



## NEW JERSEY'S HORSESHOE CRAB RESCUE PROGRAM: 2016 Summary Report

Lisa Ferguson, Allison Anholt  
The Wetlands Institute

Laura Chamberlin  
WHSRN Executive Office

### Program Overview

#### Background Information

The Delaware Bay is home to the densest spawning population of Atlantic horseshoe crabs (*Limulus polyphemus*) in the world. Over 600,000 horseshoe crabs annually climb onto New Jersey beaches to spawn, and are in greatest number during full and new moon high tides in May and June (Swan et al. 2013). During spawning, crabs risk becoming stranded on the beach. Waves can overturn crabs, or they may become impinged in man-made structures, marine debris, or natural obstacles. The risk of stranding is compounded by the fact that crabs may come ashore to spawn multiple times each season. Stranding can result in the mortality of significant numbers of horseshoe crabs due to desiccation, predation, or overheating if they are not overturned or freed from impingements.

During peak spawning months, the shores of the Delaware Bay also support hundreds of thousands of shorebirds stopping over to refuel and rest during northbound migrations of 7,000 miles or more to their breeding grounds. These shorebirds depend on the presence of abundant horseshoe crab eggs so that they can gain the nutrition necessary to complete their migration and nest successfully.

Due to a combination of factors, including overharvest and habitat loss, the horseshoe crab population experienced a substantial decline in recent decades (Niles et al. 2009). As the number of horseshoe crabs spawning in the Delaware Bay has dropped, so too has the number of shorebirds. In response, many Delaware Bay beaches in New Jersey are closed to the public from May 7 to June 7 each year so that shorebirds can forage undisturbed. During the closures, horseshoe crabs that become stranded on the beach are inaccessible to help.

The reTURN the Favor (RTF) program was initiated in the spring of 2013 as a means to reduce strandings and subsequent preventable losses of horseshoe crabs on New Jersey beaches while complying with state laws and regulations that protect horseshoe crabs and shorebirds. reTURN the Favor is a collaborative program, sanctioned by the New Jersey Division of Fish & Wildlife (NJDFW) and supported by nine organizations, that enables volunteers to rescue horseshoe crabs stranded on New Jersey's spawning beaches, including those that are seasonally closed to protect shorebirds.

The program is managed by a steering committee consisting of representatives from NJDFW and three member organizations (Table 1) who develop and coordinate program logistics. reTURN the Favor's nine partner organizations and trained program volunteers serve 18 beaches on the Delaware Bayshore (Table 1). The overall goals of reTURN the Favor are to: 1) rescue stranded horseshoe crabs, 2) provide an organized way to rescue horseshoe crabs on New Jersey's seasonally closed beaches, 3) increase awareness of horseshoe crabs, shorebirds, and their management, and 4) collect data and information on stranded crabs, potential hazards, and tagged crabs to aid in management and restoration.

*Results are preliminary and represent all data submitted to the reTURN the Favor program through August 5, 2016.*



Table 1. Sponsoring organization(s) for each reTURN the Favor location in 2016. \* indicates Steering Committee Partner.

Location	Partner
Sea Breeze	Western Hemisphere Shorebird Reserve Network (WHSRN)*
Money Island	Bayshore Center at Bivalve
Gandys Beach	Bayshore Center at Bivalve
Dyers Cove	WHSRN*/Conserve Wildlife Foundation*
Fortescue/Raybins	Bayshore Center at Bivalve
East Point	Citizens United for the Maurice River and its Tributaries
Thompsons Beach	WHSRN*
Moore's Beach	Bayshore Center at Bivalve
Reeds Beach	The Wetlands Institute*
Cooks Beach	New Jersey Audubon
Kimble's Beach	Friends of Cape May NWR
Pierces Point	New Jersey Audubon
Highs Beach	New Jersey Audubon
Rutgers Beach	Rutgers University
Sunray/Norbury	The Nature Conservancy
Villas	The Wetlands Institute*
North Cape May	The Wetlands Institute*
Cherry Tree Beach	No sponsor (RTF volunteers)
Sunset Beach	No sponsor (RTF volunteers)



**Program Funding:**



## Program Developments

The reTURN the Favor steering committee made several program updates for 2016 based on results and recommendations from partners and volunteers in 2015.

