 | 2022 | Northern Gannet | 1 | C | 1 | 805 | South | 150 |

Table D-2.4 (*continued*). Onshore ground truth survey data at Island Beach State Park, New Jersey, in fall 2008. All radar data are TracScan.

| Date | Dist. (NM) | Time | Species (Common Name) | No. | C/U | Qdrt | Range (m) | Heading (cardinal) | Altitude (ft ASL) |
|-----------|------------|------|--------------------------|-----|-----|------|-----------|--------------------|-------------------|
| 10/4/2008 | 0.03 | 1758 | Gull, large (unknown) | 2 | C | . | 483 | South | 30 |
| 10/4/2008 | 0.03 | 1759 | Great Black-backed Gull | 1 | C | . | 483 | North | 20 |
| 10/4/2008 | 0.03 | 1801 | Laughing Gull | 1 | C | . | 1207 | East | 50 |
| 10/4/2008 | 0.03 | 1806 | Unknown | 1 | C | . | 1609 | variable | 150 |
| 10/4/2008 | 0.03 | 1808 | Unknown | 1 | C | . | 1609 | South | 25 |
| 10/4/2008 | 0.03 | 1809 | Herring Gull | 1 | C | . | 1207 | South | 50 |
| 10/4/2008 | 0.03 | 1811 | Laughing Gull | 1 | C | . | 322 | North | 30 |
| 10/4/2008 | 0.03 | 1813 | Herring Gull | 1 | C | . | 1207 | Southwest | 60 |
| 10/4/2008 | 0.03 | 1814 | Unknown, large | 1 | C | . | 2414 | North | 25 |
| 10/4/2008 | 0.03 | 1815 | Laughing Gull | 1 | C | . | 1207 | East | 30 |
| 10/4/2008 | 0.03 | 1817 | Laughing Gull | 1 | C | . | 161 | South | 40 |
| 10/4/2008 | 0.03 | 1819 | Unknown, large | 1 | C | . | 1609 | West | 30 |
| 10/4/2008 | 0.03 | 1821 | Herring Gull | 1 | C | . | 805 | Northeast | 30 |
| 10/4/2008 | 0.03 | 1823 | Scoter/Atlantic Brant | 8 | C | . | 1609 | Northwest | 25 |
| 10/4/2008 | 0.03 | 1826 | Great Black-backed Gull | 1 | C | . | 1207 | Southeast | 70 |
| 10/4/2008 | 0.03 | 1829 | Laughing Gull | 1 | C | . | 805 | South | 40 |
| 10/4/2008 | 0.03 | 1830 | Gull, large (unknown) | 1 | C | . | 1207 | South | 50 |
| 10/4/2008 | 0.03 | 1834 | Unknown | 3 | C | . | 1609 | South | 20 |
| 10/4/2008 | 0.03 | 1835 | Herring Gull | 1 | C | . | 402 | South | 40 |
| 10/4/2008 | 0.03 | 1838 | Herring Gull | 2 | C | . | 1609 | Southwest | 10 |
| 10/4/2008 | 0.03 | 1840 | Gull, large (unknown) | 1 | C | . | 1207 | Southwest | 15 |
| 10/4/2008 | 0.03 | 1842 | Herring Gull | 1 | C | . | 1207 | West | 60 |
| 10/4/2008 | 0.03 | 1843 | Gull, large (unknown) | 1 | C | . | 805 | East | 40 |
| 10/4/2008 | 0.03 | 1844 | Herring Gull | 1 | C | . | 805 | South | 100 |
| 10/4/2008 | 0.03 | 1847 | Gull, large (unknown) | 2 | C | . | 805 | North | 40 |
| 10/4/2008 | 0.03 | 1848 | Herring Gull | 1 | C | . | 805 | South | 30 |
| 10/4/2008 | 0.03 | 1850 | Herring Gull | 1 | C | . | 402 | North | 30 |
| 10/4/2008 | 0.03 | 1906 | Brown Pelican | 1 | C | . | 644 | South | 10 |
| 10/4/2008 | 0.03 | 1909 | Double-crested Cormorant | 1 | C | . | 402 | North | 10 |

Table D-2.4 (*continued*). Onshore ground truth survey data at Island Beach State Park, New Jersey, in fall 2008. All radar data are TracScan.

| Date | Dist. (NM) | Time | Species (Common Name) | No. | C/U | Qdrt | Range (m) | Heading (cardinal) | Altitude (ft ASL) |
|-----------|------------|------|-------------------------------|-----|-----|------|-----------|--------------------|-------------------|
| 10/4/2008 | 0.03 | 1910 | Laughing Gull | 1 | C | . | 322 | North | 40 |
| 10/4/2008 | 0.03 | 1912 | Herring Gull | 1 | C | . | 805 | East | 15 |
| 10/4/2008 | 0.03 | 1913 | Herring Gull | 1 | U | . | 402 | South | 60 |
| 10/4/2008 | 0.03 | 1914 | Great Black-backed Gull | 1 | C | . | 805 | Northeast | 30 |
| 10/4/2008 | 0.03 | 1917 | Osprey | 1 | C | . | 644 | West | 200 |
| 10/4/2008 | 0.03 | 1918 | Herring Gull | 2 | C | . | 322 | West | 100 |
| 10/4/2008 | 0.03 | 1920 | Gull, large (unknown) | 1 | C | . | 1207 | Southwest | 10 |
| 10/4/2008 | 0.03 | 1922 | Herring Gull | 1 | C | . | 1207 | Northwest | 40 |
| 10/4/2008 | 0.03 | 1923 | Great Black-backed Gull | 1 | C | . | 483 | North | 20 |
| 10/4/2008 | 0.03 | 1925 | Great Black-backed Gull | 1 | C | . | 402 | Northwest | 30 |
| 10/4/2008 | 0.03 | 1926 | Great Black-backed Gull | 1 | U | . | 402 | East | 40 |
| 10/4/2008 | 0.03 | 1928 | Gull, small (unknown) | 1 | C | . | 805 | South | 40 |
| 10/4/2008 | 0.03 | 1929 | Great Black-backed Gull | 1 | C | . | 483 | North | 30 |
| 10/4/2008 | 0.03 | 1935 | Double-crested Cormorant | 1 | C | . | 805 | Southwest | 40 |
| 10/4/2008 | 0.03 | 1937 | Sanderling | 40 | U | . | 193 | North | 3 |
| 10/4/2008 | 0.03 | 1941 | Gull, large (unknown) | 1 | C | . | 1207 | South | 20 |
| 10/4/2008 | 0.03 | 1942 | Herring Gull | 1 | C | . | 805 | North | 30 |
| 10/4/2008 | 0.03 | 1943 | Herring Gull | 1 | C | . | 805 | East | 40 |
| 10/4/2008 | 0.03 | 1944 | Herring Gull | 1 | C | . | 1609 | East | 100 |
| 10/4/2008 | 0.03 | 1945 | Herring Gull | 1 | C | . | 402 | Southeast | 25 |
| 10/4/2008 | 0.03 | 1946 | Herring Gull | 1 | C | . | 965 | Northeast | 50 |
| 10/4/2008 | 0.03 | 1949 | Herring Gull | 1 | C | . | 322 | North | 50 |
| 10/4/2008 | 0.03 | 1950 | Great Black-backed Gull | 1 | C | . | 322 | South | 25 |
| 10/4/2008 | 0.03 | 1951 | Gull, large (unknown) | 1 | C | . | 1609 | South | 80 |
| 10/4/2008 | 0.03 | 1952 | Scoter, dark-winged (unknown) | 7 | C | . | 1207 | North | 3 |
| 10/4/2008 | 0.03 | 1953 | Herring Gull | 1 | C | . | 322 | West | 100 |
| 10/4/2008 | 0.03 | 1955 | Herring Gull | 1 | C | . | 1207 | South | 50 |
| 10/4/2008 | 0.03 | 1956 | Herring Gull | 1 | C | . | 402 | Southeast | 100 |
| 10/4/2008 | 0.03 | 1957 | Herring Gull | 1 | C | . | 805 | variable | 50 |

Table D-2.4 (*continued*). Onshore ground truth survey data at Island Beach State Park, New Jersey, in fall 2008. All radar data are TracScan.

| Date | Dist. (NM) | Time | Species (Common Name) | No. | C/U | Qdrt | Range (m) | Heading (cardinal) | Altitude (ft ASL) |
|-----------|------------|------|-------------------------|-----|-----|------|-----------|--------------------|-------------------|
| 10/4/2008 | 0.03 | 1958 | Herring Gull | 1 | C | . | 322 | North | 100 |
| 10/4/2008 | 0.03 | 1959 | Herring Gull | 1 | C | . | 1207 | Southwest | 40 |
| 10/4/2008 | 0.03 | 2000 | Gull, large (unknown) | 1 | C | . | 1609 | North | 50 |
| 10/4/2008 | 0.03 | 2001 | Royal Tern | 2 | C | . | 483 | South | 20 |
| 10/4/2008 | 0.03 | 2003 | Great Black-backed Gull | 1 | C | . | 965 | East | 25 |
| 10/4/2008 | 0.03 | 2004 | Royal Tern | 1 | C | . | 483 | South | 100 |
| 10/4/2008 | 0.03 | 2005 | Great Black-backed Gull | 1 | C | . | 965 | East | 30 |
| 10/4/2008 | 0.03 | 2007 | Gull (unknown) | 1 | C | . | 1609 | North | 150 |
| 10/4/2008 | 0.03 | 2008 | Herring Gull | 1 | C | . | 644 | North | 50 |
| 10/4/2008 | 0.03 | 2009 | Royal Tern | 2 | C | . | 644 | South | 80 |
| 10/4/2008 | 0.03 | 2010 | Royal Tern | 1 | C | . | 805 | South | 200 |
| 10/4/2008 | 0.03 | 2011 | Gull, large (unknown) | 1 | C | . | 1207 | Southwest | 20 |
| 10/4/2008 | 0.03 | 2012 | Great Black-backed Gull | 1 | C | . | 644 | West | 150 |
| 10/4/2008 | 0.03 | 2015 | Sanderling | 6 | C | . | 1207 | South | 3 |
| 10/4/2008 | 0.03 | 2016 | Great Black-backed Gull | 1 | C | . | 322 | Southwest | 40 |
| 10/4/2008 | 0.03 | 2018 | Royal Tern | 2 | C | . | 402 | South | 40 |
| 10/4/2008 | 0.03 | 2019 | Atlantic Brant | 9 | C | . | 644 | South | 3 |
| 10/4/2008 | 0.03 | 2021 | Gull, large (unknown) | 4 | C | . | 1609 | variable | 50 |
| 10/4/2008 | 0.03 | 2022 | Tern, large (unknown) | 2 | C | . | 1609 | Southwest | 25 |
| 10/4/2008 | 0.03 | 2024 | Great Black-backed Gull | 1 | C | . | 402 | South | 10 |
| 10/4/2008 | 0.03 | 2026 | Tern, large (unknown) | 1 | C | . | 805 | South | 75 |
| 10/4/2008 | 0.03 | 2028 | Falcon (unknown) | 1 | C | . | 402 | North | 100 |
| 10/4/2008 | 0.03 | 2028 | Laughing Gull | 2 | C | . | 402 | East | 2 |
| 10/4/2008 | 0.03 | 2033 | Tern, large (unknown) | 1 | C | . | 805 | South | 25 |
| 10/4/2008 | 0.03 | 2116 | Great Black-backed Gull | 1 | C | . | 805 | Northeast | 50 |
| 10/4/2008 | 0.03 | 2118 | Brown Pelican | 1 | C | . | 805 | South | 15 |
| 10/4/2008 | 0.03 | 2119 | Herring Gull | 1 | C | . | 1207 | South | 5 |
| 10/4/2008 | 0.03 | 2120 | Herring Gull | 1 | C | . | 483 | Southeast | 50 |
| 10/4/2008 | 0.03 | 2121 | Northern Gannet | 1 | C | . | 483 | Southeast | 2 |

Table D-2.4 (*continued*). Onshore ground truth survey data at Island Beach State Park, New Jersey, in fall 2008. All radar data are TracScan.

| Date | Dist. (NM) | Time | Species (Common Name) | No. | C/U | Qdrt | Range (m) | Heading (cardinal) | Altitude (ft ASL) |
|-----------|------------|------|----------------------------|-----|-----|------|-----------|--------------------|-------------------|
| 10/4/2008 | 0.03 | 2121 | Northern Gannet | 1 | U | . | 644 | South | 30 |
| 10/4/2008 | 0.03 | 2123 | Double-crested Cormorant | 1 | C | . | 483 | North | 30 |
| 10/4/2008 | 0.03 | 2127 | Double-crested Cormorant | 1 | C | . | 483 | South | 10 |
| 10/4/2008 | 0.03 | 2129 | Double-crested Cormorant | 1 | C | . | 402 | South | 2 |
| 10/4/2008 | 0.03 | 2130 | Atlantic Brant | 1 | C | . | 805 | South | 2 |
| 10/4/2008 | 0.03 | 2133 | Brown Pelican | 2 | C | . | 965 | West | 75 |
| 10/4/2008 | 0.03 | 2135 | Herring Gull | 1 | C | . | 1207 | West | 50 |
| 10/4/2008 | 0.03 | 2141 | Great Black-backed Gull | 3 | C | . | 1609 | Southeast | 100 |
| 10/4/2008 | 0.03 | 2146 | Tern, large (unknown) | 1 | C | . | 805 | South | 150 |
| 10/4/2008 | 0.03 | 2147 | Herring Gull | 1 | C | . | 1207 | West | 200 |
| 10/4/2008 | 0.03 | 2151 | Unknown | 3 | C | . | 1207 | South | 1 |
| 10/4/2008 | 0.03 | 2154 | Herring Gull | 1 | C | . | 1207 | South | 50 |
| 10/4/2008 | 0.03 | 2155 | Laughing Gull | 1 | C | . | 805 | South | 25 |
| 10/4/2008 | 0.03 | 2157 | Laughing Gull | 8 | C | . | 805 | Southwest | 150 |
| 10/4/2008 | 0.03 | 2158 | Shorebird, large (unknown) | 9 | C | . | 805 | South | 2 |
| 10/4/2008 | 0.03 | 2201 | Herring Gull | 1 | C | . | 805 | South | 40 |
| 10/4/2008 | 0.03 | 2203 | Great Black-backed Gull | 4 | C | . | 965 | South | 150 |
| 10/4/2008 | 0.03 | 2204 | Gull, small (unknown) | 2 | C | . | 644 | South | 2 |
| 10/4/2008 | 0.03 | 2207 | Shorebird, large (unknown) | 1 | C | . | 805 | South | 50 |
| 10/4/2008 | 0.03 | 2211 | Shorebird, large (unknown) | 13 | C | . | 644 | South | 2 |
| 10/4/2008 | 0.03 | 2214 | Gull, large (unknown) | 3 | C | . | 965 | Southwest | 80 |
| 10/4/2008 | 0.03 | 2214 | Herring Gull | 2 | C | . | 483 | Southwest | 75 |
| 10/4/2008 | 0.03 | 2215 | Gull, large (unknown) | 2 | C | . | 805 | West | 50 |
| 10/4/2008 | 0.03 | 2218 | Unknown, large | 25 | C | . | 1207 | South | 150 |
| 10/4/2008 | 0.03 | 2220 | Gull, large (unknown) | 20 | C | . | 1609 | Southwest | 200 |
| 10/4/2008 | 0.03 | 2223 | Gull, large (unknown) | 2 | C | . | 1207 | Northwest | 250 |
| 10/4/2008 | 0.03 | 2225 | Herring Gull | 2 | C | . | 805 | South | 250 |
| 10/4/2008 | 0.03 | 2226 | Royal Tern | 4 | C | . | 483 | South | 100 |
| 10/4/2008 | 0.03 | 2227 | Gull, large (unknown) | 1 | C | . | 965 | North | 50 |

Table D-2.4 (*continued*). Onshore ground truth survey data at Island Beach State Park, New Jersey, in fall 2008. All radar data are TracScan.

| Date | Dist. (NM) | Time | Species (Common Name) | No. | C/U | Qdrt | Range (m) | Heading (cardinal) | Altitude (ft ASL) |
|-----------|------------|------|-----------------------|-----|-----|------|-----------|--------------------|-------------------|
| 10/4/2008 | 0.03 | 2228 | Gull, large (unknown) | 1 | C | . | 402 | East | 30 |
| 10/4/2008 | 0.03 | 2230 | Tern, large (unknown) | 2 | C | . | 805 | South | 75 |
| 10/4/2008 | 0.03 | 2231 | Gull, large (unknown) | 15 | C | . | 965 | Southwest | 75 |
| 10/4/2008 | 0.03 | 2233 | Unknown, large | 15 | C | . | 1609 | South | 75 |
| 10/4/2008 | 0.03 | 2234 | Herring Gull | 1 | C | . | 402 | Southwest | 200 |
| 10/4/2008 | 0.03 | 2234 | Herring Gull | 4 | C | . | 322 | Southwest | 100 |
| 10/4/2008 | 0.03 | 2235 | Gull, large (unknown) | 3 | C | . | 805 | Southwest | 75 |
| 10/4/2008 | 0.03 | 2236 | Tern, large (unknown) | 5 | C | . | 402 | South | 20 |
| 10/4/2008 | 0.03 | 2237 | Tern, large (unknown) | 10 | C | . | 1207 | South | 75 |
| 10/4/2008 | 0.03 | 2240 | Unknown | 2 | C | . | 805 | South | 2 |
| 10/4/2008 | 0.03 | 2241 | Herring Gull | 2 | C | . | 805 | West | 75 |
| 10/5/2008 | 0.03 | 1756 | Great Blue Heron | 15 | C | . | . | South | 2800 |

NM = nautical mile(s)

No. = number

C/U = Confirmed/Unconfirmed

Qdrt = Observation quadrant

m = meters

ft ASL = feet above sea level

. = missing data

Table D-2.5. Onshore ground truth survey data at Sea Isle City, New Jersey, in fall 2008. All radar data are TracScan.

| Date | Dist. (NM) | Time | Species (Common Name) | No. | C/U | Qdrt | Range (m) | Heading (cardinal) | Altitude (ft ASL) |
|-----------|------------|------|-------------------------------|-----|-----|------|-----------|--------------------|-------------------|
| 10/6/2008 | 0.03 | 1435 | Common Loon | 1 | C | 2 | 1609 | South | 20 |
| 10/6/2008 | 0.03 | 1437 | Atlantic Brant | 21 | C | 2 | 805 | South | 50 |
| 10/6/2008 | 0.03 | 1439 | Surf Scoter | 7 | C | 2 | 2414 | South | 40 |
| 10/6/2008 | 0.03 | 1447 | Duck (unknown) | . | . | 2 | 1931 | Southwest | 15 |
| 10/6/2008 | 0.03 | 1453 | Green-winged Teal | 1 | C | 1 | 805 | South | 5 |
| 10/6/2008 | 0.03 | 1453 | Scoter, dark-winged (unknown) | 6 | C | 1 | 805 | South | 5 |
| 10/6/2008 | 0.03 | 1456 | Common Loon | 2 | C | 2 | 1609 | South | 40 |
| 10/6/2008 | 0.03 | 1501 | Scoter, dark-winged (unknown) | 25 | C | 2 | 1207 | South | 3 |
| 10/6/2008 | 0.03 | 1501 | Green-winged Teal | 2 | C | 2 | 1207 | South | 3 |
| 10/6/2008 | 0.03 | 1505 | Double-crested Cormorant | 37 | C | 2 | 2414 | South | 50 |
| 10/6/2008 | 0.03 | 1510 | Atlantic Brant | 9 | C | 2 | 1609 | South | 150 |
| 10/6/2008 | 0.03 | 1510 | Double-crested Cormorant | 2 | C | 2 | 1609 | South | 150 |
| 10/6/2008 | 0.03 | 1513 | Green-winged Teal | 38 | C | 2 | 1207 | South | 5 |
| 10/6/2008 | 0.03 | 1514 | Northern Pintail | 25 | C | 2 | 1931 | South | 250 |
| 10/6/2008 | 0.03 | 1514 | Northern Shoveler | 1 | C | 2 | 1931 | South | 250 |
| 10/6/2008 | 0.03 | 1520 | . | . | U | 2 | 1609 | Southeast | . |
| 10/6/2008 | 0.03 | 1524 | Scoter, dark-winged (unknown) | 31 | C | 2 | 2574 | Southwest | 5 |
| 10/6/2008 | 0.03 | 1529 | Scoter, dark-winged (unknown) | 26 | C | 1 | 3218 | South | 30 |
| 10/6/2008 | 0.03 | 1537 | Double-crested Cormorant | 60 | C | 2 | 3218 | South | 150 |
| 10/6/2008 | 0.03 | 1538 | Scoter, dark-winged (unknown) | 57 | C | 2 | 2896 | South | 30 |
| 10/6/2008 | 0.03 | 1538 | Green-winged Teal | 1 | C | 2 | 2896 | South | 30 |
| 10/6/2008 | 0.03 | 1542 | Surf Scoter | 20 | C | 2 | 1207 | North | 3 |
| 10/6/2008 | 0.03 | 1555 | Northern Pintail | 12 | C | 1 | 2414 | South | 70 |
| 10/6/2008 | 0.03 | 1556 | Double-crested Cormorant | 68 | C | 1 | 3379 | South | 300 |
| 10/6/2008 | 0.03 | 1633 | Scoter, dark-winged (unknown) | 15 | C | 2 | 1931 | South | 4 |
| 10/6/2008 | 0.03 | 1633 | Green-winged Teal | 4 | C | 2 | 1931 | South | 4 |
| 10/6/2008 | 0.03 | 1639 | Forster's Tern | 5 | C | 2 | 1207 | North | 30 |
| 10/6/2008 | 0.03 | 1639 | Laughing Gull | 1 | C | 2 | 1207 | North | 30 |
| 10/6/2008 | 0.03 | 1642 | Double-crested Cormorant | 2 | C | 1 | 402 | South | 1000 |
| 10/6/2008 | 0.03 | 1643 | Black Scoter | 12 | C | 2 | 1207 | South | 3 |

Table D-2.5 (*continued*). Onshore ground truth survey data at Sea Isle City, New Jersey, in fall 2008. All radar data are TracScan.

| Date | Dist. (NM) | Time | Species (Common Name) | No. | C/U | Qdrt | Range (m) | Heading (cardinal) | Altitude (ft ASL) |
|-----------|------------|------|-------------------------------|-----|-----|------|-----------|--------------------|-------------------|
| 10/6/2008 | 0.03 | 1644 | Black Scoter | 19 | C | 2 | 2253 | South | 5 |
| 10/6/2008 | 0.03 | 1644 | Green-winged Teal | 1 | C | 2 | 2253 | South | 5 |
| 10/6/2008 | 0.03 | 1650 | American Oystercatcher | 11 | C | 2 | 1770 | South | 100 |
| 10/6/2008 | 0.03 | 1655 | Double-crested Cormorant | 25 | C | 2 | 2816 | South | 100 |
| 10/6/2008 | 0.03 | 1656 | Double-crested Cormorant | 44 | C | 1 | 2092 | South | 150 |
| 10/6/2008 | 0.03 | 1657 | Double-crested Cormorant | 17 | C | 2 | 2253 | South | 150 |
| 10/6/2008 | 0.03 | 1700 | Surf Scoter | 3 | C | 1 | 2414 | South | 5 |
| 10/6/2008 | 0.03 | 1702 | Northern Pintail | 9 | C | 2 | 1207 | South | 1000 |
| 10/6/2008 | 0.03 | 1707 | Double-crested Cormorant | 18 | C | 2 | 2414 | South | 200 |
| 10/6/2008 | 0.03 | 1709 | Black Scoter | 25 | C | 1 | 2414 | South | 15 |
| 10/6/2008 | 0.03 | 1714 | Northern Pintail | 23 | C | 3 | 2816 | South | 1500 |
| 10/6/2008 | 0.03 | 1715 | Double-crested Cormorant | 35 | C | 2 | 2735 | South | 300 |
| 10/6/2008 | 0.03 | 1716 | Scaup (unknown) | 30 | C | 2 | 2816 | South | 500 |
| 10/6/2008 | 0.03 | 1719 | Double-crested Cormorant | 25 | C | 2 | 3218 | South | 1000 |
| 10/6/2008 | 0.03 | 1724 | Scoter, dark-winged (unknown) | 11 | C | 2 | 2253 | South | 20 |
| 10/6/2008 | 0.03 | 1909 | Scoter, dark-winged (unknown) | 8 | C | 2 | 2735 | South | 20 |
| 10/6/2008 | 0.03 | 1909 | Green-winged Teal | 2 | C | 2 | 2735 | South | 20 |
| 10/6/2008 | 0.03 | 1915 | Double-crested Cormorant | 44 | C | S | 3057 | Southwest | 300 |
| 10/6/2008 | 0.03 | 1918 | Scoter, dark-winged (unknown) | 27 | C | 1 | 2414 | South | 30 |
| 10/6/2008 | 0.03 | 1920 | Scoter, dark-winged (unknown) | 16 | C | 1 | 2253 | South | 20 |
| 10/6/2008 | 0.03 | 1924 | Double-crested Cormorant | 52 | C | 2 | 2414 | South | 300 |
| 10/6/2008 | 0.03 | 1934 | Double-crested Cormorant | 120 | C | 2 | 4023 | South | 450 |
| 10/6/2008 | 0.03 | 1940 | Double-crested Cormorant | 12 | C | 1 | 4023 | South | 150 |
| 10/6/2008 | 0.03 | 1944 | Surf Scoter | 23 | C | 2 | 1609 | South | 2 |
| 10/6/2008 | 0.03 | 1945 | Double-crested Cormorant | 17 | C | 1 | 1931 | Southwest | 200 |
| 10/6/2008 | 0.03 | 1952 | Northern Pintail | 13 | C | 1 | 2414 | East | 200 |
| 10/6/2008 | 0.03 | 1956 | Scoter, dark-winged (unknown) | 24 | C | 2 | 3057 | South | 20 |
| 10/6/2008 | 0.03 | 1959 | Northern Pintail | 25 | C | 2 | 2735 | South | 300 |
| 10/6/2008 | 0.03 | 2011 | Double-crested Cormorant | 35 | C | 2 | 2253 | South | 20 |
| 10/6/2008 | 0.03 | 2025 | Black Scoter | 73 | C | 1 | 805 | South | 5 |

Table D-2.5 (*continued*). Onshore ground truth survey data at Sea Isle City, New Jersey, in fall 2008. All radar data are TracScan.

| Date | Dist. (NM) | Time | Species (Common Name) | No. | C/U | Qdrt | Range (m) | Heading (cardinal) | Altitude (ft ASL) |
|-----------|------------|------|-------------------------------|-----|-----|------|-----------|--------------------|-------------------|
| 10/6/2008 | 0.03 | 2025 | Green-winged Teal | 7 | C | 1 | 805 | South | 5 |
| 10/7/2008 | 0.03 | 1157 | Green-winged Teal | 7 | C | 2 | 1609 | South | 3 |
| 10/7/2008 | 0.03 | 1213 | Green-winged Teal | 14 | C | 2 | 2092 | Southwest | 100 |
| 10/7/2008 | 0.03 | 1214 | Atlantic Brant | 17 | C | 2 | 965 | Northwest | 250 |
| 10/7/2008 | 0.03 | 1217 | Surf Scoter | 10 | C | 2 | 1609 | Southwest | 20 |
| 10/7/2008 | 0.03 | 1223 | Scoter, dark-winged (unknown) | 200 | C | 2 | 2558 | South | 10 |
| 10/7/2008 | 0.03 | 1230 | Scoter, dark-winged (unknown) | 55 | C | 2 | 2414 | Southwest | 10 |
| 10/7/2008 | 0.03 | 1232 | Double-crested Cormorant | 11 | C | 2 | 1931 | Southwest | 50 |
| 10/7/2008 | 0.03 | 1235 | Double-crested Cormorant | 1 | C | 4 | 1850 | East | 200 |
| 10/7/2008 | 0.03 | 1240 | Scoter, dark-winged (unknown) | 15 | C | 2 | 1754 | Southwest | 5 |
| 10/7/2008 | 0.03 | 1245 | Common Loon | 1 | C | 2 | 1770 | Southwest | 300 |
| 10/7/2008 | 0.03 | 1249 | Double-crested Cormorant | 45 | C | 2 | 2816 | Southwest | 750 |
| 10/7/2008 | 0.03 | 1251 | Scoter, dark-winged (unknown) | 35 | C | 2 | 2993 | Southwest | 30 |
| 10/7/2008 | 0.03 | 1253 | Scoter, dark-winged (unknown) | 130 | C | 2 | 2333 | South | 10 |
| 10/7/2008 | 0.03 | 1256 | Double-crested Cormorant | 60 | C | 2 | 3717 | Southwest | 500 |
| 10/7/2008 | 0.03 | 1257 | Double-crested Cormorant | 23 | C | 2 | 3218 | Southwest | 500 |
| 10/7/2008 | 0.03 | 1300 | Herring Gull | 8 | C | 2 | 1931 | South | 200 |
| 10/7/2008 | 0.03 | 1313 | Double-crested Cormorant | 110 | C | 2 | 2961 | South | 500 |
| 10/7/2008 | 0.03 | 1316 | Double-crested Cormorant | 140 | C | 2 | 2011 | Southwest | 700 |
| 10/7/2008 | 0.03 | 1317 | Double-crested Cormorant | 18 | C | 2 | 1545 | Southeast | 300 |
| 10/7/2008 | 0.03 | 1319 | Green-winged Teal | 23 | C | 2 | 1561 | South | 25 |
| 10/7/2008 | 0.03 | 1323 | Double-crested Cormorant | 55 | C | 2 | 2735 | Southwest | 300 |
| 10/7/2008 | 0.03 | 1327 | Green-winged Teal | 15 | C | 3 | 1770 | South | 10 |
| 10/7/2008 | 0.03 | 1327 | Northern Pintail | 5 | C | 3 | 1770 | South | 10 |
| 10/7/2008 | 0.03 | 1327 | Black Scoter | 1 | C | 3 | 1770 | South | 10 |
| 10/7/2008 | 0.03 | 1331 | Atlantic Brant | 28 | C | 2 | 1207 | North | 5 |
| 10/7/2008 | 0.03 | 1340 | Double-crested Cormorant | 95 | C | 2 | 2478 | East | 500 |
| 10/7/2008 | 0.03 | 1343 | Great Blue Heron | 3 | C | 2 | 2816 | South | 700 |
| 10/7/2008 | 0.03 | 1346 | Double-crested Cormorant | 100 | C | 2 | 4312 | Southwest | 500 |
| 10/7/2008 | 0.03 | 1350 | Double-crested Cormorant | 28 | C | 1 | 2896 | Southwest | 300 |

Table D-2.5 (*continued*). Onshore ground truth survey data at Sea Isle City, New Jersey, in fall 2008. All radar data are TracScan.

| Date | Dist. (NM) | Time | Species (Common Name) | No. | C/U | Qdrt | Range (m) | Heading (cardinal) | Altitude (ft ASL) |
|-----------|------------|------|-------------------------------|-----|-----|------|-----------|--------------------|-------------------|
| 10/7/2008 | 0.03 | 1355 | Canada Goose | 18 | C | 1 | 2671 | North | 200 |
| 10/7/2008 | 0.03 | 1357 | Scoter, dark-winged (unknown) | 60 | C | 2 | 2735 | Southwest | 30 |
| 10/7/2008 | 0.03 | 1401 | Double-crested Cormorant | 37 | C | 2 | 3765 | Northeast | 600 |
| 10/7/2008 | 0.03 | 1405 | Scoter (unknown) | 6 | C | 2 | 3379 | North | 50 |
| 10/7/2008 | 0.03 | 1406 | Green-winged Teal | 10 | C | 2 | 1207 | Southwest | 50 |
| 10/7/2008 | 0.03 | 1408 | Scoter, dark-winged (unknown) | 90 | C | 2 | 2092 | North | 5 |
| 10/7/2008 | 0.03 | 1411 | Double-crested Cormorant | 95 | C | 2 | 2253 | Southwest | 300 |
| 10/7/2008 | 0.03 | 1414 | Scoter, dark-winged (unknown) | 40 | C | 2 | 1207 | East | 5 |
| 10/7/2008 | 0.03 | 1417 | Double-crested Cormorant | 110 | C | 2 | 3572 | Southwest | 400 |
| 10/7/2008 | 0.03 | 1417 | Common Loon | 4 | C | 2 | 3572 | Southwest | 400 |
| 10/7/2008 | 0.03 | 1419 | Green-winged Teal | 5 | C | 2 | 1046 | East | 15 |
| 10/7/2008 | 0.03 | 1423 | Scoter (unknown) | 22 | C | 2 | 3620 | Southwest | 25 |
| 10/7/2008 | 0.03 | 1437 | Double-crested Cormorant | 31 | C | 2 | 1496 | North | 400 |
| 10/7/2008 | 0.03 | 1441 | Double-crested Cormorant | 27 | C | 2 | 3862 | Southeast | 400 |
| 10/7/2008 | 0.03 | 1444 | Scoter, dark-winged (unknown) | 130 | C | 2 | 2977 | West | 10 |
| 10/7/2008 | 0.03 | 1445 | Double-crested Cormorant | 50 | C | 2 | 2735 | Southwest | 350 |
| 10/7/2008 | 0.03 | 1448 | Common Loon | 4 | C | 2 | 2864 | Southwest | 300 |
| 10/7/2008 | 0.03 | 1451 | Double-crested Cormorant | 46 | C | 2 | 2011 | Southwest | 400 |
| 10/7/2008 | 0.03 | 1456 | Scoter, dark-winged (unknown) | 45 | C | 2 | 1786 | South | 5 |
| 10/7/2008 | 0.03 | 1458 | Scoter, dark-winged (unknown) | 30 | C | 1 | 2253 | Southwest | 10 |
| 10/7/2008 | 0.03 | 1501 | Green-winged Teal | 13 | C | 2 | 2414 | West | 50 |
| 10/7/2008 | 0.03 | 1501 | Duck (unknown dabbling) | 10 | C | 2 | 2414 | West | 50 |
| 10/7/2008 | 0.03 | 1504 | Double-crested Cormorant | 30 | C | 1 | 1931 | South | 300 |
| 10/7/2008 | 0.03 | 1508 | Double-crested Cormorant | 38 | C | 2 | 2832 | East | 400 |
| 10/7/2008 | 0.03 | 1510 | Northern Pintail | 11 | C | 2 | 1448 | Southwest | 80 |
| 10/7/2008 | 0.03 | 1510 | Wood Duck | 1 | C | 2 | 1448 | Southwest | 80 |
| 10/7/2008 | 0.03 | 1510 | Green-winged Teal | 1 | C | 2 | 1448 | Southwest | 80 |
| 10/7/2008 | 0.03 | 1510 | Mallard | 6 | C | 2 | 1448 | Southwest | 80 |
| 10/7/2008 | 0.03 | 1513 | Green-winged Teal | 17 | C | 2 | 1770 | West | 8 |
| 10/7/2008 | 0.03 | 1517 | Northern Gannet | 1 | C | 2 | 2735 | East | 60 |

Table D-2.5 (*continued*). Onshore ground truth survey data at Sea Isle City, New Jersey, in fall 2008. All radar data are TracScan.

| Date | Dist. (NM) | Time | Species (Common Name) | No. | C/U | Qdrt | Range (m) | Heading (cardinal) | Altitude (ft ASL) |
|-----------|------------|------|-------------------------------|-----|-----|------|-----------|--------------------|-------------------|
| 10/7/2008 | 0.03 | 1519 | American Black Duck | 7 | C | 2 | 2414 | Northeast | 8 |
| 10/7/2008 | 0.03 | 1526 | Common Loon | 1 | C | 2 | 1770 | Southeast | 20 |
| 10/7/2008 | 0.03 | 1527 | Scoter, dark-winged (unknown) | 90 | C | 2 | 1931 | South | 5 |
| 10/7/2008 | 0.03 | 1531 | Scoter, dark-winged (unknown) | 29 | C | 1 | 3218 | Southwest | 3 |
| 10/7/2008 | 0.03 | 1538 | Double-crested Cormorant | 75 | C | 2 | 2574 | Southwest | 400 |
| 10/7/2008 | 0.03 | 1541 | Black Scoter | 11 | C | 2 | 3379 | West | 80 |
| 10/7/2008 | 0.03 | 1552 | Scoter, dark-winged (unknown) | 38 | C | 2 | 1931 | Southwest | 7 |
| 10/7/2008 | 0.03 | 1554 | Double-crested Cormorant | 38 | C | 2 | 4183 | Southwest | 700 |
| 10/7/2008 | 0.03 | 1557 | Scoter (unknown) | 300 | C | 2 | 3701 | Southwest | 15 |
| 10/7/2008 | 0.03 | 1600 | Double-crested Cormorant | 2 | C | 2 | 2574 | Southwest | 200 |
| 10/7/2008 | 0.03 | 1601 | Double-crested Cormorant | 115 | C | 2 | 4666 | Southwest | 1000 |
| 10/7/2008 | 0.03 | 1604 | Double-crested Cormorant | 40 | C | 1 | 2735 | Southwest | 1000 |
| 10/7/2008 | 0.03 | 1607 | Double-crested Cormorant | 105 | C | 2 | 4344 | West | 1000 |
| 10/7/2008 | 0.03 | 1610 | Green-winged Teal | 1 | C | 1 | 2253 | Southwest | 1000 |
| 10/7/2008 | 0.03 | 1610 | Wood Duck | 4 | C | 1 | 2253 | Southwest | 1000 |
| 10/7/2008 | 0.03 | 1615 | Double-crested Cormorant | 45 | C | 2 | 1931 | South | 500 |
| 10/7/2008 | 0.03 | 1620 | Scoter, dark-winged (unknown) | 210 | C | 2 | 3057 | South | 10 |
| 10/7/2008 | 0.03 | 1624 | Scoter, dark-winged (unknown) | 135 | C | 2 | 2092 | Southwest | 8 |
| 10/7/2008 | 0.03 | 1627 | Double-crested Cormorant | 57 | C | 2 | 2414 | South | 500 |
| 10/7/2008 | 0.03 | 1628 | Double-crested Cormorant | 38 | C | 1 | 2092 | East | 1000 |
| 10/7/2008 | 0.03 | 1630 | Scoter, dark-winged (unknown) | 38 | C | 2 | 2414 | Southwest | 7 |
| 10/7/2008 | 0.03 | 1634 | Scoter, dark-winged (unknown) | 115 | C | 2 | 2414 | Southwest | 10 |
| 10/7/2008 | 0.03 | 1639 | Double-crested Cormorant | 22 | C | 1 | 1931 | Southwest | 300 |
| 10/7/2008 | 0.03 | 1642 | Green-winged Teal | 18 | C | 2 | 965 | Southwest | 3 |
| 10/7/2008 | 0.03 | 1656 | Green-winged Teal | 11 | C | 2 | 965 | Southwest | 3 |
| 10/7/2008 | 0.03 | 1659 | Scoter (unknown) | 225 | C | 2 | 3540 | Southwest | 20 |
| 10/7/2008 | 0.03 | 1702 | Common Loon | 1 | C | 2 | 2011 | West | 400 |
| 10/7/2008 | 0.03 | 1703 | Double-crested Cormorant | 4 | C | 1 | 1931 | South | 400 |
| 10/7/2008 | 0.03 | 1709 | Common Loon | 1 | C | 1 | 2574 | Northeast | 150 |
| 10/7/2008 | 0.03 | 1719 | Double-crested Cormorant | 30 | C | 1 | 2430 | South | 400 |

Table D-2.5 (*continued*). Onshore ground truth survey data at Sea Isle City, New Jersey, in fall 2008. All radar data are TracScan.

