2005

Clam Aquaculture / Migrant Shorebird Conflict Assessment Along the Lower Delmarva Seaside

B. J. Paxton
The Center for Conservation Biology, bjpaxt@wm.edu

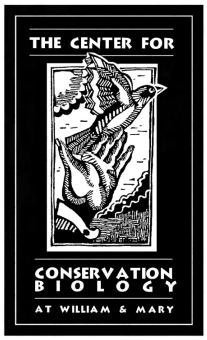
August 2005

Clam Aquaculture / Migrant Shorebird Conflict Assessment Along the Lower Delmarva Seaside.

Barton J. Paxton
Center for Conservation Biology
College of William and Mary
Williamsburg, VA 23187-8795

CCB Technical Report 05-08

This report was funded in part by the Virginia Coastal Program at the Department of Environmental Quality through Grant # NA03NOS4190104 of the National Oceanic and Atmospheric Administration, Office of Ocean and Coastal Resource Management, under the Coastal Zone Management Act of 1972, as amended. The views expressed herein are those of the author and do not necessarily reflect the views of NOAA or any of its subagencies.



Introduction

Shorebirds are among the most migratory groups of animals known to science. Of the 49 species of shorebirds that breed in North America, 36 spend their northern winter in Latin America. Some shorebird species may spend as much as two-thirds of their annual cycle in migration and may travel 30,000 kilometers per year. Because of their broad geographic movements, shorebirds have been acknowledged as both international resources and international responsibilities.

The physical demands of migrating long distances between the summer breeding grounds and wintering areas are extreme. For many species distances are covered during several nonstop, long-distance flights that are separated by periods of rest and replacement of energy stores. Worldwide, locations with enough prey to support large numbers of shorebirds during these refueling stops appear to be extremely rare. Such areas have tremendous conservation significance. Some of the staging sites are known to support high percentages of entire world populations of certain species and have likely played a role in the evolution of their migration strategies.

The Virginia Coast Reserve and associated habitats along the seaside of the Delmarva Peninsula support significant numbers of migrant shorebird and have been designated as a Western Hemisphere Shorebird Reserve with international status (i.e. host to >100,000 shorebirds). Recent investigations within this system have indicated that the majority of migrant shorebirds focus their foraging activities on inter-tidal mudflats. Peak densities of migrant shorebirds within mudflats during the spring migration of 1994-1996 averaged greater than 800 birds/km2 (Watts and Truit, unpublished data). This density is on par with some of the most significant shorebird staging areas known for the western hemisphere. Many of the areas favored by foraging shorebirds are also favored for the commercial aquaculture of clams.

Commercial aquaculture of hard clams (Mercenaria mercinaria) in Virginia began in the 1970's, but was not widespread until the mid 1990's. Clam aquaculture involves planting beds of clams that are covered with predator excluding plastic mesh for 1.5 – 2 years before harvesting A large clam farm may have 100 or more nets covering an area of several acres. At the present time we do not know exactly how many such nets are located along the Delmarva Peninsula or what percentage of available shorebird foraging habitat they impact.

The recent United States Shorebird Conservation Plan (Brown et al., 2001) identifies the mid-Atlantic region as an important staging area for shorebirds using the Atlantic Flyway and underscores the need to protect prey resources within staging areas. The ecological importance of the Delmarva seaside to migrating shorebirds is significant. It is essential to identify core areas

of migrant shorebird activity in order to begin to assess the potential conflicts between clam aquaculture and migrant shore birds and help guide policy revision of leasing criteria.

The primary objective of this project was to determine the degree of conflict between clam aquaculture and migrant shorebirds by utililzing GIS layers of shorebird concentration areas and bottom leases withing the barrier island lagoon system. This conflict analysis will determine to what degree clam aquaculture site are infringing upon the favored foraging sites for migrant shorebirds.