In 2016, Fact Sheets were developed for sponsored beaches to provide volunteers information on the beach features, known impingement hazards, closure status, and other details. In turn, volunteers collected data on revised datasheets that included more detailed fields for impingement hazards in order to help us better understand the degree to which these potential hazards may impact horseshoe crabs.

Information collected has also allowed the program to develop and implement small-scale, volunteer-based restoration and debris-removal projects to address impingement hazards. With funding through New Jersey Corporate Wetlands Restoration Partnership, we were able to undertake projects to improve spawning conditions on three beaches based on data collected in 2013-2015. Over four work days, 26 participants joined efforts to remove debris, including marine debris, construction material, monofilament fishing line, and hundreds of pieces of rubble.

Four recruitment and training workshops were held in March and April: two at The Wetlands Institute in Stone Harbor, NJ, one at the Bayshore Center at Bivalve in Bivalve, NJ, and one at Kimbles Beach on Cape May National Wildlife Refuge. Trainings were attended by 83 volunteers who received information on the program, methods, and next steps for involvement.

Partner organizations each sponsored 1-4 beaches, and had the flexibility to manage program walks on their beaches as best fit their organizations – independent volunteers, staff, public walks, or a combination of activities. Partners committed to develop a schedule for walk times, follow program protocols, and ensure data submission.



Figure 1. Moore's Beach during cleanup efforts (top), post-cleanup (middle), and debris removal volunteers (bottom). Photos: Ferguson





### 2016: Program Results

In total, 78,041 horseshoe crabs were rescued during 524 rescue walks by reTURN the Favor partners and volunteers at 18 New Jersey spawning beaches between April and July 2016 (Figure 2, Table 2). With the help of outreach materials, the reTURN the Favor website, and partner efforts, over 1,000 volunteers participated in program walks. In total, 1,981 hours were contributed by reTURN the Favor walk leaders and participants, which continues the upward trend of volunteer engagement seen throughout the four years of the program. The average walk lasted one hour eighteen minutes and covered a distance of 0.76 km, with an average of three participants. This year, 72 different walk leaders conducted rescue walks privately and/or led public walks for their associated organization.

Due in large part to our drastic increase in participation and effort of volunteers, we far exceeded our target of 25,000 crabs rescued. In addition, we exceeded all previous goals set by this program, both effort-related goals and crabs rescued goals.