| Date | Dist. (NM) | Time | Species (Common Name) | No. | C/U | Qdrt | Range (m) | Heading (cardinal) | Altitude (ft ASL) |
|------------|------------|------|-------------------------------|-----|-----|------|-----------|--------------------|-------------------|
| 10/7/2008 | 0.03 | 1721 | Scoter, dark-winged (unknown) | 14 | C | 2 | 2478 | Southwest | 80 |
| 10/7/2008 | 0.03 | 1726 | American Black Duck | 2 | C | 2 | 949 | Southwest | 75 |
| 10/7/2008 | 0.03 | 1729 | Double-crested Cormorant | 71 | C | 2 | 3556 | Southwest | 250 |
| 10/7/2008 | 0.03 | 1735 | Double-crested Cormorant | 80 | C | 2 | 3701 | Southwest | 900 |
| 10/7/2008 | 0.03 | 1738 | Osprey | 1 | C | 2 | 2446 | Northwest | 120 |
| 10/7/2008 | 0.03 | 1740 | Common Loon | 1 | C | 2 | 2414 | South | 500 |
| 10/7/2008 | 0.03 | 1742 | Double-crested Cormorant | 18 | C | 1 | 1641 | Southeast | 800 |
| 10/7/2008 | 0.03 | 1754 | Double-crested Cormorant | 18 | C | 1 | 2446 | West | 600 |
| 10/7/2008 | 0.03 | 1756 | Black Scoter | 14 | C | 2 | 1770 | Northeast | 5 |
| 10/7/2008 | 0.03 | 1808 | Double-crested Cormorant | 78 | C | 2 | 2574 | West | 1000 |
| 10/7/2008 | 0.03 | 1814 | Double-crested Cormorant | 35 | C | 1 | 3620 | West | 300 |
| 10/16/2008 | 0.40 | 1755 | Gull, large (unknown) | 1 | C | . | 1609 | North | 20 |
| 10/16/2008 | 0.40 | 1800 | . | . | U | . | 1207 | East | . |
| 10/16/2008 | 0.40 | 1805 | Gull, large (unknown) | 1 | C | . | 805 | South | 30 |
| 10/16/2008 | 0.40 | 1813 | Great Black-backed Gull | 1 | C | . | 1207 | East | 60 |
| 10/16/2008 | 0.40 | 1814 | Gull, large (unknown) | 1 | C | . | 805 | Southeast | 100 |
| 10/16/2008 | 0.40 | 1816 | Gull, large (unknown) | 1 | C | . | 965 | South | 80 |
| 10/16/2008 | 0.40 | 1822 | Gull, large (unknown) | 1 | C | . | 1207 | West | 20 |
| 10/16/2008 | 0.40 | 1826 | Great Black-backed Gull | 1 | C | . | 1207 | South | 50 |
| 10/17/2008 | 0.03 | 1501 | Double-crested Cormorant | 130 | C | . | 2414 | South | 1000 |
| 10/17/2008 | 0.03 | 1504 | Double-crested Cormorant | 13 | C | . | 1931 | South | 800 |
| 10/17/2008 | 0.03 | 1506 | Double-crested Cormorant | 4 | C | . | 2414 | South | 100 |
| 10/17/2008 | 0.03 | 1508 | Double-crested Cormorant | 60 | C | . | 2011 | South | 1000 |
| 10/17/2008 | 0.03 | 1512 | Double-crested Cormorant | 50 | C | . | 2414 | Southwest | 1500 |
| 10/17/2008 | 0.03 | 1519 | Double-crested Cormorant | 35 | C | . | 2414 | Southwest | 1000 |
| 10/17/2008 | 0.03 | 1524 | Unknown, large | 80 | C | . | 2414 | South | 800 |
| 10/17/2008 | 0.03 | 1527 | Unknown, large | 50 | C | . | 2011 | South | 100 |
| 10/17/2008 | 0.03 | 1530 | Geese / cormorant | 40 | C | . | 2414 | South | 2000 |
| 10/17/2008 | 0.03 | 1534 | Geese / cormorant | 200 | C | . | 2896 | South | 40 |
| 10/17/2008 | 0.40 | 1756 | Double-crested Cormorant | 60 | C | . | 1609 | South | 100 |

Table D-2.5 (*continued*). Onshore ground truth survey data at Sea Isle City, New Jersey, in fall 2008. All radar data are TracScan.

| Date | Dist. (NM) | Time | Species (Common Name) | No. | C/U | Qdrt | Range (m) | Heading (cardinal) | Altitude (ft ASL) |
|------------|------------|------|-------------------------------|-----|-----|------|-----------|--------------------|-------------------|
| 10/17/2008 | 0.40 | 1801 | Double-crested Cormorant | 8 | C | . | 1609 | South | 500 |
| 10/17/2008 | 0.40 | 1805 | Duck (unknown) | 12 | C | . | 965 | South | 20 |
| 10/17/2008 | 0.40 | 1806 | Double-crested Cormorant | 30 | C | . | 2414 | South | 500 |
| 10/17/2008 | 0.40 | 1806 | Duck (unknown) | 9 | U | . | 2414 | North | 550 |
| 10/17/2008 | 0.40 | 1817 | Double-crested Cormorant | 50 | C | . | 1609 | South | 200 |
| 10/17/2008 | 0.40 | 1819 | Double-crested Cormorant | 40 | C | . | 2414 | South | 200 |
| 10/17/2008 | 0.40 | 1820 | Scoter (unknown) | 90 | C | . | 1609 | South | 10 |
| 10/17/2008 | 0.40 | 1832 | Scoter (unknown) | 80 | C | . | 2253 | South | 40 |
| 10/17/2008 | 0.40 | 1836 | Scoter (unknown) | 75 | C | . | 2414 | South | 5 |
| 10/17/2008 | 0.40 | 1839 | Cormorant (unknown) | 30 | C | . | 2574 | South | 1000 |
| 10/17/2008 | 0.40 | 1840 | Cormorant (unknown) | 30 | U | . | 1609 | South | 50 |
| 10/17/2008 | 0.40 | 1846 | Scoter, dark-winged (unknown) | 75 | C | . | 1609 | South | 5 |
| 10/17/2008 | 0.40 | 1851 | Cormorant / scoter | 50 | C | . | 3218 | South | 200 |
| 10/17/2008 | 0.40 | 1854 | Scoter (unknown) | 30 | C | . | 1609 | South | 25 |
| 10/17/2008 | 0.40 | 1856 | Snow Goose | 30 | C | . | 1207 | West | 500 |
| 10/17/2008 | 0.40 | 1901 | Cormorant (unknown) | 70 | C | . | 805 | Southwest | 500 |
| 10/17/2008 | 0.40 | 1906 | Scoter (unknown) | 80 | C | . | 1609 | South | 20 |
| 10/17/2008 | 0.40 | 1910 | Scoter, dark-winged (unknown) | 10 | C | . | 1207 | South | 3 |
| 10/17/2008 | 0.40 | 1910 | Duck (unknown) | 8 | C | . | 1207 | South | 3 |
| 10/17/2008 | 0.40 | 1915 | Cormorant (unknown) | 12 | C | . | 2414 | South | 1000 |
| 10/17/2008 | 0.40 | 1918 | Scoter (unknown) | 100 | C | . | 2011 | South | 20 |
| 10/17/2008 | 0.40 | 1929 | Atlantic Brant | 20 | C | . | 1207 | South | 25 |
| 10/17/2008 | 0.40 | 1933 | Scoter (unknown) | 15 | C | . | 2414 | South | 50 |
| 10/17/2008 | 0.40 | 1936 | Scoter (unknown) | 25 | C | . | 1609 | South | 25 |
| 10/17/2008 | 0.40 | 1942 | cormorant / scoter | 20 | C | . | 2414 | South | 50 |
| 10/17/2008 | 0.40 | 1947 | Scoter (unknown) | 75 | C | . | 1207 | South | 30 |
| 10/17/2008 | 0.40 | 1951 | Duck (unknown) | 20 | C | . | 805 | South | 100 |
| 10/17/2008 | 0.03 | 2039 | Cormorant (unknown) | 130 | C | . | 1207 | South | 400 |
| 10/17/2008 | 0.03 | 2042 | Double-crested Cormorant | 130 | C | . | 1207 | South | 400 |
| 10/17/2008 | 0.03 | 2051 | Cormorant (unknown) | 25 | C | . | 2011 | South | 200 |

Table D-2.5 (*continued*). Onshore ground truth survey data at Sea Isle City, New Jersey, in fall 2008. All radar data are TracScan.

| Date | Dist. (NM) | Time | Species (Common Name) | No. | C/U | Qdrt | Range (m) | Heading (cardinal) | Altitude (ft ASL) |
|------------|------------|------|-------------------------------|-----|-----|------|-----------|--------------------|-------------------|
| 10/17/2008 | 0.03 | 2057 | Cormorant/Atlantic Brant | 8 | C | . | 2011 | South | 300 |
| 10/17/2008 | 0.03 | 2103 | . | 1 | U | . | 2414 | Southwest | 40 |
| 10/17/2008 | 0.03 | 2106 | Cormorant (unknown) | 90 | C | . | 1207 | South | 100 |
| 10/17/2008 | 0.03 | 2112 | Cormorant/Atlantic Brant | 40 | C | . | 1609 | South | 300 |
| 10/17/2008 | 0.03 | 2120 | Scoter (unknown) | 7 | C | . | 1207 | South | 5 |
| 10/17/2008 | 0.03 | 2130 | Cormorant/Atlantic Brant | 9 | C | . | 1609 | South | 60 |
| 10/17/2008 | 0.03 | 2132 | Cormorant/Atlantic Brant | 11 | C | . | 2414 | South | 10 |
| 10/17/2008 | 0.03 | 2133 | Scoter (unknown) | 30 | C | . | 2011 | South | 3 |
| 10/17/2008 | 0.03 | 2138 | Unknown, large | 40 | C | . | 1609 | Southwest | 130 |
| 10/17/2008 | 0.03 | 2140 | Cormorant/Atlantic Brant | 26 | C | . | 1207 | South | 600 |
| 10/17/2008 | 0.03 | 2144 | Cormorant/Atlantic Brant | 8 | C | . | 2011 | South | 700 |
| 10/17/2008 | 0.03 | 2150 | Cormorant/Atlantic Brant | 10 | U | . | 1609 | South | 30 |
| 10/21/2008 | 0.03 | 1257 | Scoter (unknown) | 50 | C | 1 | 1931 | East | 30 |
| 10/21/2008 | 0.03 | 1306 | Brown Pelican | 10 | C | 1 | 724 | South | 15 |
| 10/21/2008 | 0.03 | 1310 | Northern Gannet | 1 | C | 1 | 1110 | North | 75 |
| 10/21/2008 | 0.03 | 1313 | Surf Scoter | 16 | C | 2 | 2076 | Southwest | 8 |
| 10/21/2008 | 0.03 | 1314 | Brown Pelican | 6 | C | 2 | 1062 | Southwest | 5 |
| 10/21/2008 | 0.03 | 1320 | Brown Pelican | 2 | C | 2 | 1512 | North | 5 |
| 10/21/2008 | 0.03 | 1321 | Brown Pelican | 2 | C | 1 | 2011 | North | 50 |
| 10/21/2008 | 0.03 | 1324 | Surf Scoter | 8 | C | 2 | 2027 | South | 3 |
| 10/21/2008 | 0.03 | 1325 | Northern Gannet | 1 | C | 2 | 965 | East | 50 |
| 10/21/2008 | 0.03 | 1327 | Surf Scoter | 10 | C | 2 | 2510 | Northeast | 20 |
| 10/21/2008 | 0.03 | 1331 | Scoter, dark-winged (unknown) | 12 | C | 1 | 2526 | Northeast | 8 |
| 10/21/2008 | 0.03 | 1334 | Scoter, dark-winged (unknown) | 3 | C | 1 | 1448 | South | 8 |
| 10/21/2008 | 0.03 | 1339 | Double-crested Cormorant | 175 | C | 4 | 2397 | Southwest | 150 |
| 10/21/2008 | 0.03 | 1341 | Red-throated Loon | 4 | C | 2 | 1448 | Southwest | 100 |
| 10/21/2008 | 0.03 | 1346 | Surf Scoter | 15 | C | 2 | 917 | Southwest | 8 |
| 10/21/2008 | 0.03 | 1350 | Northern Gannet | 8 | C | 2 | 1030 | South | 50 |
| 10/21/2008 | 0.03 | 1352 | Green-winged Teal | 7 | C | 2 | 1416 | South | 5 |
| 10/21/2008 | 0.03 | 1353 | Surf Scoter | 3 | C | 2 | 2494 | Northeast | 20 |

Table D-2.5 (*continued*). Onshore ground truth survey data at Sea Isle City, New Jersey, in fall 2008. All radar data are TracScan.

| Date | Dist. (NM) | Time | Species (Common Name) | No. | C/U | Qdrt | Range (m) | Heading (cardinal) | Altitude (ft ASL) |
|------------|------------|------|-------------------------------|-----|-----|------|-----------|--------------------|-------------------|
| 10/17/2008 | 0.03 | 2054 | Cormorant/Atlantic Brant | 25 | C | . | 2011 | South | 400 |
| 10/21/2008 | 0.03 | 1402 | Great Black-backed Gull | 1 | C | 2 | 1287 | Northeast | 150 |
| 10/21/2008 | 0.03 | 1407 | Double-crested Cormorant | 5 | C | 3 | 1770 | South | 100 |
| 10/21/2008 | 0.03 | 1410 | Surf Scoter | 6 | C | 2 | 805 | Southwest | 5 |
| 10/21/2008 | 0.03 | 1410 | Green-winged Teal | 1 | C | 2 | 805 | Southwest | 5 |
| 10/21/2008 | 0.03 | 1414 | Royal Tern | 4 | C | 2 | 644 | South | 50 |
| 10/21/2008 | 0.03 | 1414 | Northern Gannet | 1 | C | 2 | 644 | South | 50 |
| 10/21/2008 | 0.03 | 1417 | Northern Gannet | 1 | C | 2 | 1287 | West | 75 |
| 10/21/2008 | 0.03 | 1422 | Double-crested Cormorant | 63 | C | 3 | 965 | Southwest | 75 |
| 10/21/2008 | 0.03 | 1425 | Double-crested Cormorant | 17 | C | 4 | 2574 | South | 120 |
| 10/21/2008 | 0.03 | 1427 | Scoter (unknown) | 50 | C | 2 | 3701 | North | 5 |
| 10/21/2008 | 0.03 | 1429 | Surf Scoter | 16 | C | 2 | 805 | Northeast | 5 |
| 10/21/2008 | 0.03 | 1431 | Surf Scoter | 16 | C | 2 | 1770 | South | 5 |
| 10/21/2008 | 0.03 | 1433 | Herring Gull | 1 | C | 2 | 1126 | Northeast | 75 |
| 10/21/2008 | 0.03 | 1436 | Surf Scoter | 10 | C | 2 | 805 | Southwest | 4 |
| 10/21/2008 | 0.03 | 1441 | Brown Pelican | 9 | C | 1 | 1046 | Northeast | 20 |
| 10/21/2008 | 0.03 | 1445 | Surf Scoter | 9 | C | 2 | 2188 | Southwest | 5 |
| 10/21/2008 | 0.03 | 1447 | Scoter, dark-winged (unknown) | 40 | C | 1 | 2735 | Northeast | 5 |
| 10/21/2008 | 0.03 | 1451 | Scoter, dark-winged (unknown) | 15 | C | 2 | 3057 | Northeast | 40 |
| 10/21/2008 | 0.03 | 1453 | Surf Scoter | 15 | C | 2 | 2735 | North | 30 |
| 10/21/2008 | 0.03 | 1455 | Scoter, dark-winged (unknown) | 16 | C | 2 | 2574 | Northeast | 5 |
| 10/21/2008 | 0.03 | 1457 | Scoter, dark-winged (unknown) | 4 | C | 2 | 2832 | Southwest | 5 |
| 10/21/2008 | 0.03 | 1501 | Northern Gannet | 1 | C | 2 | 1770 | North | 50 |
| 10/21/2008 | 0.03 | 1504 | Herring Gull | 1 | C | 3 | 1255 | North | 100 |
| 10/21/2008 | 0.03 | 1507 | Atlantic Brant | 4 | C | 3 | 1448 | North | 50 |
| 10/21/2008 | 0.03 | 1508 | Great Black-backed Gull | 1 | C | 2 | 1448 | Northeast | 200 |
| 10/21/2008 | 0.03 | 1510 | Surf Scoter | 33 | C | 1 | 1609 | Southwest | 5 |
| 10/21/2008 | 0.03 | 1512 | Great Black-backed Gull | 1 | C | 3 | 1770 | East | 100 |
| 10/21/2008 | 0.03 | 1513 | Common Loon | 1 | C | 2 | 1609 | North | 5 |
| 10/21/2008 | 0.03 | 1604 | Scoter, dark-winged (unknown) | 23 | C | 2 | 1142 | South | 3 |

Table D-2.5 (*continued*). Onshore ground truth survey data at Sea Isle City, New Jersey, in fall 2008. All radar data are TracScan.

| Date | Dist. (NM) | Time | Species (Common Name) | No. | C/U | Qdrt | Range (m) | Heading (cardinal) | Altitude (ft ASL) |
|------------|------------|------|-------------------------------|-----|-----|------|-----------|--------------------|-------------------|
| 10/21/2008 | 0.03 | 1605 | Sanderling | 32 | C | 1 | 805 | Northwest | 8 |
| 10/21/2008 | 0.03 | 1605 | Black-bellied Plover | 3 | C | 1 | 805 | Northwest | 8 |
| 10/21/2008 | 0.03 | 1609 | Herring Gull | 1 | C | 3 | 1014 | Southeast | 50 |
| 10/21/2008 | 0.03 | 1610 | Green-winged Teal | 11 | C | 2 | 2414 | South | 3 |
| 10/21/2008 | 0.03 | 1612 | Surf Scoter | 4 | C | 2 | 2414 | Southwest | 5 |
| 10/21/2008 | 0.03 | 1612 | White-winged Scoter | 1 | C | 2 | 2414 | Southwest | 5 |
| 10/21/2008 | 0.03 | 1615 | Surf Scoter | 11 | C | 2 | 1207 | South | 4 |
| 10/21/2008 | 0.03 | 1617 | Turkey Vulture | 1 | C | 3 | 402 | Southeast | 60 |
| 10/21/2008 | 0.03 | 1621 | Red-throated Loon | 1 | C | 1 | 1046 | North | 60 |
| 10/21/2008 | 0.03 | 1631 | Northern Pintail | 24 | C | 2 | 2494 | South | 30 |
| 10/21/2008 | 0.03 | 1633 | Atlantic Brant | 7 | U | 1 | 2092 | Northeast | 35 |
| 10/21/2008 | 0.03 | 1637 | Northern Gannet | 1 | C | 2 | 2011 | South | 70 |
| 10/21/2008 | 0.03 | 1638 | Surf Scoter | 8 | C | 2 | 2896 | East | 25 |
| 10/21/2008 | 0.03 | 1642 | Scoter, dark-winged (unknown) | 48 | C | 3 | 2816 | Southwest | 10 |
| 10/21/2008 | 0.03 | 1647 | Atlantic Brant | 35 | C | 2 | 2253 | South | 10 |
| 10/21/2008 | 0.03 | 1648 | Green-winged Teal | 6 | C | 3 | 1207 | South | 4 |
| 10/21/2008 | 0.03 | 1648 | Greater Scaup | 1 | C | 3 | 1207 | South | 4 |
| 10/21/2008 | 0.03 | 1653 | Common Loon | 2 | C | 3 | 2414 | Northeast | 100 |
| 10/21/2008 | 0.03 | 1701 | Surf Scoter | 8 | C | 2 | 805 | Southwest | 8 |
| 10/21/2008 | 0.03 | 1702 | Red-throated Loon | 1 | C | 2 | 1207 | South | 5 |
| 10/21/2008 | 0.03 | 1703 | Royal Tern | 1 | C | 1 | 805 | South | 50 |
| 10/21/2008 | 0.03 | 1708 | Double-crested Cormorant | 1 | C | 4 | 1496 | East | 150 |
| 10/21/2008 | 0.03 | 1709 | Scoter, dark-winged (unknown) | 40 | U | 2 | 2816 | South | 150 |
| 10/21/2008 | 0.03 | 1712 | Northern Gannet | 1 | C | 1 | 1722 | North | 60 |
| 10/21/2008 | 0.03 | 1714 | Great Black-backed Gull | 1 | C | 1 | 981 | South | 100 |
| 10/21/2008 | 0.03 | 1717 | Scoter, dark-winged (unknown) | 75 | C | 2 | 2590 | West | 30 |
| 10/21/2008 | 0.03 | 1719 | Duck (unknown dabbling) | 2 | C | 1 | 2430 | South | 150 |
| 10/21/2008 | 0.03 | 1725 | Scoter, dark-winged (unknown) | 34 | C | 2 | 2526 | Northeast | 10 |
| 10/21/2008 | 0.03 | 1726 | Northern Gannet | 1 | C | 2 | 1110 | East | 40 |
| 10/21/2008 | 0.03 | 1730 | Atlantic Brant | 9 | C | 4 | 1271 | Northeast | 40 |

Table D-2.5 (*continued*). Onshore ground truth survey data at Sea Isle City, New Jersey, in fall 2008. All radar data are TracScan.

| Date | Dist. (NM) | Time | Species (Common Name) | No. | C/U | Qdrt | Range (m) | Heading (cardinal) | Altitude (ft ASL) |
|------------|------------|------|-------------------------------|-----|-----|------|-----------|--------------------|-------------------|
| 10/21/2008 | 0.03 | 1732 | Royal Tern | 1 | C | 2 | 1368 | South | 30 |
| 10/21/2008 | 0.03 | 1733 | Surf Scoter | 38 | C | 2 | 1593 | South | 12 |
| 10/21/2008 | 0.03 | 1733 | Black Scoter | 5 | C | 2 | 1593 | South | 12 |
| 10/21/2008 | 0.03 | 1739 | Surf Scoter | 3 | C | 1 | 2381 | Southwest | 15 |
| 10/21/2008 | 0.03 | 1744 | Northern Gannet | 1 | C | 2 | 1352 | Northeast | 50 |
| 10/21/2008 | 0.03 | 1745 | Great Black-backed Gull | 1 | C | 1 | 1110 | West | 150 |
| 11/16/2008 | 0.20 | 2040 | . | . | U | S | 1400 | Northeast | . |
| 11/16/2008 | 0.20 | 2043 | Northern Gannet | 1 | C | 2 | 1448 | North | 30 |
| 11/16/2008 | 0.20 | 2048 | Double-crested Cormorant | 24 | C | 2 | 644 | South | 5 |
| 11/16/2008 | 0.20 | 2050 | Scoter, dark-winged (unknown) | 3 | C | 2 | 1126 | South | 20 |
| 11/16/2008 | 0.20 | 2052 | Northern Gannet | 1 | C | 2 | 1287 | South | 125 |
| 11/16/2008 | 0.20 | 2054 | Northern Gannet | 1 | U | 2 | 1287 | North | 5 |
| 11/16/2008 | 0.20 | 2055 | Scoter, dark-winged (unknown) | 9 | C | 2 | 1126 | South | 15 |
| 11/16/2008 | 0.20 | 2101 | Black Scoter | 2 | C | 2 | 644 | South | 10 |
| 11/16/2008 | 0.20 | 2102 | Northern Gannet | 1 | C | 2 | 965 | South | 40 |
| 11/16/2008 | 0.20 | 2105 | Scoter, dark-winged (unknown) | 1 | C | 1 | 1126 | North | 12 |
| 11/16/2008 | 0.20 | 2106 | Great Black-backed Gull | 1 | C | 2 | 644 | South | 65 |
| 11/16/2008 | 0.20 | 2110 | Laughing Gull | 1 | C | 2 | 965 | South | 10 |

NM = nautical mile(s)

m = meters

No. = number

ft ASL = feet above sea level

C/U = Confirmed/Unconfirmed

. = missing data

Qdrt = Observation quadrant

Table D-2.6. Onshore ground truth survey data at Brigantine Beach, New Jersey, in fall 2008. All radar data are TracScan.

| Date | Dist. (NM) | Time | Species (Common Name) | No. | C/U | Qdrt | Range (m) | Heading (cardinal) | Altitude (ft ASL) |
|------------|------------|------|--------------------------|-----|-----|------|-----------|--------------------|-------------------|
| 10/27/2008 | 0.10 | 1321 | Black-bellied Plover | 14 | C | 1 | 3138 | East | 300 |
| 10/27/2008 | 0.10 | 1327 | American Black Duck | 5 | C | 4 | 2397 | South | 250 |
| 10/27/2008 | 0.10 | 1330 | Great Black-backed Gull | 1 | C | 1 | 1142 | East | 200 |
| 10/27/2008 | 0.10 | 1335 | American Black Duck | 2 | C | 1 | 1609 | West | 150 |
| 10/27/2008 | 0.10 | 1338 | Atlantic Brant | 6 | C | 1 | 2993 | North | 10 |
| 10/27/2008 | 0.10 | 1343 | Great Black-backed Gull | 1 | C | 2 | 1754 | South | 75 |
| 10/27/2008 | 0.10 | 1355 | Northern Gannet | 1 | C | 2 | 1577 | Northeast | 50 |
| 10/27/2008 | 0.10 | 1404 | American Black Duck | 12 | C | 4 | 3459 | West | 200 |
| 10/27/2008 | 0.10 | 1406 | Northern Gannet | 3 | C | 2 | 1400 | North | 10 |
| 10/27/2008 | 0.10 | 1410 | Double-crested Cormorant | 40 | U | 3 | 3218 | Southeast | 100 |
| 10/27/2008 | 0.10 | 1422 | American Black Duck | 12 | C | 4 | 3218 | NW | 300 |
| 10/27/2008 | 0.10 | 1425 | Double-crested Cormorant | 38 | C | 4 | 2011 | South | 15 |
| 10/27/2008 | 0.10 | 1428 | American Black Duck | 5 | U | . | 2414 | NW | 100 |
| 10/27/2008 | 0.10 | 1436 | Great Black-backed Gull | 1 | C | 2 | 1207 | NW | 5 |
| 10/27/2008 | 0.10 | 1437 | Scoter (unknown) | 10 | C | 1 | 3218 | North | 50 |
| 10/27/2008 | 0.10 | 1440 | Double-crested Cormorant | 30 | C | 4 | 4023 | Southwest | 200 |
| 10/27/2008 | 0.10 | 1440 | Shorebird (unknown) | 750 | C | 4 | 3218 | East | 20 |
| 10/27/2008 | 0.10 | 1442 | American Black Duck | 2 | C | 4 | 2414 | Southwest | 160 |
| 10/27/2008 | 0.10 | 1448 | Northern Gannet | 1 | C | 2 | 1207 | NW | 50 |
| 10/27/2008 | 0.10 | 1449 | Common Loon | 1 | C | 2 | 1609 | North | 20 |
| 10/27/2008 | 0.10 | 1450 | Shorebird (unknown) | 400 | C | 4 | 3218 | East | 200 |
| 10/27/2008 | 0.10 | 1453 | Great Black-backed Gull | 1 | C | 1 | 1931 | North | 150 |
| 10/27/2008 | 0.10 | 1457 | Double-crested Cormorant | 175 | C | 1 | 3540 | South | 150 |
| 10/27/2008 | 0.10 | 1459 | Red-throated Loon | 2 | C | 2 | 1207 | Northeast | 150 |
| 10/27/2008 | 0.10 | 1501 | Osprey | 1 | C | 1 | 1609 | South | 100 |
| 10/27/2008 | 0.10 | 1510 | American Black Duck | 4 | C | 4 | 3218 | Southwest | 200 |
| 10/27/2008 | 0.10 | 1517 | Double-crested Cormorant | 9 | C | 1 | 805 | South | 250 |
| 10/27/2008 | 0.10 | 1523 | Double-crested Cormorant | 19 | C | 4 | 3701 | Southwest | 100 |
| 10/27/2008 | 0.10 | 1527 | Double-crested Cormorant | 700 | C | 2 | 1931 | South | 50 |
| 10/27/2008 | 0.10 | 1531 | Double-crested Cormorant | 119 | C | 1 | 4023 | South | 150 |

Table D-2.6 (*continued*). Onshore ground truth survey data at Brigantine Beach, New Jersey, in fall 2008. All radar data are TracScan.

| Date | Dist. (NM) | Time | Species (Common Name) | No. | C/U | Qdrt | Range (m) | Heading (cardinal) | Altitude (ft ASL) |
|-----------|------------|------|--------------------------|-----|-----|------|-----------|--------------------|-------------------|
| 11/7/2008 | 0.10 | 1811 | Duck (unknown) | 50 | C | 4 | 2253 | variable | 150 |
| 11/8/2008 | 0.10 | 1614 | Herring Gull | 1 | C | 4 | 1931 | East | 60 |
| 11/9/2008 | 0.10 | 1405 | Great Black-backed Gull | 1 | C | 1 | 1368 | Northeast | 50 |
| 11/9/2008 | 0.10 | 1412 | Herring Gull | 1 | C | 1 | 1207 | East | 45 |
| 11/9/2008 | 0.10 | 1414 | . | . | U | 1 | 1609 | West | . |
| 11/9/2008 | 0.10 | 1422 | Royal Tern | 1 | C | 2 | 1609 | West | 40 |
| 11/9/2008 | 0.10 | 1424 | Herring Gull | 1 | C | 2 | 965 | South | 70 |
| 11/9/2008 | 0.10 | 1427 | Ring-billed Gull | 1 | C | 3 | 1609 | West | 65 |
| 11/9/2008 | 0.10 | 1430 | Northern Gannet | 1 | C | 1 | 2414 | Northeast | 30 |
| 11/9/2008 | 0.10 | 1435 | Great Black-backed Gull | 1 | C | 2 | 2092 | North | 80 |
| 11/9/2008 | 0.10 | 1440 | Laughing Gull | 1 | C | 2 | 805 | Northeast | 40 |
| 11/9/2008 | 0.10 | 1444 | Raptor (unknown) | 1 | C | 1 | 1770 | NW | 90 |
| 11/9/2008 | 0.10 | 1449 | Great Black-backed Gull | 1 | C | 1 | 1770 | North | 90 |
| 11/9/2008 | 0.10 | 1454 | Northern Gannet | 1 | C | 1 | 2092 | variable | 250 |
| 11/9/2008 | 0.10 | 1545 | Double-crested Cormorant | 1 | C | 1 | 2414 | Northeast | 40 |
| 11/9/2008 | 0.10 | 1552 | Northern Gannet | 1 | C | 1 | 3057 | Northeast | 40 |
| 11/9/2008 | 0.10 | 2030 | Double-crested Cormorant | 3 | C | 4 | 3218 | Northeast | 120 |
| 11/9/2008 | 0.10 | 2031 | Northern Gannet | 1 | C | 2 | 1931 | North | 60 |
| 11/9/2008 | 0.10 | 2034 | Northern Gannet | 1 | C | 2 | 2092 | South | 40 |
| 11/9/2008 | 0.10 | 2037 | Scoter (unknown) | 200 | C | 4 | 2735 | Northeast | 500 |
| 11/9/2008 | 0.10 | 2039 | . | . | U | 2 | 3218 | Northeast | . |
| 11/9/2008 | 0.10 | 2041 | Common Loon | 2 | C | 2 | 1609 | South | 60 |
| 11/9/2008 | 0.10 | 2043 | Northern Gannet | 2 | C | 1 | 1770 | North | 40 |
| 11/9/2008 | 0.10 | 2044 | Northern Gannet | 1 | C | 1 | 1609 | South | 55 |
| 11/9/2008 | 0.10 | 2047 | Northern Gannet | 1 | C | 4 | 1609 | North | 55 |
| 11/9/2008 | 0.10 | 2052 | Northern Gannet | 1 | C | 2 | 2011 | South | 30 |
| 11/9/2008 | 0.10 | 2053 | Northern Harrier | 1 | C | 4 | 1207 | Northeast | 15 |
| 11/9/2008 | 0.10 | 2056 | Laughing Gull | 1 | C | 1 | 1770 | North | 45 |
| 11/9/2008 | 0.10 | 2058 | Northern Gannet | 1 | C | 1 | 1609 | Southeast | 38 |
| 11/9/2008 | 0.10 | 2102 | Shorebird (unknown) | 100 | C | 1 | 2414 | Northeast | 115 |

Table D-2.6 (*continued*). Onshore ground truth survey data at Brigantine Beach, New Jersey, in fall 2008. All radar data are TracScan.

| Date | Dist. (NM) | Time | Species (Common Name) | No. | C/U | Qdrt | Range (m) | Heading (cardinal) | Altitude (ft ASL) |
|------------|------------|------|-------------------------------|-----|-----|------|-----------|--------------------|-------------------|
| 11/9/2008 | 0.10 | 2105 | Northern Gannet | 1 | C | 2 | 1609 | South | 90 |
| 11/9/2008 | 0.10 | 2109 | Great Egret | 7 | C | 1 | 805 | South | 120 |
| 11/9/2008 | 0.10 | 2111 | Atlantic Brant | 1 | C | 1 | 1609 | South | 40 |
| 11/9/2008 | 0.10 | 2114 | Northern Gannet | 1 | C | 2 | 2414 | Northeast | 38 |
| 11/9/2008 | 0.10 | 2119 | Great Egret | 2 | C | 1 | 1609 | South | 1000 |
| 11/9/2008 | 0.10 | 2127 | Northern Gannet | 1 | C | 2 | 1609 | Northeast | 30 |
| 11/9/2008 | 0.10 | 2129 | Northern Gannet | 3 | C | 1 | 2092 | South | 20 |
| 11/9/2008 | 0.10 | 2131 | Northern Gannet | 1 | C | 1 | 1609 | South | 20 |
| 11/9/2008 | 0.10 | 2133 | Great Black-backed Gull | 1 | C | 1 | 2092 | North | 40 |
| 11/9/2008 | 0.10 | 2134 | Laughing Gull | 1 | C | 1 | 2092 | Northeast | 50 |
| 11/9/2008 | 0.10 | 2137 | Northern Gannet | 1 | C | 2 | 1609 | Northeast | 40 |
| 11/12/2008 | 0.10 | 2026 | Northern Gannet | 1 | C | 2 | 1126 | Southwest | 50 |
| 11/12/2008 | 0.10 | 2035 | Northern Gannet | 1 | C | 2 | 2253 | Southwest | 20 |
| 11/12/2008 | 0.10 | 2037 | Northern Gannet | 1 | C | 1 | 2092 | variable | 50 |
| 11/12/2008 | 0.10 | 2039 | Northern Gannet | 1 | C | 1 | 1384 | Southwest | 60 |
| 11/12/2008 | 0.10 | 2041 | Scoter (unknown) | 150 | C | 2 | 2414 | Southwest | 5 |
| 11/12/2008 | 0.10 | 2043 | Northern Gannet | 2 | C | 2 | 2011 | Southwest | 55 |
| 11/12/2008 | 0.10 | 2045 | Scoter, dark-winged (unknown) | 147 | C | 2 | 2011 | Southwest | 5 |
| 11/12/2008 | 0.10 | 2045 | Loon (unknown) | 3 | C | 2 | 2011 | Southwest | 5 |
| 11/12/2008 | 0.10 | 2047 | Herring Gull | 1 | C | 1 | 1287 | Southwest | 40 |
| 11/12/2008 | 0.10 | 2048 | Northern Gannet | 1 | C | 2 | 1448 | South | 80 |
| 11/12/2008 | 0.10 | 2050 | Northern Gannet | 1 | C | 2 | 1818 | South | 50 |
| 11/12/2008 | 0.10 | 2053 | Scoter, dark-winged (unknown) | 200 | C | 2 | 2253 | South | 6 |
| 11/12/2008 | 0.10 | 2054 | Herring Gull | 1 | C | 1 | 1287 | Northeast | 50 |
| 11/12/2008 | 0.10 | 2056 | Northern Gannet | 1 | C | 1 | 1287 | South | 60 |
| 11/12/2008 | 0.10 | 2057 | Northern Gannet | 1 | C | 1 | 1287 | Southwest | 40 |
| 11/12/2008 | 0.10 | 2058 | Northern Gannet | 1 | C | 2 | 1448 | Southwest | 50 |
| 11/12/2008 | 0.10 | 2100 | Scoter, dark-winged (unknown) | 50 | C | 2 | 2092 | Southwest | 10 |
| 11/12/2008 | 0.10 | 2101 | . | . | U | 2 | 2253 | Southwest | . |
| 11/12/2008 | 0.10 | 2103 | . | . | U | 2 | 3041 | Southwest | . |

Table D-2.6 (*continued*). Onshore ground truth survey data at Brigantine Beach, New Jersey, in fall 2008. All radar data are TracScan.

| Date | Dist. (NM) | Time | Species (Common Name) | No. | C/U | Qdrt | Range (m) | Heading (cardinal) | Altitude (ft ASL) |
|------------|------------|------|-------------------------------|-----|-----|------|-----------|--------------------|-------------------|
| 11/12/2008 | 0.10 | 2106 | Scoter, dark-winged (unknown) | 70 | C | 2 | 2414 | Southwest | 5 |
| 11/12/2008 | 0.10 | 2107 | Northern Gannet | 1 | C | 2 | 1287 | Southwest | 40 |
| 11/12/2008 | 0.10 | 2108 | . | . | U | 1 | 1834 | Southwest | . |
| 11/12/2008 | 0.10 | 2114 | Northern Gannet | 1 | C | 1 | 1207 | West | 25 |
| 11/12/2008 | 0.10 | 2116 | Great Blue Heron | 1 | C | 1 | 1931 | Southwest | 60 |
| 11/12/2008 | 0.10 | 2121 | Northern Gannet | 2 | C | 2 | 1287 | Northeast | 40 |
| 11/12/2008 | 0.10 | 2122 | Scoter, dark-winged (unknown) | 20 | C | 2 | 1287 | South | 5 |
| 11/12/2008 | 0.10 | 2125 | Scoter, dark-winged (unknown) | 220 | C | 2 | 2816 | South | 5 |
| 11/12/2008 | 0.10 | 2132 | Northern Gannet | 1 | C | 2 | 1609 | West | 65 |
| 11/12/2008 | 0.10 | 2133 | Atlantic Brant | 4 | C | 2 | 1609 | South | 250 |
| 11/12/2008 | 0.10 | 2137 | Northern Gannet | 1 | C | 2 | 1609 | Southwest | 40 |
| 11/12/2008 | 0.10 | 2138 | Northern Gannet | 1 | C | 1 | 1609 | South | 40 |
| 11/12/2008 | 0.10 | 2140 | Northern Gannet | 1 | C | 2 | 1287 | West | 45 |
| 11/12/2008 | 0.10 | 2143 | . | . | U | 2 | 1609 | South | . |
| 11/12/2008 | 0.10 | 2145 | . | . | U | 1 | 805 | South | . |
| 11/12/2008 | 0.10 | 2149 | Northern Gannet | 1 | C | 1 | 1287 | North | 80 |
| 11/12/2008 | 0.10 | 2150 | . | . | U | 2 | 1609 | South | . |

NM = nautical mile(s)

m = meters

No. = number

ft ASL = feet above sea level

C/U = Confirmed/Unconfirmed

. = missing data

Qdrt = Observation quadrant

Table D-2.7. Ground truth survey data taken offshore Brigantine Beach, New Jersey, on 11 November 2008. All radar data are TracScan, and the radar was based onshore.

| Date | Dist. (NM) | Time | Species (Common Name) | No. | C/U | Qdrt | Range (m) | Heading (cardinal) | Altitude (ft ASL) |
|------------|------------|------|-----------------------|-----|-----|------|-----------|--------------------|-------------------|
| 11/11/2008 | 2.75 | 1459 | Northern Gannet | 1 | C | 1 | 300 | West | 40 |
| 11/11/2008 | 2.75 | 1500 | Northern Gannet | 1 | C | 1 | 400 | Northwest | 40 |
| 11/11/2008 | 2.75 | 1501 | White-winged Scoter | 2 | U | 2 | . | South | 40 |
| 11/11/2008 | 2.75 | 1502 | Northern Gannet | 1 | C | 4 | 20 | Southwest | 30 |
| 11/11/2008 | 2.75 | 1504 | Northern Gannet | 1 | C | 2 | 500 | South | 40 |
| 11/11/2008 | 2.75 | 1505 | Northern Gannet | 1 | C | 3 | 250 | West | 20 |
| 11/11/2008 | 2.75 | 1506 | Laughing Gull | 1 | C | 3 | 50 | South | 35 |
| 11/11/2008 | 2.75 | 1508 | Northern Gannet | 1 | C | 2 | 600 | South | 20 |
| 11/11/2008 | 2.75 | 1509 | Northern Gannet | 1 | C | 1 | 50 | South | 25 |
| 11/11/2008 | 2.75 | 1510 | Scoter/Atlantic Brant | 100 | C | 3 | 600 | South | 15 |
| 11/11/2008 | 2.75 | 1512 | Northern Gannet | 2 | C | 4 | 300 | Southwest | 25 |
| 11/11/2008 | 2.75 | 1514 | Scoter (unknown) | 65 | U | 2 | 350 | South | 5 |
| 11/11/2008 | 2.75 | 1517 | Northern Gannet | 1 | C | 4 | 500 | Southwest | 25 |
| 11/11/2008 | 2.75 | 1518 | Northern Gannet | 1 | C | 4 | 500 | South | 25 |
| 11/11/2008 | 2.75 | 1520 | Northern Gannet | 2 | C | 1 | 10 | South | 30 |
| 11/11/2008 | 2.75 | 1521 | Scoter (unknown) | 60 | U | 2 | 300 | South | 10 |
| 11/11/2008 | 2.75 | 1522 | Northern Gannet | 1 | C | 1 | 600 | Southeast | 30 |
| 11/11/2008 | 2.75 | 1524 | Northern Gannet | 1 | C | 4 | 50 | South | 20 |
| 11/11/2008 | 2.75 | 1526 | Northern Gannet | 1 | C | 4 | 400 | West | 20 |
| 11/11/2008 | 2.75 | 1527 | Northern Gannet | 1 | C | 1 | 10 | East | 20 |
| 11/11/2008 | 2.75 | 1528 | Black Scoter | 16 | C | 4 | 450 | South | 50 |
| 11/11/2008 | 2.75 | 1529 | Northern Gannet | 1 | C | 1 | 50 | Southwest | 25 |
| 11/11/2008 | 2.75 | 1540 | Laughing Gull | 1 | C | 4 | 50 | West | 20 |
| 11/11/2008 | 2.75 | 1541 | Northern Gannet | 1 | C | . | 400 | South | 20 |
| 11/11/2008 | 2.75 | 1543 | Northern Gannet | 3 | C | 1 | 150 | South | 35 |
| 11/11/2008 | 2.75 | 1545 | Northern Gannet | 2 | C | 4 | 100 | Southwest | 40 |
| 11/11/2008 | 2.75 | 1546 | Northern Gannet | 1 | C | 4 | 200 | West | 40 |
| 11/11/2008 | 2.75 | 1549 | Northern Gannet | 1 | C | 2 | 200 | South | 30 |
| 11/11/2008 | 2.75 | 1551 | Northern Gannet | 1 | C | 2 | 400 | Southwest | 35 |

