

**September 8, 2009
Limulus polyphemus**

**Final Report for 2009
Horseshoe Crab Monitoring & Tagging Activity in
Raritan Bay & Sandy Hook Bay, Monmouth County, New Jersey
May & June 2009
Conducted by the Bayshore Regional Watershed Council**



**Report to: US Fish & Wildlife
National Park Service/Gateway National Recreation Area
NJDEP/Fish & Wildlife Division
Brookdale Community College, Environmental Science Department
American Littoral Society
M.A.S.T (Marine Academy of Science and Technology)**

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Summary

- During May & June 2009, a Raritan Bay – Sandy Hook Bay, Monmouth County, New Jersey Horseshoe Crab a first-year spawning survey was implemented in by volunteers with the Bayshore Regional Watershed Council and with cooperation from Brookdale Community College, Environmental Science Department. More than 30 volunteers and coordinators worked to implement this survey in an accurate manner.
- The spawning survey by the Bayshore Regional Watershed Council is the first conducted for the Sandy Hook Bay-Raritan Bay region of Monmouth County, New Jersey in more than 30 years.
- Volunteers at five (5) sites throughout the region conducted monitoring and tagging activities during periods of high tide on dates that coordinated with full moon phases.
- Spawning activity was slow to start in May, but peaked markedly during early June.
- Two out of the three sites had very little spawning activity throughout May & June, though historically these two sites (Ideal Beach in Middletown Township & Conaskonck Point in Union Beach) had been reported by local, long-established residents as being productive Horseshoe Crab spawning locations during the 1960s and through the 1990s.
- Weather played an important factor during this study. Stormy weather cancelled monitoring activities at several locations in May and higher than normal high tides in late June cancelled monitoring activities at all five sites.

The full tagging database is available for downloading from the Bayshore Regional Watershed Council's internet site:

<http://www.bayshorewatershed.org>

In addition, Brookdale Community College, Environmental Science Department, Sandy Hook Field House location has a copy of this report and all relevant materials.

Background

Horseshoe crabs play a vital role ecologically along the shores of the New York – New Jersey Harbor Estuary, including Sandy Hook Bay & Raritan Bay. Migratory shorebirds depend on the eggs of horseshoe crabs to refuel on their migrations from South America to the Arctic. One bird in particular, the red knot, *Calidris canutus*, feeds primarily on horseshoe crab eggs during its stopover. That bird is under a status review for listing under the federal Endangered Species Act.

In 2009, volunteer members of the Bayshore Regional Watershed Council approved a measure to conduct a five (5) year study to monitor and tag horseshoe crab (*Limulus polyphemus*) spawning populations at five (5) sites along Sandy Hook Bay & Raritan Bay in Monmouth County, New Jersey. The goal of the study would be to get a better determination of the spawning population of this aquatic species and to ascertain if the population is stable, increasing, or decreasing. In addition, by tagging horseshoe crabs, this study would help people to better understand the migration patterns, abundance, and survival rates of recaptured tagged horseshoe crabs over the course of the program in the project area.

The five (5) monitoring sites along Raritan Bay & Sandy Hook Bay in Monmouth County, New Jersey include: 1) Plum Island at Sandy Hook Gateway National Recreation Area, 2) near the mouth of Many Mind Creek in the Borough of Atlantic Highlands, 3) Ideal Beach in Middletown Township, 4) Conaskonck Point in the Borough of Union Beach, and 5) Cliffwood Beach in Aberdeen Township.

During late winter 2009, members of the Bayshore Regional Watershed Council also reached out to staff at Brookdale Community College, Environmental Science Department to help with horseshoe crab monitoring activities and to help keep track of the data. Both Jim Burkitt and Cathy Folio from the Environmental Science Department at Brookdale Community College agreed to help and be part of the monitoring program. Data was collected during full moon and new moon high tide event cycles in May and early June. Dates included: Saturday, May 9, 2009, Sunday, May 24, 2009, Sunday, June 7, 2009, and Monday, June 22, 2009.

Monitoring activities by volunteers were divided into two main actions: (1) counting spawning populations of horseshoe crabs and (2) tagging adult horseshoe crabs. Both activities took place at the same time by watershed volunteers in May & early June.