Methods

Shorebird were surveyed six times per year during the spring migration periods of 1994-1996 (Watts and Truit, unpublished data). Each survey was consisted of flying fixed wing aircraft along predetermined transects routes and counting, identifying, and mapping shorebird flocks observed within 400 meters of the transect line (fig 1). Data collected during survey flights were used to create georeferenced polygons of repeated shorebird use with all associated data (concentration areas). Polygons were created for all species group identifiable from the aircraft and included: black-bellied plover, sanderling, whimbrel, dowitcher (nearly 100% short-billed dowitcher with the possibilitly of small numbers of long-billed dowitchers), red knot, dunlin, and peeps (mostly semipalmated sandpipers, with fewer numbers of other *Calidris* sandpipers and *Charadrius* plovers).

The resulting concentration layers were to be compared with the bottom lease layer to look at potential conflict. However, due unforseen complications, the bottom lease layer was not able to be produced. In order to assess potentential clam aquaculture/migrant shore bird conflict a layer of clam aquaculture sites existing in 2002 was produced. This layer (2002 ClamBeds) was produced by systematically reviewing Virginia 2002 basemap imagery for the entire Northampton and Accomack County lagoon system and manually digitizing the approximate perimeters of all clam aquaculture sites. Imagery was reviewed at appoximately 1:5000 scale with guide lines running east-west spaced at 750 meters, to prevent review overlap or ommision.

The resulting clam bed layer along with the shorebird concentration, and 1994-1996 survey layer were used to determine the total area of clam aquaculture in 2002 and the proportion of the migrant shorebird survey area, and the actual shorebird concentration areas impacted by clam aquaculture activites.

Results

Review of aerial imagery from 2002, showed 73 different clam aquaculture site within the lagoon system (figure 2). The sites range in size from 0.007 hectares to 59.88 ha, with an average size 2.02 ha. During the 1994-1996 surveys a total of 1054 ha of lagoon system was surveyed along the transect

lines. Within the survey area 77 shorebird concentration areas were identified having a total area of 1,229 ha, or 10.8% of the entire surveyed area (figure 3). Within this same survey area, only 10.3 ha of clam aquaculture sites were identified, occupying just 0.09% of the survey area (figure 4). The actual area of overlap between shorebird concentration areas and clam aquaculture sites was 1.2 ha, or 0.1% of the shorebird concentration areas.

Discussion

It appears that a very small percentage of the preferred migrant shorebird foraging areas are impacted by clam aquaculture sites. This is most likely due the different characteristics that make sites attractive to shorebirds and clam aquaculturists.

Some shorebird species use intertidal lagoon to a greater degree than others. Sanderlings and red knots were primarily confined to the outer beach and were not regularly encountered within the lagoon system. Whimbrels and dowitchers were most often detected within the lagoon system and dunlin, peep, and black-bellied plovers, while found to use both the outer beach and lagoon system, were regularly detected within the lagoon system. While the species that occupy the lagoon system will feed opportunistically, the preferred foraging areas typically have a mud bottom type and shallow water (Davis and Smith 2001). Clam aquaculturists prefer to erect clam beds in areas with a sandy bottom type, as little fetch as possible, and in water less than one meter deep at mean low tide (VCRMP 1999).

While both shorebirds and clam aquaculturists prefer shallow water, there does seem to be a degree of separation. It appears that most clam beds are constructed in sites with water less than 1 m deep at mean low tide, but not regularly exposed at normal low tides. Conversely, shorebird key in on flats regularly exposed, or with just a few centimeters of water, at normal low tides. Even if clam beds were placed within the bathymetric range preferred by shorebirds, it is likely that the substrate type would be of a composed of a higher percentage of sand than is typically preferred by foraging shorebird.

To accurately determine the areas most desired by shorebird, areas currently favored by aquaculturists, and the potential conflict if the industry continues to grow, several pieces of data would be needed. These include but are not limited to; an accurate layer of bottom type, an accurate bathymetric layer with cm resolution, and a layer with bottom leases containing both active and inactive leases.

Based the locations of clam aquaculture sites taken from 2002 imagery, it does not appear that the conflict between foraging shorebirds and clam aquaculture is significant. However, if the clam aquaculture industry continues to grow unchecked, and growers are forced into the less desirable sites with mud

bottom and very shallow water, a conflict may arise. Utilization of sites now deemed undesirable by the aquaculturists, but preferred by shorebirds, would greatly reduce the amount of area currently available to foraging shorebirds.