Table D-2.7 (continued). Ground truth survey data taken offshore Brigantine Beach, New Jersey, on 11 November 2008. All radar data are TracScan, and the radar was based onshore.

| Date | Dist. (NM) | Time | Species (Common Name) | No. | C/U | Qdrt | Range (m) | Heading (cardinal) | Altitude (ft ASL) |
|------------|------------|------|------------------------------|-----|-----|------|-----------|--------------------|-------------------|
| 11/11/2008 | 2.75 | 1552 | Northern Gannet | 1 | C | 1 | 900 | South | 40 |
| 11/11/2008 | 2.75 | 1554 | Northern Gannet | 1 | C | 1 | 600 | West | 30 |
| 11/11/2008 | 2.75 | 1555 | Northern Gannet/Herring Gull | 1 | U | 1 | 300 | Northeast | 45 |
| 11/11/2008 | 2.75 | 1556 | Northern Gannet | 1 | C | 2 | 150 | Southwest | 15 |
| 11/11/2008 | 2.75 | 1557 | Northern Gannet | 1 | C | 2 | 400 | Southeast | 20 |
| 11/11/2008 | 2.75 | 1600 | Northern Gannet | 1 | C | 1 | 400 | South | 25 |
| 11/11/2008 | 2.75 | 1602 | Northern Gannet | 1 | C | 1 | 150 | Southwest | 50 |
| 11/11/2008 | 2.75 | 1606 | Laughing Gull | 1 | C | 1 | 50 | Northeast | 25 |
| 11/11/2008 | 2.75 | 1609 | Northern Gannet | 1 | C | 1 | 400 | West | 20 |
| 11/11/2008 | 2.75 | 1610 | Northern Gannet | 1 | C | 4 | 600 | West | 30 |
| 11/11/2008 | 2.75 | 1612 | Northern Gannet | 1 | C | 2 | 200 | West | 40 |
| 11/11/2008 | 1.67 | 1633 | Laughing Gull | 1 | C | 1 | 250 | Northwest | 70 |
| 11/11/2008 | 1.67 | 1635 | Laughing Gull | 1 | C | 2 | 200 | Northwest | 50 |
| 11/11/2008 | 1.67 | 1636 | Laughing Gull | 1 | C | 4 | 200 | Northeast | 40 |
| 11/11/2008 | 1.67 | 1637 | Northern Gannet | 1 | C | 4 | 600 | Southwest | 90 |
| 11/11/2008 | 1.67 | 1639 | Northern Gannet | 1 | C | 4 | 550 | South | 110 |
| 11/11/2008 | 1.67 | 1640 | Double-crested Cormorant | 45 | C | 1 | 400 | Southwest | 300 |
| 11/11/2008 | 1.67 | 1644 | Northern Gannet | 1 | C | 1 | 600 | Southwest | 80 |
| 11/11/2008 | 1.67 | 1644 | Northern Gannet | 1 | C | 1 | 550 | Southwest | 80 |
| 11/11/2008 | 1.67 | 1647 | Black Scoter | 10 | C | 1 | 600 | Southwest | 15 |
| 11/11/2008 | 1.67 | 1649 | Laughing Gull | 1 | C | 2 | 400 | Northeast | 20 |
| 11/11/2008 | 1.67 | 1651 | Laughing Gull | 1 | C | 4 | 250 | Northeast | 40 |
| 11/11/2008 | 1.67 | 1654 | Northern Gannet | 4 | C | 4 | 150 | South | 110 |
| 11/11/2008 | 1.67 | 1656 | Herring Gull | 1 | C | 3 | 400 | West | 80 |
| 11/11/2008 | 1.67 | 1701 | Laughing Gull | 1 | C | 4 | 800 | Southwest | 8 |
| 11/11/2008 | 1.67 | 1703 | Northern Gannet | 1 | C | 4 | 600 | Southwest | 40 |
| 11/11/2008 | 1.67 | 1704 | Northern Gannet | 1 | C | 4 | 400 | West | 50 |
| 11/11/2008 | 1.67 | 1706 | Northern Gannet | 2 | C | 1 | 600 | West | 45 |
| 11/11/2008 | 1.67 | 1707 | Laughing Gull | 1 | C | 3 | 150 | Southeast | 15 |

Table D-2.7 (continued). Ground truth survey data taken offshore Brigantine Beach, New Jersey, on 11 November 2008. All radar data are TracScan, and the radar was based onshore.

| Date | Dist. (NM) | Time | Species (Common Name) | No. | C/U | Qdrt | Range (m) | Heading (cardinal) | Altitude (ft ASL) |
|------------|------------|------|--------------------------|-----|-----|------|-----------|--------------------|-------------------|
| 11/11/2008 | 1.67 | 1709 | Laughing Gull | 1 | C | 1 | 50 | West | 20 |
| 11/11/2008 | 1.67 | 1710 | Northern Gannet | 1 | C | 4 | 200 | Southwest | 35 |
| 11/11/2008 | 1.67 | 1712 | Northern Gannet | 2 | C | 2 | 400 | South | 60 |
| 11/11/2008 | 1.67 | 1713 | Northern Gannet | 1 | C | 4 | 20 | Southwest | 40 |
| 11/11/2008 | 1.67 | 1715 | Northern Gannet | 1 | C | 4 | 200 | West | 40 |
| 11/11/2008 | 1.67 | 1716 | Northern Gannet | 3 | C | 4 | 200 | Southwest | 60 |
| 11/11/2008 | 1.67 | 1718 | Northern Gannet | 1 | C | 4 | 500 | West | 90 |
| 11/11/2008 | 1.67 | 1720 | Northern Gannet | 1 | C | 4 | 600 | Southwest | 90 |
| 11/11/2008 | 1.67 | 1721 | Laughing Gull | 1 | C | 4 | 200 | Southwest | 40 |
| 11/11/2008 | 1.67 | 1723 | Northern Gannet | 1 | C | 2 | 250 | Southwest | 60 |
| 11/11/2008 | 1.67 | 1725 | Herring Gull | 1 | C | 2 | 500 | South | 95 |
| 11/11/2008 | 1.67 | 1727 | Laughing Gull | 1 | C | 4 | 400 | Southwest | 50 |
| 11/11/2008 | 1.67 | 1728 | Herring Gull | 1 | C | 4 | 300 | West | 150 |
| 11/11/2008 | 1.67 | 1738 | Northern Gannet | 1 | C | 4 | 250 | South | 50 |
| 11/11/2008 | 1.67 | 1739 | Northern Gannet | 1 | C | 4 | 350 | South | 60 |
| 11/11/2008 | 1.67 | 1740 | Herring Gull | 1 | C | 4 | 200 | Southwest | 80 |
| 11/11/2008 | 2.00 | 1759 | Northern Gannet | 1 | C | 1 | 400 | South | 25 |
| 11/11/2008 | 2.00 | 1800 | Gull, large (unknown) | 1 | C | 1 | 400 | West | 35 |
| 11/11/2008 | 2.00 | 1803 | Cormorant (unknown) | 70 | C | 1 | 400 | South | 300 |
| 11/11/2008 | 2.00 | 1805 | Cormorant (unknown) | 6 | C | 4 | 400 | Southwest | 300 |
| 11/11/2008 | 2.00 | 1806 | Northern Gannet | 1 | C | 3 | 300 | South | 55 |
| 11/11/2008 | 2.00 | 1808 | Laughing Gull | 1 | C | 1 | 50 | Southwest | 45 |
| 11/11/2008 | 2.00 | 1809 | Northern Gannet | 1 | C | 4 | 200 | Southwest | 20 |
| 11/11/2008 | 2.00 | 1810 | Cormorant/Atlantic Brant | 3 | C | 1 | 600 | Southwest | 70 |
| 11/11/2008 | 2.00 | 1812 | Gull, large (unknown) | 1 | C | 4 | 200 | Southwest | 60 |
| 11/11/2008 | 2.00 | 1814 | Gull, large (unknown) | 1 | C | 2 | 400 | Southwest | 30 |
| 11/11/2008 | 2.00 | 1816 | Laughing Gull | 1 | C | 3 | 200 | West | 30 |
| 11/11/2008 | 2.00 | 1817 | Northern Gannet | 1 | C | . | 400 | West | 50 |
| 11/11/2008 | 2.00 | 1819 | Northern Gannet | 1 | C | 4 | 900 | West | 80 |

Table D-2.7 (continued). Ground truth survey data taken offshore Brigantine Beach, New Jersey, on 11 November 2008. All radar data are TracScan, and the radar was based onshore.

| Date | Dist. (NM) | Time | Species (Common Name) | No. | C/U | Qdrt | Range (m) | Heading (cardinal) | Altitude (ft ASL) |
|------------|------------|------|--------------------------|-----|-----|------|-----------|--------------------|-------------------|
| 11/11/2008 | 2.00 | 1820 | Northern Gannet | 1 | C | 4 | 275 | Southwest | 60 |
| 11/11/2008 | 2.00 | 1822 | Northern Gannet | 1 | C | 3 | 300 | Southwest | 50 |
| 11/11/2008 | 2.00 | 1823 | Northern Gannet | 1 | C | 4 | 250 | West | 50 |
| 11/11/2008 | 2.00 | 1824 | Northern Gannet | 1 | C | 3 | 400 | Southwest | 40 |
| 11/11/2008 | 2.00 | 1825 | Northern Gannet | 4 | C | 3 | 250 | Southwest | 50 |
| 11/11/2008 | 2.00 | 1827 | Northern Gannet | 2 | C | 3 | 275 | South | 38 |
| 11/11/2008 | 2.00 | 1829 | Northern Gannet | 1 | C | 4 | 400 | West | 45 |
| 11/11/2008 | 2.00 | 1829 | Northern Gannet | 1 | C | 2 | 400 | West | 50 |
| 11/11/2008 | 2.00 | 1831 | Northern Gannet | 1 | C | 2 | 100 | West | 50 |
| 11/11/2008 | 2.00 | 1832 | Northern Gannet | 1 | C | 3 | 275 | South | 30 |
| 11/11/2008 | 2.00 | 1833 | Northern Gannet | 2 | C | 1 | 400 | West | 80 |
| 11/11/2008 | 2.00 | 1836 | Northern Gannet | 1 | C | 4 | 250 | South | 30 |
| 11/11/2008 | 2.00 | 1837 | Northern Gannet | 1 | C | 4 | 200 | Southwest | 15 |
| 11/11/2008 | 2.00 | 1838 | . | . | U | 4 | 400 | South | . |
| 11/11/2008 | 2.00 | 1839 | Northern Gannet | 1 | C | 4 | 300 | Southwest | 20 |
| 11/11/2008 | 2.00 | 1840 | Northern Gannet | 2 | C | 4 | 200 | West | 60 |
| 11/11/2008 | 2.00 | 1841 | . | . | U | 4 | 400 | Southwest | . |
| 11/11/2008 | 2.00 | 1842 | Laughing Gull | 1 | C | 2 | 200 | West | 20 |
| 11/11/2008 | 2.00 | 1844 | Northern Gannet | 1 | C | 4 | 300 | West | 30 |
| 11/11/2008 | 2.00 | 1845 | Laughing Gull | 1 | C | 3 | 50 | West | 20 |
| 11/11/2008 | 2.00 | 1852 | Double-crested Cormorant | 80 | C | 4 | 1207 | South | 700 |
| 11/11/2008 | 2.00 | 1859 | Laughing Gull | 1 | C | 3 | 400 | Southwest | 40 |
| 11/11/2008 | 2.00 | 1900 | Laughing Gull | 1 | C | . | 250 | Southwest | 30 |

NM = nautical mile(s)

m = meters

No. = number

ft ASL = feet above sea level

C/U = Confirmed/Unconfirmed

. = missing data

Qdrt = Observation quadrant

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APPENDIX E
OFFSHORE KERNEL DENSITY

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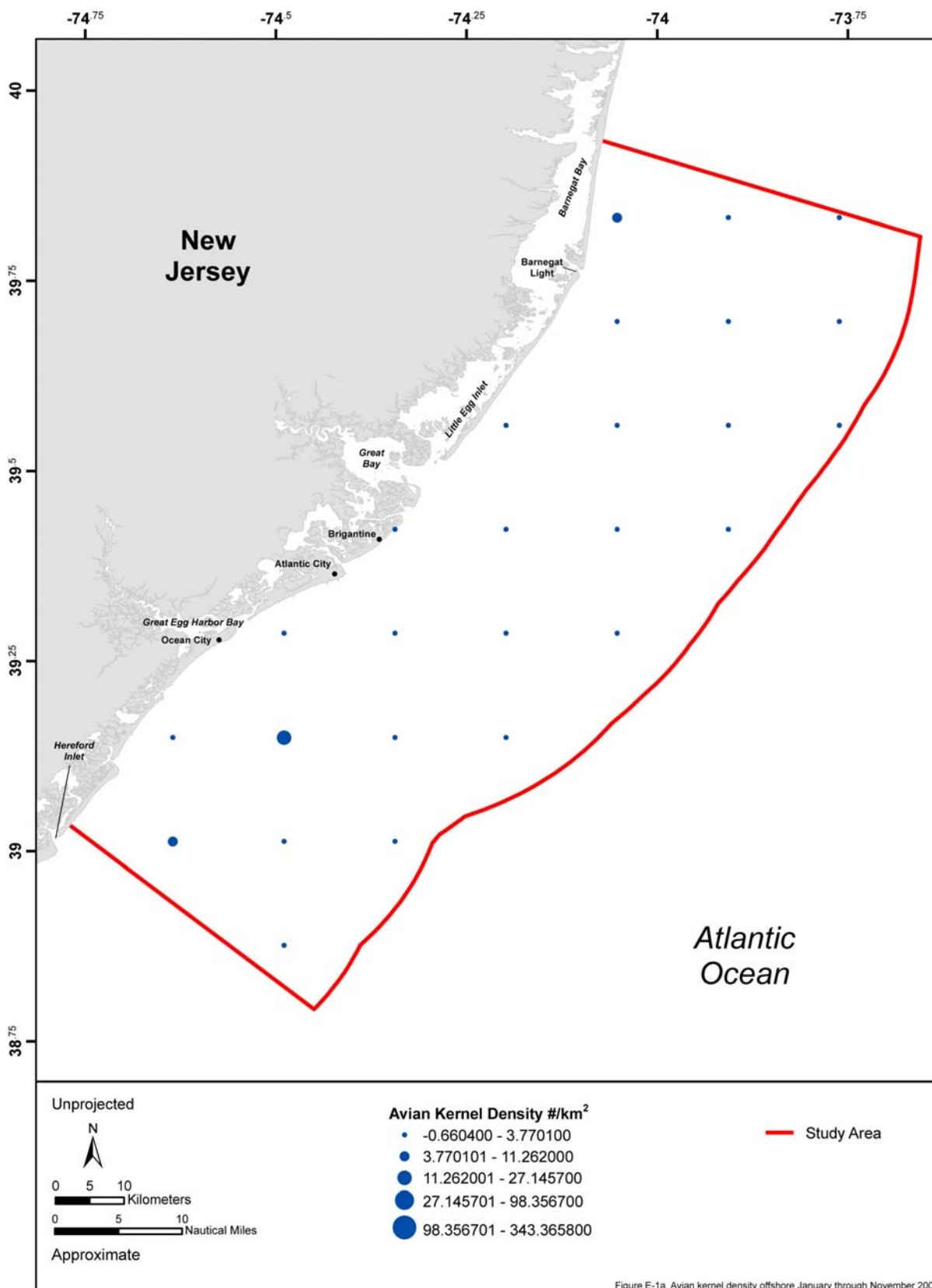


Figure E-1a. Avian kernel density (No./km²) in the New Jersey Study Area during the shipboard offshore surveys from January through November 2008.

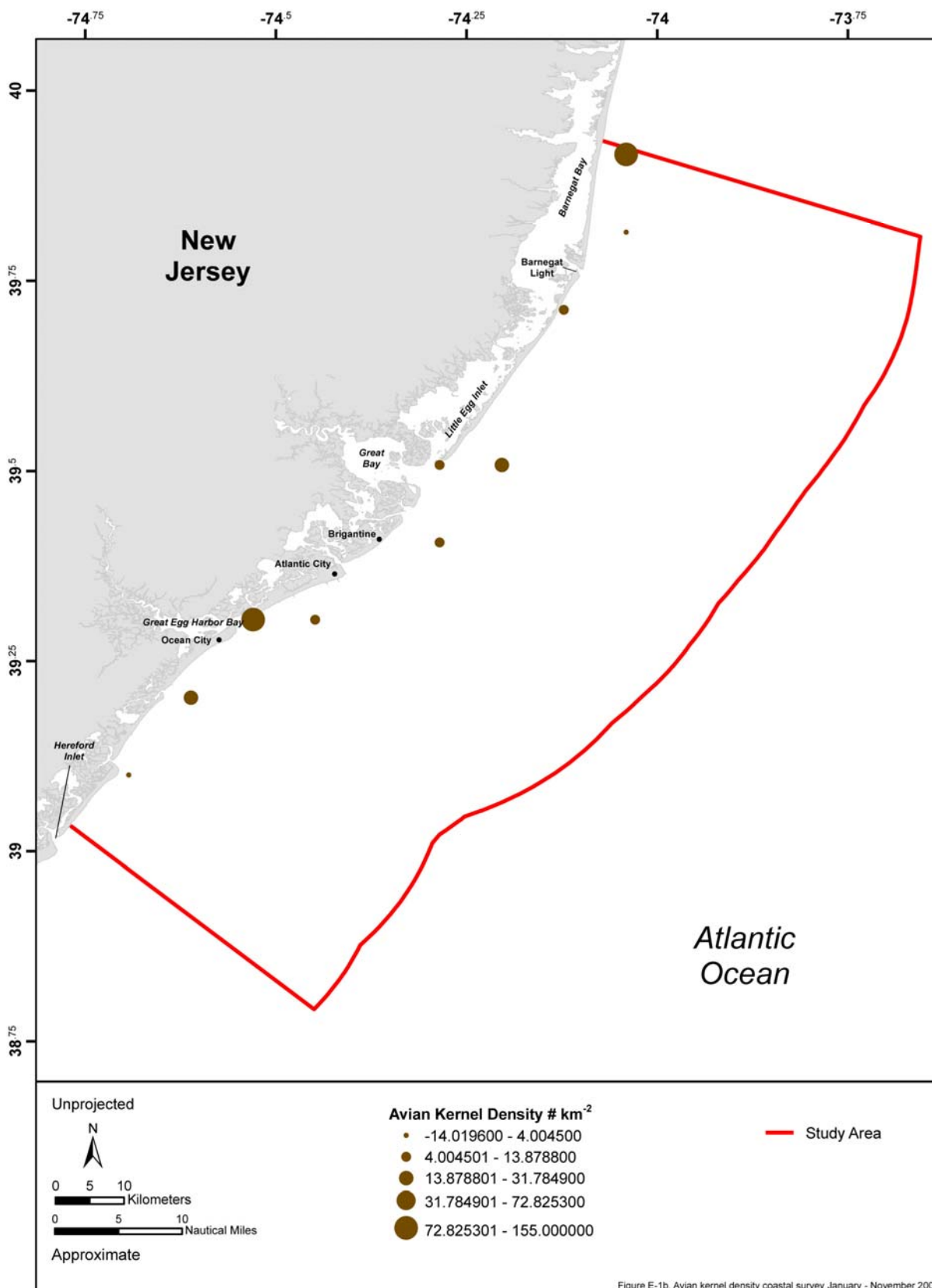


Figure E-1b. Avian kernel density (No./km²) in the New Jersey Study Area during the coastal surveys from January through November 2008.

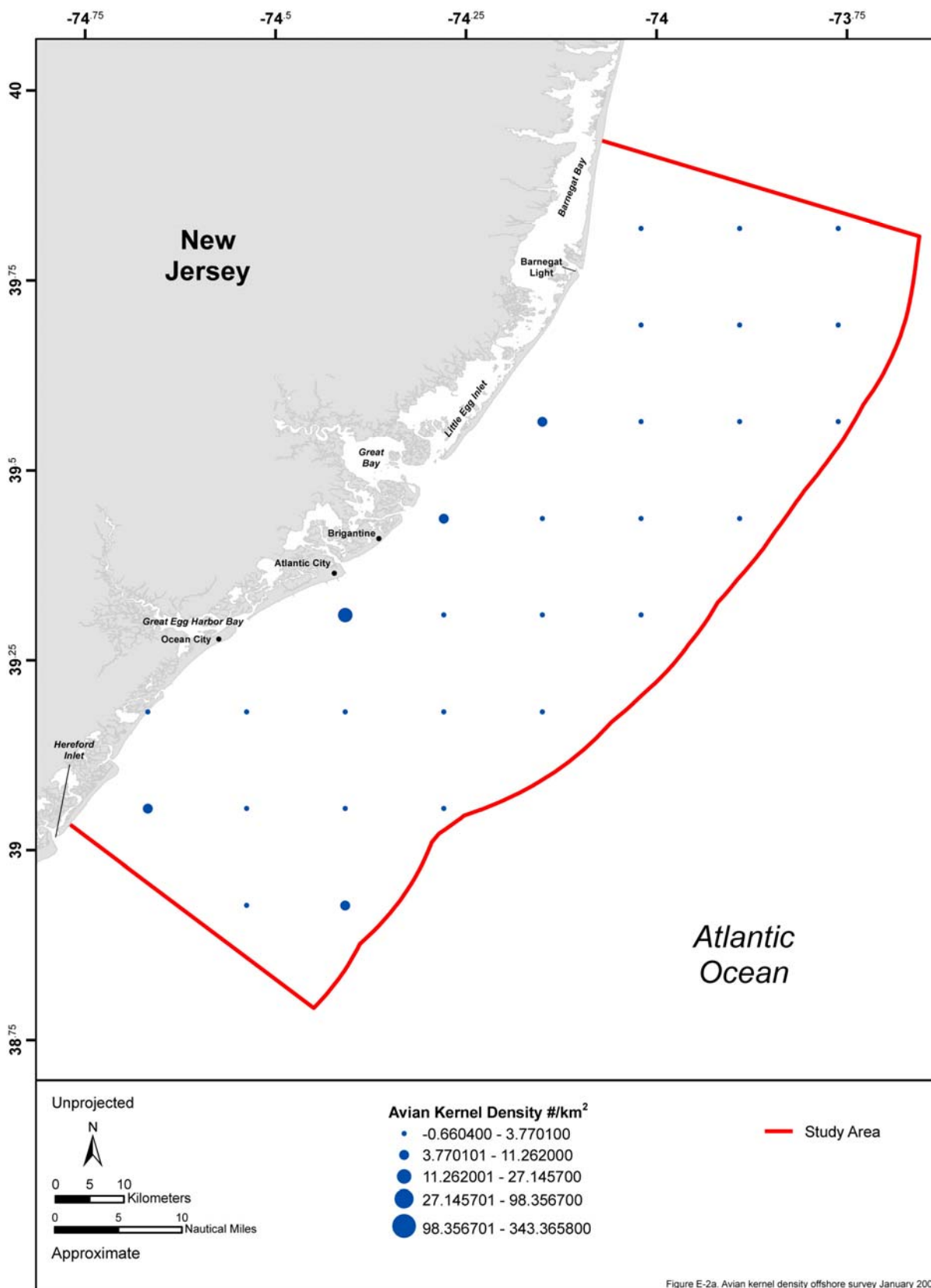


Figure E-2a. Avian kernel density (No./km²) in the New Jersey Study Area during the shipboard offshore survey in January 2008.

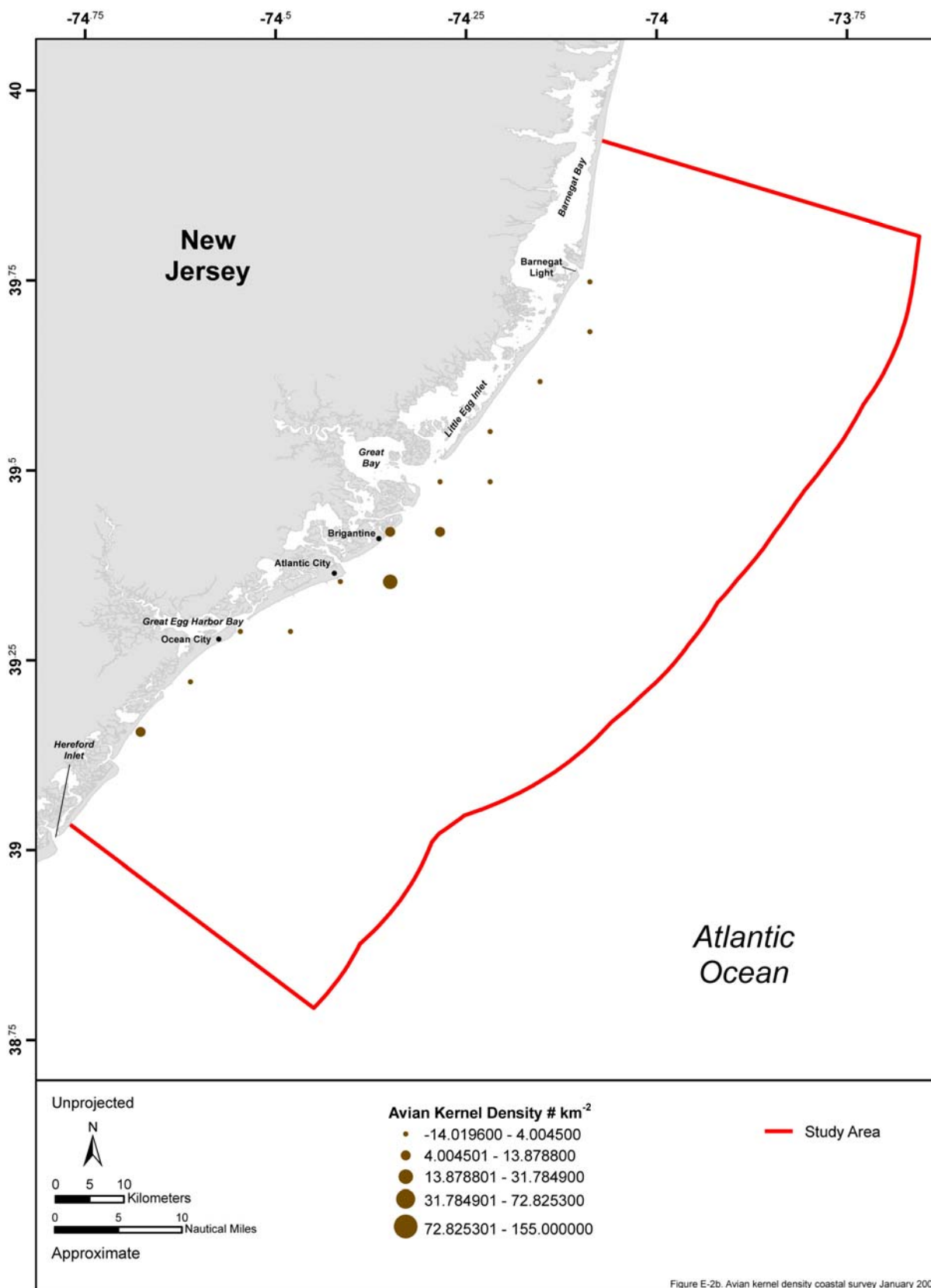


Figure E-2b. Avian kernel density (No./km²) in the New Jersey Study Area during the coastal survey in January 2008.

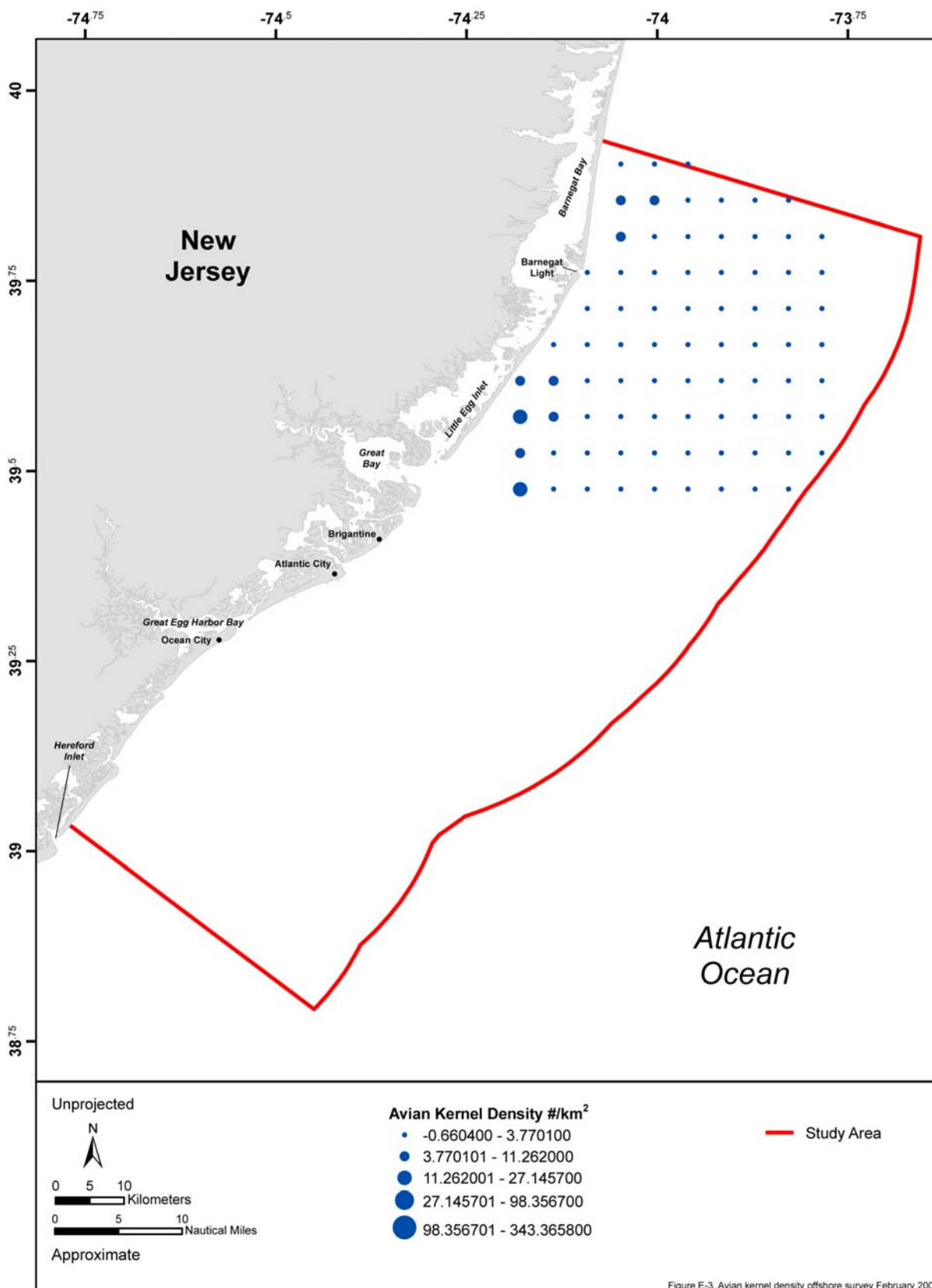


Figure E-3. Avian kernel density (No./km²) in the New Jersey Study Area during the shipboard offshore survey in February 2008.

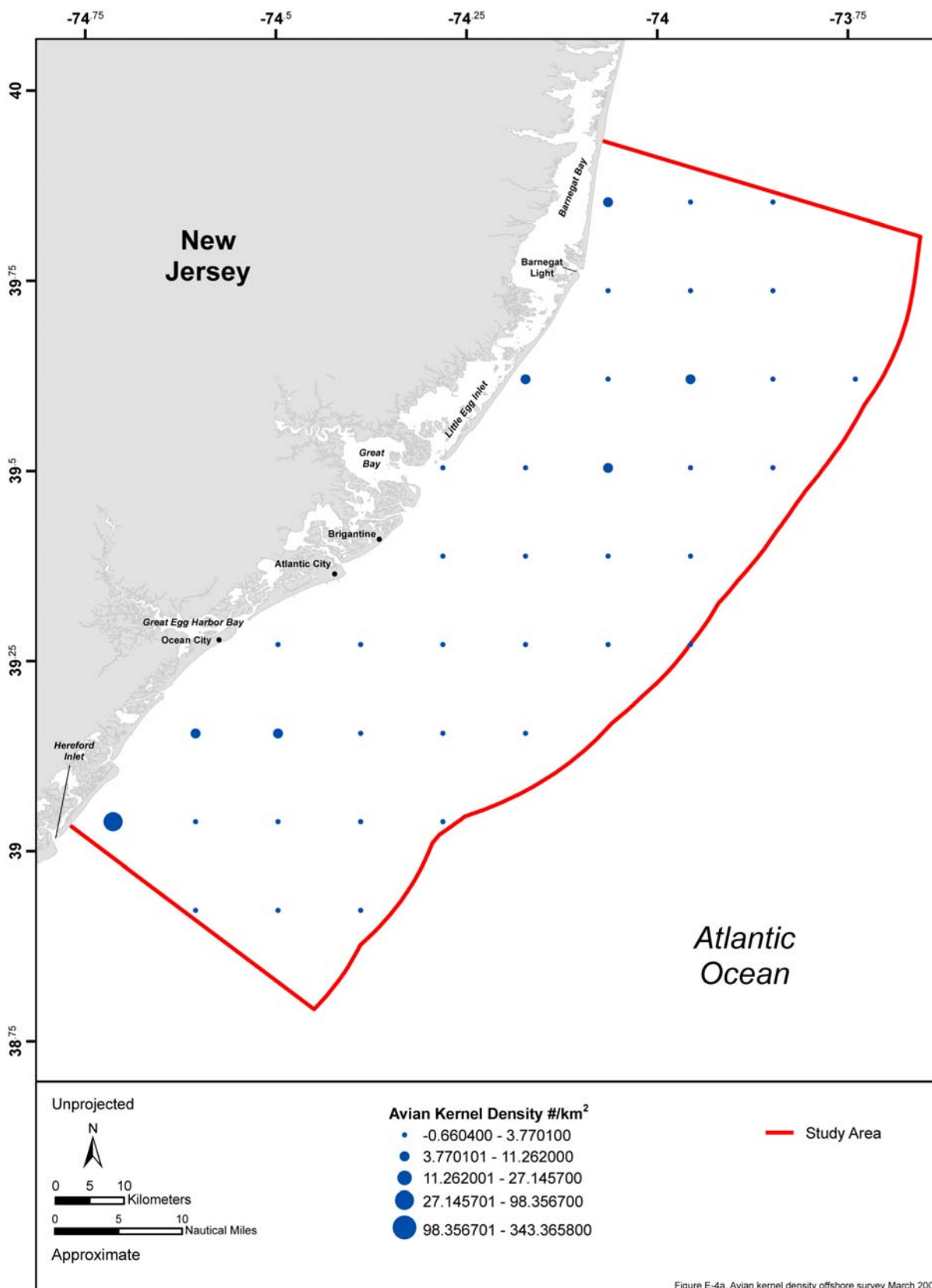


Figure E-4a. Avian kernel density (No./km²) in the New Jersey Study Area during the shipboard offshore survey in March 2008.

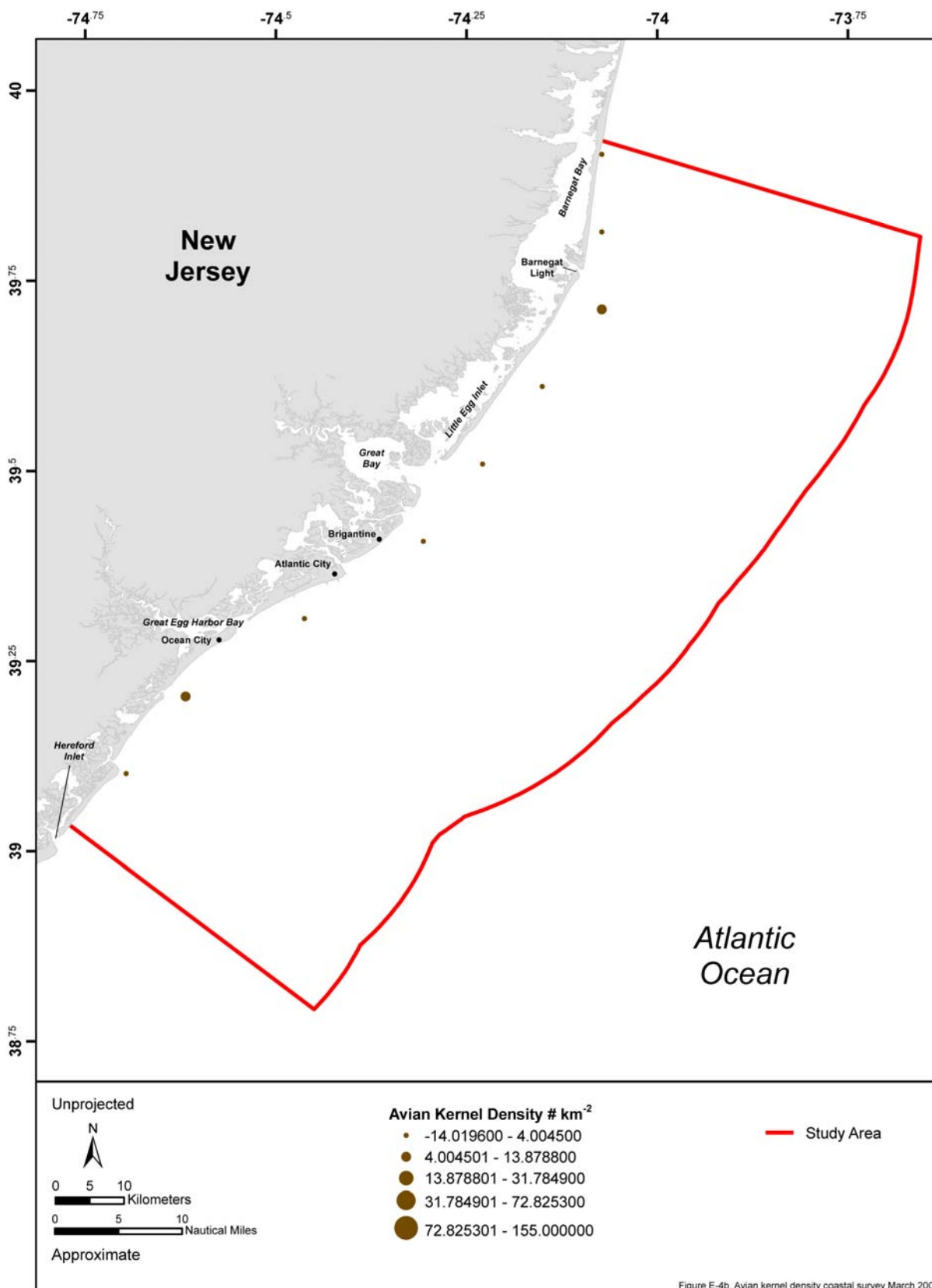


Figure E-4b. Avian kernel density (No./km^2) in the New Jersey Study Area during the coastal survey in March 2008.