Field Methods

Field methods and activities for counting crab populations by watershed volunteers were similar to protocol described by the USGS in their volunteer information entitled, "SURVEYING HORSESHOE CRABS" (please see USGS web site: <http://www.lsc.usgs.gov/aeb/2065/protocol.asp>). In brief, watershed volunteers first determined the tide height or water's edge during high tide using a tide stick. When the height of the tide on the tide stick remained constant for approximately 10 minutes or began to decrease, volunteers would walk 1 meter (approx 3 feet) below the water's edge to place the first meter stick for width. From this tide meter stick, a volunteer would walk one meter (approx 3 feet) from the water's edge and place a second meter stick for width. There was a total of 2 meters or approximately 6 feet for width. For length, volunteers marked out exactly 1,000 feet of beach or as close to 1,000 feet as possible on certain small, narrow beaches. Volunteers then began to walk towards one end of the beach, counting and recording on the tally sheets all horseshoe crabs within the 2 meter width transect along the entire 1,000 feet length of the survey area. Field methods for tagging crab population were the same protocol as described by USFWS. In brief, the protocol called for volunteers to attach a circular individual numbered disc to the left posterior (rear) of the prosoma (first section of body) by drilling a 5/32" hole through the side and then pushing the plastic pin (with tag) into the hole as far as it goes. Data sheets recorded the tag number, sex, prosomal width (PW) in millimeters (widest point of the crab), the date tagged, beach name, waterbed name, and state. The watershed council received a total of 400 tags supplied by USFWS, though only 330 tags were employed this year due to poor weather conditions.

Findings

Saturday, May 9, 2009.

High Tide: 8:30pm

Weather: Partly cloudy skies, breezy with southwest winds 10-20 mph, and lows in the upper 50s. Surface water temperatures in the bay ranged between 57 to 61 degrees Fahrenheit.

1) Sandy Hook/Plum Island: Due to high tide, volunteers were only able to monitor 500ft of beach. They counted 74 horseshoe crabs and tagged 48 male crabs. Out of the 74 crabs counted, there were 26 mating pairs, and 22 single males.

2) Atlantic Highlands/Many Mind Creek: Volunteers were able to monitor 600 feet of beach. They counted 54 horseshoe crabs and tagged 24 males near the mouth of Many Mind Creek. Out of that number, there were 13 mating pairs and one cluster of 3 males trying to pair with one female; 24 single males.

3) Ideal Beach/Middletown Township: Volunteers counted 4 crabs - 2 mating pairs of crabs (male & female) within 1,000 feet of beach.

4) Conaskonck Point/Union Beach: Volunteers counted 3 crabs - 2 males and 1 female horseshoe crab. Due to high tide conditions, only 500 feet of beach was monitored.

5) Cliffwood Beach/Aberdeen Township: Volunteers were able to monitor 1,000 feet of beach. They counted 63 total crabs. There were 22 clusters of horseshoe crabs. Three (3) clusters consisted of 2 males and 1 female; the remaining 19 were male/female pairs. Males = 25. Females = 22. They counted 13 solitary crabs which were all males. From that population they tagged 9 crabs. They also counted 1 dead male and 2 dead females. Including dead crabs, they counted 39 males, 24 females..

Sunday, May 24, 2009

High tide: 8:28pm

Weather: Warm and humid with serve thunderstorms. Surface water temperatures were in the low 60s.

1) Sandy Hook/Plum Island: Volunteers counted 50 horseshoe crabs, but due to the stormy weather they were not able to tag any crabs. Out of this number, 21 mating pairs, one cluster that had 4 males and 1 female, and three single males.

2) Atlantic Highlands/Many Mind Creek: Volunteers monitored 400 feet of beach. They counted 51 horseshoe crabs near the mouth of Many Mind Creek. Out of that number, there were 16 mating pairs (male & female), 17 single males and 2 single females. No clusters found. Volunteers tagged 15 single HSC (13 males & two females).

3) Ideal Beach/Middletown: Four (4) horseshoe crabs were found before the weather turned bad. One crab was tagged.