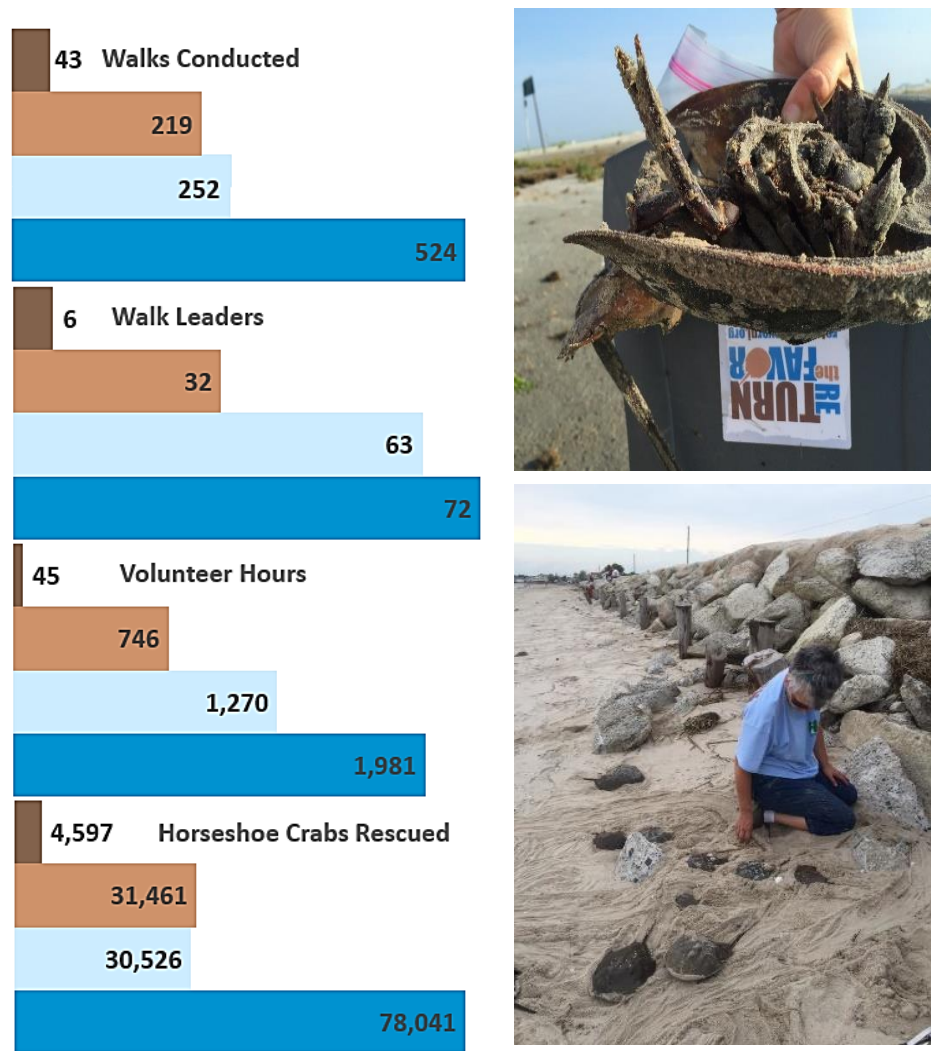


Figure 2. Comparison of results from 2013 (dark brown), 2014 (light brown), 2015 (light blue), and 2016 (dark blue); photos from reTURN the Favor walks: Anholt (top), removing crabs from impingements, Cranmer (bottom).



Table 2. Results from the 2016 reTURN the Favor season by beach, ordered north to south. Average crabs rescued/100m is based on Total per walk and average distance walked at each site.

Location	Walks	Crabs Rescued						Avg per Walk	Avg per 100m
		Overtured	Man-made Impingement	Natural Impingement	Other	Total			
Cherry Tree Beach	1	248	0	12	0	260	260	26	
Sea Breeze	36	878	1,617	834	6	3,335	93	13	
Money Island	25	1,576	641	238	55	2,510	100	21	
Gandys Beach	38	1,090	3,837	24	0	4,951	130	32	
Dyers Cove	58	9,458	481	138	0	10,077	174	33	
Fortescue/Raybins	65	4,590	4,397	178	0	9,165	141	23	
East Point	57	1,450	864	1,085	54	3,453	61	7	
Thompsons Beach	39	9,329	451	38	0	9,818	252	26	
Moores Beach	38	4,903	195	94	0	5,192	137	13	
Reeds Beach	53	12,038	1,211	71	100	13,420	253	29	
Cooks Beach	1	8	0	36	0	44	44	14	
Kimbles Beach	8	192	6	2	0	200	25	2	
Pierces Point	4	101	11	0	8	120	30	5	
Highs Beach	1	136	0	0	0	136	136	14	
Rutgers Beach	11	1,578	170	18	0	1,766	161	22	
Sunray/Norbury	0	0	0	0	0	0	0	0	
Villas	33	8,858	592	92	0	9,542	289	28	
North Cape May	21	2,672	69	0	0	2,741	131	14	
Sunset Beach	35	1,263	1	47	0	1,311	37	6	
<b>Totals</b>	<b>524</b>	<b>60,368</b>	<b>14,543</b>	<b>2,907</b>	<b>223</b>	<b>78,041</b>			

## Overtured Horseshoe Crabs Rescued

A majority of the total rescued crabs (60,368 crabs, 77%) were stranded due to natural wave action or movements during spawning activity, which is similar to the two prior years' program results (2015- 81%, 2014- 74%). Spawning beaches with the most overtured crabs were Reeds Beach (12,038 crabs), Dyers Cove (9,458 crabs), and Thompsons Beach (9,329 crabs) (Figure 3, Table 2). When controlling for effort by calculating per-walk averages, the sponsored spawning beaches with the most overtured crabs were Villas Beach (268 crabs/walk), Thompsons Beach (239 crabs/walk), and Cherry Tree Beach (248 crabs/walk). The cause of naturally overtured horseshoe crabs may be due to local habitat



characteristics such as beach slope, density of spawning crabs, wind/wave direction, or to variation within the local spawning population. Timing of rescue walks may also influence results. For example, walks that occur after large spawning nights or storms may result in more overturned crabs.