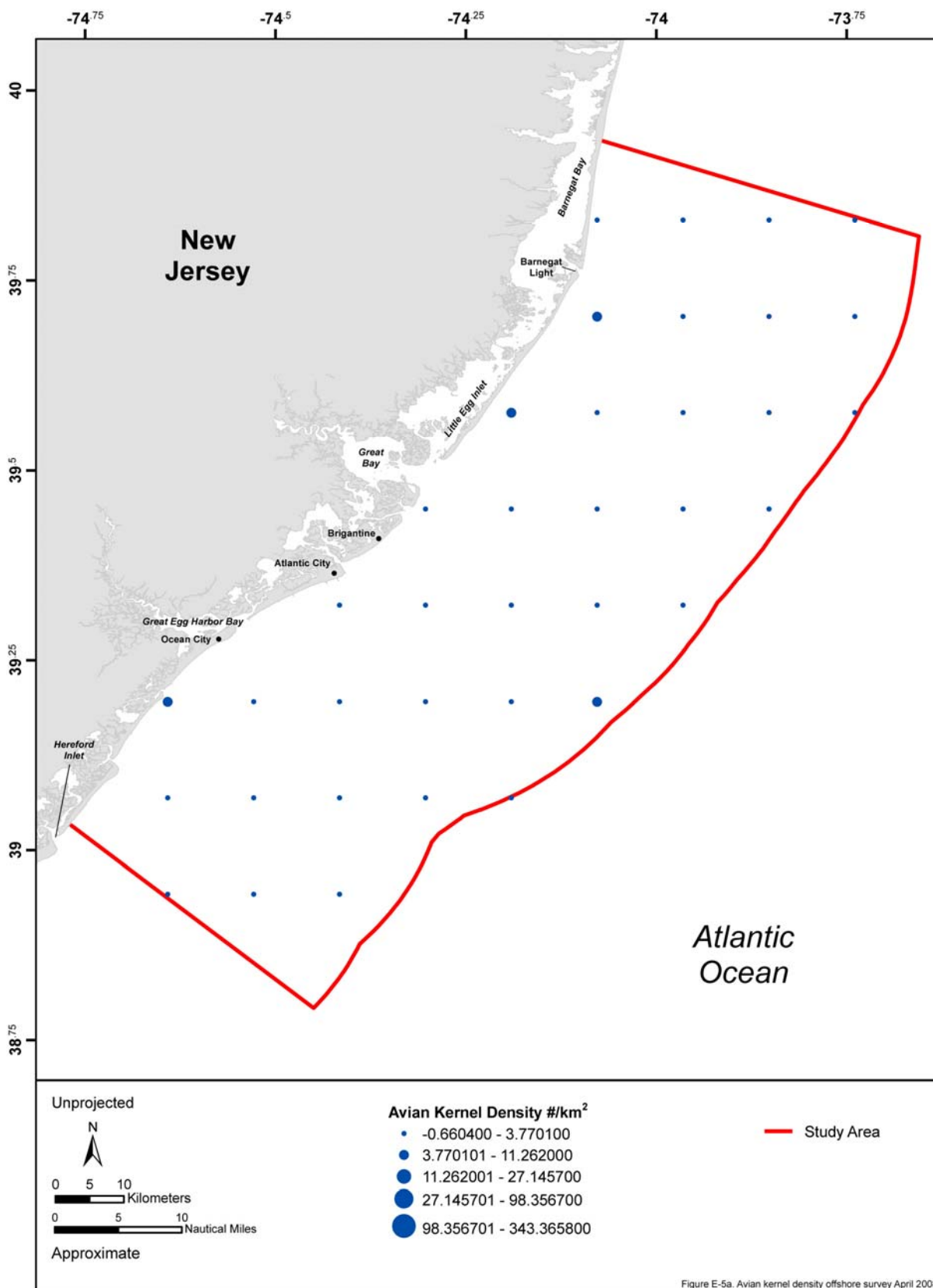


Figure E-5a. Avian kernel density (No./km²) in the New Jersey Study Area during the shipboard offshore survey in April 2008.

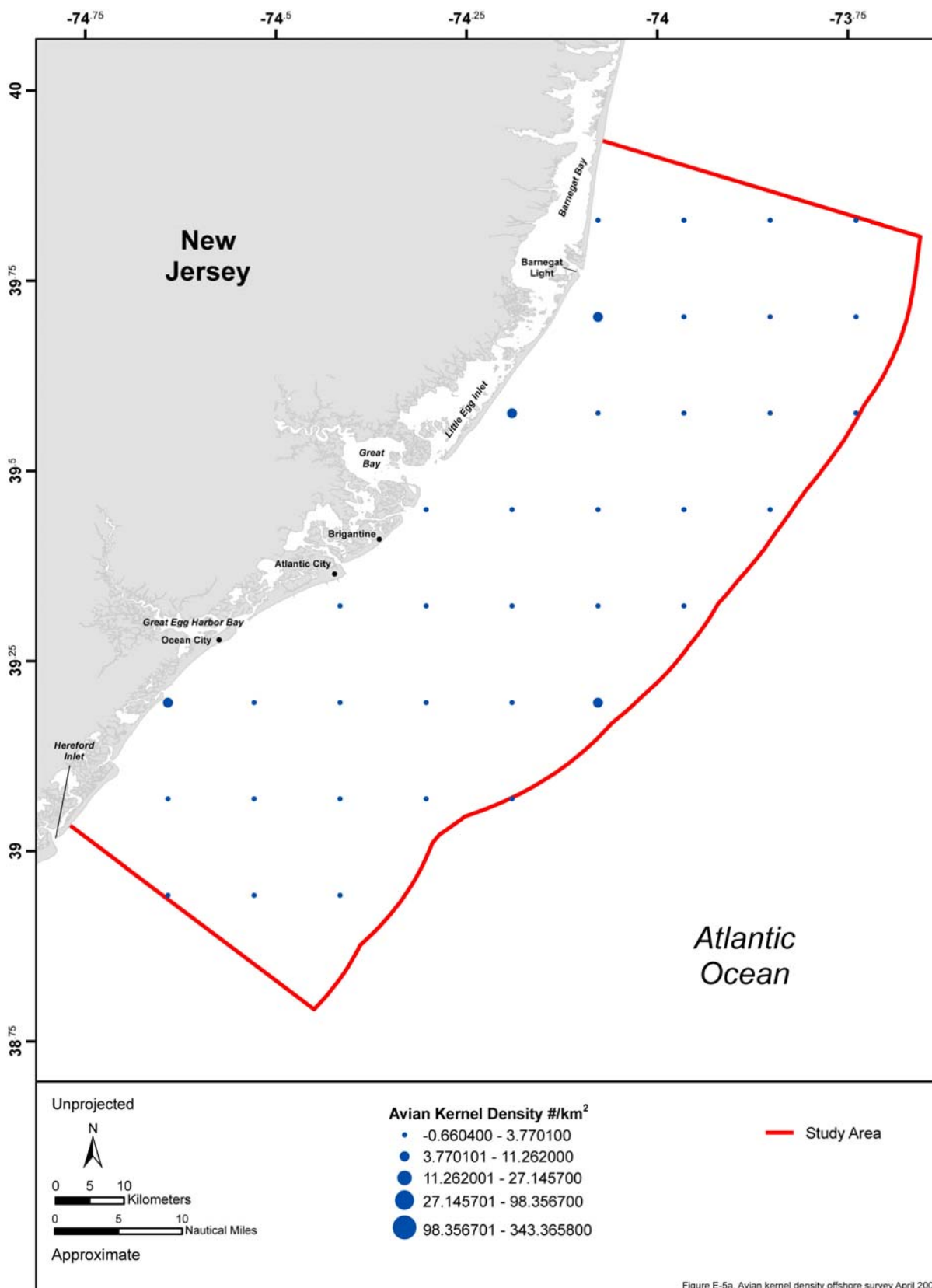


Figure E-5b. Avian kernel density (No./km²) in the New Jersey Study Area during the coastal survey in April 2008.

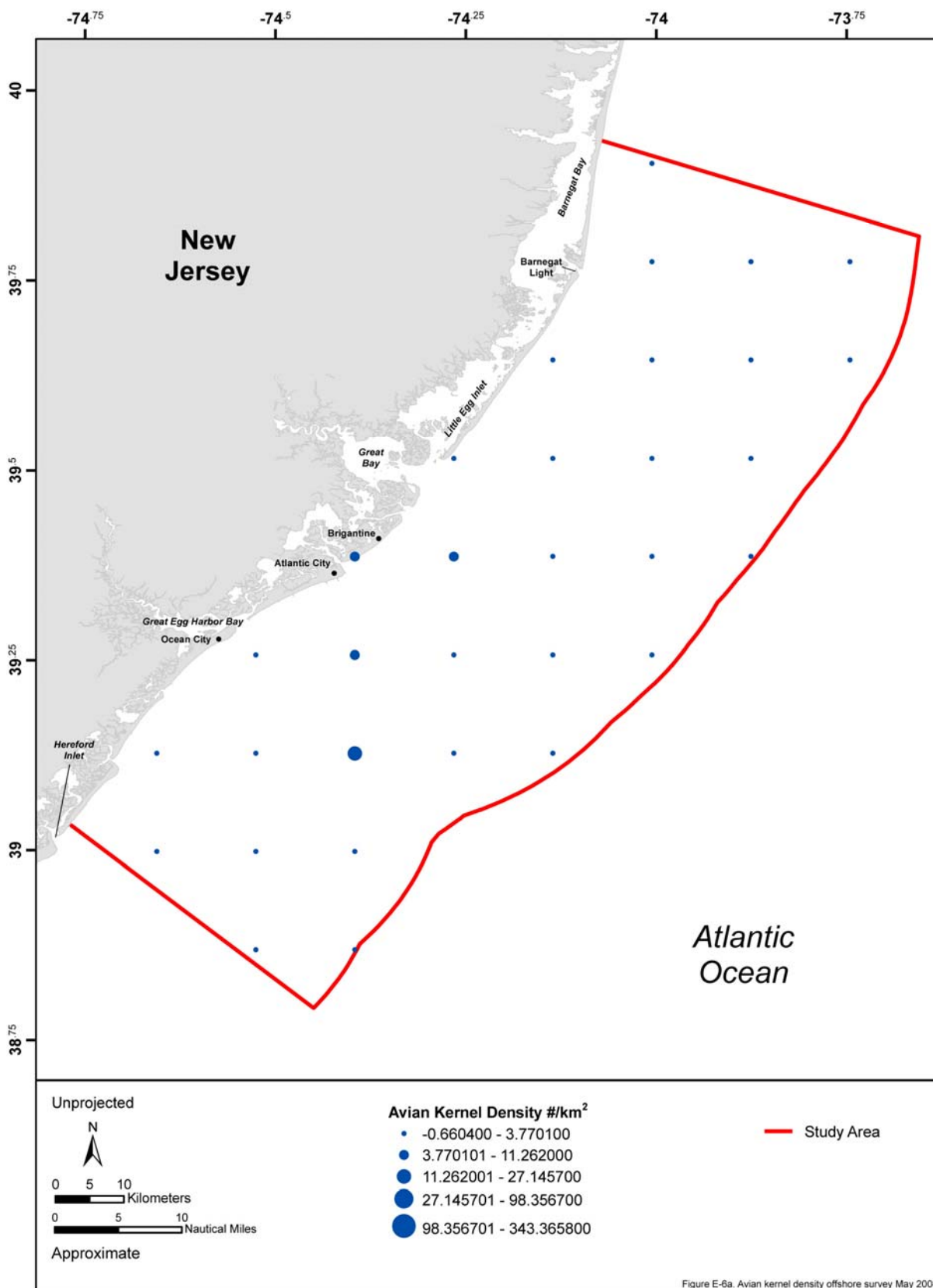


Figure E-6a. Avian kernel density (No./km²) in the New Jersey Study Area during the shipboard offshore survey in May 2008.

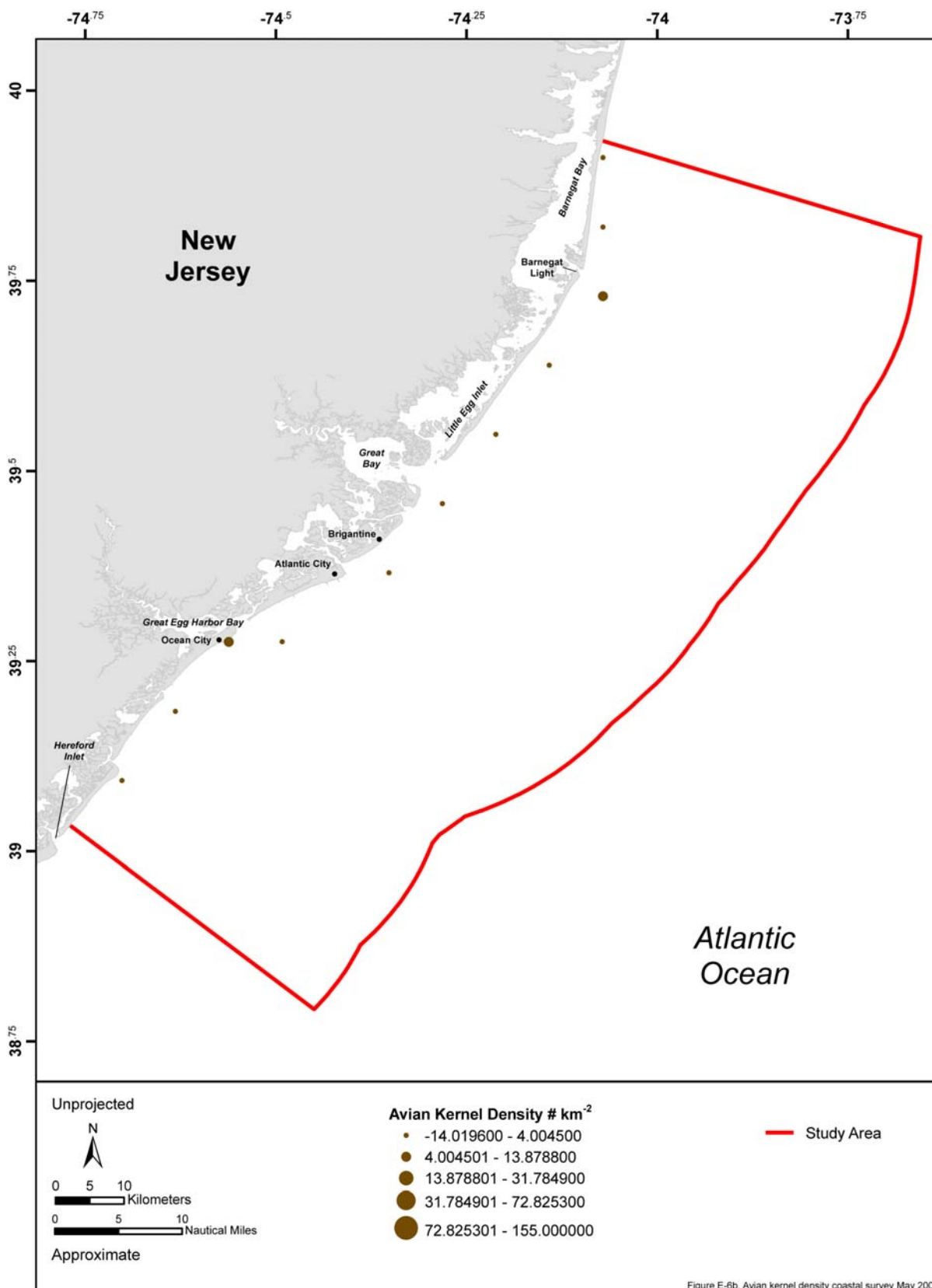


Figure E-6b. Avian kernel density (No./km²) in the New Jersey Study Area during the coastal survey in May 2008.

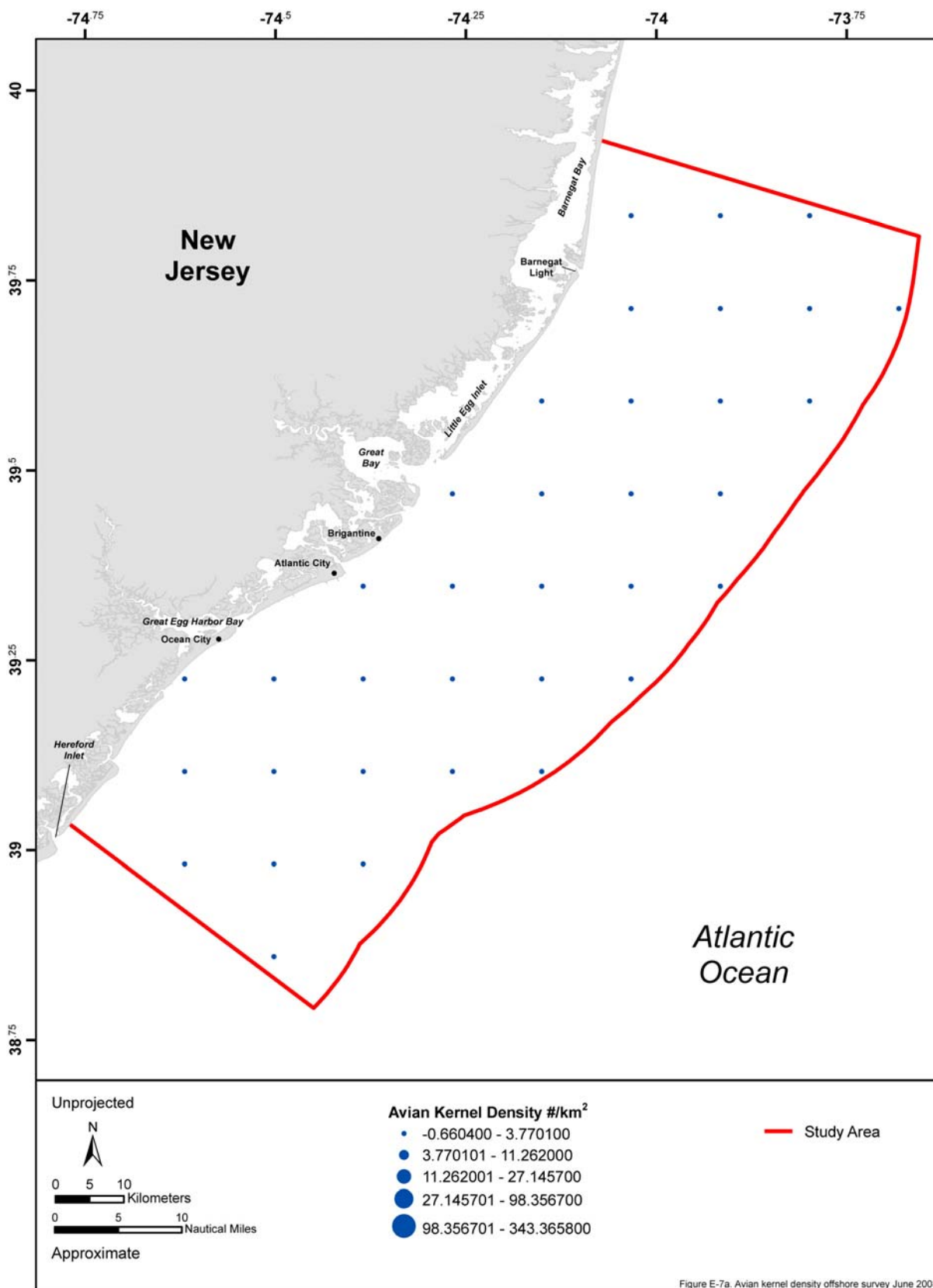


Figure E-7a. Avian kernel density (No./km²) in the New Jersey Study Area during the shipboard offshore survey in June 2008.

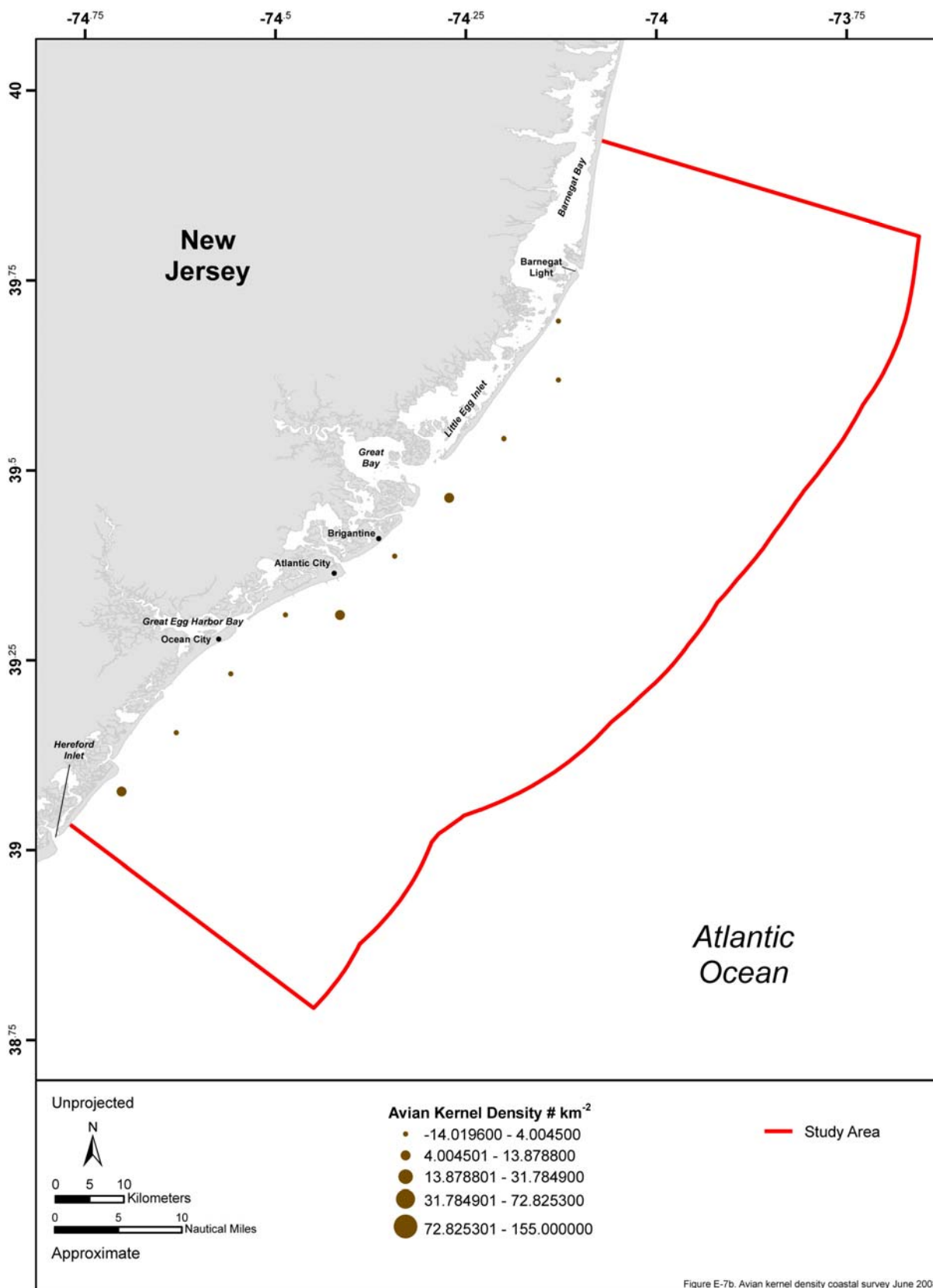


Figure E-7b. Avian kernel density (No./km²) in the New Jersey Study Area during the coastal survey in June 2008.

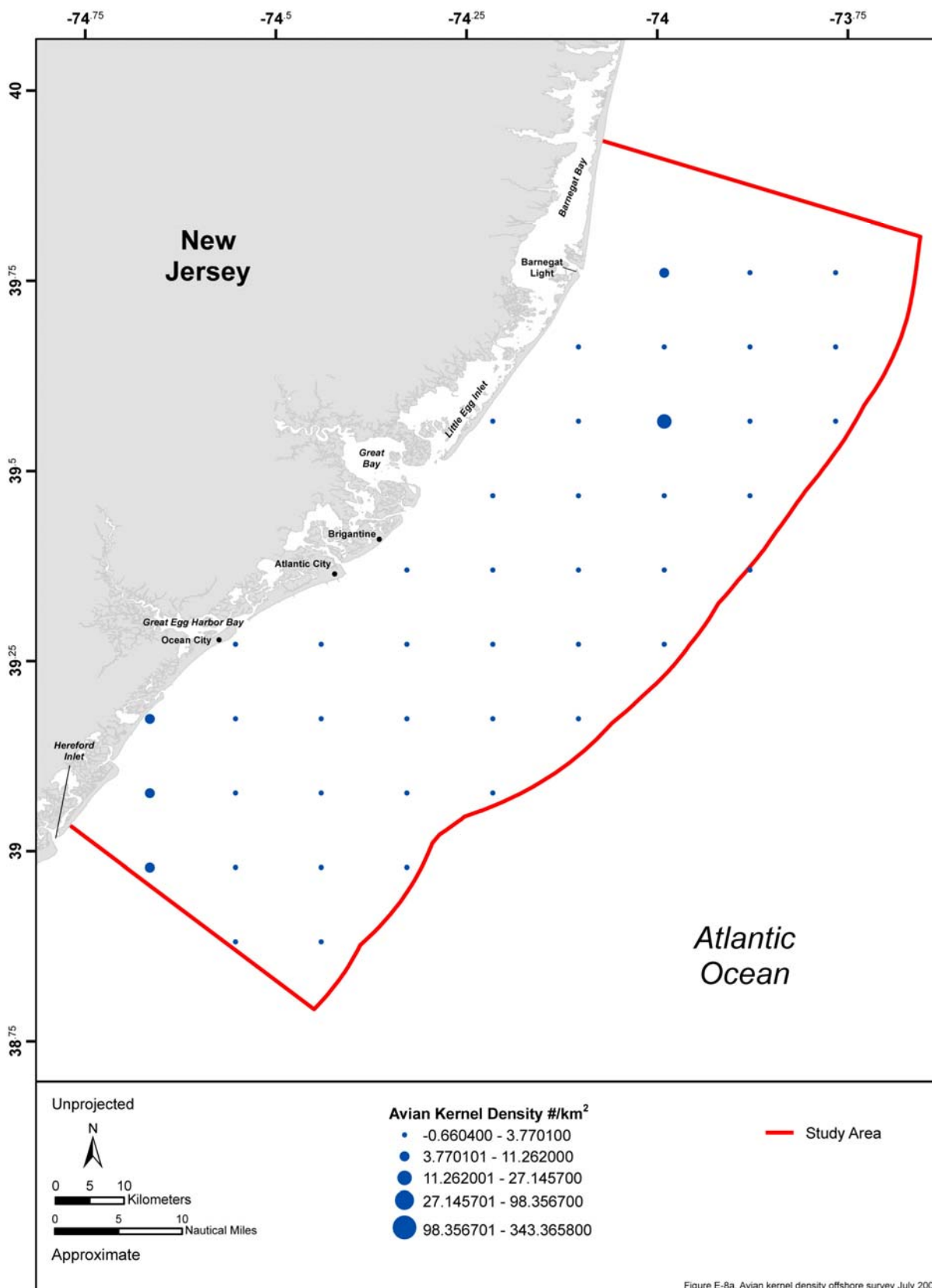


Figure E-8a. Avian kernel density (No./km²) in the New Jersey Study Area during the shipboard offshore survey in July 2008.

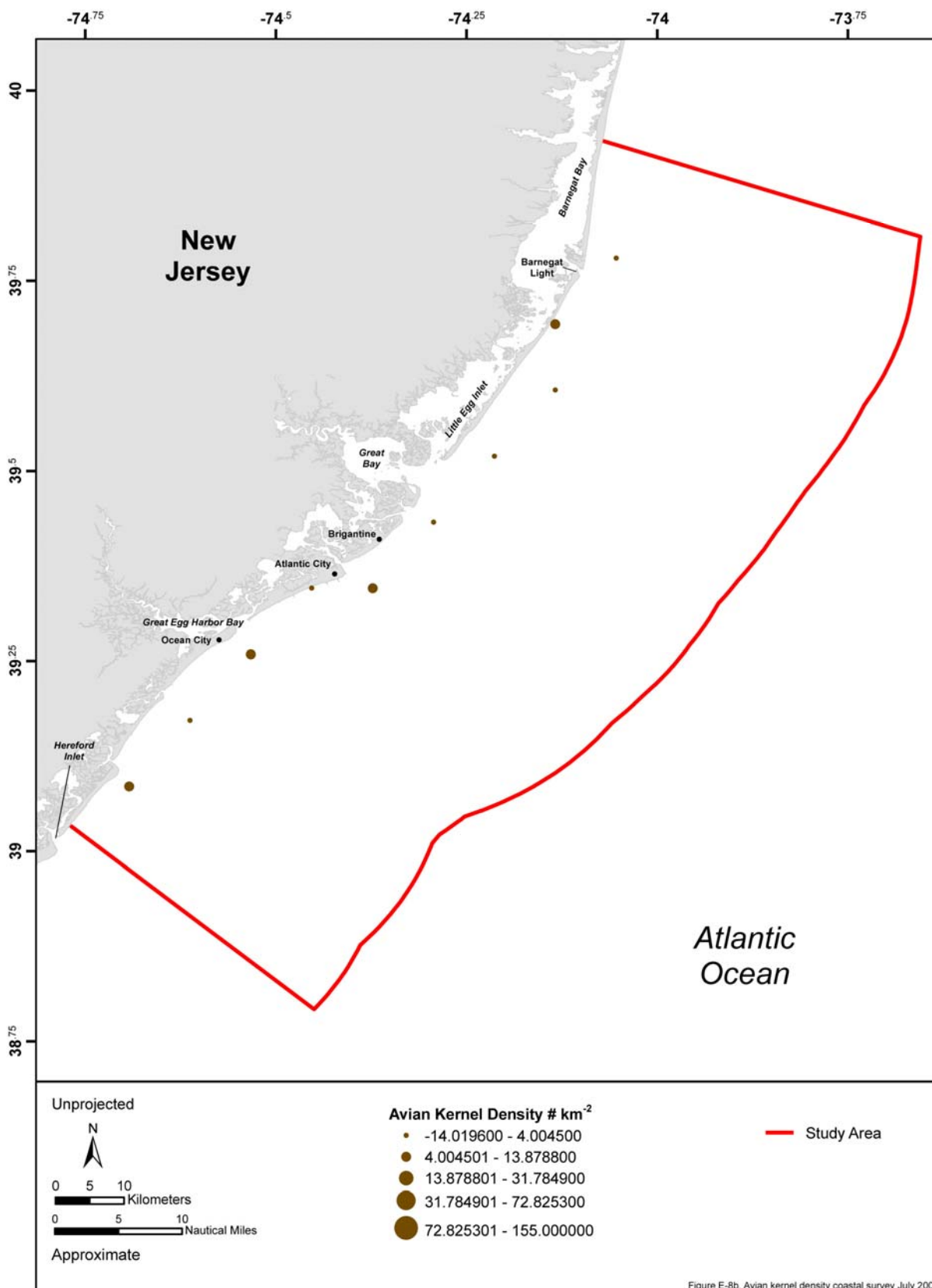


Figure E-8b. Avian kernel density (No./km²) in the New Jersey Study Area during the coastal survey in July 2008.

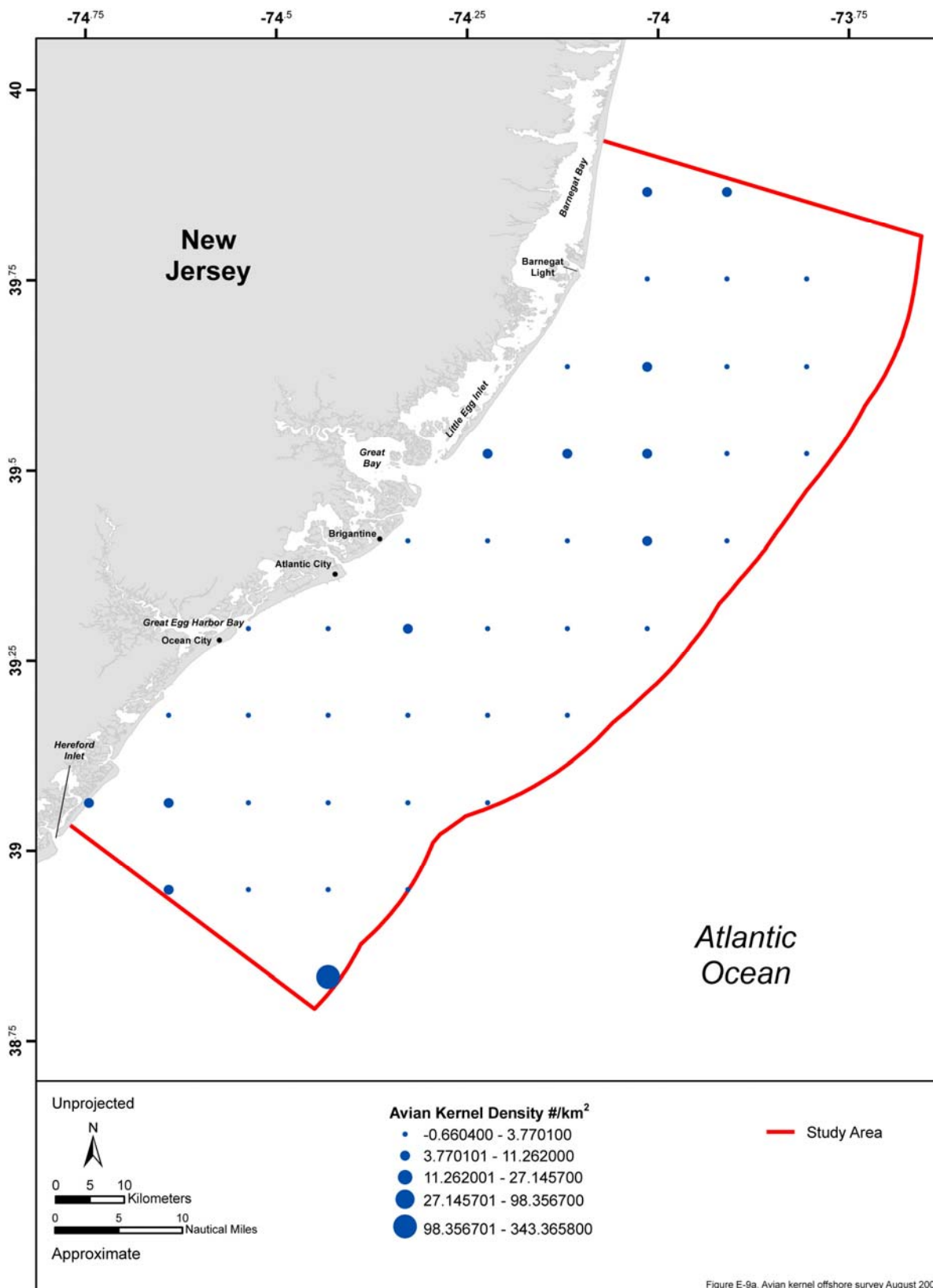


Figure E-9a. Avian kernel density (No./km²) in the New Jersey Study Area during the shipboard offshore survey in August 2008.

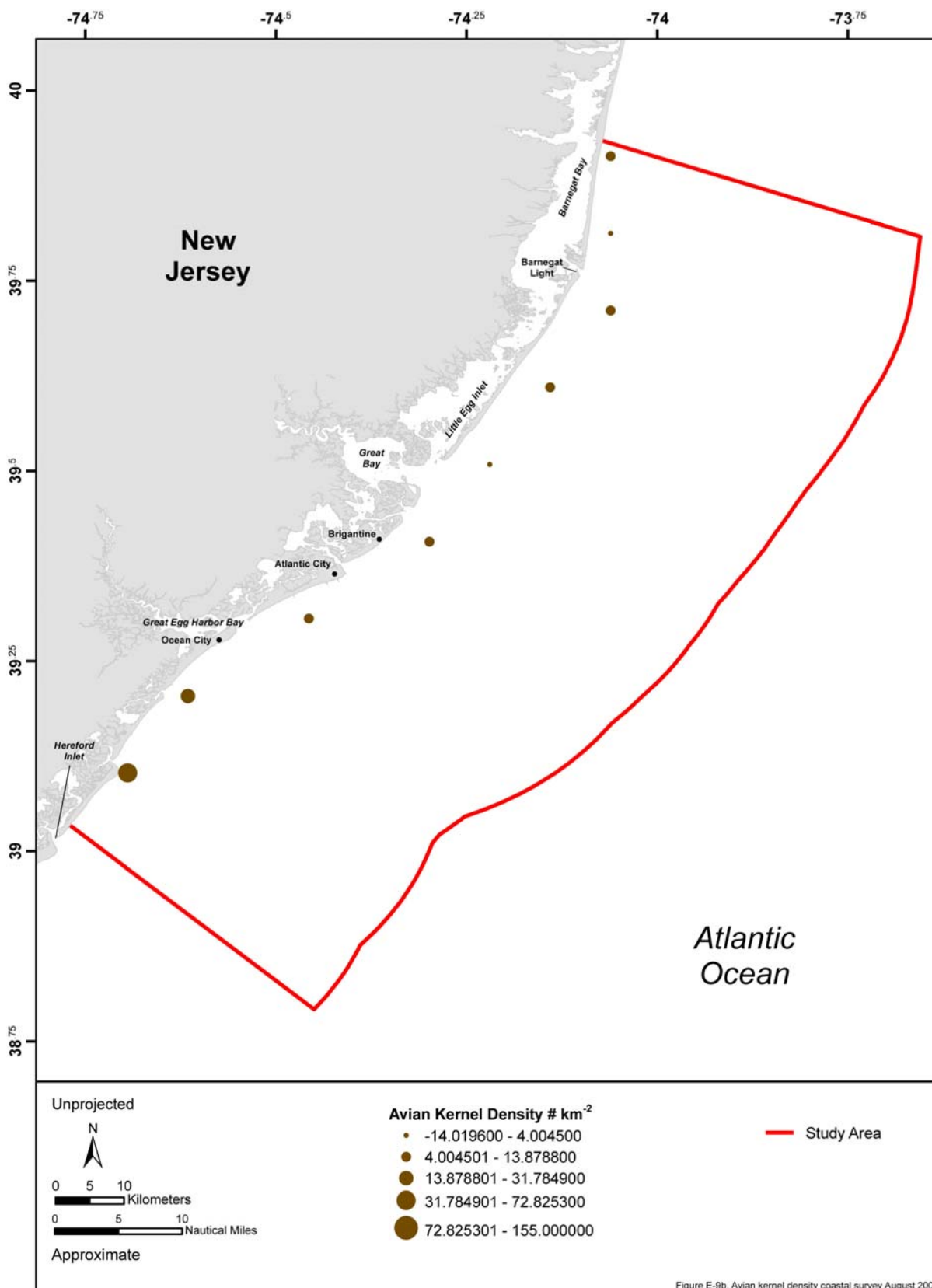


Figure E-9b. Avian kernel density (No./km²) in the New Jersey Study Area during the coastal survey in August 2008.

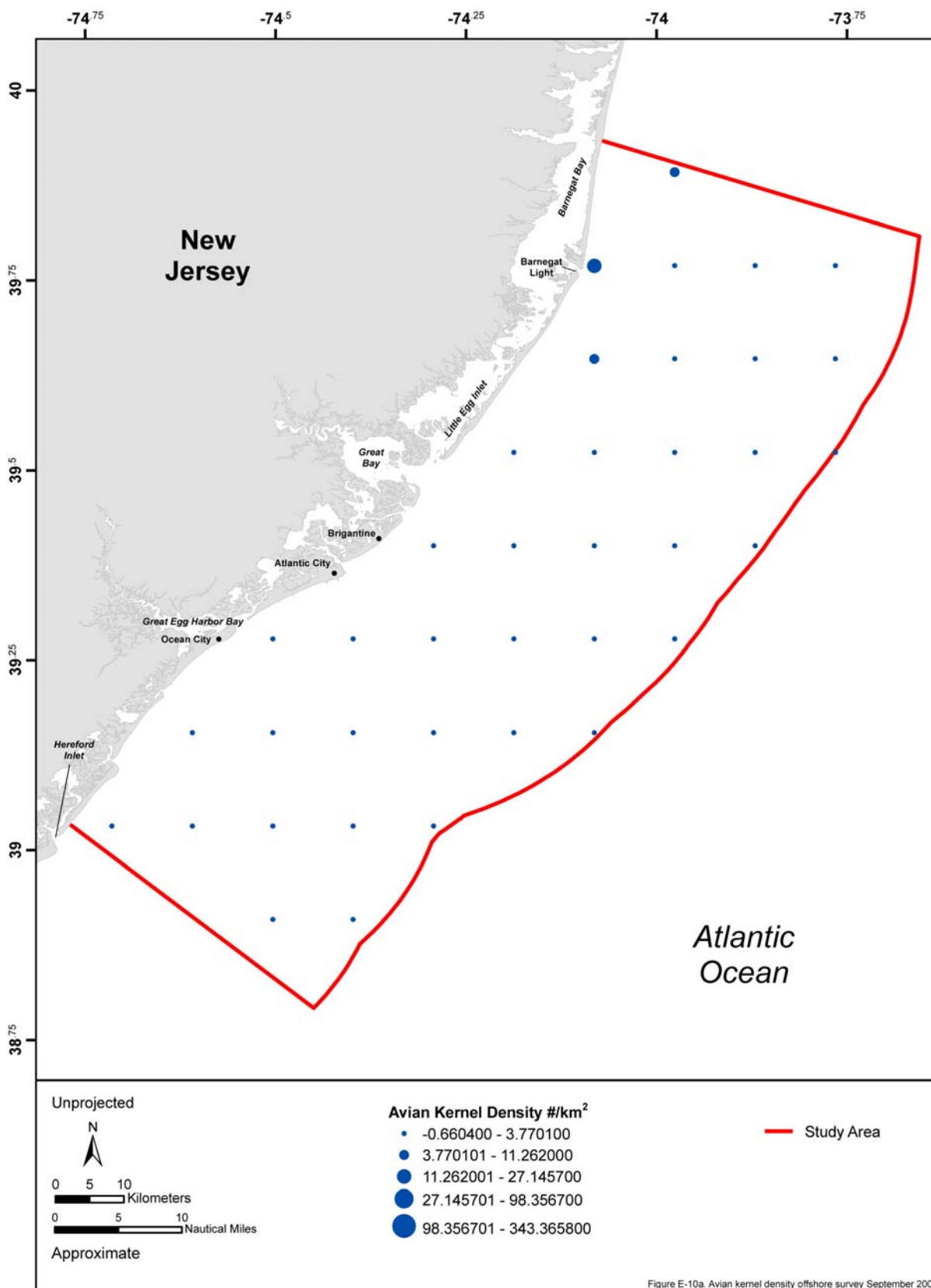


Figure E-10a. Avian kernel density (No./km²) in the New Jersey Study Area during the shipboard offshore survey in September 2008.

