

December 24, 2012

**Final Report for 2012
Limulus polyphemus**

**Horseshoe Crab Monitoring & Tagging Activity in Raritan Bay & Sandy Hook Bay,
Monmouth County, New Jersey May & June 2012
Conducted by Volunteers with 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)



(Picture taken at Plum Island, Sandy Hook NRA, May 2012)

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The full database is available for downloading from the Bayshore Regional Watershed Council's web site: <http://www.restoreourbay.org/current-projects/horseshoe-crab-monitoring/>

Summary

During May & June 2012, a Raritan Bay – Sandy Hook Bay, Monmouth County, New Jersey Horseshoe Crab spawning survey was implemented by volunteers with the Bayshore Regional Watershed Council, with cooperation from Brookdale Community College, Environmental Science Department, and high school students with the Marine Academy of Science and Technology (M.A.S.T.), located at Sandy Hook. Volunteers with Monmouth County Parks & Bergen County Parks were also on hand. More than 40 volunteers were involved to implement this survey in an accurate manner.

OLD BUSINESS

- The spawning survey by the Bayshore Regional Watershed Council was the fourth in a five-year project conducted for the Sandy Hook Bay-Raritan Bay region of Monmouth County, New Jersey.
- Volunteers at five (5) sites throughout the region conducted monitoring and tagging activities during periods of high tide on dates that coordinated with full & new moon phases.

NEW BUSINESS

- Monitoring activities were cancelled at most sites on Monday, June 4, 2012 due to higher than normal tides resulting from an off-shore storm that washed out many beaches and created unsafe conditions for volunteers. Once again, weather played an important factor during this study.
- Males out-numbered females again this year, by a huge ratio of nearly 26:1. Both mating pairs and clusters of HSC were reported higher this year, especially at Plum Island at Sandy Hook NRA, which this year was the hot spot for HSC spawning activity.
- Overall total population numbers for 2012 were nearly steady with 2011, but still an increase compared to the two previous years of the study.

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. Red Knots have been reported feeding at two sites in the study area: Conaskonck Point in Union Beach and at the tip of Sandy Hook.

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 is to obtain 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 will help 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) Leonardo Beach in Middletown Township, 4) Conaskonck Point in the Borough of Union Beach, and 5) Cliffwood Beach in Aberdeen Township.

Data was collected during full moon and new moon high tide event cycles in May and June. Dates included: Sunday, May 6 at 9:00pm, Sunday, May 20 at 8:30pm, Monday, June 4 at 9:00pm , and Tuesday, June 19 at 9:00pm.

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 go. 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.

RESULTS

FIRST NIGHT

Sunday, May 6, 2012

9:00pm to approx 10pm.

Weather: Clear skies. Air and water temperatures were both in the 50s to low 60s degree Fahrenheit.

Sandy Hook/Plum Island:

Total HSC: 100

Live males: 61

Live females: 30

Single males: 26

Single females: 1

Mating pairs: 27

Clusters: 2 (4 males w/ 1 female)

Dead crabs: 9 (dead males – 7 & dead females – 2)

Atlantic Highlands/Mouth of Many Mind Creek:

Total HSC: 117

Single live males: 30

Single females: 0

Mating pairs: 40

Clusters: 3 (two clusters had one female & two males, the other cluster had one female and three males)

Dead crabs: 0

Leonardo Public Beach/ Middletown Township

Total HSC: 190

Single Females 4

Single Males 43

Female/Male Couples 62 (total 124)

Clusters 1F/2M 5 (total 15)

 1F/3M 1 (total 4)

Union Beach/ Conaskonck Point

Total HSC: 15

Single live males: 1

Mating pairs: 4

Dead crabs: 6 (sex unidentified)

Aberdeen Township/Cliffwood Beach

Total HSC: 145 (90 males & 54 females + 1 dead crab)

Single males: 19

Single females: 1

Mating pairs: 42

Clusters: 11 cluster and 40 total crabs where there were 2 or 3 males/female

Dead crabs: 1 female

SECOND NIGHT

Tuesday, May 17, 2011

8:30pm to approx 10pm

Weather: Partly cloudy skies with showers. Breezy. Air temperatures were in the upper 60s to low 70s.