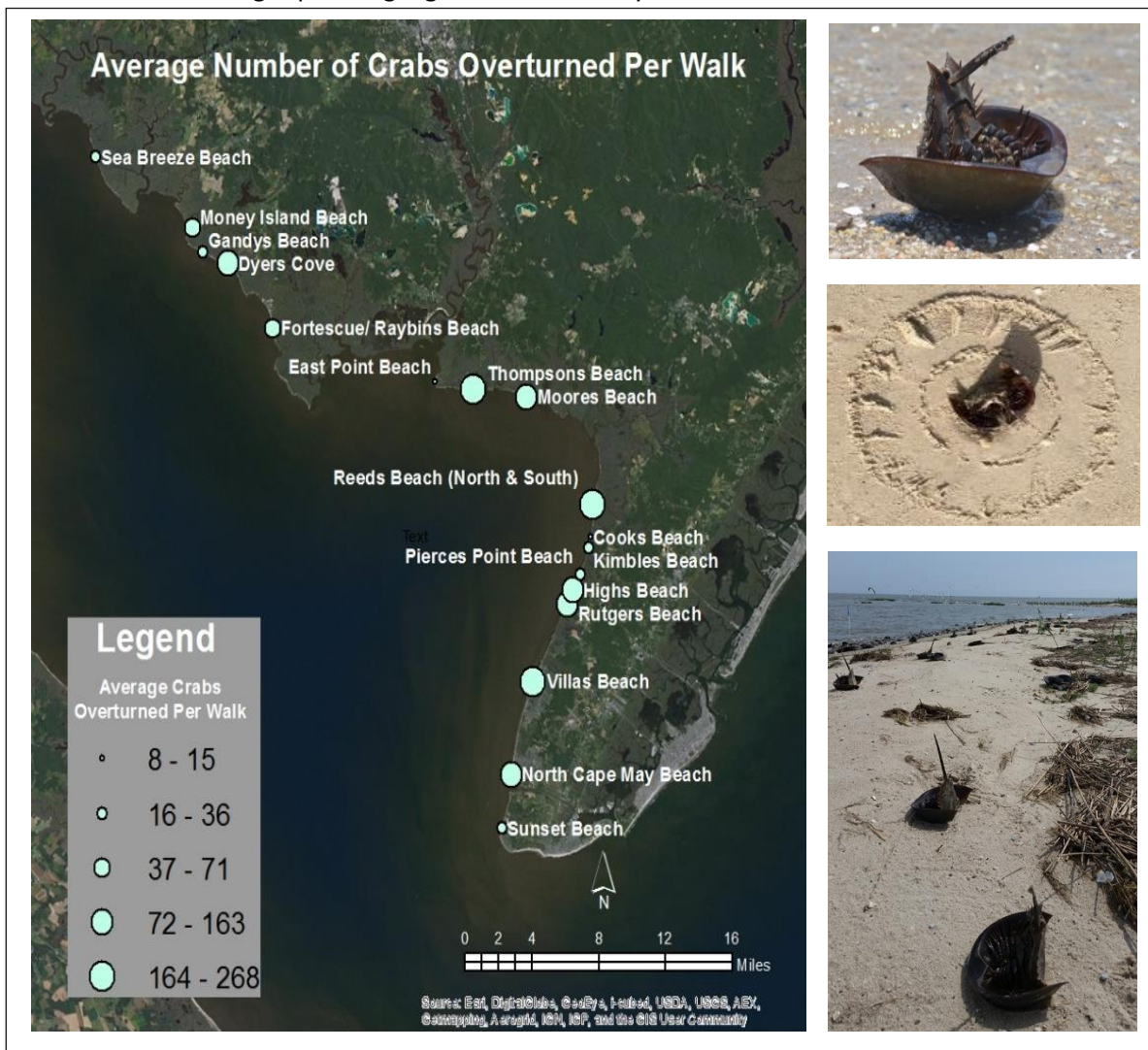


Figure 3. Map displays the number of overturned horseshoe crabs rescued in 2016. Graduated symbols indicate the number of crabs that were rescued during reTURN the Favor walks at each location. Overturned crab photos: Tedesco (top), Cranmer (middle), Ayers (bottom).