Literature Cited

Brown, S., C. Hickey, and B. Harrington. 2001. The U.S. shorebird conservation plan. 2nd ed: Manomet Center for Conservation Sciences, Manomet, MA.

David, C.A., Smith, L.M. Foraging strategies and niche dynamics of coexisting shorebirds at stopover sites in the southern Great Plains. Auk (2001) 118:484-495.

Virginia Coastal Resources Management Program. 1999. Shallow Water Resource Use Conflicts: Clam Aquaculture and Submerged Aquatic Vegetation. Virginia Institute of Marine Science, College of William and Mary, Gloucester Point, VA

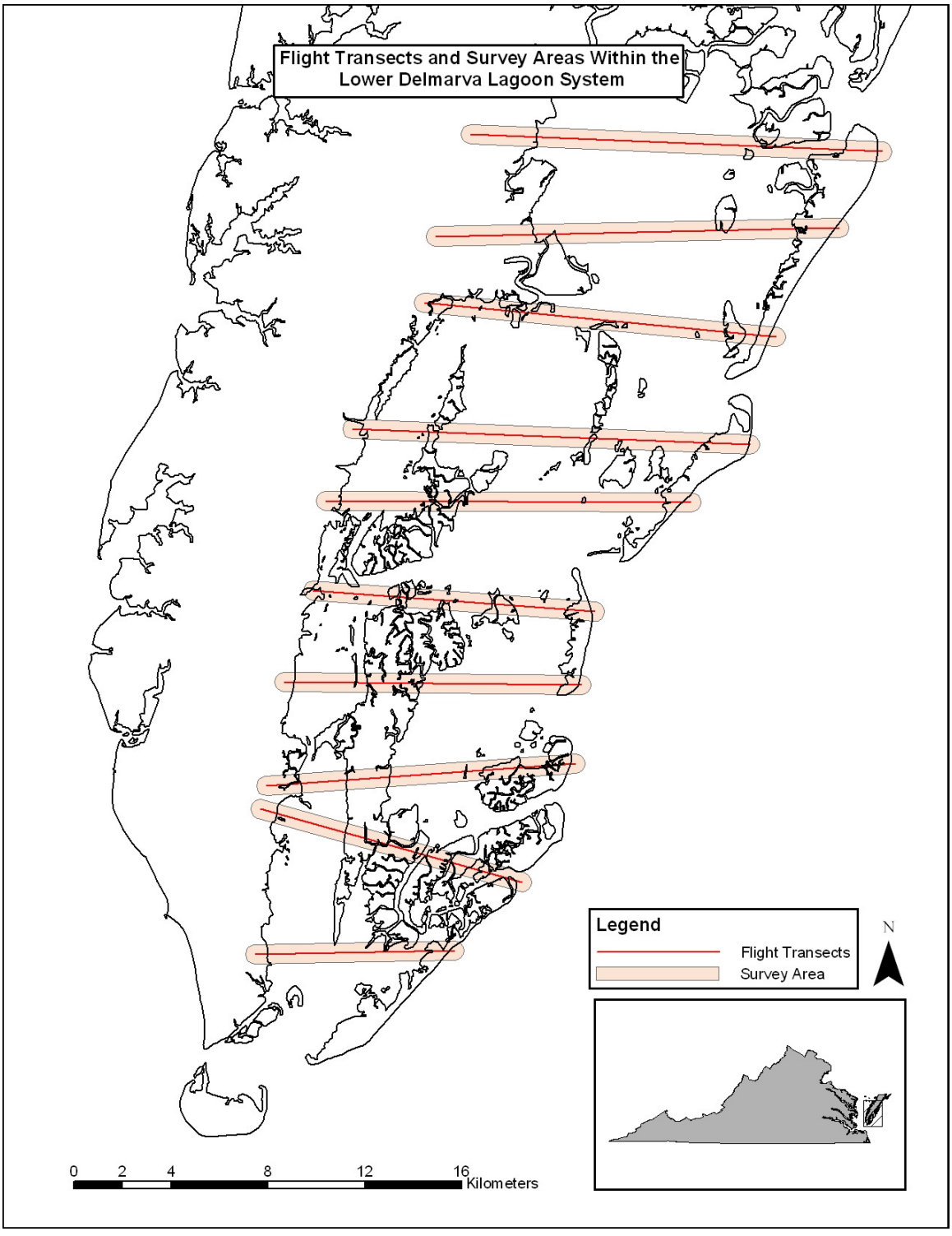


Figure 1. Flight transects and survey area within lagoon system of the Lower Delmarva.