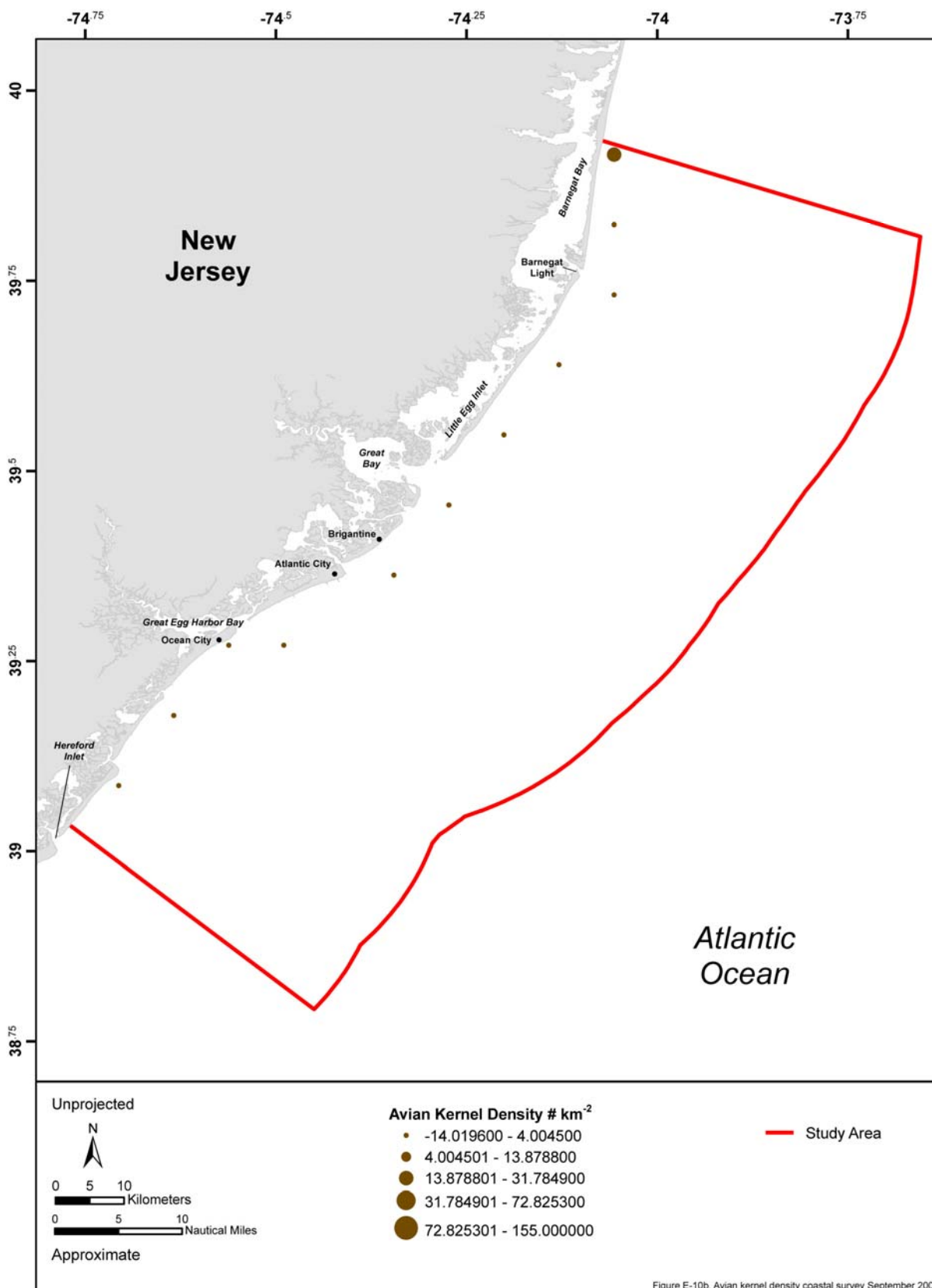


Figure E-10b. Avian kernel density (No./km²) in the New Jersey Study Area during the coastal survey in September 2008.

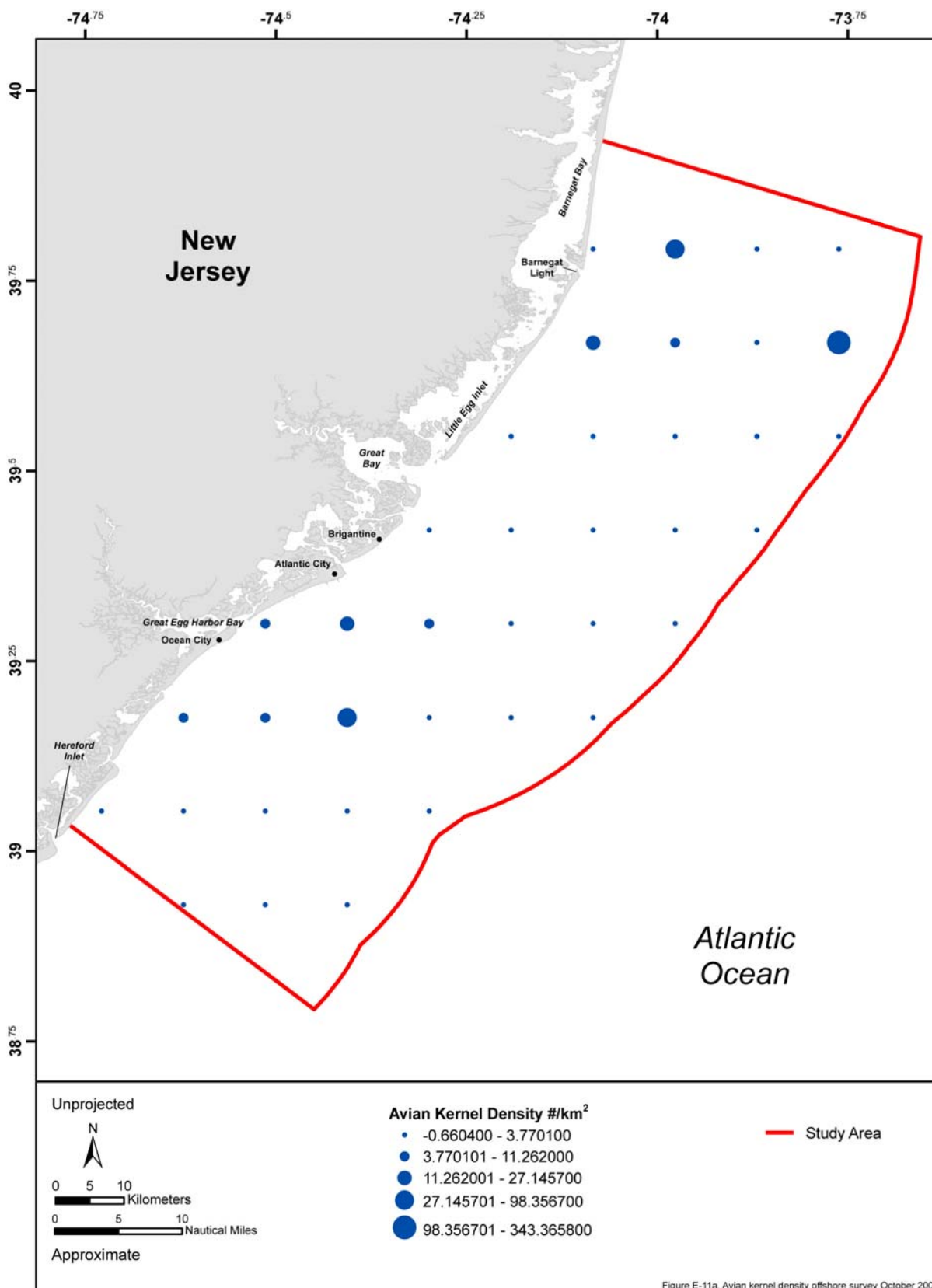


Figure E-11a. Avian kernel density (No./km²) in the New Jersey Study Area during the shipboard offshore survey in October 2008.

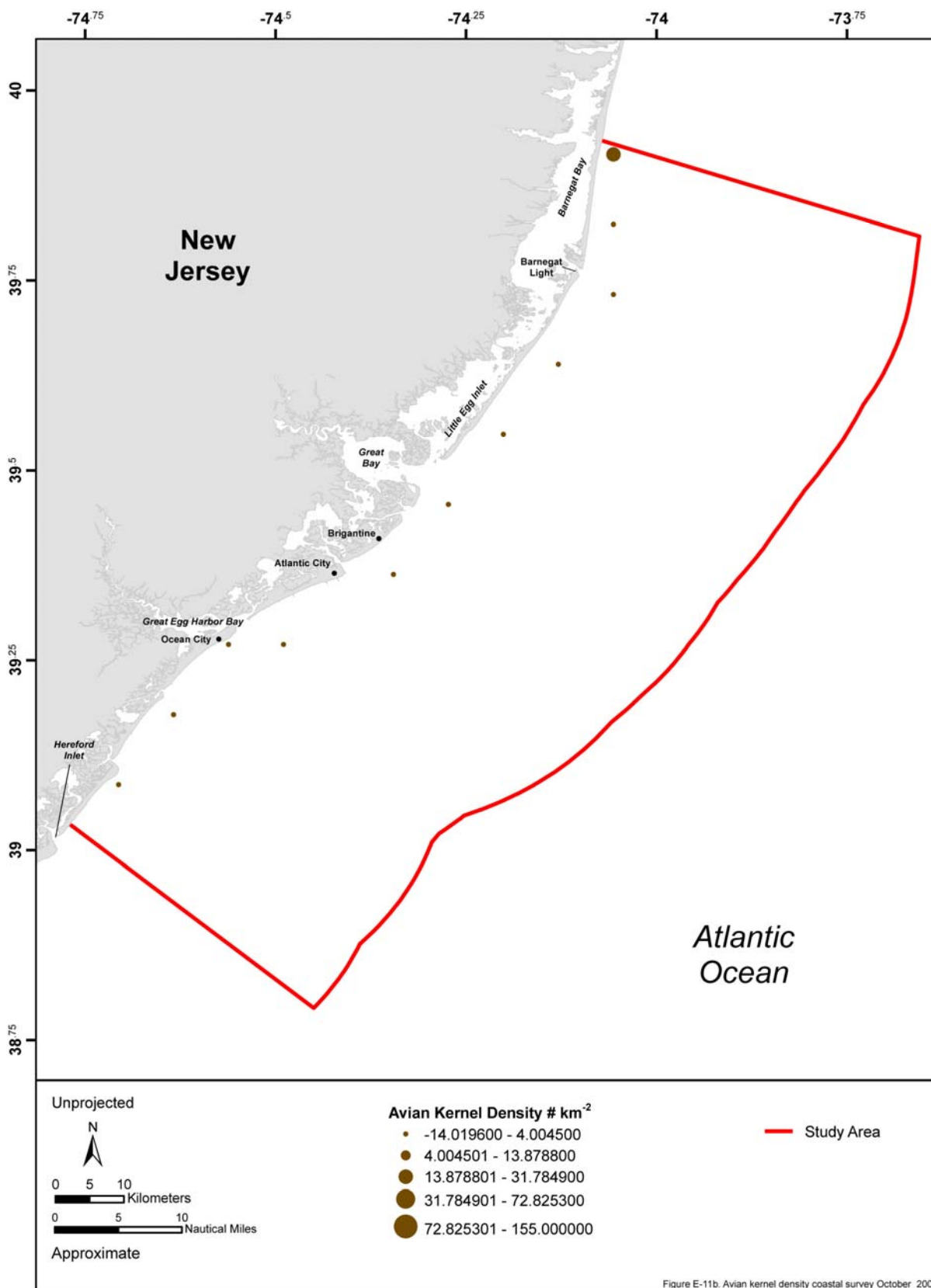


Figure E-11b. Avian kernel density (No./km^2) in the New Jersey Study Area during the coastal survey in October 2008.

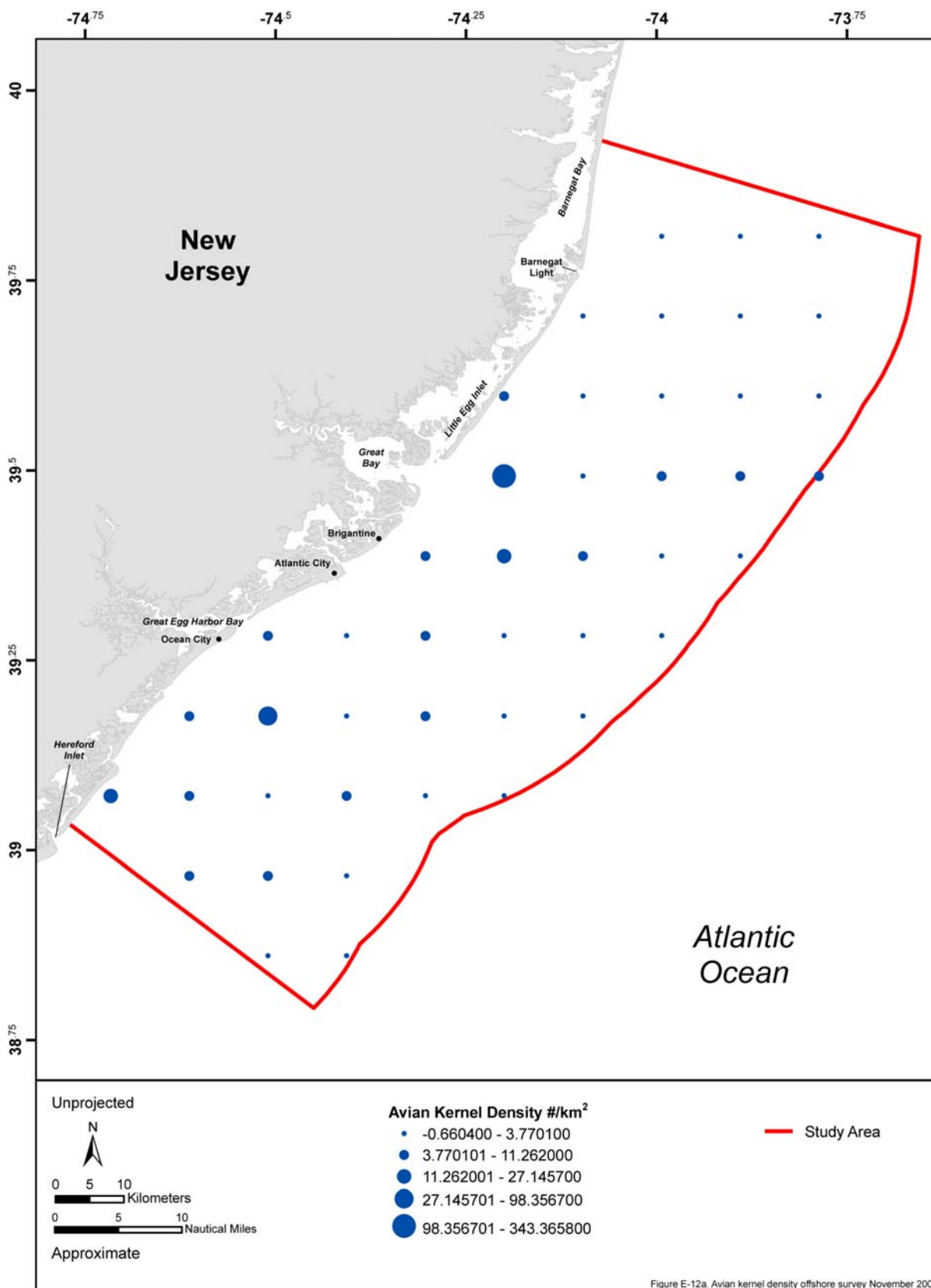


Figure E-12a. Avian kernel density (No./km²) in the New Jersey Study Area during the shipboard offshore survey in November 2008.

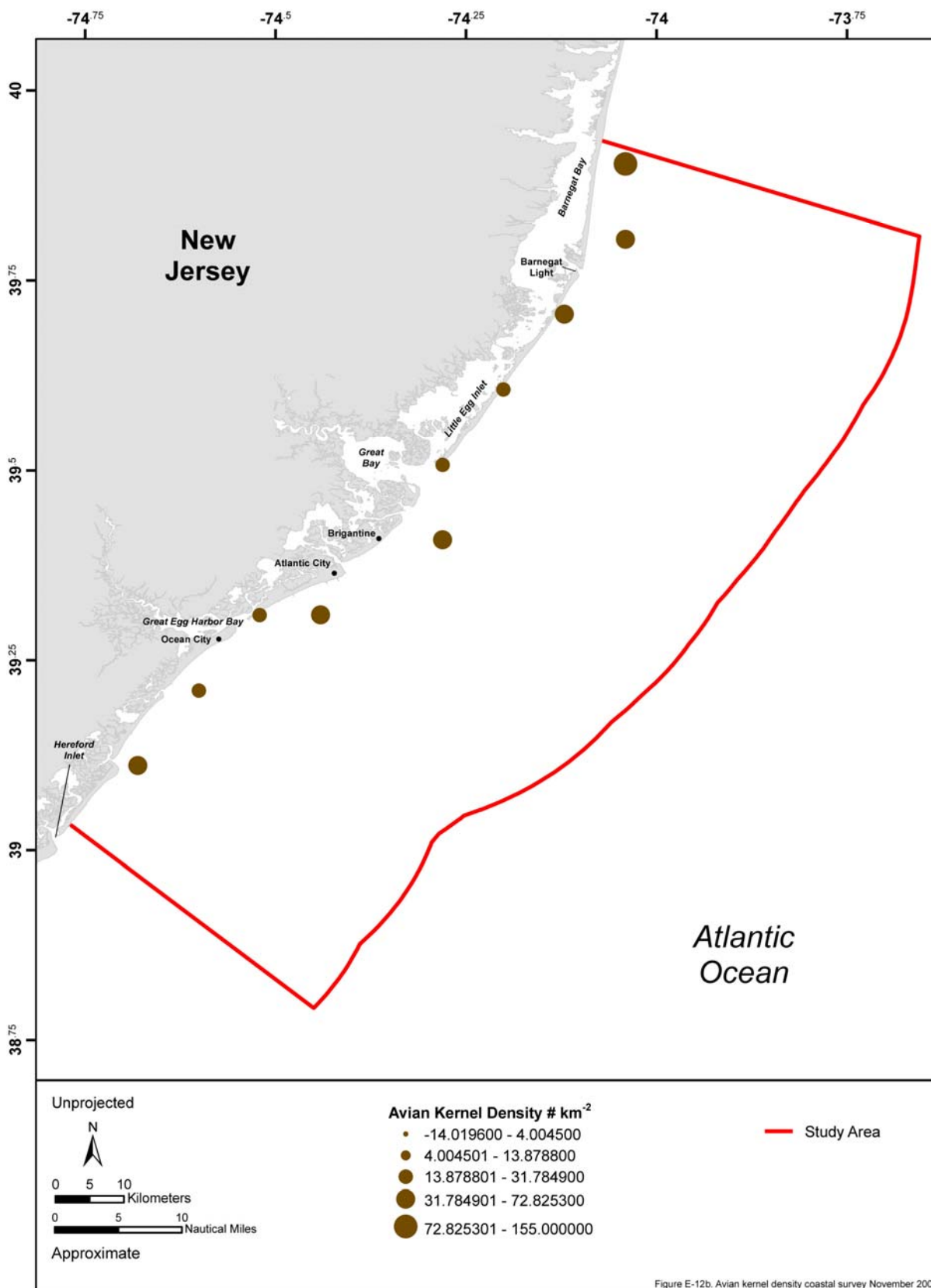


Figure E-12b. Avian kernel density (No./km²) in the New Jersey Study Area during the coastal survey in November 2008.

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APPENDIX F
ESSENTIAL FISH HABITAT MAPS

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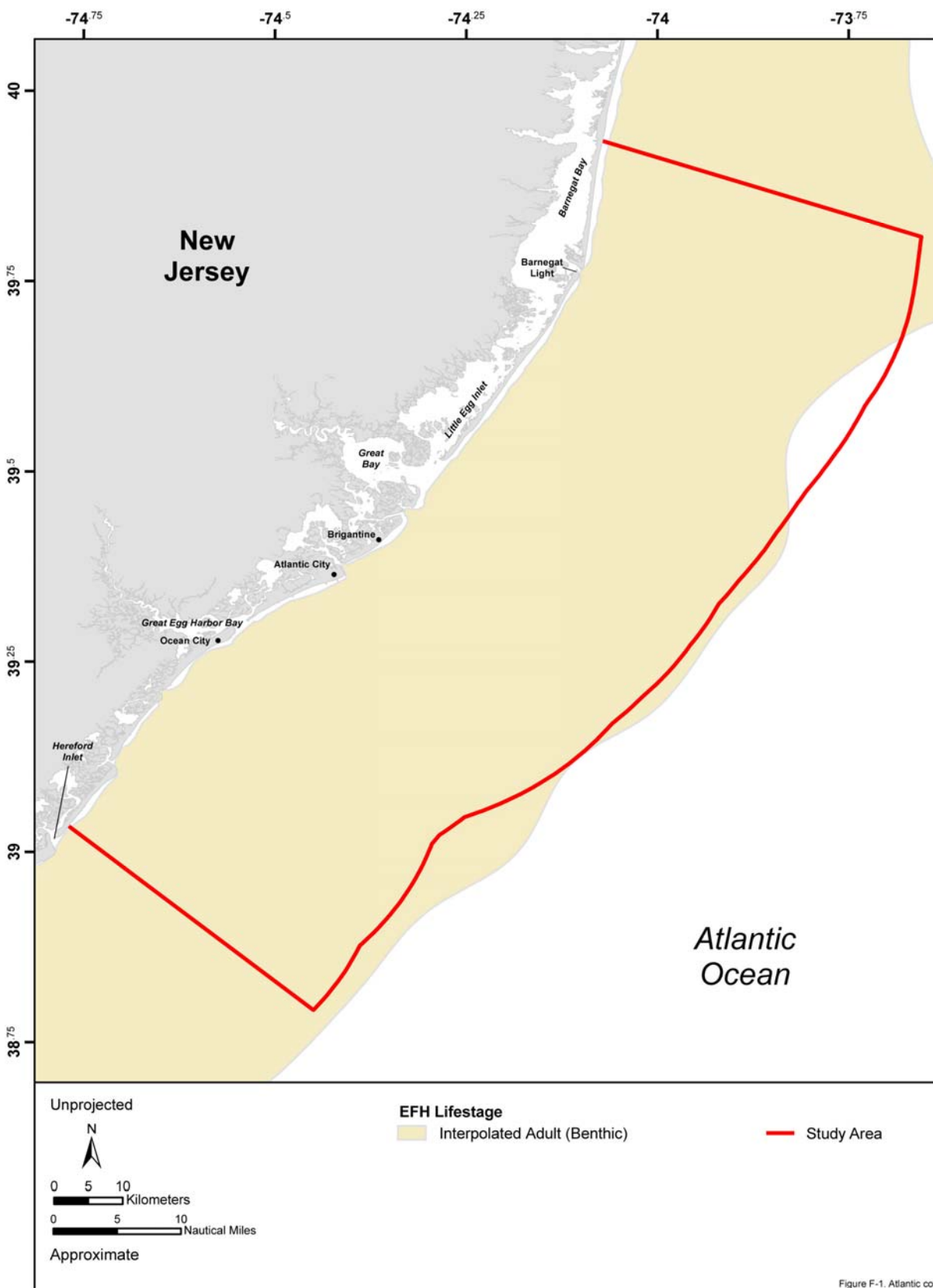


Figure F-1. Essential fish habitat designated in the New Jersey Study Area for adult lifestage of Atlantic cod. Source map (scanned): NEFMC (1998).

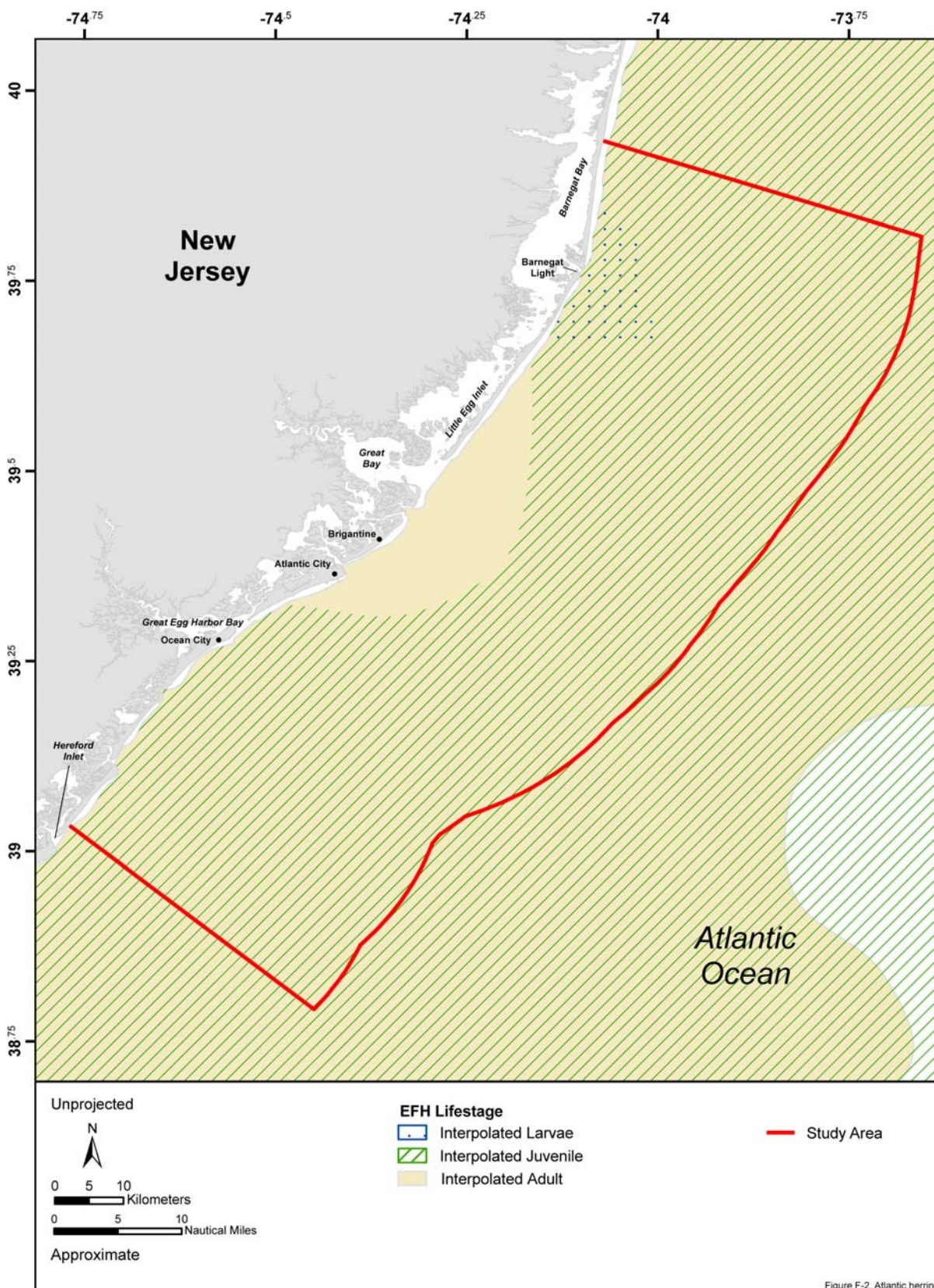


Figure F-2. Essential fish habitat designated in the New Jersey Study Area for all lifestages of Atlantic herring. Source map (scanned): NEFMC (1998).

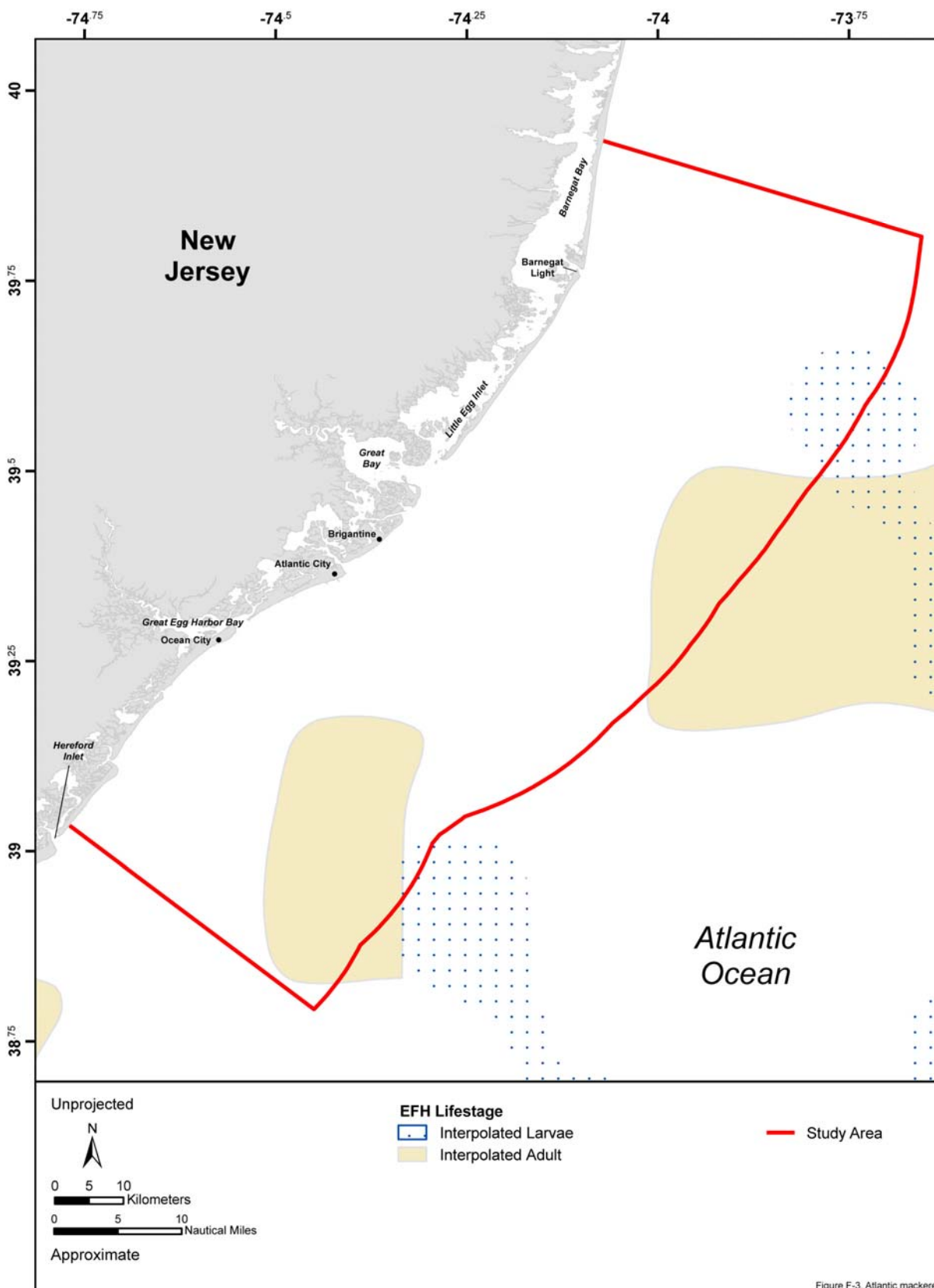


Figure F-3. Essential fish habitat designated in the New Jersey Study Area for larval and adult lifestages of Atlantic mackerel. Source map (scanned): MAFMC (1998b).

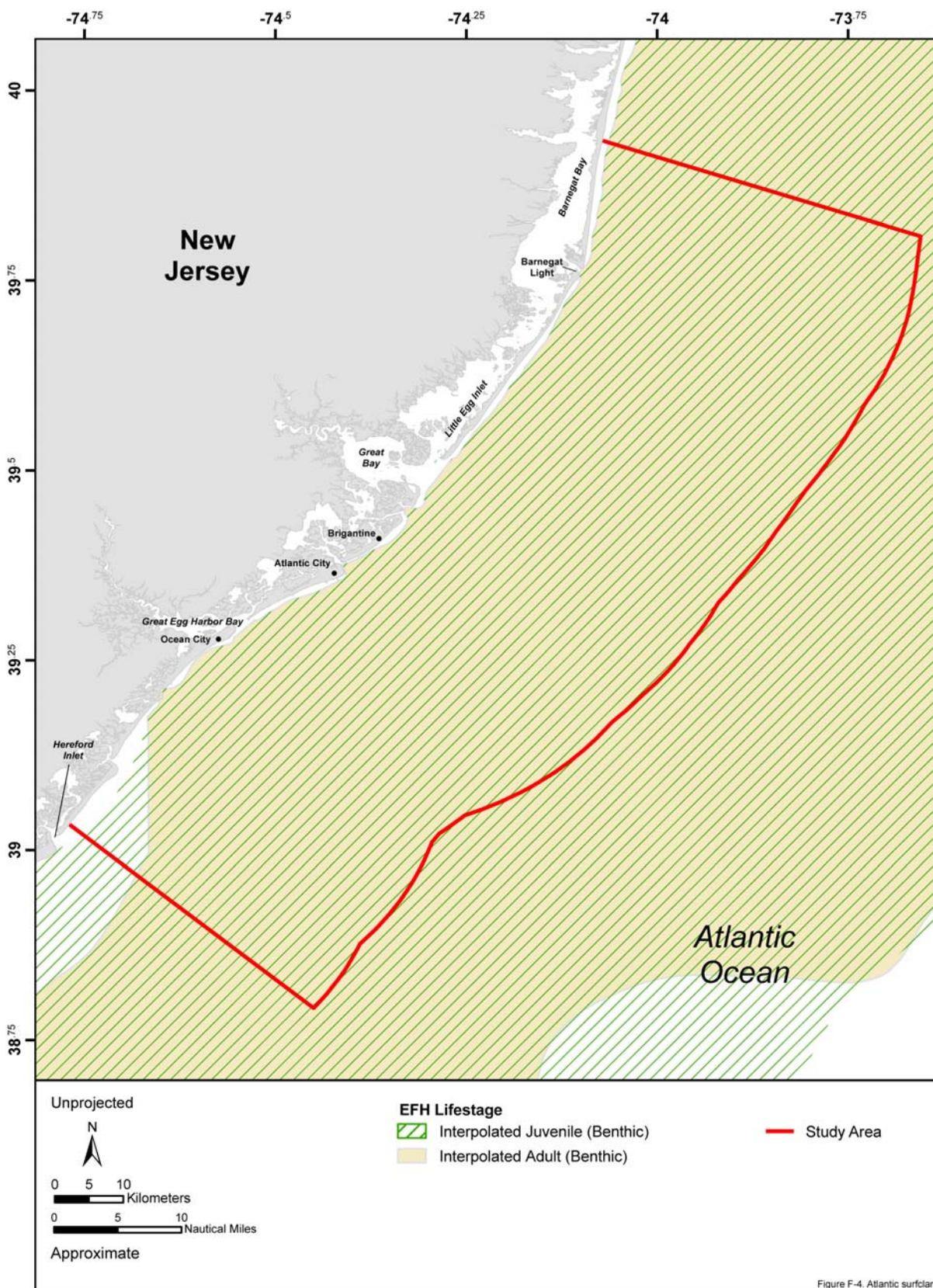


Figure F-4. Essential fish habitat designated in the New Jersey Study Area for all lifestages of the Atlantic surfclam. Source map (scanned): MAFMC (1998a).

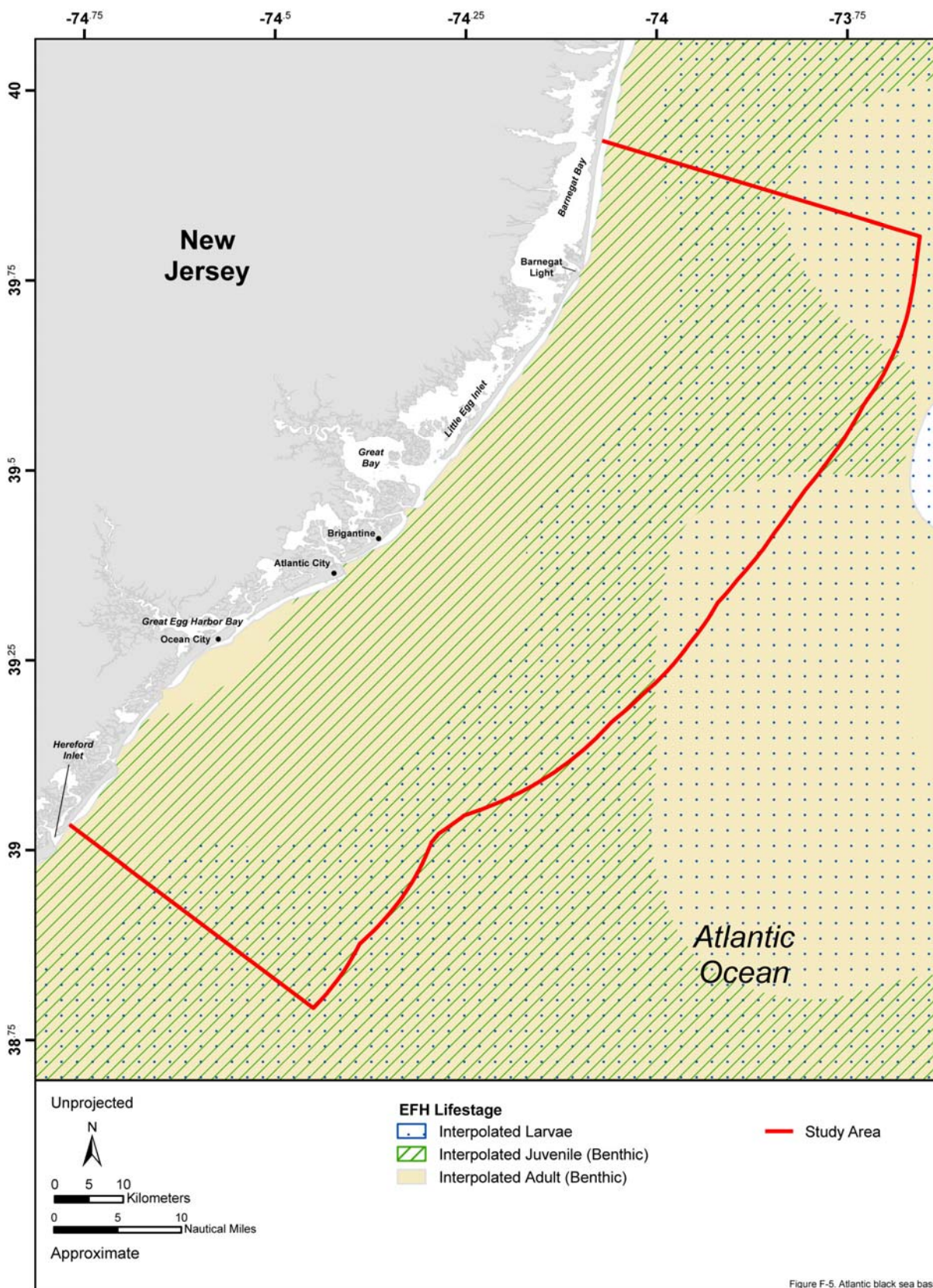


Figure F-5. Essential fish habitat designated in the New Jersey Study Area for all lifestages of black sea bass. Source map (scanned): MAFMC and ASMFC (1998a).