## Horseshoe Crabs Rescued from Man-Made Impingement Hazards

The presence of man-made impingements hazards is a risk to all crabs in the nearshore waters and, once stuck, these crabs have a small chance of survival unless rescued. It can be expensive and challenging to remove these hazards, but the potential benefits to horseshoe crabs are high.

An additional 14,543 (19%) horseshoe crabs were impinged or stuck in man-made hazards such as rubble, bulkheads, riprap, trash or other debris, and dilapidated housing structures (Table 2, Table 3). Rescue walks more than doubled between the last two years, and saved over three times the number of crabs from man-made impingements (2015: 4,288 crabs, 2016: 14,543 crabs). Improvements to datasheets and data recording, introduction of fact sheets for sponsored beaches, and increased





efforts directed to beaches with known hazards may account for the increase number of horseshoe crabs rescued from man-made impingements in 2016.

When controlling for effort by calculating per-walk averages, beaches with the most total crabs rescued from man-made hazards include Fortescue/Raybins Beach (4,397 crabs or 68 crabs/walk), Gandys Beach (3,837 crabs or 101 crabs/walk), and Sea Breeze (1,617 crabs or 45 crabs/walk; Figures 4 and 5). These three beaches, which were also the three leading beaches for manmade impingements in 2015, contain large amounts of concrete rubble and riprap which account for most of the impingement numbers. At these beaches, the increased percentage of crabs impinged (up from 14% in 2015) is likely due to increased walk efforts (39 walks at the leading impingement beaches in 2015, 101 walks in 2016) and increased emphasis on saving impinged crabs at these beaches. While Fortescue/Raybins remains a site with high numbers of man-made impinged crabs, continued restoration efforts seem to have helped decrease impingements per walk for the second year in a row (2014: 245 crabs/walk, 2015: 99 crabs/walk, 2016: 83 crabs/walk).



Figure 4. Map displays the number of horseshoe crabs rescued from man-made impingements in 2016. Graduated symbols indicate the number of crabs that were rescued during reTURN the Favor walks at each location. Man-made impingement photos: Sea Breeze, Anderson (top); removing impinged crab, Cranmer (middle); crab entwined in monofilament line and sinkers, Ferguson (bottom).