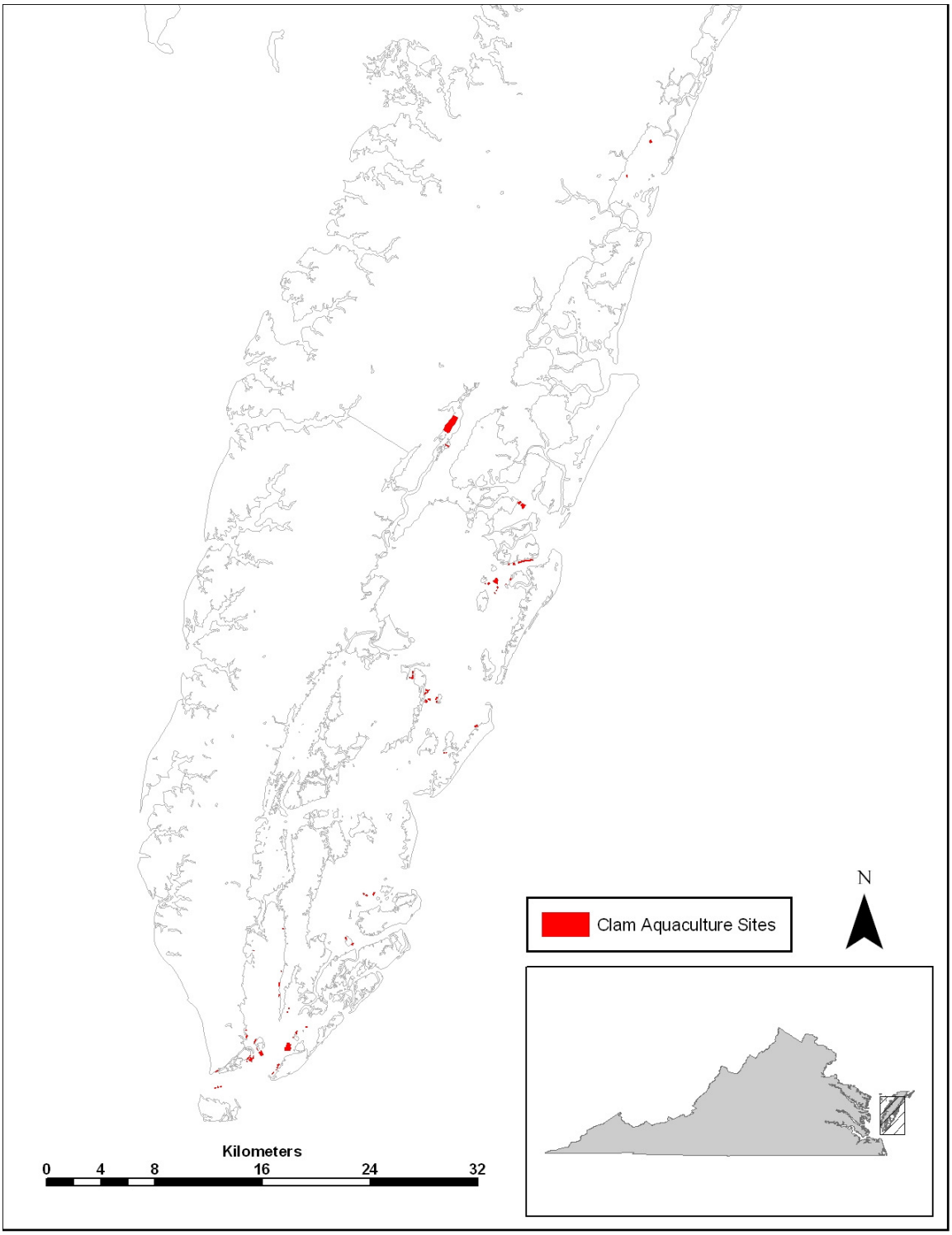


Figure 2. Clam aquaculture sites identified from 2002 Virginia Base Map Imagery.