Water temperatures were in the upper 50s to mid 60s degree Fahrenheit.

Sandy Hook/Plum Island:

Total alive horseshoe crabs counted: 950

Horseshoe crabs counted:

Single males: 351

Single females: 8

Mating pairs: 157

Clusters:

2 males / 1 female: 7 clusters

3 males / 1 female: 17 clusters

4 males / 1 female: 9 clusters

5 males / 1 female: 7 clusters

6 males / 1 female: 4 clusters

7 males / 1 female: 2 clusters

9 males / 1 female: 1 cluster

10 males / 1 female: 3 clusters

13 males / 1 female: 1 cluster

dead males: 83

dead females: 11

(The number of dead is much higher than anyone at the site remembered)

Atlantic Highlands/Mouth of Many Mind Creek:

Total alive Horseshoe Crabs: 230

107 Single Males

2 Single Female

44 Pairs

8 Clusters with 2 males & 1 female

1 Cluster with 3 males & 1 female

1 Cluster with 4 males & 1 female

4 dead males

3 dead females

Leonardo Public Beach/ Middletown Township

Total alive Horseshoe Crabs: 161

21 Single males

2 Single females

62 pairs

4 Clusters of 2 males & 1 female

1 Dead female

1 Dead male

Union Beach/ Conaskonck Point

Total alive Horseshoe Crabs: 2
1 Mating Pair
2 Dead crabs (sex unidentified)

Aberdeen Township/Cliffwood Beach

Total alive Horseshoe Crabs: 176
Single Males - 32
Mating Pairs - 53
Clusters - 11
Total males 109 Males
Total females: 67 Females

THIRD NIGHT

Monday, June 4, 2012

9:00pm - approx. 10:00pm

Weather: Mostly cloudy skies with gusty winds out of the north. Both air and water temperatures were in the 60 degree Fahrenheit range.

***Unfortunately, the monitoring event had to be cancelled due to higher than normal tides from an off-shore storm that created very narrow beaches, flooded roads, and unsafe conditions for volunteers.

Laura Bagwell, beach captain at Plum Island, Sandy Hook, and Frank Huza, beach captain at Cliffwood Beach summed up the wild weather conditions that night best. Laura reported , "Plum Island is under water," and Frank wrote, "There were actual waves moving across Lakeshore Drive!" What a night!

FOURTH NIGHT

Tuesday, June 19, 2012

9:00pm - approx. 10:00pm

Weather: Clear skies. Calm winds. Air and water temperatures were in the 70 degree Fahrenheit range.

Sandy Hook: Plum Island

Total crabs 86
total females: 6
total males: 80
75 single males
1 single female
5 mating pairs (1 male with 1 female)
0 clusters
0 dead

Atlantic Highlands: Mouth of Many Mind Creek

Total Crabs 63
Total females: 6
Total males: 57
54 Single males
3 Single females
3 pairs (1 male & 1 female)
No Clusters
No dead crabs

Middletown Township: Leonardo Beach

Total Crabs 26
Total females: 3
Total Males: 23
20 Single Males
3 Pairs (1 male & 1 female)
No clusters

Union Beach: Conaskonck Point

Total Crabs 16
Total males: 10
Total females: 6
6 Single Males
2 Single females
4 Pairs (1 male & 1 female)

Aberdeen Township: Cliffwood Beach

Total Crabs 43
22 Single Males
1 Single female
Clusters - 1 male 1 female - 5
Clusters - 2 male 1 female - 2
Clusters - 3 male 1 female - 1
Solitary Males - 22
Solitary Females - 1
Dead - 1 male, 1 female

(next page for total numbers)

2012, 2011 & 2010 & 2009 TOTAL LIVE CRAB NUMBERS FOR EACH SITE (minus found dead crabs on beach)

Sandy Hook: Plum Island

YEAR	Total Crabs	Single Males	Single Females	Pairs	Clusters
2009	319	191	124	123	1
2010	326	285	41	32	4
2011	269	186	6	17	7
2012	1136	452	10	189	53