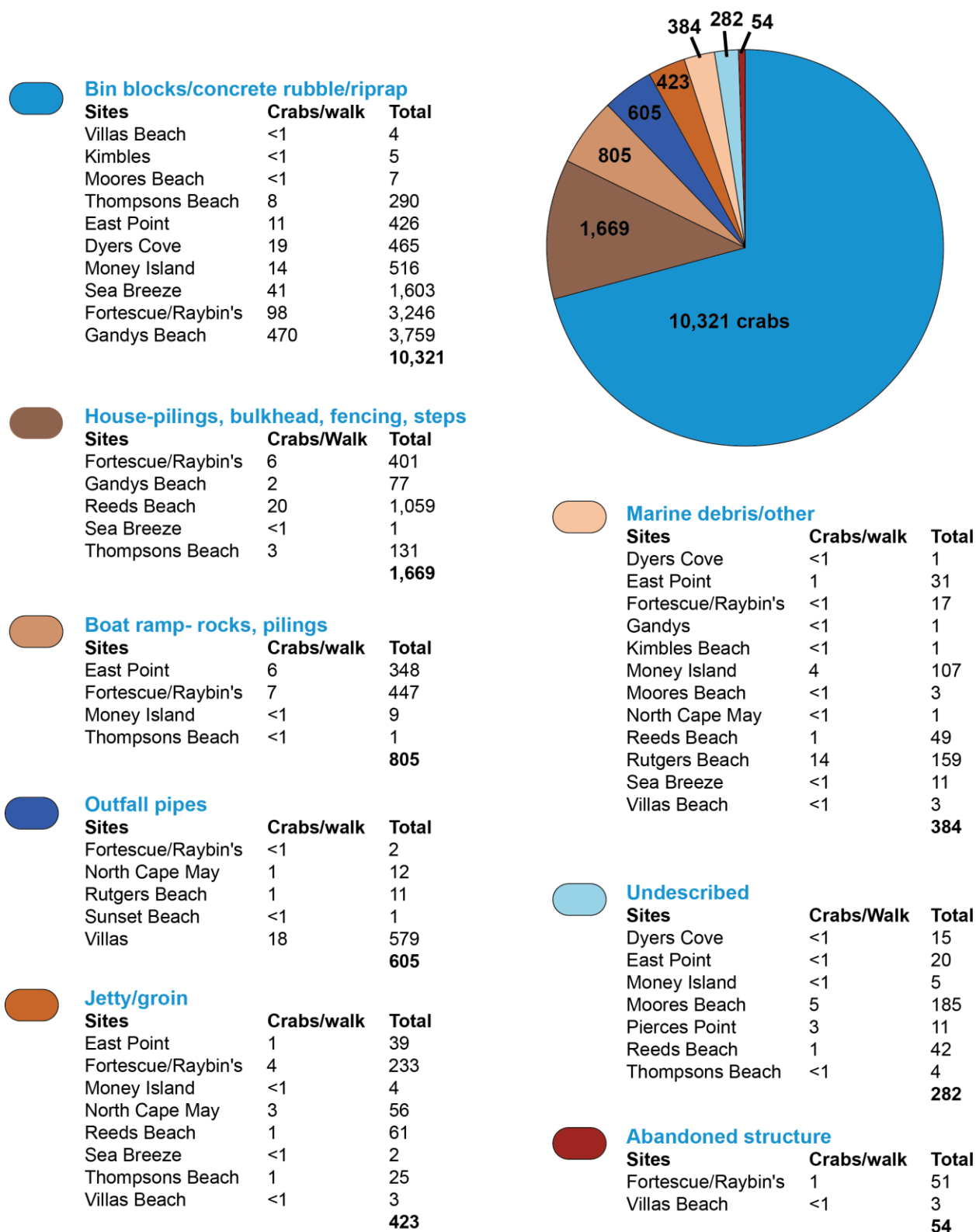


Figure 5. Number of horseshoe crabs rescued from man-made impingements by hazard type and location, 2016. A total of 14,543 crabs were rescued from man-made impingements, including 282 undescribed hazards and those detailed above.





## Horseshoe Crabs Rescued from Natural Impingement Hazards

Natural impingements such as marsh grasses and peat outcrops accounted for 2,907 (4%) crabs rescued. East Point (1,085 crabs), Sea Breeze (834 crabs), and Money Island (238 crabs) had the most crabs rescued from natural impingements. When controlling for effort, Cooks Beach had the most crabs rescued from natural impingements (36 crabs/walk), followed by Sea Breeze and East Point beaches (Table 2). Beach erosion due to sea level rise, extreme storms, and other factors, has degraded the quality of spawning beach habitat along the Delaware Bay. Continued beach restoration can improve spawning habitat and reduce risk from natural impingement to horseshoe crabs spawning on these receding beaches.

## Additional Results

In addition to the crabs previously mentioned, 223 crabs were rescued right side up from above the high tide line. These rescues occurred during the heat of the day at low tide, when the crabs could potentially overheat and desiccate. This result is not standardized protocol, and thus represents the minimum numbers of crabs that were rescued in this manner.

Of the 78,041 rescued horseshoe crabs, 53,599 (69%) were male and 24,442 (31%) were female. The 2.2:1 male to female ratio of stranded crabs includes greater representative of female crabs than what is generally recorded during spawning surveys of the Delaware Bay population (Swan et al. 2015).

During reTURN the Favor walks, 166 observations of 135 tagged individuals were recorded and batch submitted to U.S. Fish and Wildlife Service. By identifying tagged crabs, reTURN the Favor contributes to federal and statewide efforts to study horseshoe crab population dynamics and movements.

## Conclusions: More walks, more crabs

The 2016 reTURN the Favor season resulted in nearly double the number of horseshoe crabs rescued as in 2015. In fact, the 2016 total exceeded the previous three years combined. Effort more than doubled as well, with many important horseshoe crab spawning sites receiving more attention than in years past (See Figure 2). Volunteer participation increased in turn, with 1,359 volunteers participating in 2016, up from 1,070 in 2015. As a result of this increased effort and volunteer participation, 78,041 horseshoe crabs were rescued.