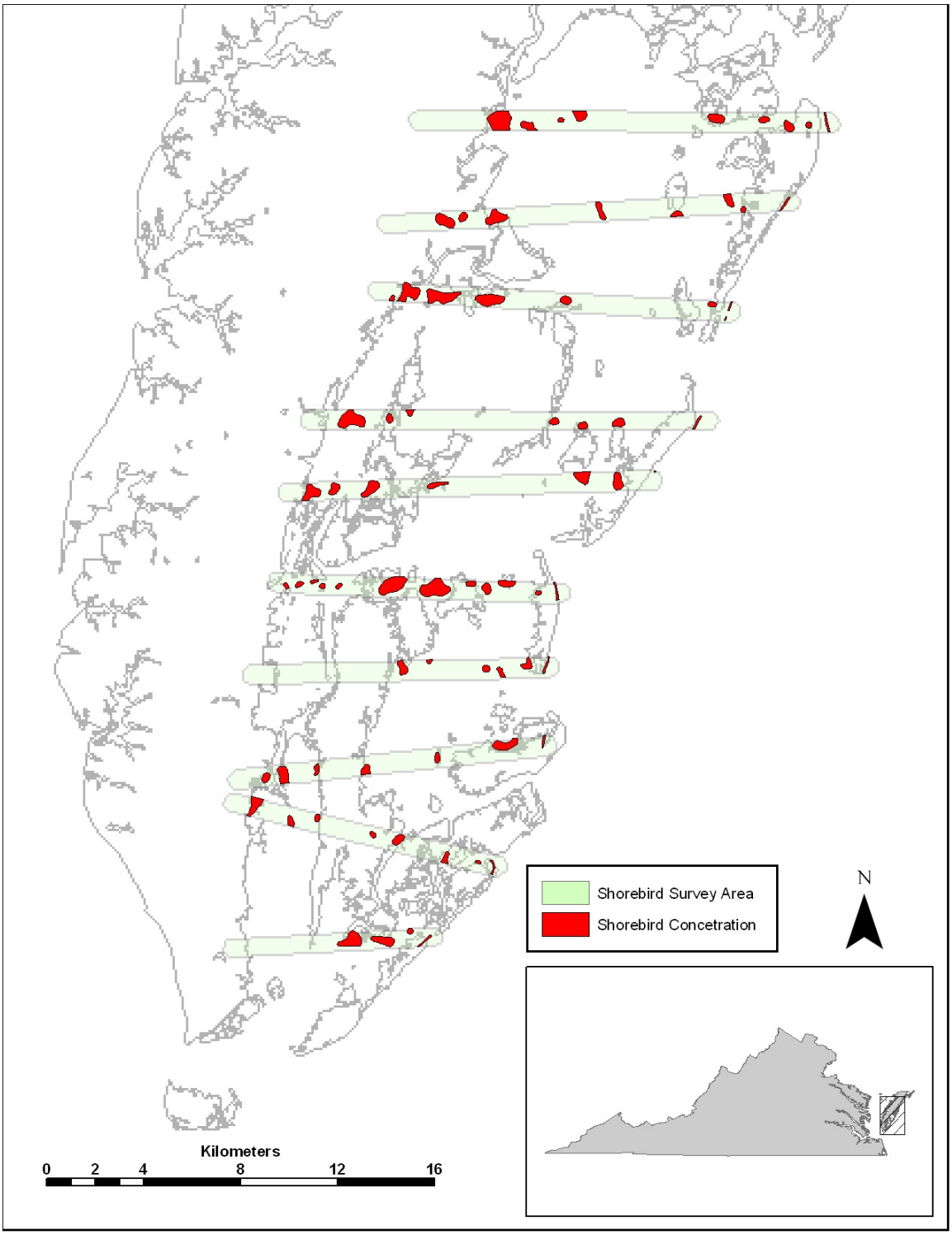


Figure 3. Shorebird concentration areas identified within shorebird survey areas.