Atlantic Highlands: Mouth of Many Mind Creek

YEAR	Total Crabs	Single Males	Single Females	Pairs	Clusters
2009	180	133	45	76	2
2010	146	123	26	21	1
2011	742	514	10	55	24
2012	410	194	8	87	13

Middletown Township: Leonardo Beach

YEAR	Total Crabs	Single Males	Single Females	Pairs	Clusters
2009	43	31	9	9	0
2010	235	176	68	20	21
2011	486	378	66	21	38
2012	377	84	9	127	23

Union Beach: Conaskonck Point

YEAR	Total Crabs	Single Males	Single Females	Pairs	Clusters
2009	100	65	38	34	2
2010	48	34	10	10	0
2011	171	89	2	125	2
2012	33	7	2	9	0

Aberdeen Township: Cliffwood Beach

YEAR	Total Crabs	Single Males	Single Females	Pairs	Clusters
2009	532	453	114	92	22
2010	428	230	198	148	50
2011	648	351	90	36	68
2012	363	73	2	95	30

****TOTAL HSC ACTIVITY FOR THE REGION 2012, 2011, 2010 & 2009****

YEAR	Total Crabs	Single Males	Single Females	Pairs	Clusters
2009	1174	873	330	334	27
2010	1183	737	343	261	55
2011	2316	1518	174	254	139
2012	2319	810	31	507	119

CONCLUSION

Although the project still has another year to go, it seems clear at this early stage that overall the HSC population has been increasing since 2009. The only decrease in total crab population shown has been at Conaskonck Point in the Borough of Union Beach. The scarcity of Horseshoe Crabs here is interesting and puzzling since historically this site once had the largest spawning population of Horseshoe Crabs in the Bayshore region of Monmouth County, NJ, according to long-time residents.

The huge spike in Horseshoe Crab population at Plum Island, Sandy Hook as compared to previous years is also worth noting. While the finding here might be abnormal, it could be a result of its prime location at both the entrance of the New York - New Jersey Harbor Estuary and the Shrewsbury-Navesink River complex. Mating HSC might have found this site optimal as they entered the estuary from possible winter hibernation sites in the deeper waters of the Atlantic Ocean. The data for 2012 shows there was overall greater mating activity in the eastern part of the project study area, as opposed to the western area.

It is poignant to also note the uneven sex population of crabs at all the monitoring sites in the bay. This year there was an enormous decrease in single females. On average in 2012, for every single female, there were 26 single males. This overabundance of single males versus females is quite puzzling. The increase in mating pairs and clusters in 2012 suggests that perhaps adult sexually active females are being pursued quickly by single males. More research needs to be done to see if a similar difference is occurring at other monitoring sites in New Jersey, New York, and the northeast.

APPRECIATION

Appreciation and gratitude is given to the project partners. This study is 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, and Marine Academy of Science and Technology (M.A.S.T.) at Sandy Hook.

In addition, appreciation is given to the more than 40 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 project would have not been accomplished. Gratitude and appreciation to everyone

NOTES:

Sunday, May 20, 2012

An email was received this morning from US Fish & Wildlife to the Bayshore Watershed Council. A Horseshoe Crab that was tagged last year on 6/1/11 in Cliffwood Beach was found alive in Jamaica Bay last night.

Tuesday, June 19, 2012

Some interesting observations from the beach captains. Frank Huza from Cliffwood Beach reported that the water quality was rust colored and the visibility was about 6 inches. Joe Reynolds also reported that the water quality was pretty bad in Atlantic Highlands. The color was greenish with an overabundance of sea lettuce floating on top. Visibility was poor.

Of special note was the observation from Laura Bagwell and Shannon Evens at Sandy Hook. They said to Joe Reynolds that there were dozens of tiny horseshoe crab molting shells observed within the seaweed in the high tide line. New life! How exciting. To learn more about this special observation, you can check out my blog at

<http://natureontheedge NYC.blogspot.com/2012/06/taking-it-off-on-first-day-of-summer.html>