4) Conaskonck Point/ Union Beach: Volunteers counted 67 crabs before they were chased “back into the parking lot because of lightning bolts coming down into the bay.” There were a total of 38 males and 29 females. Out of these numbers 31 males and 27 females were part of mating pairs or clusters, while 7 males and 2 females were solitary.

5) Cliffwood Beach/Aberdeen Township: Unfortunately, this site had to totally cancel due to the stormy weather.

Sunday, June 7, 2009

High tide: 8:31pm

Weather: Partly cloudy, calm, and warm with temperatures in the 70s. Surface water temperatures ranged from the mid to upper 60s.

1) Sandy Hook/Plum Island: Volunteers counted 195 horseshoe crabs. Due to the high tide they were only able to monitor 500ft of Plum Island on Sandy Hook. They tagged 30 crabs, and exhausted all the tags. They counted mostly males and coupled females. No clusters. Out of 195 crabs, there were 76 mating pairs and 43 single males.

2) Atlantic Highlands/Many Mind Creek: Volunteers were able to monitor 600 feet of beach near the mouth of Many Mind Creek. They counted 75 HSC, including 2 dead crabs (both female), and 1 large cluster of one female & six males. Otherwise, there were 41 single males, 11 couples, and one small cluster of 2 males and 1 female. About 35 crabs were tagged and all tags were also exhausted.

3) Ideal Beach/Leonardo Beach/Middletown: No crabs were reported at Ideal Beach. Volunteers then moved to nearby Leonardo Beach and counted 43 Horseshoe crabs within 1,000 feet of beach. Half this amount were tagged by volunteers. There were 8 total females and 25 total males counted. Out of this number there were seven mating pairs and 29 single crabs. There were also 3 dead crabs found.

4) Conaskonck Point/ Union Beach: Volunteers worked about 30 ft of beach to the right of the eastern access site on Front Street. There were too many fishermen and debris at the other end. Volunteers counted 29 HSC and tagged 18. There were 20 males and 9 females. Of note: all of the HSC would come up, break the surface and then immediately turn around and go back into the bay. All the tags were exhausted.

5) Cliffwood Beach/Aberdeen: Volunteers counted 469 Horseshoe crabs within 1,000 feet of beach! Out of this number, 162 were couples, and 92 were females. The remainder of crabs found were single males. No dead crabs were located. All the tags were exhausted.

Monday, June 22, 2009

High tide: 8:14pm

**** All monitoring activities were cancelled this evening due to higher than normal high tides that washed out beach locations in the bay.

Conclusion

Although it is too early to express anything specific, these first-year findings illustrate that early June was the height of spawning activity for horseshoe crabs in Raritan Bay and Sandy Hook Bay for 2009. Also, it appears as of this year that Cliffwood Beach & Plum Island at Sandy Hook were the hot spots for HSC spawning activity. It is also poignant to note the uneven population ratio of crabs at most monitoring sites in the bay. In some cases for every female or mating pair that was found, up to six or more individual males turned up.

Additionally, it is interesting to note the scarcity of horseshoe crab activity in Middletown Township and Union Beach compared to other nearby monitoring sites to the east and west, even though historically these two sites once had high spawning activity. While further monitoring will be conducted at these two sites next year, the lack of spawning activity may have been due to physical factors, such as tidal height, wave height, water temperature, and/or geology (slope of the shoreline, shape of the beach, or sand grain size). Additional research is required here.

This study was a cooperative effort involving the U.S. Fish and Wildlife Service, National Park Service, Gateway National Recreation Area, New Jersey Division of Fish and Wildlife, Bayshore Regional Watershed Council, Brookdale Community College, Environmental Science Department, and the Marine Academy of Science and Technology. In addition, appreciation is given to the more than 30 volunteers from the watershed council and local citizens who gave up a bit of their time in May and June to assist in this project, so other people might gain a better understanding of horseshoe crab activity in Raritan Bay & Sandy Hook Bay, Monmouth County, New Jersey. With the help of everyone involved, this first-year project would have not been accomplished. Gratitude and appreciation to everyone!