Revised datasheets and the addition of site-specific fact sheets resulted in more refined data. Fact sheets allowed volunteers to understand the hazards and challenges facing their beaches, which helped direct efforts to the sites where crabs face the highest risks. Datasheet revisions also allowed volunteers to provide more information about the hazards, which will inform program decisions.

One action these data can help inform are small-scale spawning habitat restoration and improvement projects, such as those conducted at Moores Beach, Kimbles Beach, and Reeds Beach in 2016. Results of the 2016 season helped highlight sites where improvements to spawning condition for these horseshoe crabs are still needed. These data also provide an indication of the magnitude of the hazardous conditions horseshoe crabs face while spawning.

A comparison of results from the 2015 reTURN the Favor season (Ferguson et al. 2015) and the 2015 Delaware Bay Horseshoe Crab Spawning Survey results for New Jersey beaches (Swan et al. 2015) provides insight to the proportion of spawning crabs that are rescued from standings. For example, at Villas Beach, where reTURN the Favor surveys were conducted in a 1 km survey transect following all



spawning surveys, 9% of the estimated spawning crabs (36,960 crabs) were rescued (3,335 crabs). Overall, the total number of crabs rescued by the reTURN the Favor program (30,526 crabs) represents 3% of the spawning population estimated for all Delaware Bay beaches in New Jersey (982,487 crabs).

The reTURN the Favor program continues to demonstrate that the simple act of rescuing stranded crabs can become an impactful one, as large numbers of crabs can be helped with a unified effort. So far, it appears to be succeeding – through four seasons and incredible effort from volunteers and project partners, the program has already rescued 147,275 horseshoe crabs that otherwise may have been lost. This year, with the unprecedented effort of volunteers, the data are clear: when more people are engaged, more walks are conducted, and more crabs are rescued.

### Acknowledgements

This program would not be possible without the exhaustive efforts of the volunteers, partners, and steering committee members who participate in reTURN the Favor. Thanks to the New Jersey Department of Environmental Protection for program support and scientific collection permits. Funding for the program was provided by New Jersey Corporate Wetlands Restoration Partnership. In addition, various funders provided financial support directly to participating reTURN the Favor partner organizations. Sidebar photograph by Laura Chamberlin.

### Literature Cited

Danihel, M.S., L.M. O'Donnell, and T.R. Catania (2014). reTURN the Favor Horseshoe Crab Rescue Project Pilot Year Summary Report. <http://returnthefavornj.org/>. (Accessed August 19, 2014).

Ferguson, L., L. Chamberlin, K. Sellers, and M. Danihel (2014). reTURN the Favor Horseshoe Crab Rescue Project 2014 Season Summary Report. [http://returnthefavornj.org/wp-content/uploads/2014/10/RTF-2014-Report\\_Final\\_HiRes.pdf](http://returnthefavornj.org/wp-content/uploads/2014/10/RTF-2014-Report_Final_HiRes.pdf)

Ferguson, L., L. Chamberlin, and A. Anholt (2015). reTURN the Favor Horseshoe Crab Rescue Project 2015 Season Summary Report. [http://returnthefavornj.org/wp-content/uploads/2015/10/RTF-Final-Report-2015-FINAL\\_highres.pdf](http://returnthefavornj.org/wp-content/uploads/2015/10/RTF-Final-Report-2015-FINAL_highres.pdf)

Niles, L.J., J. Bart, H.P. Sitters, A.D. Dey, K.E. Clark, P.W. Atkinson, A.J. Baker, K.A. Bennett, K.S. Kalasz, N.A. Clark, J. Clark, S. Gillings, A.S. Gates, P.M. Gonzalez, D.E. Hernandez, C.D.T. Minton, R.I.G. Morrison, R.R. Porter, R.K. Ross, and C.R. Veitch (2009). Effects of Horseshoe Crab Harvest in Delaware Bay on Red Knots: Are Harvest Restrictions Working? *BioScience* 59 (2): 153-164.

Swan, B.L. W. Hall, C.N. Shuster, Jr. (2013) The 2013 Delaware Bay Horseshoe Crab Spawning Survey. Horseshoe Crab Survey Information. <http://horseshoecrabsurvey.com/>. (Accessed August 13, 2014).

Swan, B.L., W. Hall, C.N. Shuster, Jr. (2015). The 2015 Delaware Bay Horseshoe Crab Spawning Survey.