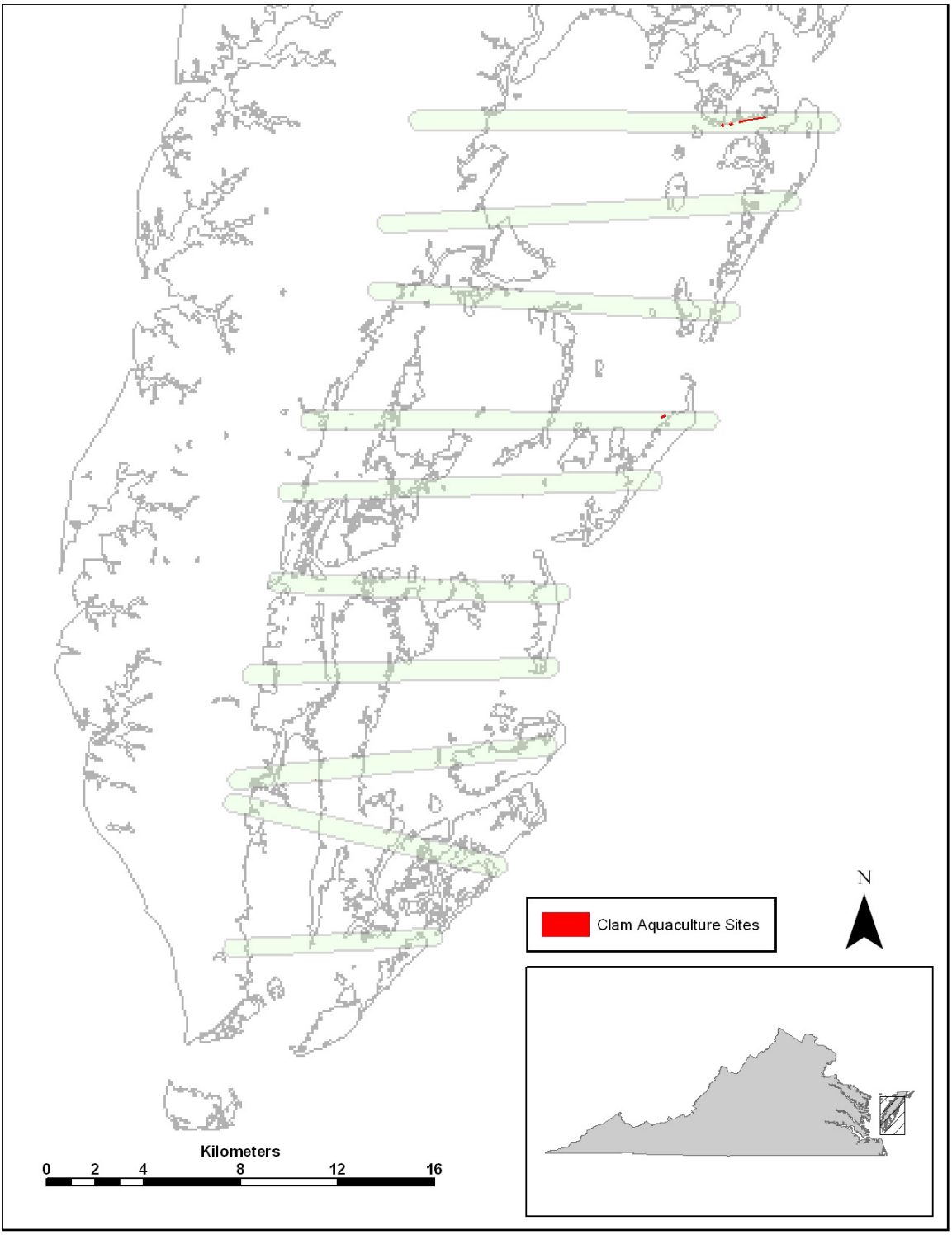


Figure 4. Clam aquaculture sites within shorebird survey area.