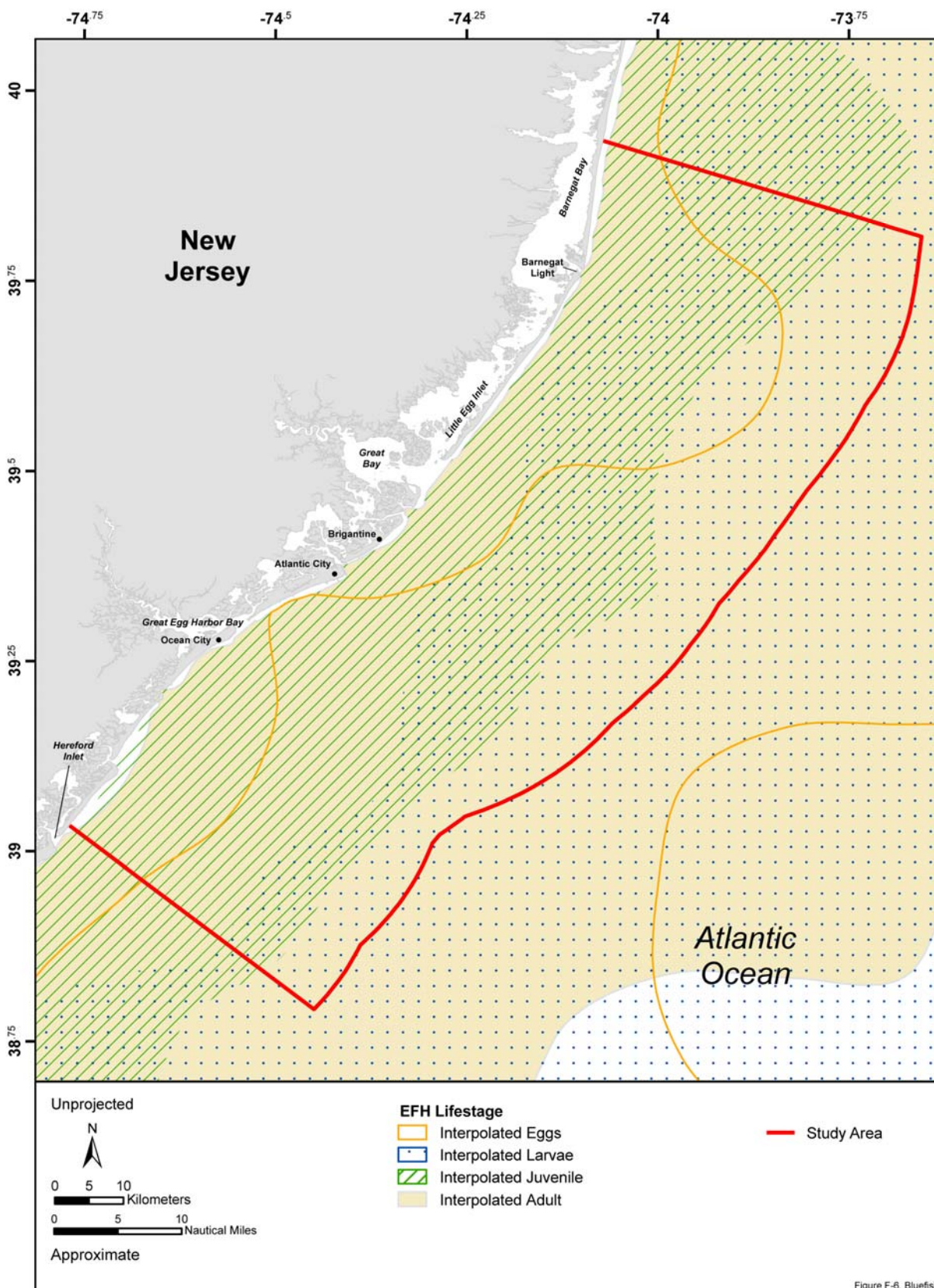


Figure F-6. Essential fish habitat designated in the New Jersey Study Area for all lifestages of bluefish. Source map (scanned): MAFMC and ASMFC (1998b).

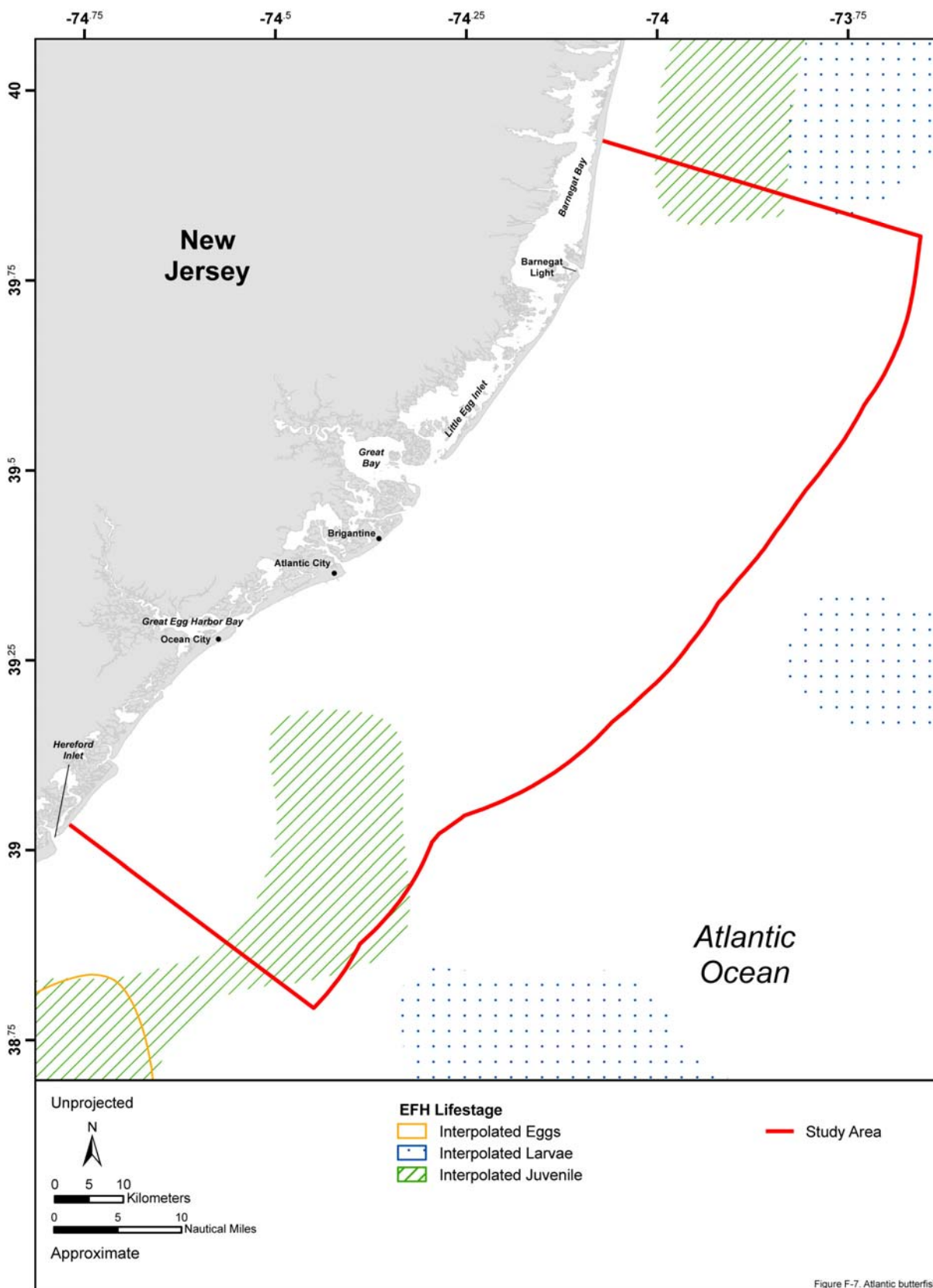


Figure F-7. Essential fish habitat designated in the New Jersey Study Area for larvae and juvenile lifestages of butterfish. Source map (scanned): MAFMC (1998b).

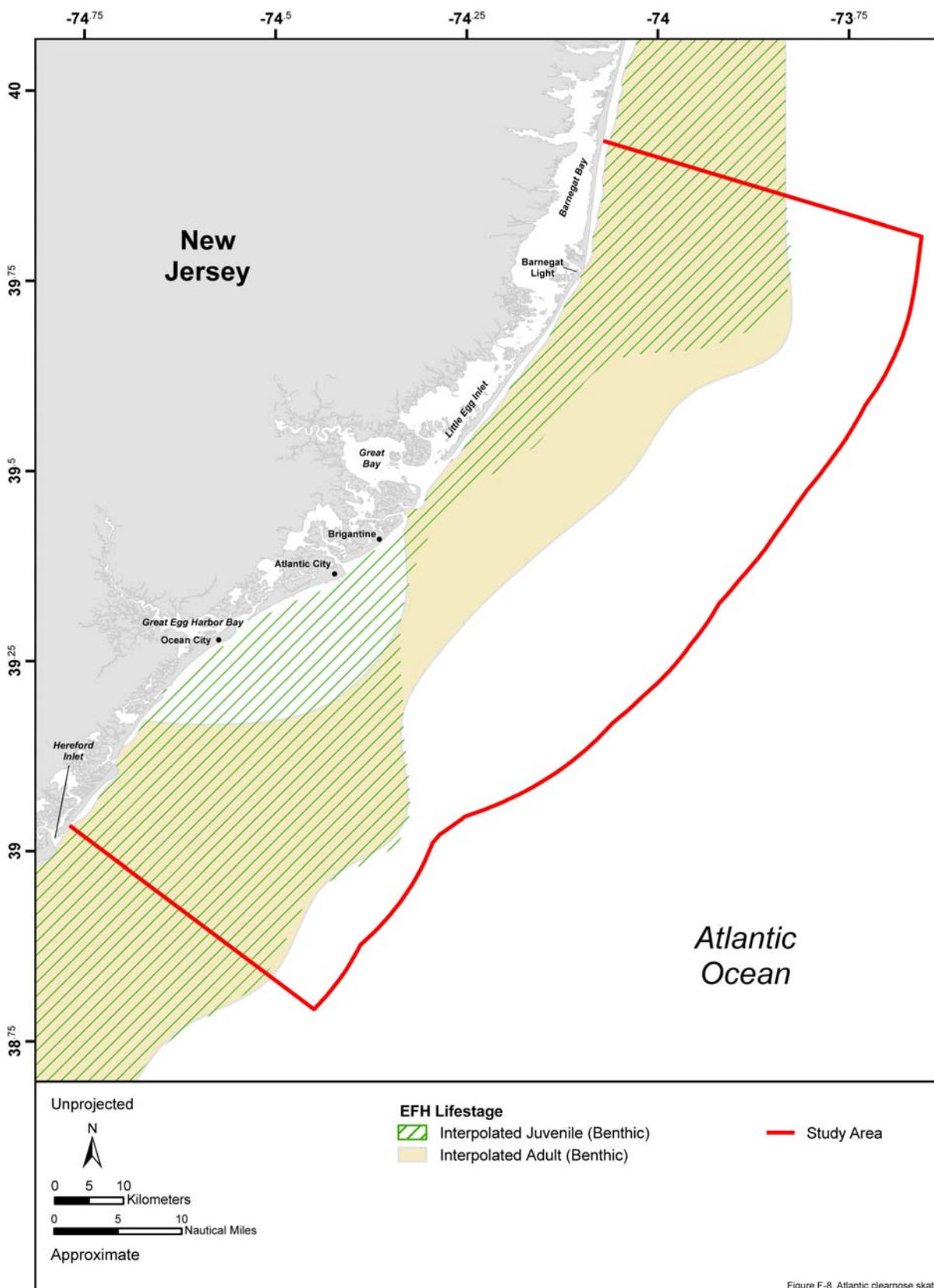


Figure F-8. Essential fish habitat designated in the New Jersey Study Area for all lifestages of clearnose skate. Source map (scanned): NEFMC (2003a).

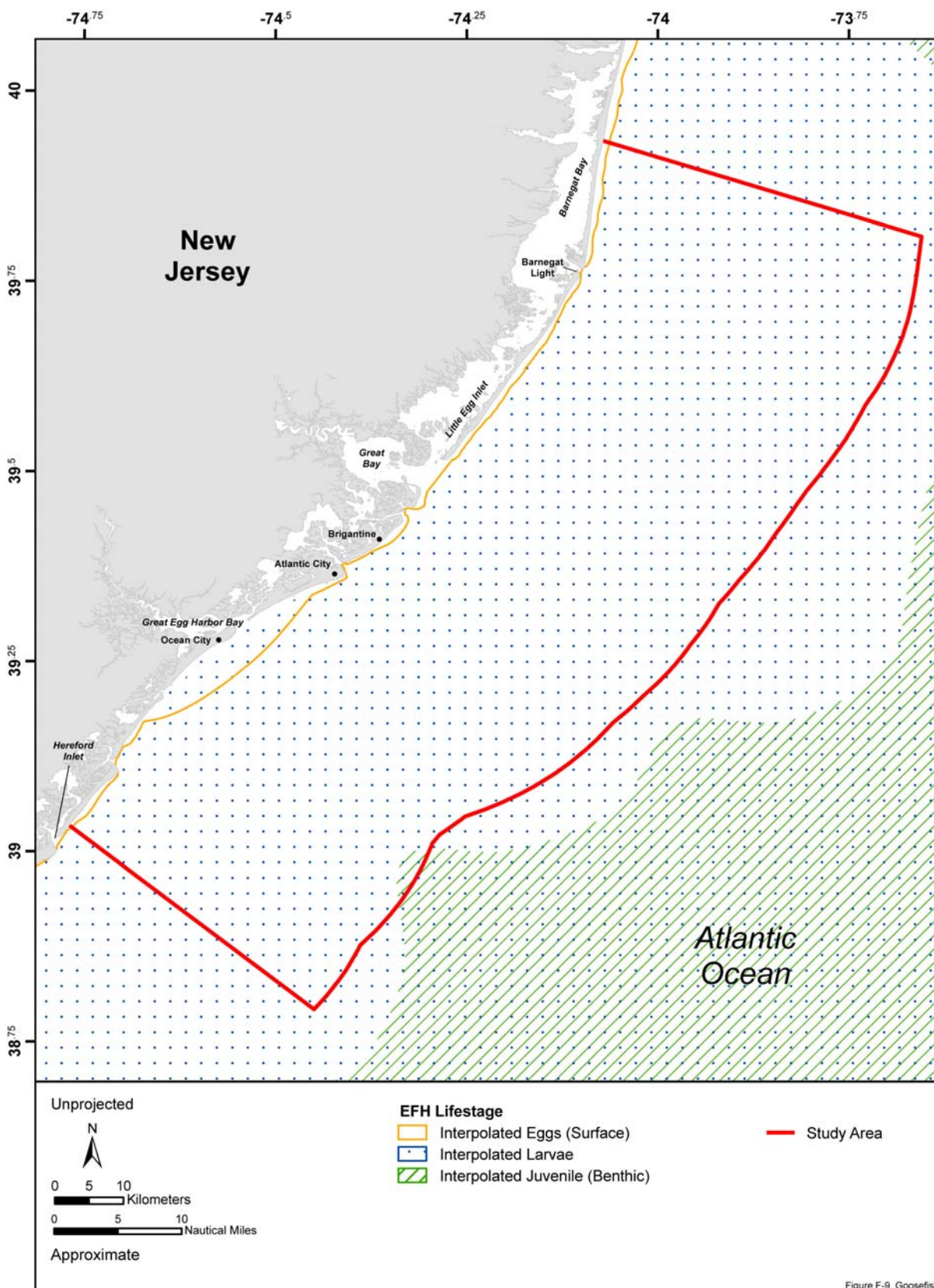


Figure F-9. Essential fish habitat designated in the New Jersey Study Area for eggs, larvae, and juvenile lifestages of goosefish. Source mapped (scanned): NEFMC (1998).

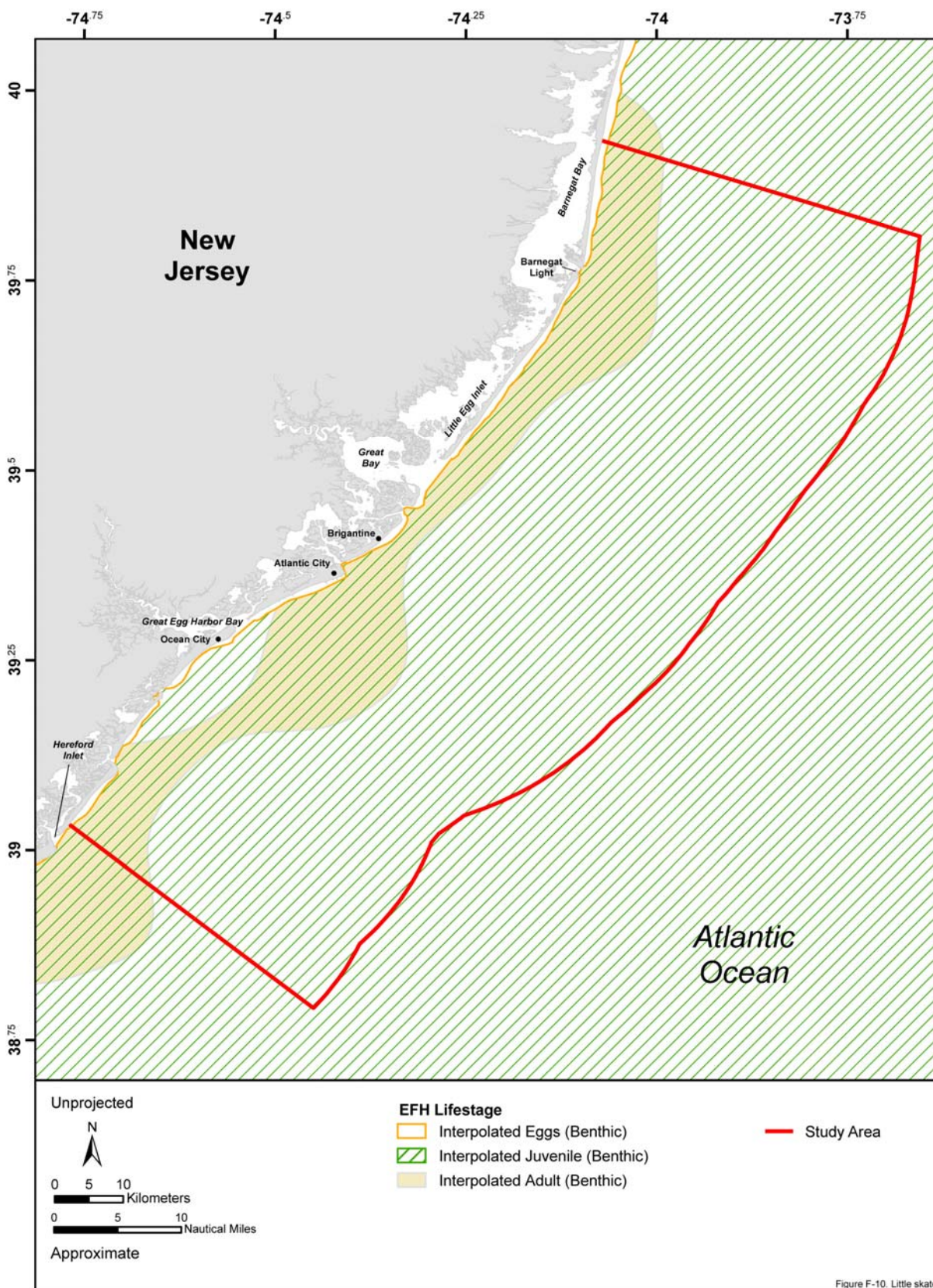


Figure F-10. Essential fish habitat designated in the New Jersey Study Area for all lifestages of little skate. Source map (scanned): NEFMC (2003a).

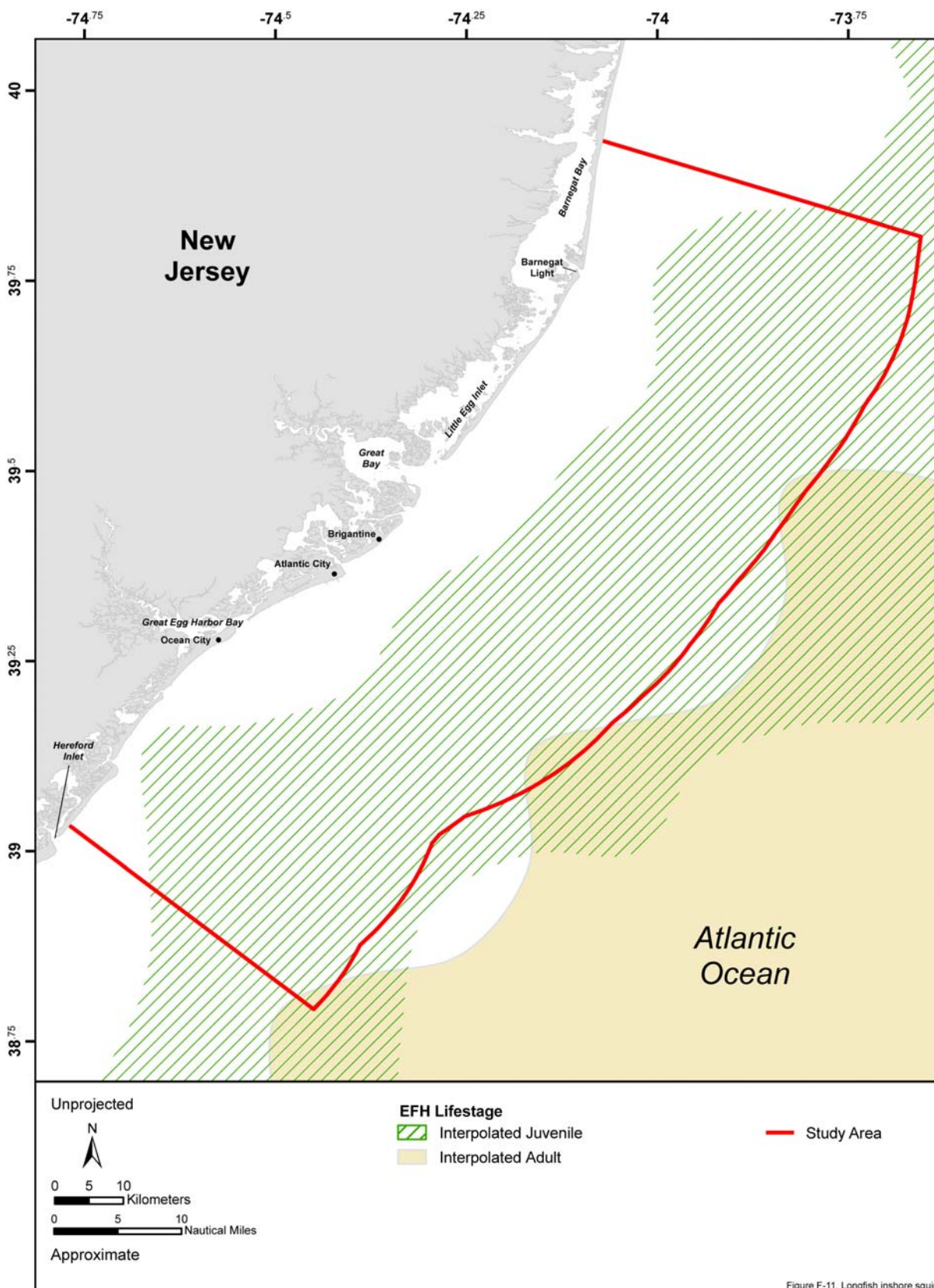


Figure F-11. Essential fish habitat designated in the New Jersey Study Area for juvenile and adult lifestages of longfin inshore squid. Source map (scanned): MAFMC (1998b).

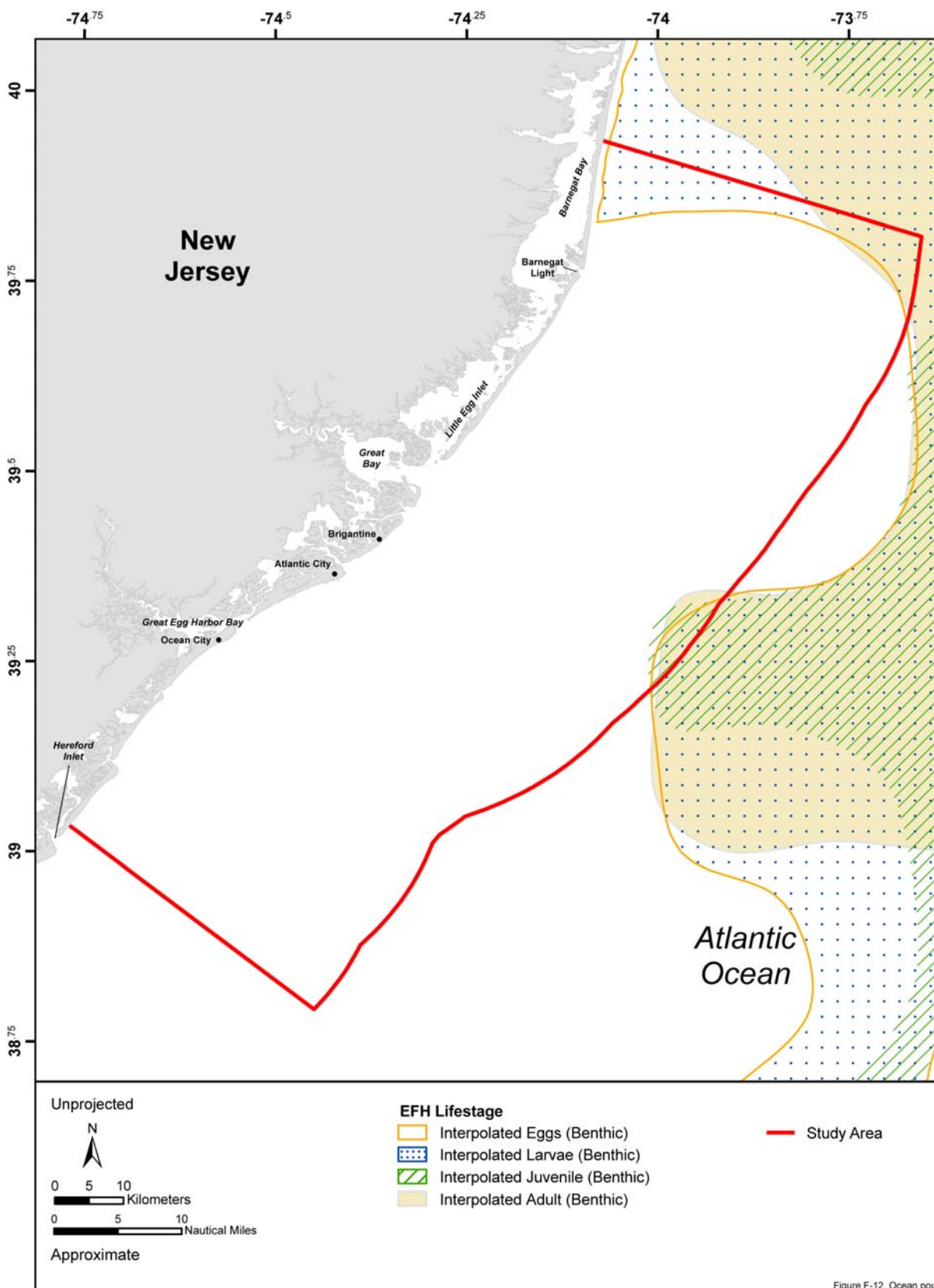


Figure F-12. Essential fish habitat designated in the New Jersey Study Area for all lifestages of ocean pout. Source map (scanned): NEFMC (1998).

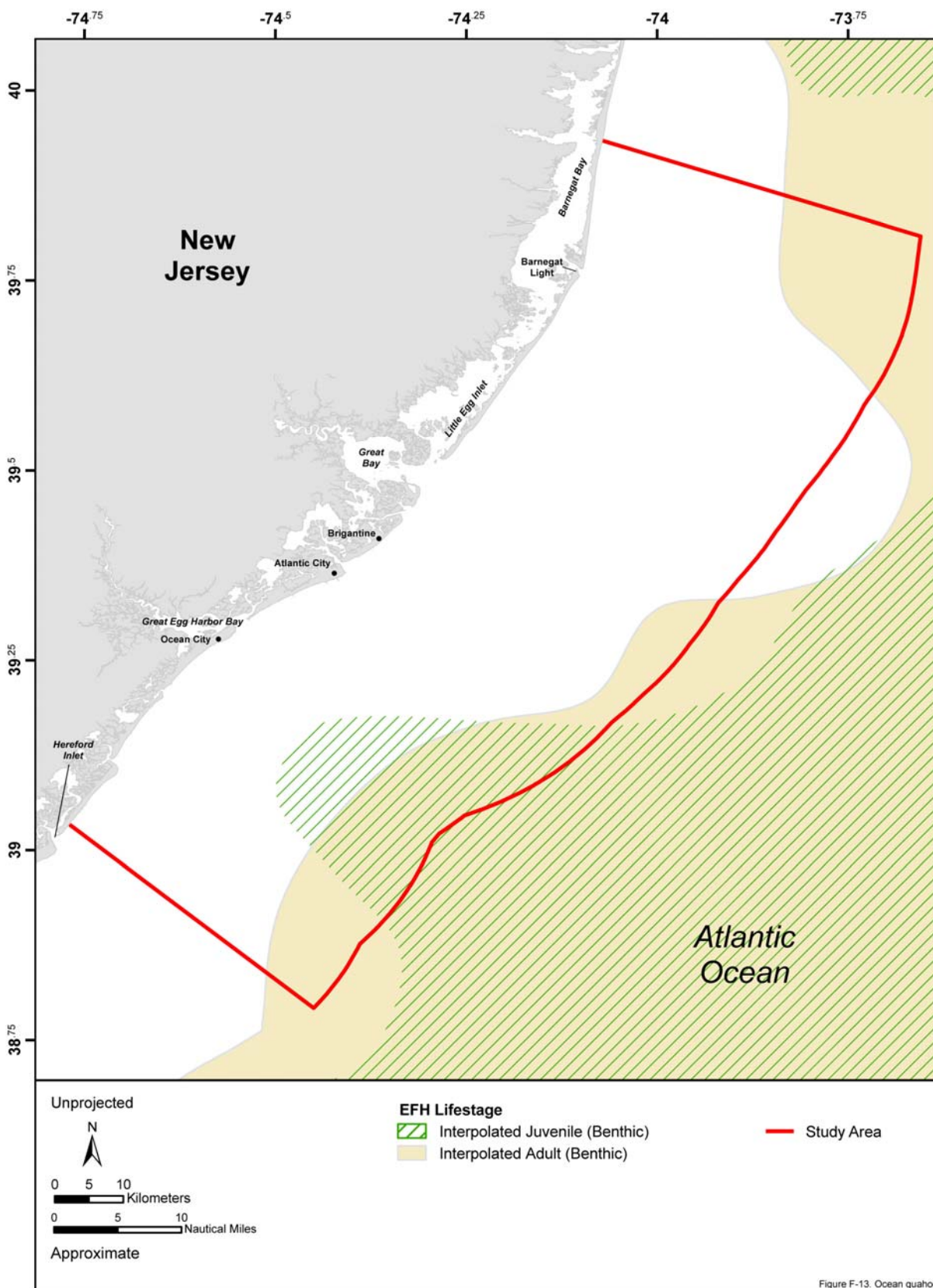


Figure F-13. Essential fish habitat designated in the New Jersey Study Area for all lifestages of the ocean quahog. Source map (scanned): MAFMC (1998a).

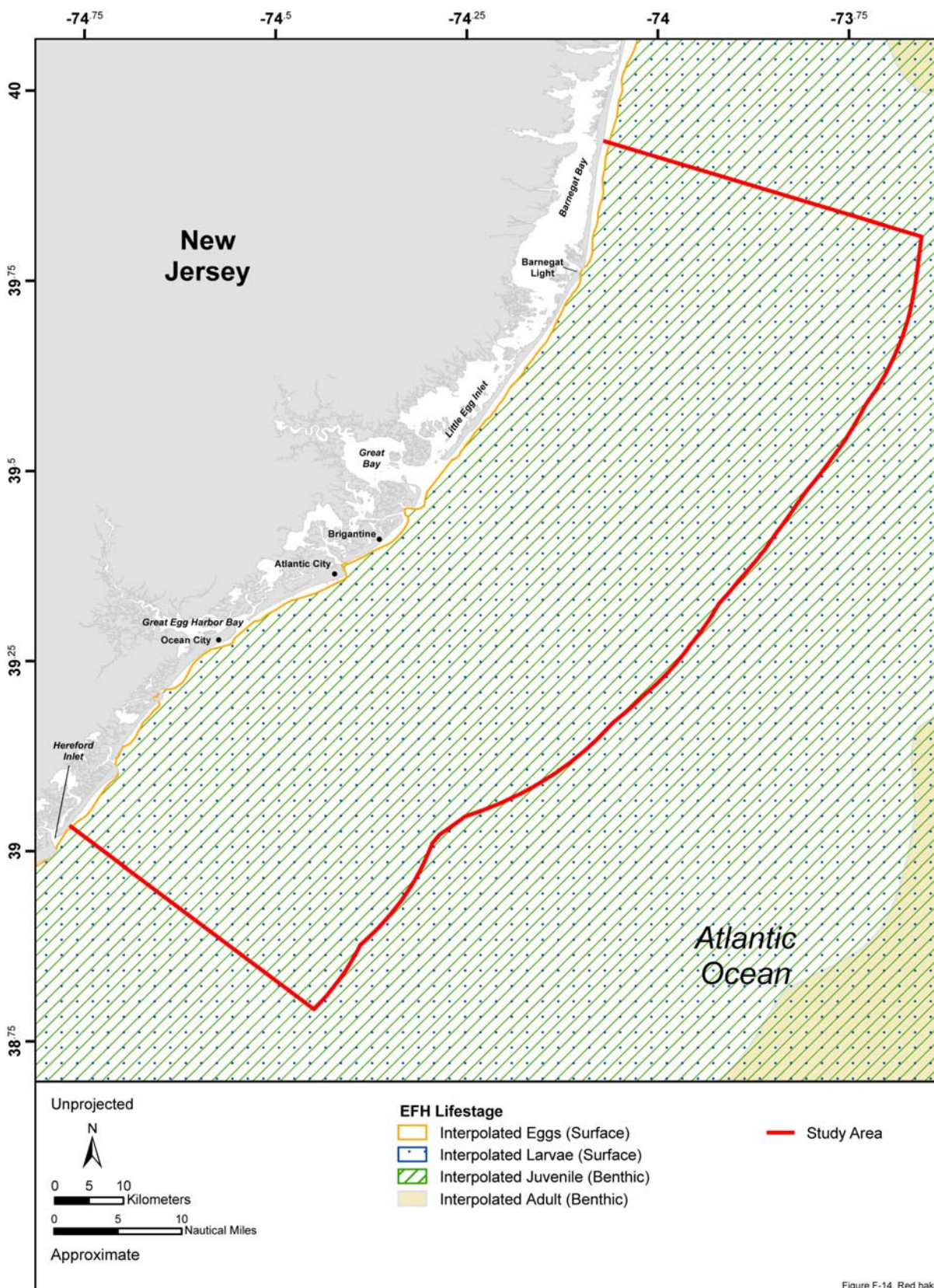


Figure F-14. Essential fish habitat designated in the New Jersey Study Area for egg, larval, and juvenile lifestages of red hake. Source map (scanned): NEFMC (1999b).

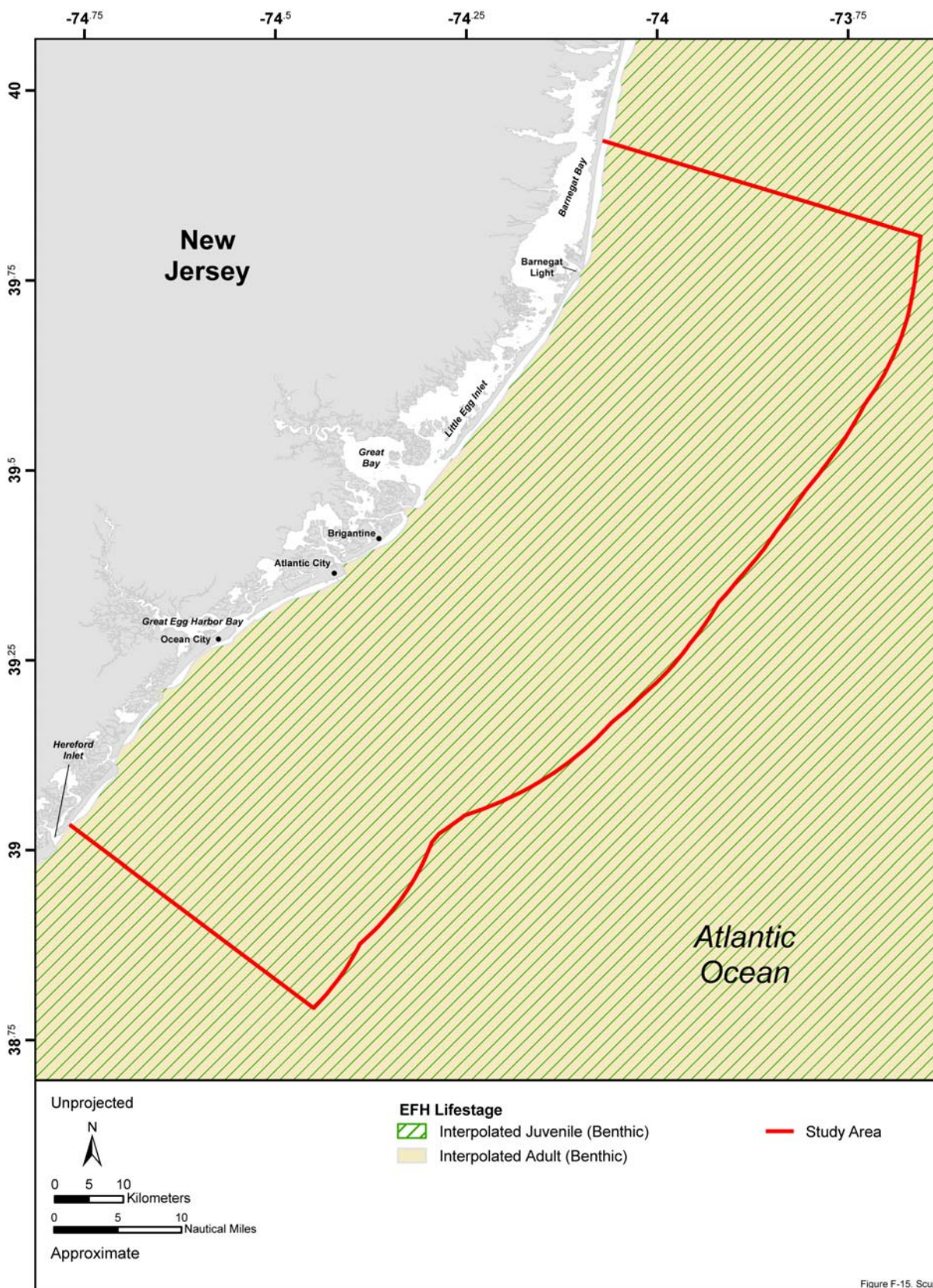


Figure F-15. Essential fish habitat designated in the New Jersey Study Area for juvenile and adult lifestages of scup. Source map (scanned): MAFMC and ASMFC (1998a).

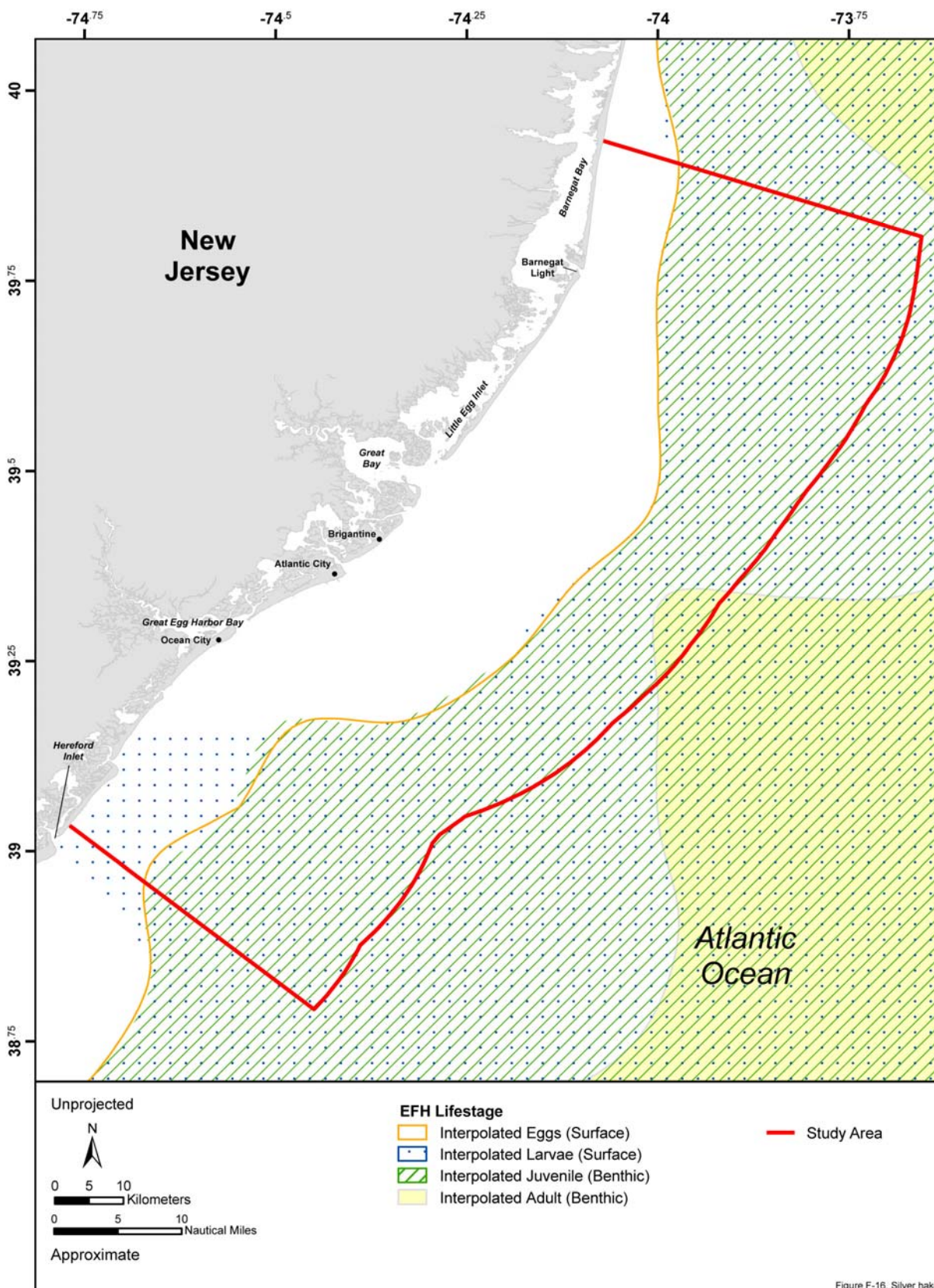


Figure F-16. Essential fish habitat designated in the New Jersey Study Area for all lifestages of silver hake. Source map (scanned): NEFMC (1999b).

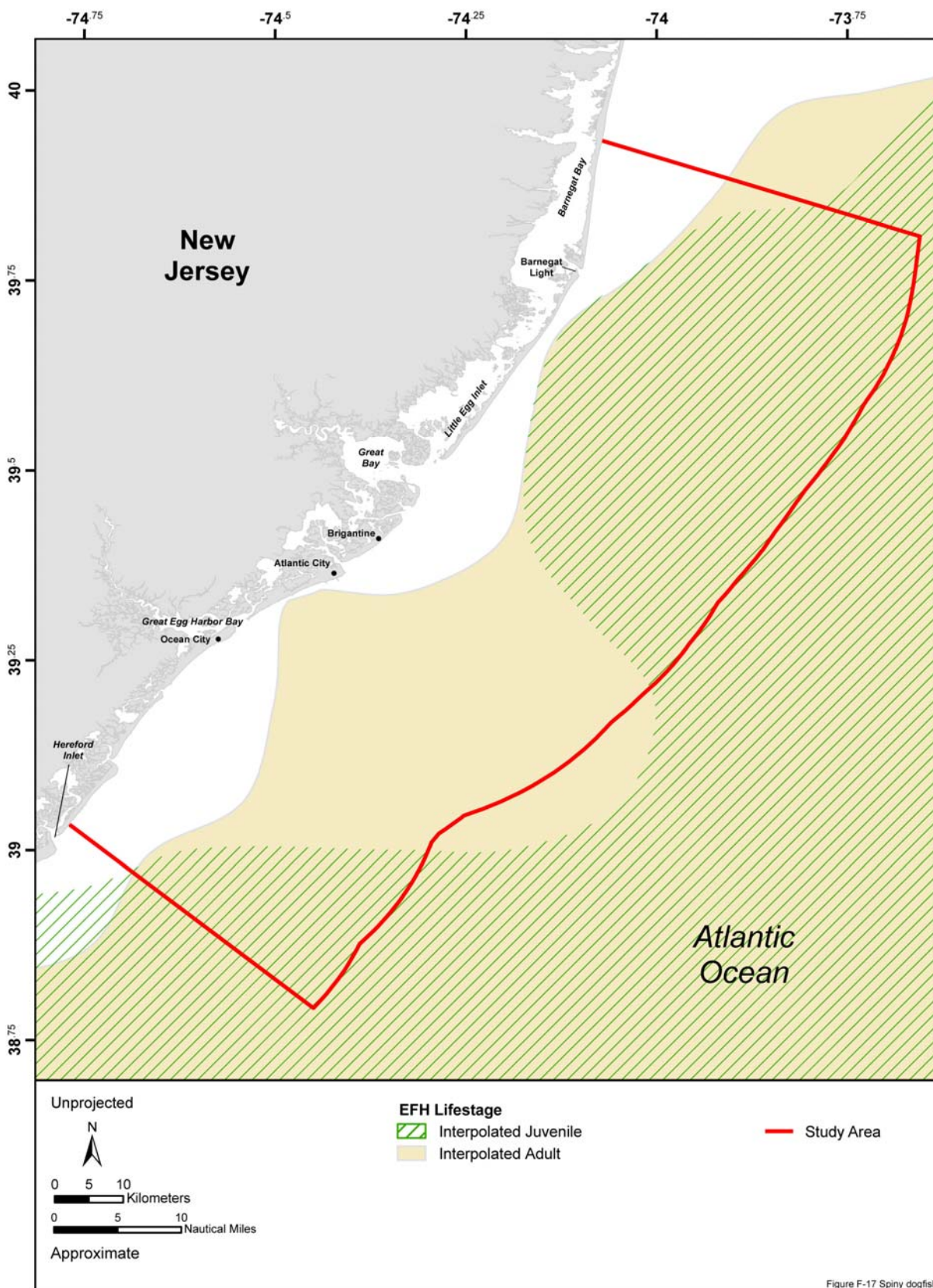


Figure F-17. Essential fish habitat designated in the New Jersey Study Area for all lifestages of spiny dogfish. Source map (scanned): MAFMC and NEFMC (1999).

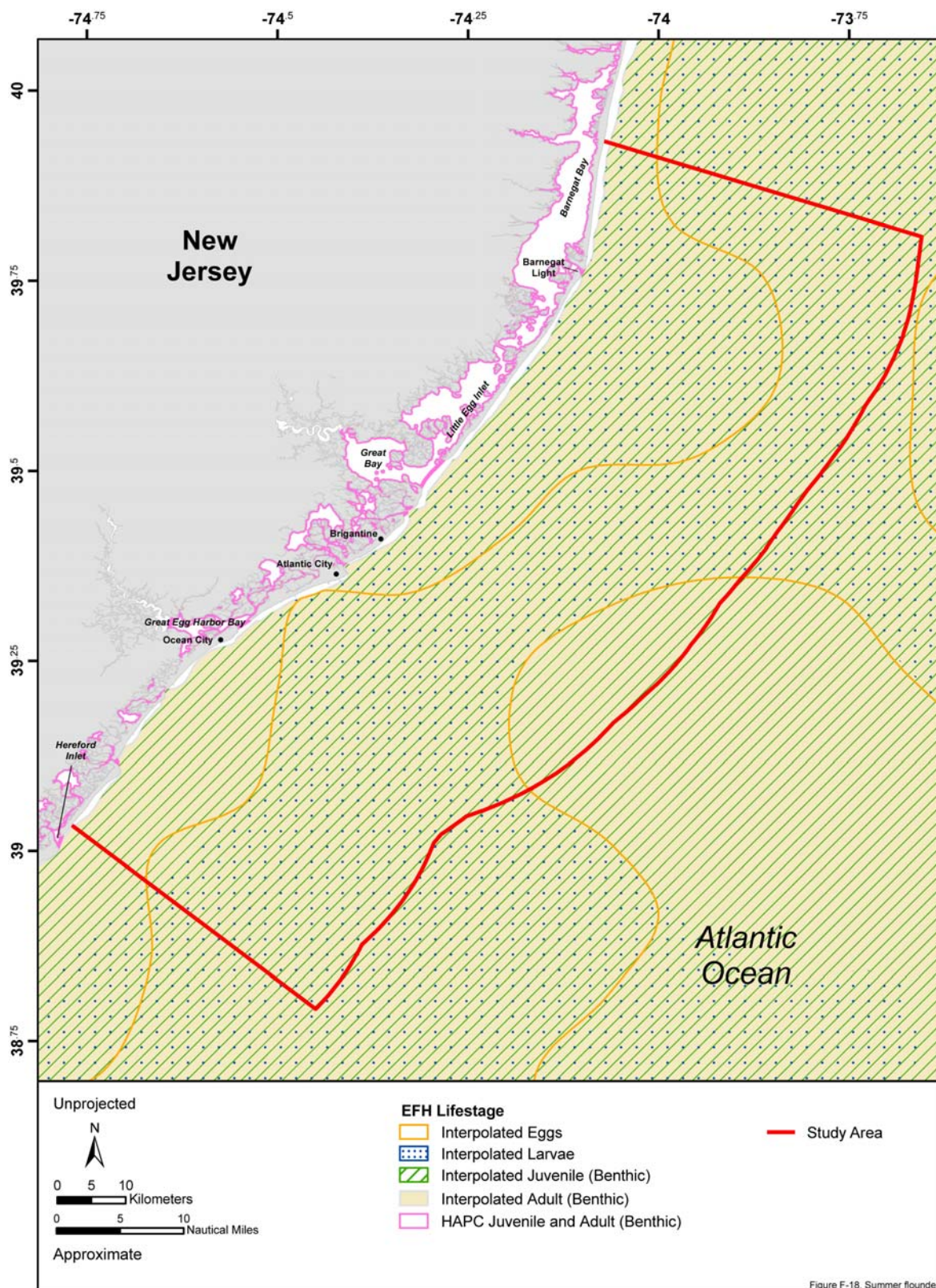


Figure F-18. Essential fish habitat and habitat areas of particular concern (HAPC) designated in the New Jersey Study Area for all lifestages of summer flounder. Source map (scanned): MAFMC and ASMFC (1998a).

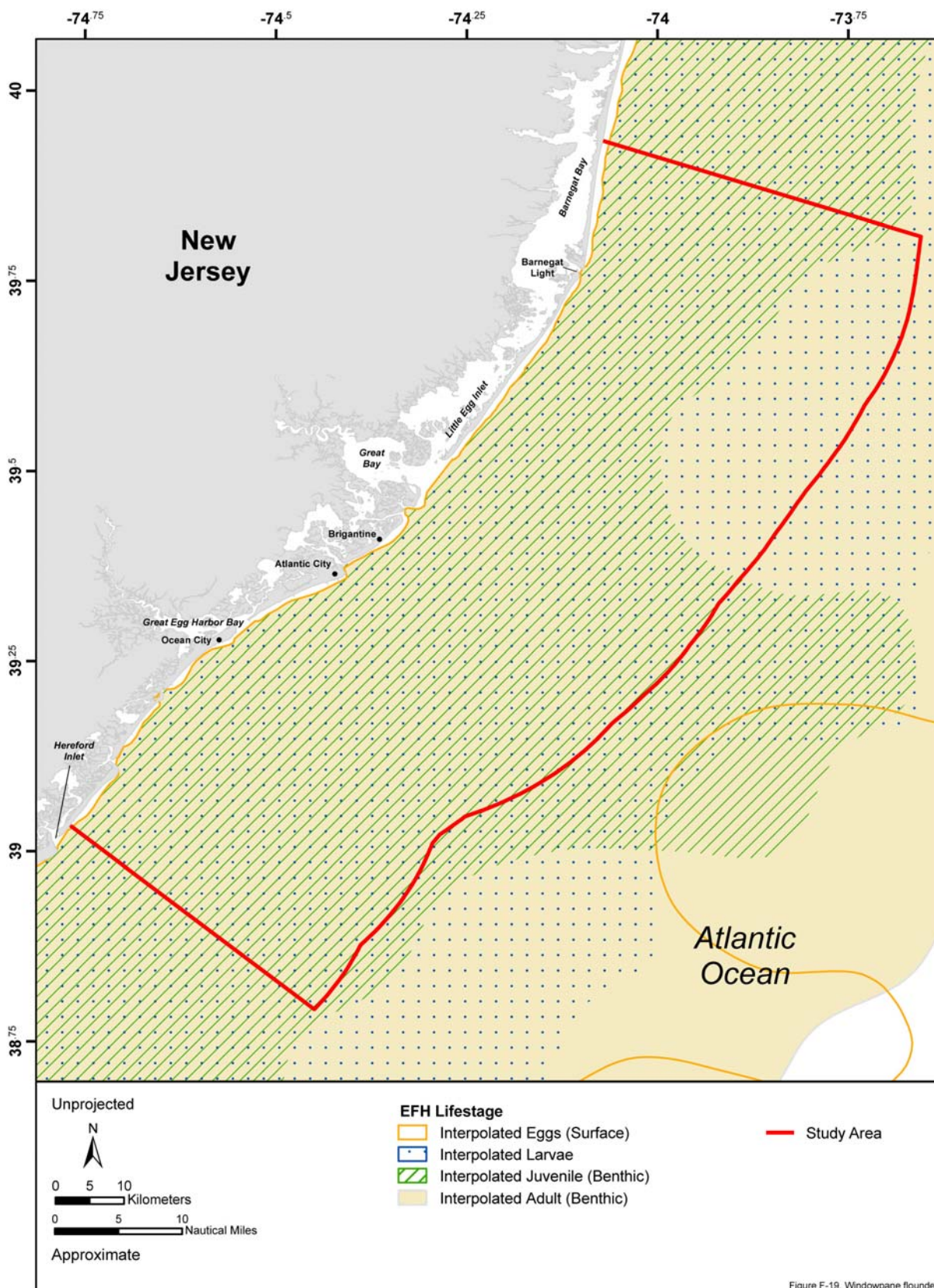


Figure F-19. Essential fish habitat designated in the New Jersey Study Area for all lifestages of windowpane flounder. Source map (scanned): NEFMC (1998).

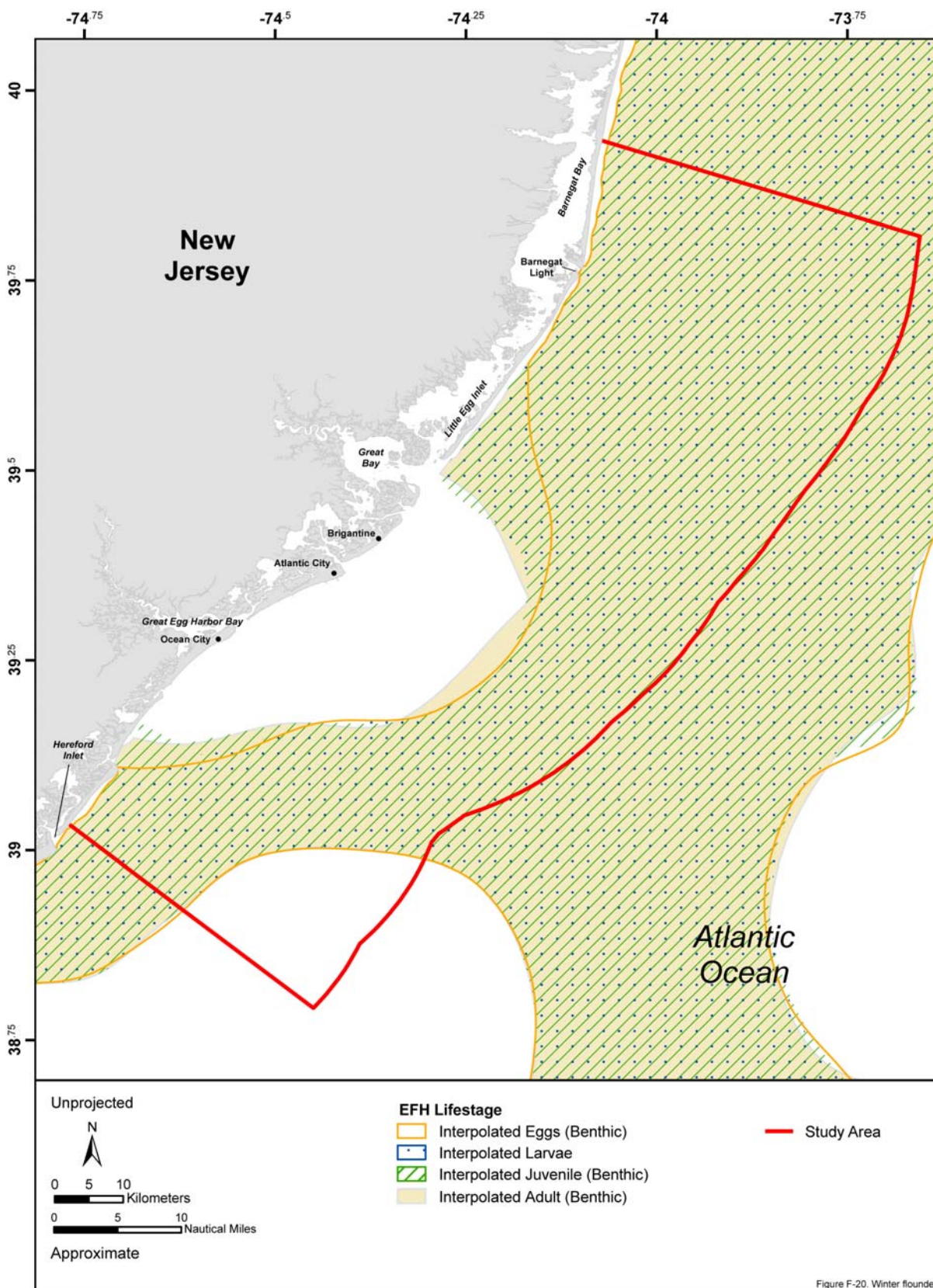


Figure F-20. Essential fish habitat designated in the New Jersey Study Area for all life stages of winter flounder. Source map (scanned): NEFMC (1998).

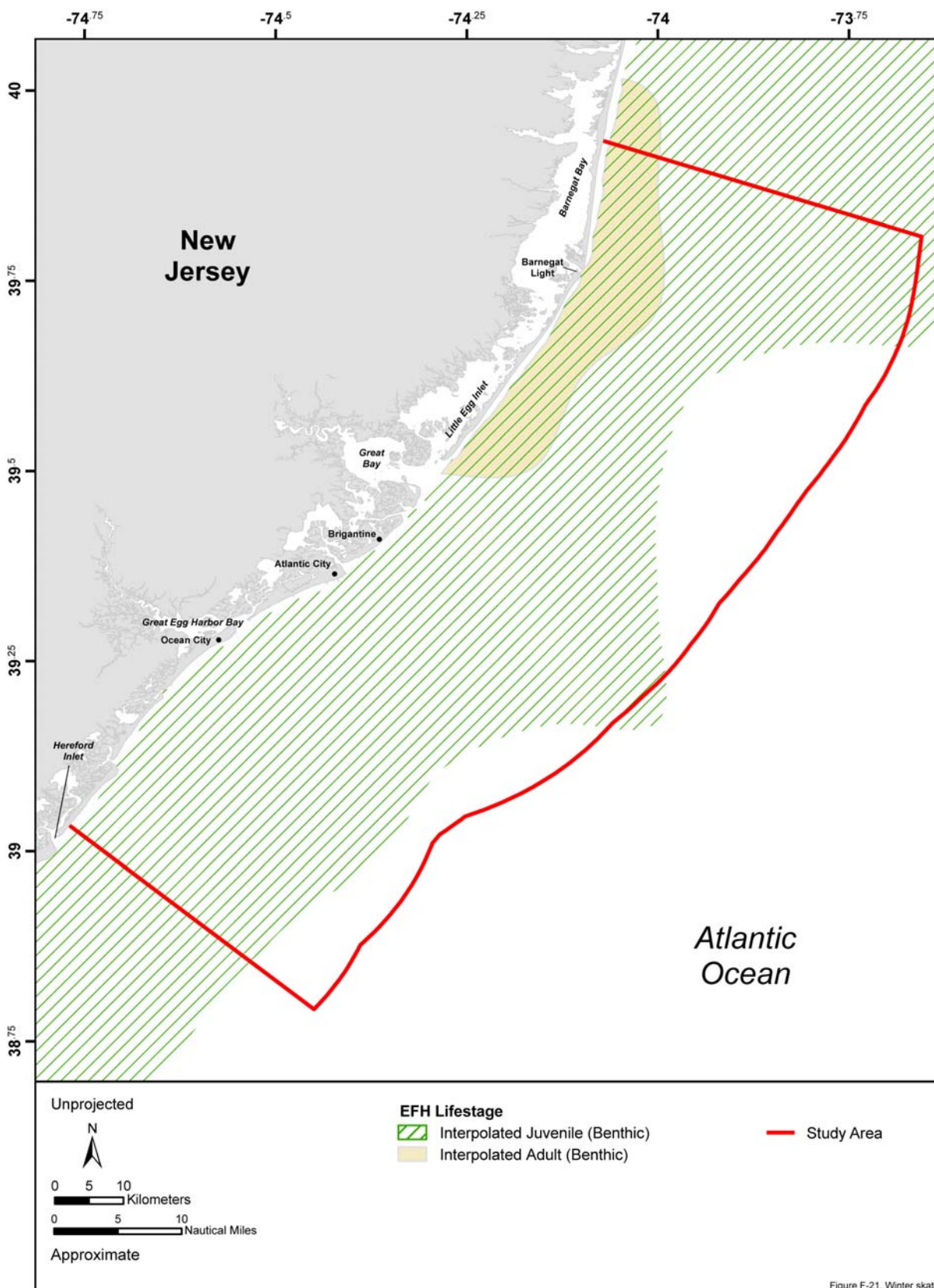


Figure F-21. Essential fish habitat designated in the New Jersey Study Area for all lifestages of winter skate. Source map (scanned): NEFMC (2003a).

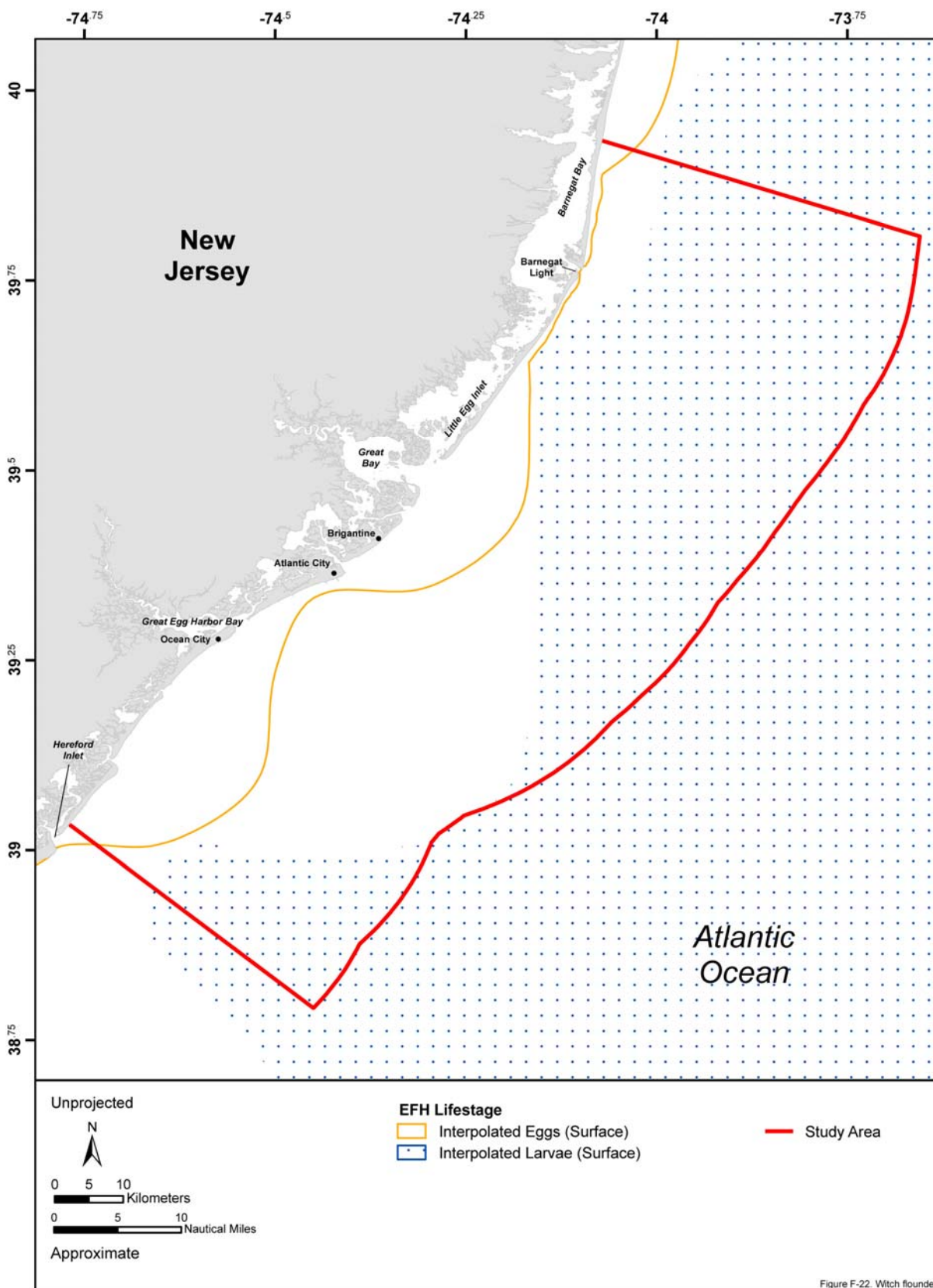


Figure F-22. Essential fish habitat designated in the New Jersey Study Area for egg and larval lifestages of witch flounder. Source map (scanned): NEFMC (1998).

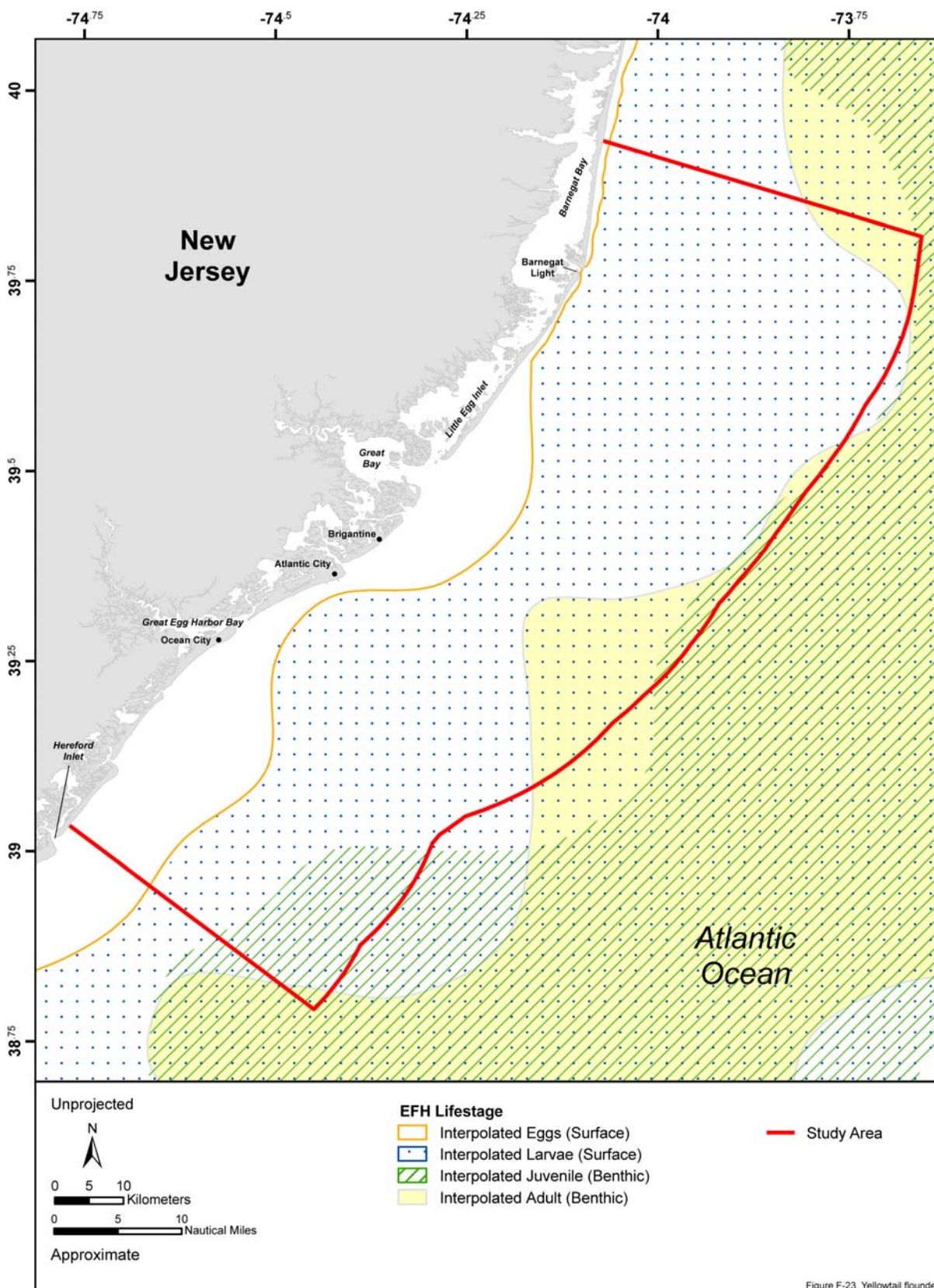


Figure F-23. Essential fish habitat designated in the New Jersey Study Area for all lifestages of yellowtail flounder. Source map (scanned): NEFMC (1998).

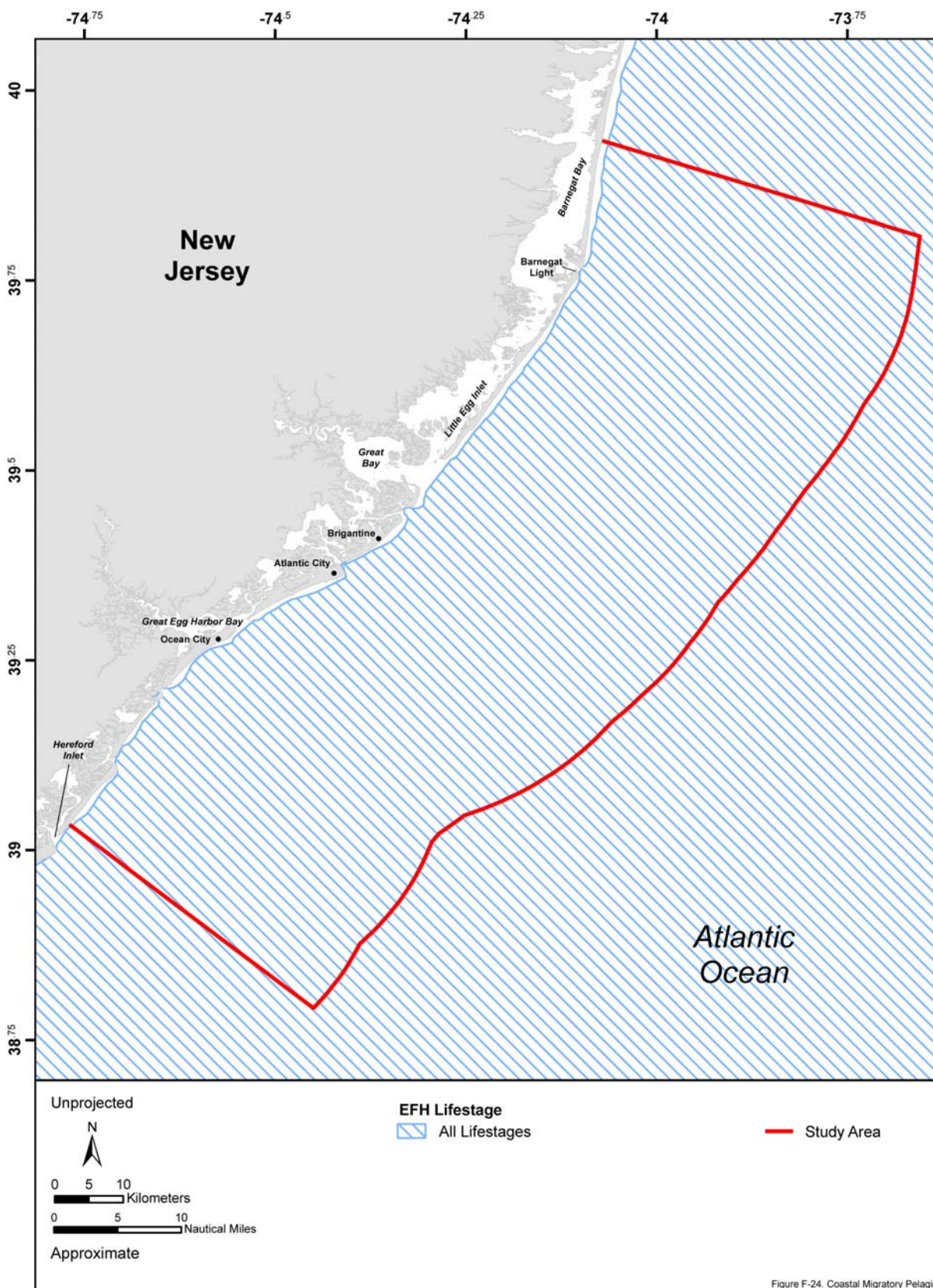


Figure F-24. Essential fish habitat designated in the New Jersey Study Area for all life stages of coastal migratory pelagic species. Map adapted from: SAFMC (1998).

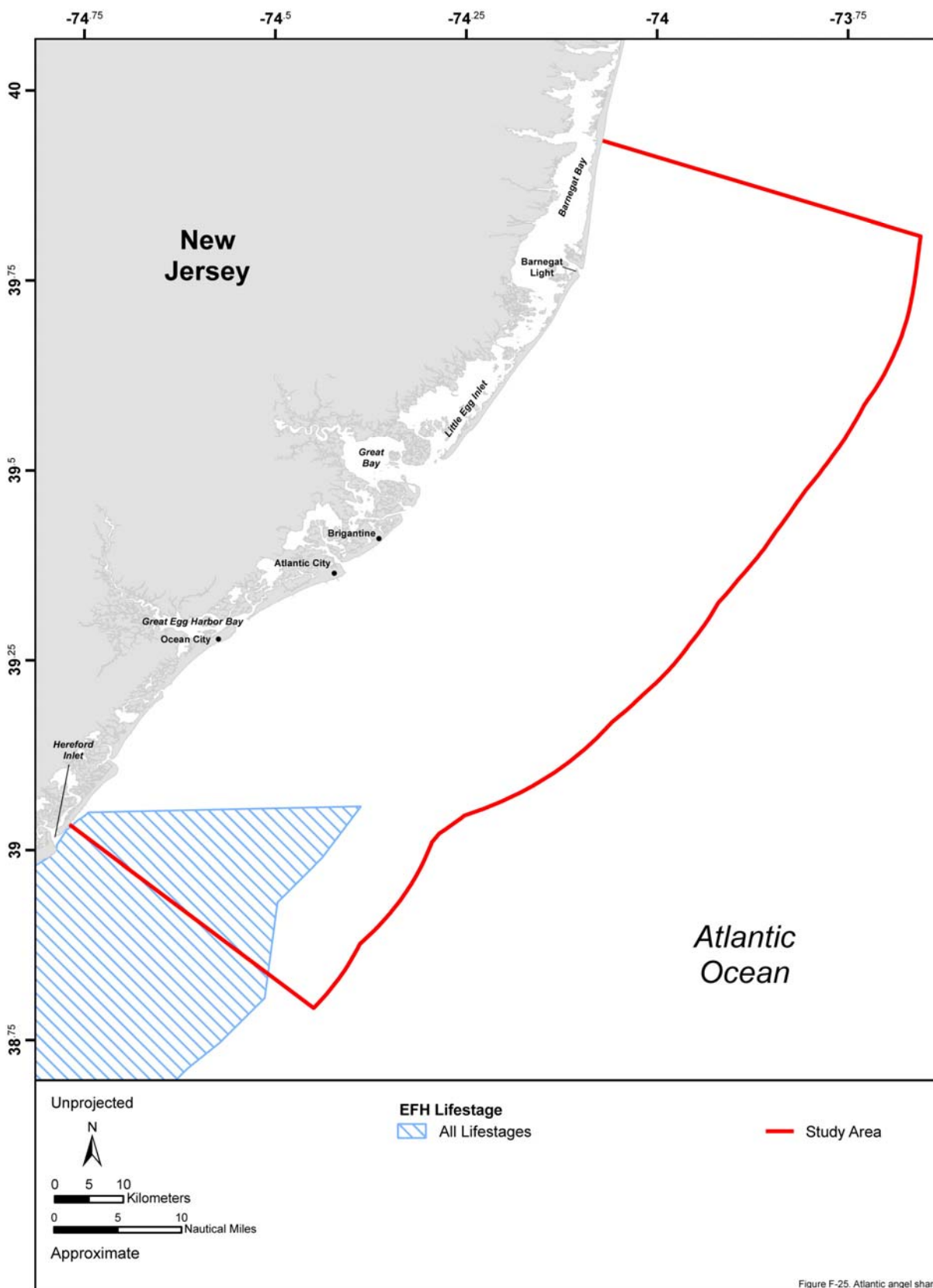


Figure F-25. Essential fish habitat designated in the New Jersey Study Area for all lifestages of Atlantic angel sharks. Source data: NMFS (2003c).

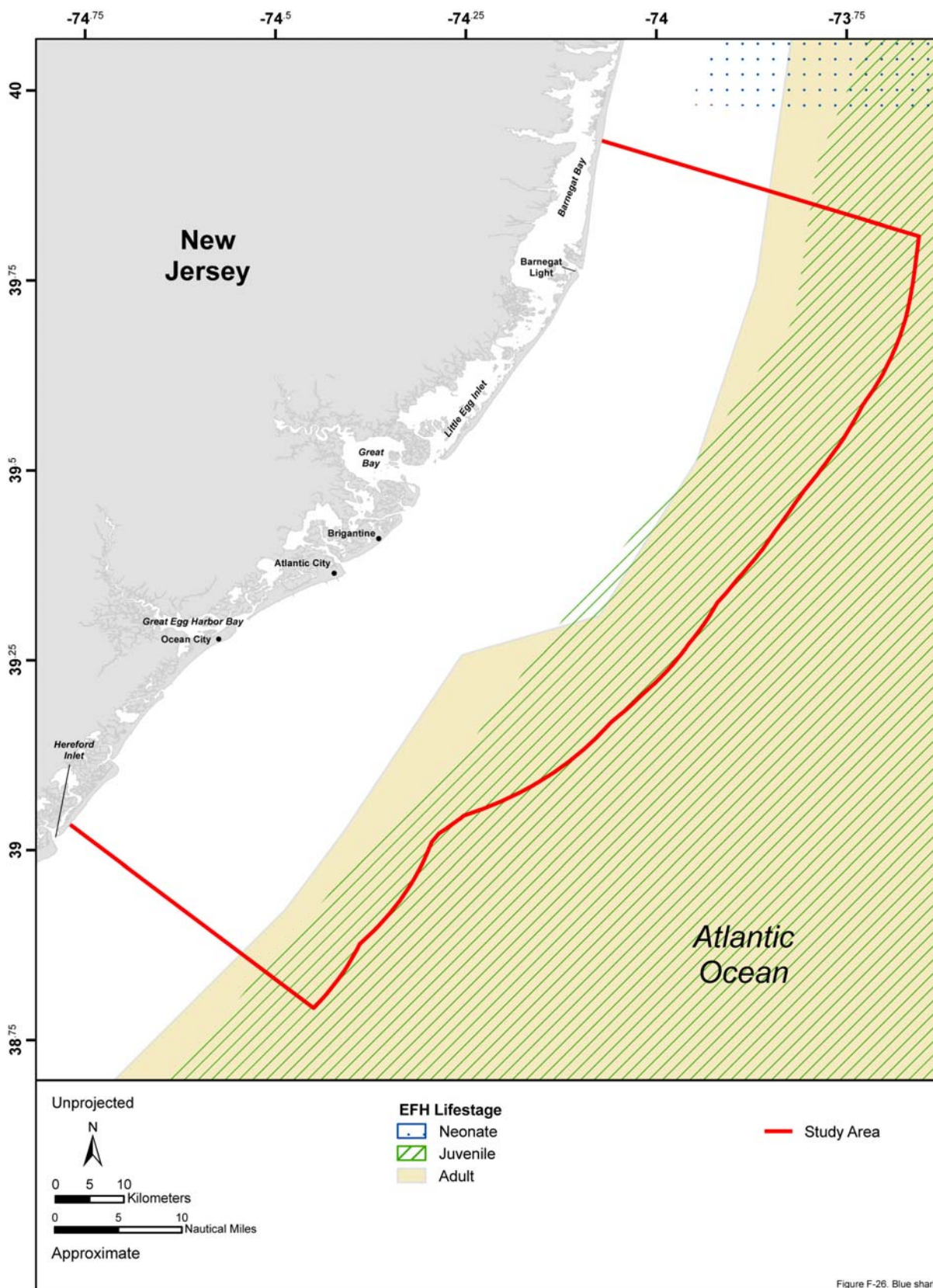


Figure F-26. Essential fish habitat designated in the New Jersey Study Area for all lifestages of blue sharks. Source data: NMFS (2003c).

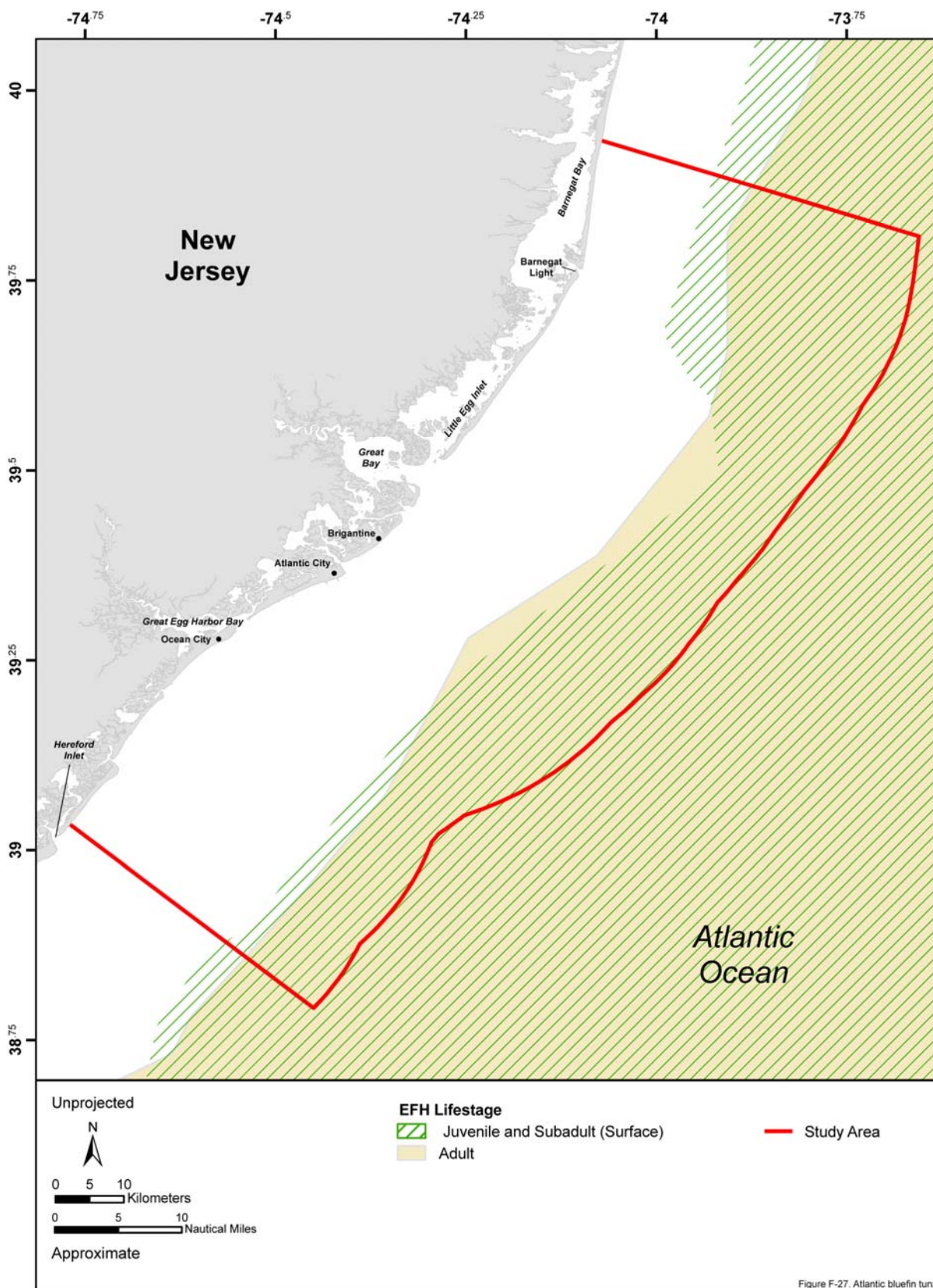


Figure F-27. Essential fish habitat designated in the New Jersey Study Area for juvenile/subadult and adult lifestages of bluefin tuna. Source data: NMFS (2003c).

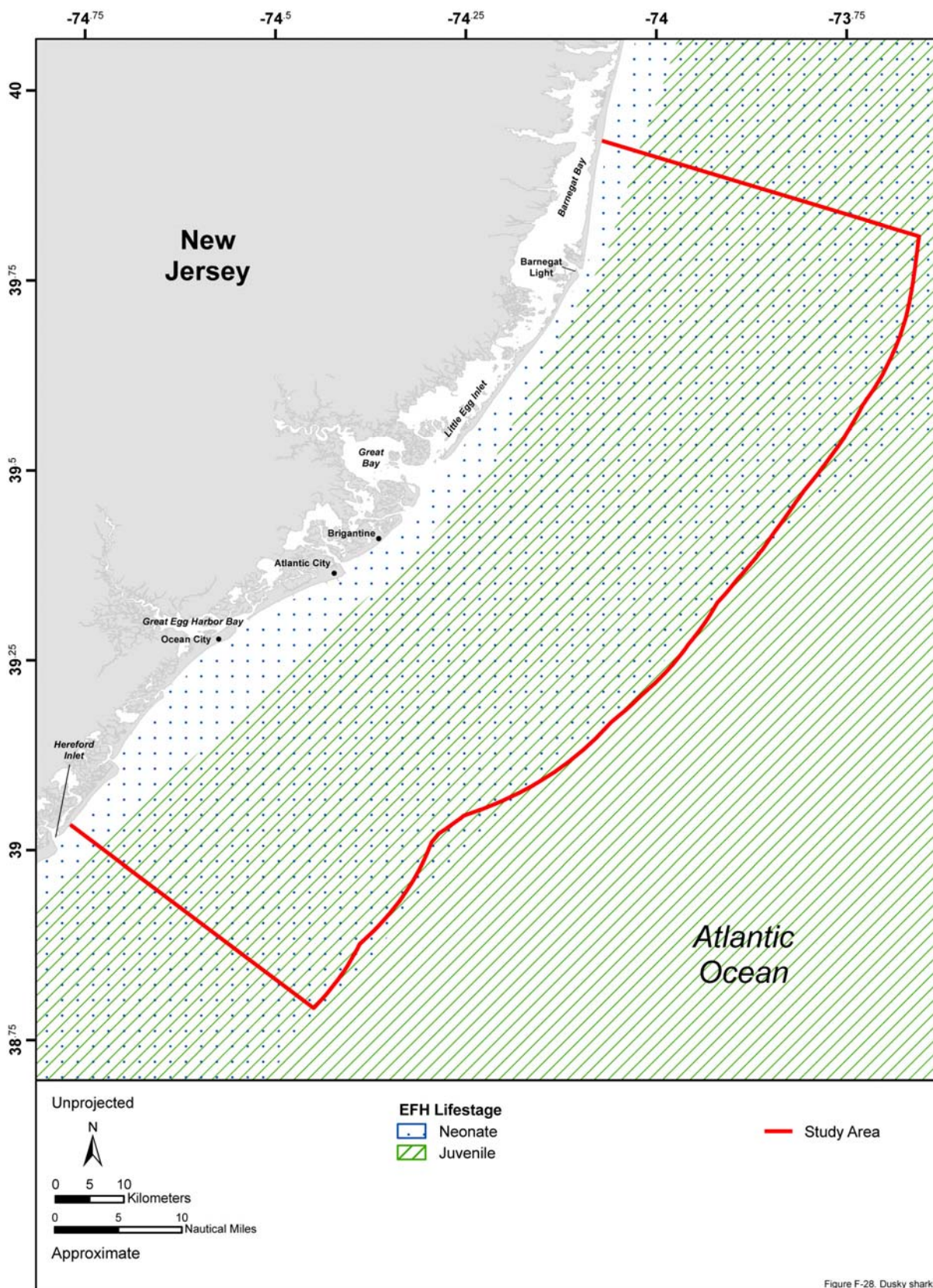


Figure F-28. Essential fish habitat designated in the New Jersey Study Area for neonate and juvenile lifestages of dusky sharks. Source data: NMFS (2003c).

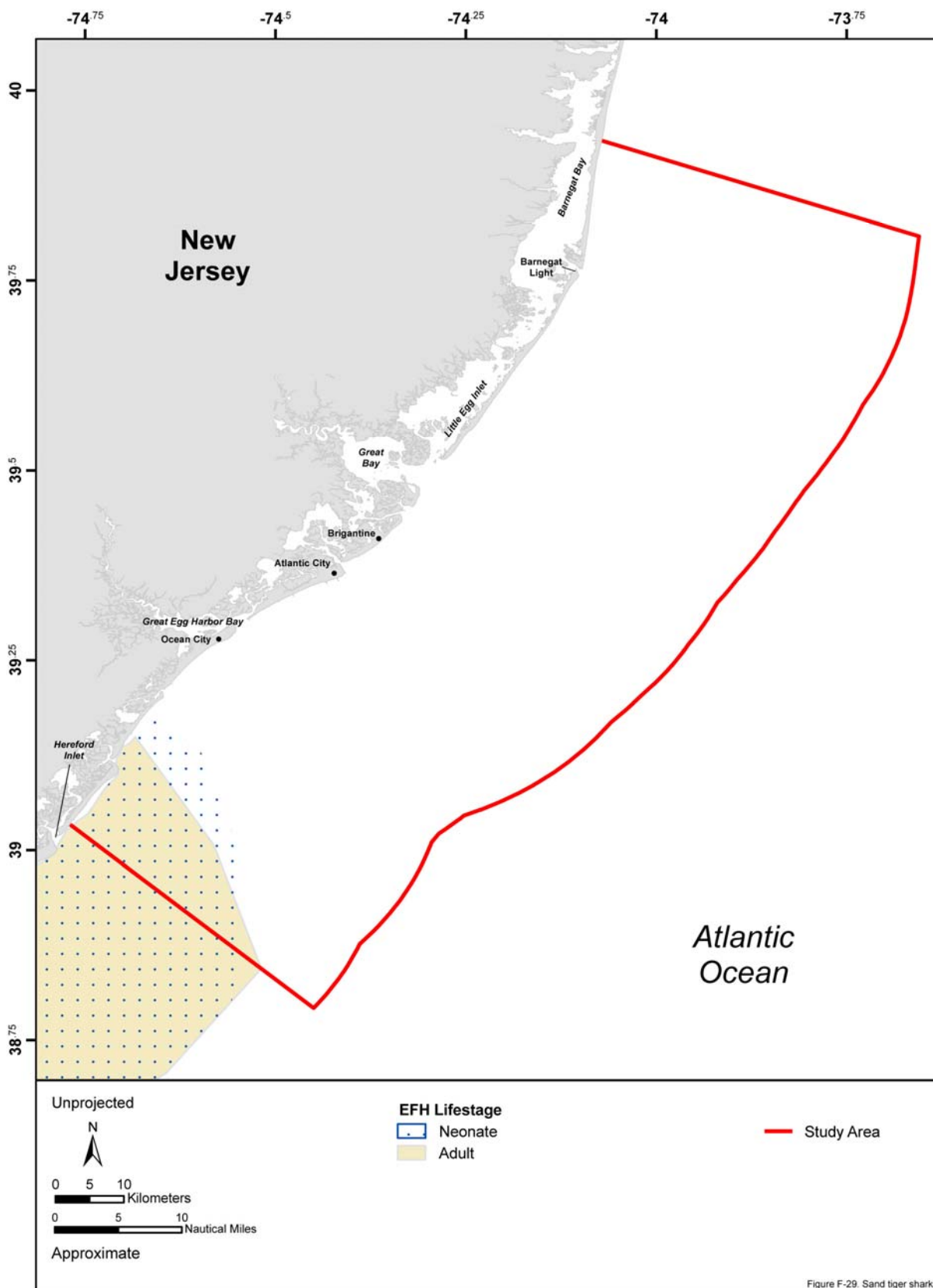


Figure F-29. Essential fish habitat designated in the New Jersey Study Area for neonate and adult lifestages of sand tiger sharks. Source data: NMFS (2003c).

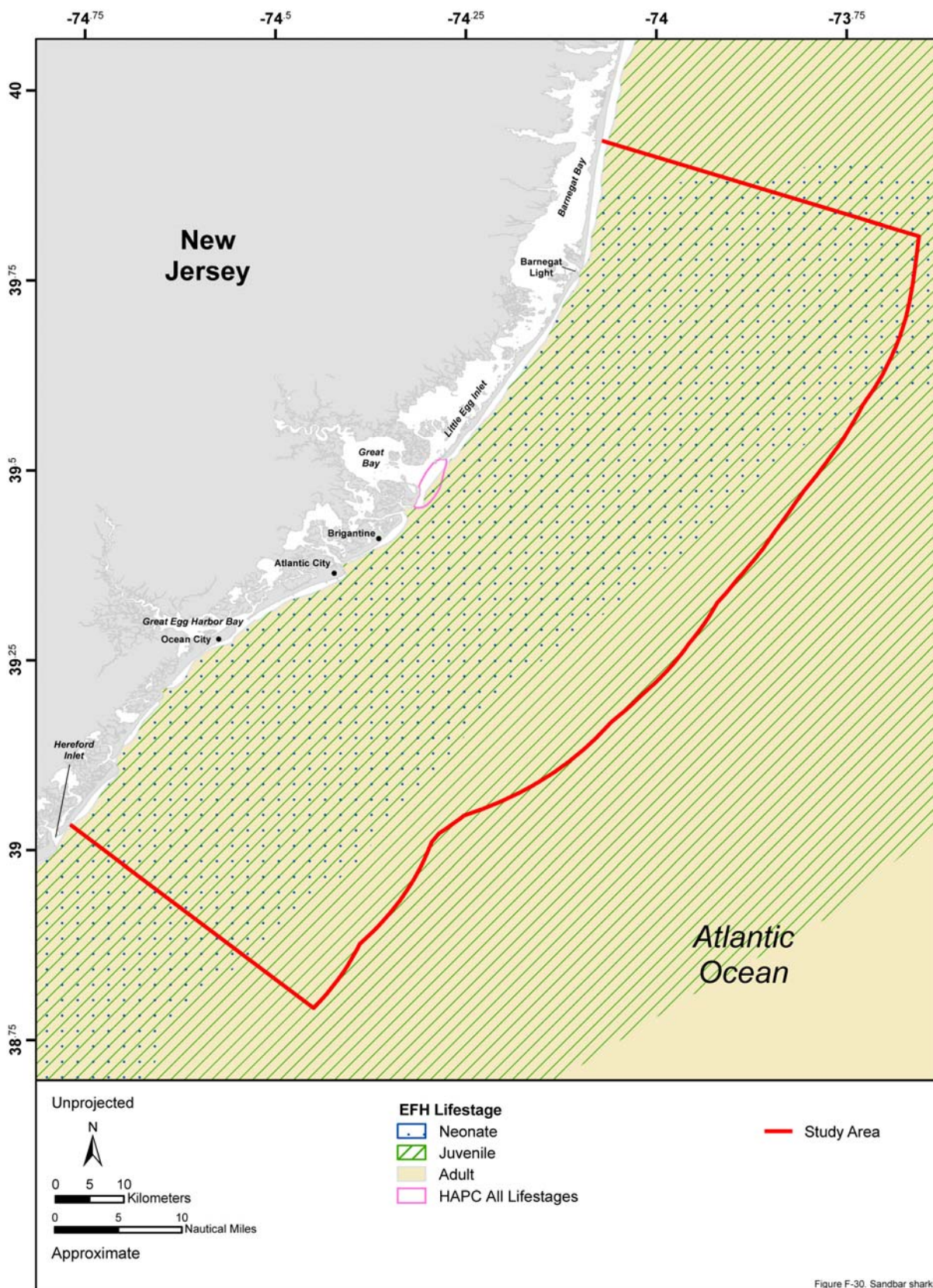


Figure F-30. Essential fish habitat and habitat areas of particular concern (HAPC) designated in the New Jersey Study Area for all lifestages of sandbar sharks. Source data: NMFS (2003c).

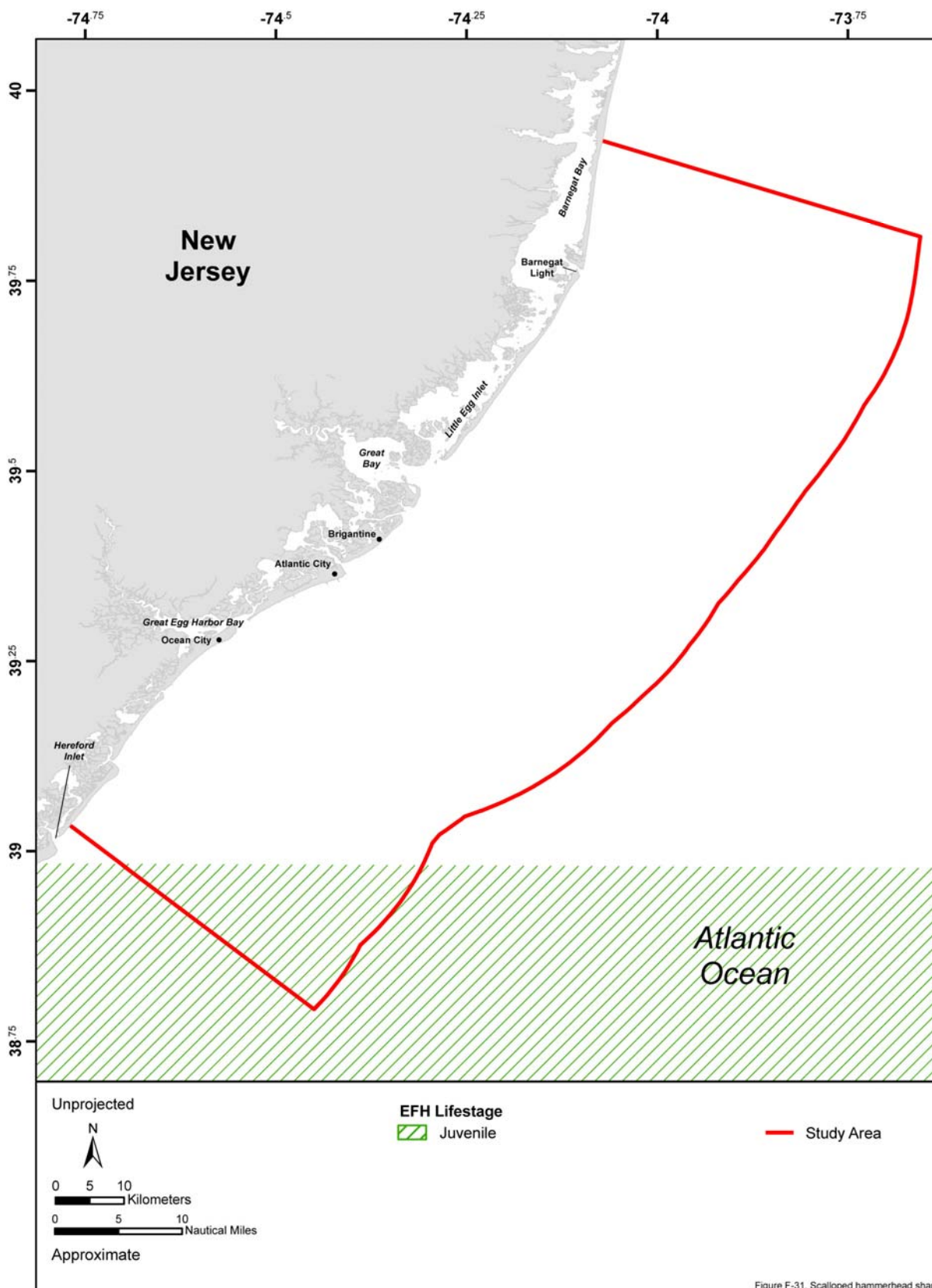


Figure F-31. Essential fish habitat designated in the New Jersey Study Area for juvenile lifecycle of scalloped hammerhead sharks. Source data: NMFS (2003c).

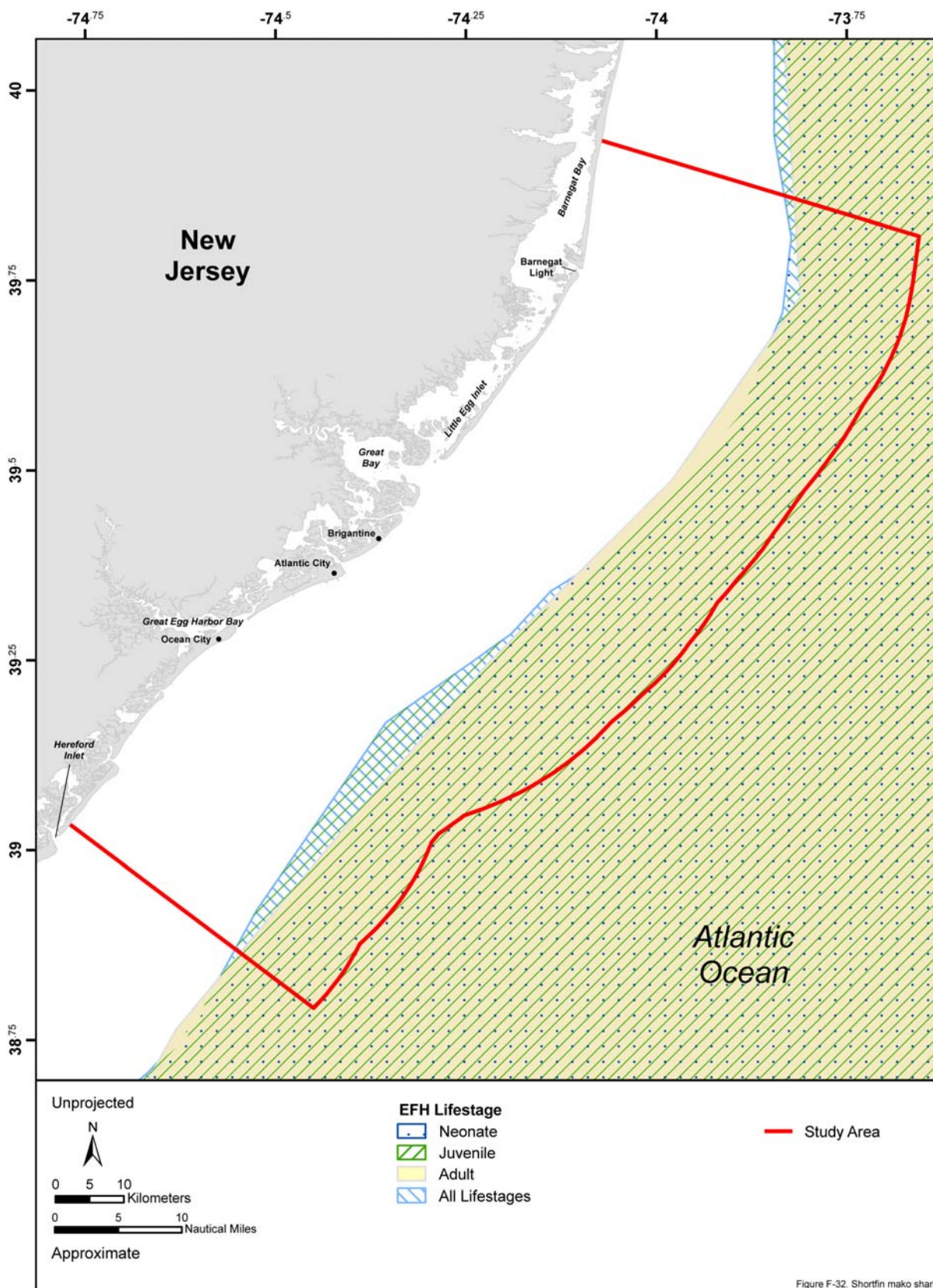


Figure F-32. Essential fish habitat designated in the New Jersey Study Area for all lifestages of shortfin mako sharks. Source data: NMFS (2003c).

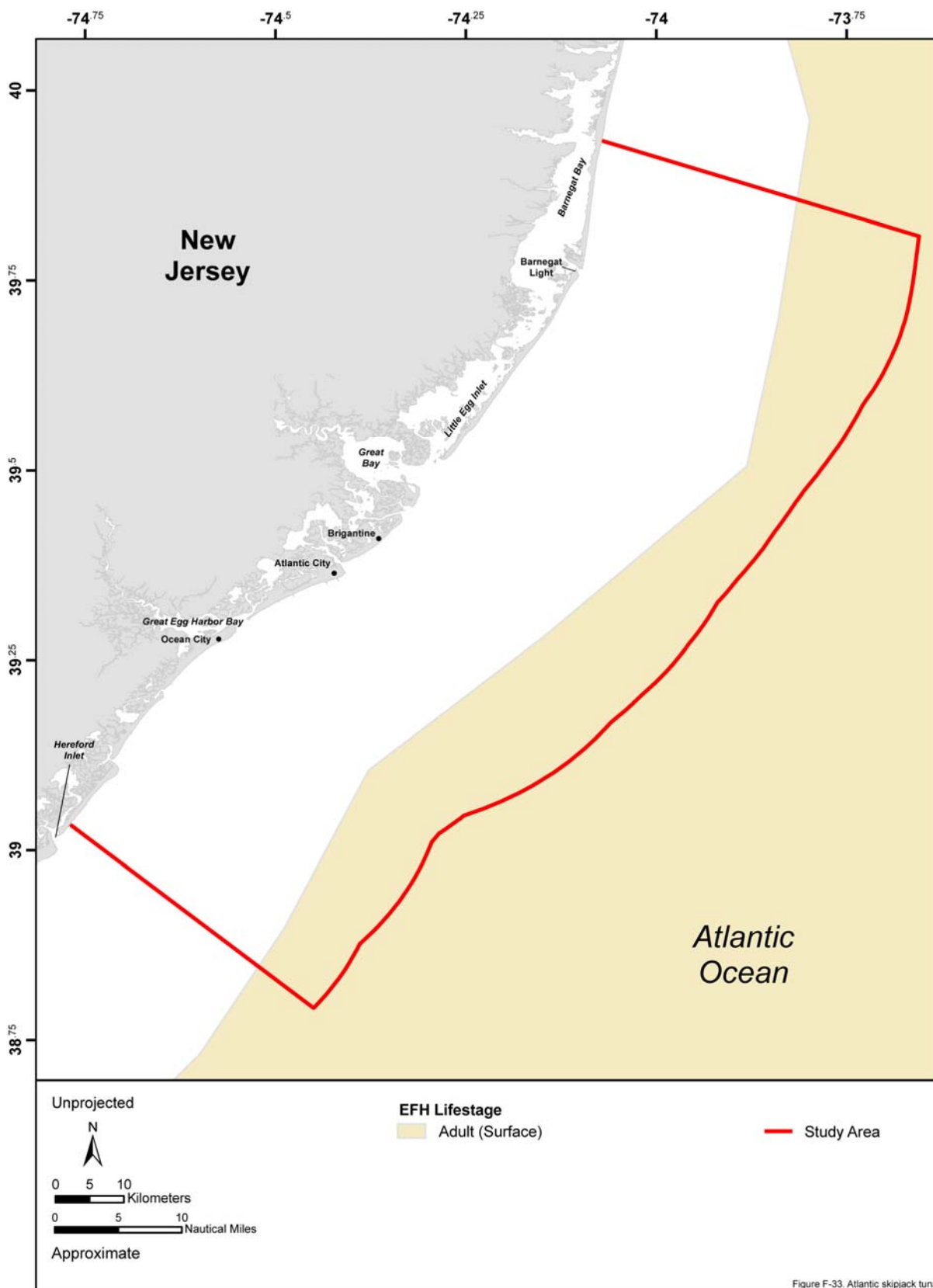


Figure F-33. Essential fish habitat designated in the New Jersey Study Area for adult lifestage of skipjack tuna. Source data: NMFS (2003c).

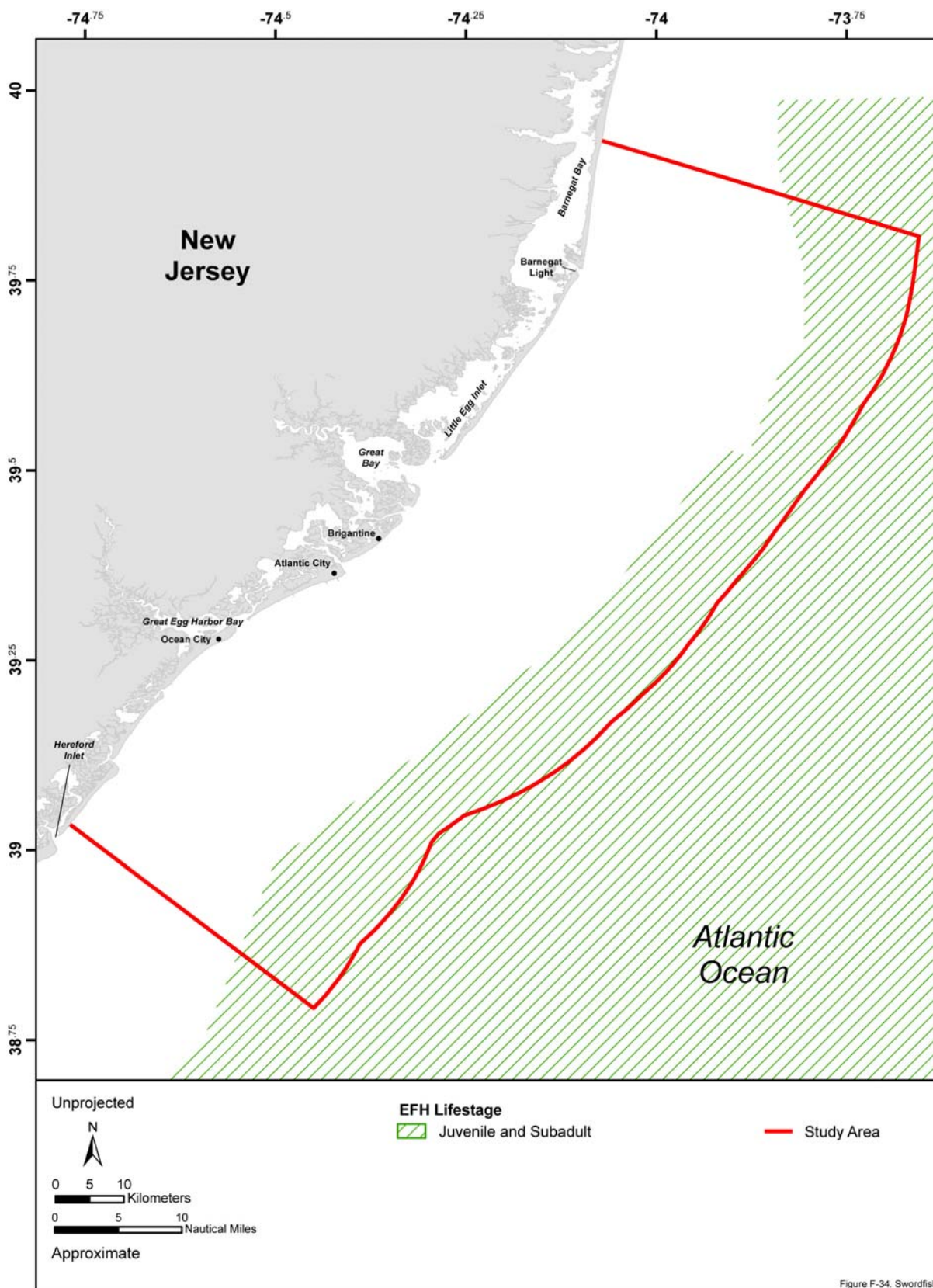


Figure F-34. Essential fish habitat designated in the New Jersey Study Area for juvenile/subadult lifstage of swordfish. Source data: NMFS (2003c).

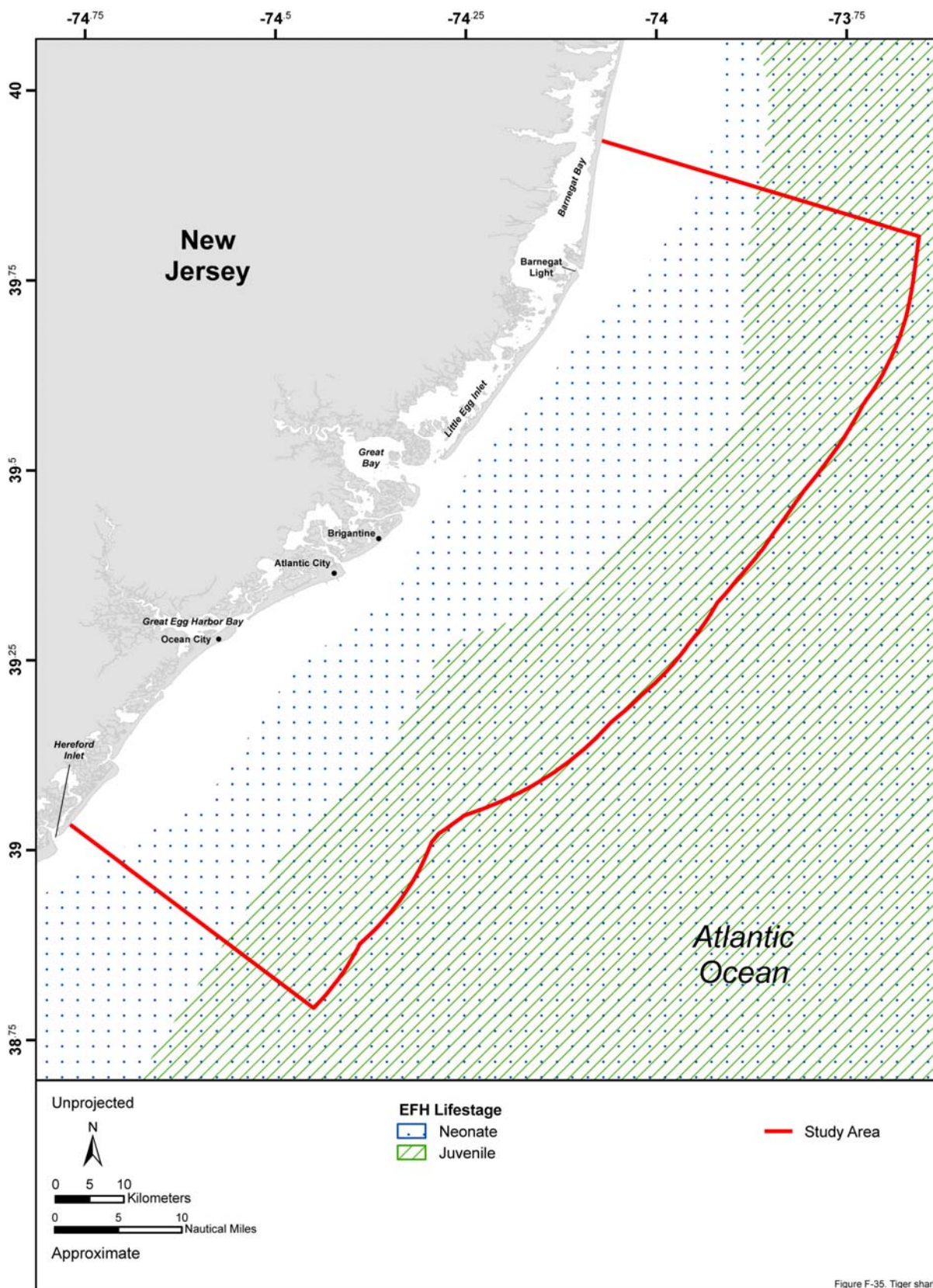


Figure F-35. Essential fish habitat designated in the New Jersey Study Area for neonate and juvenile lifestages of tiger sharks. Source data: NMFS (2003c).

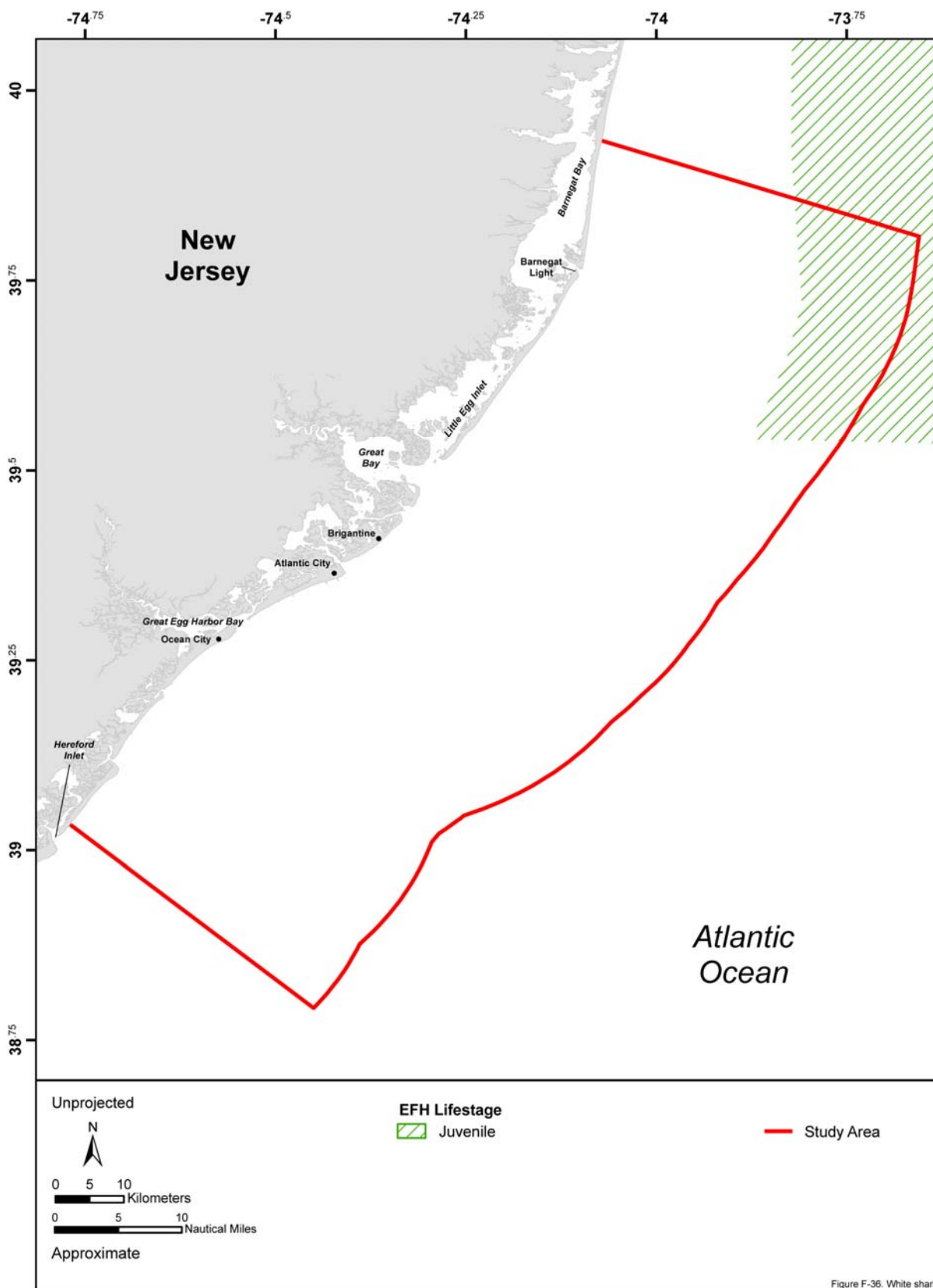


Figure F-36. Essential fish habitat designated in the New Jersey Study Area for juvenile lifecycle of white sharks. Source data: NMFS (2003c).