

reTURN the FAVOR

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NEW JERSEY'S HORSESHOE CRAB RESCUE PROJECT
2015 Season Summary Report
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Table of Contents

Background Information	1
2015 Program Developments	2
2015 Results and Discussion	3
Overall Results	3
Overturned Horseshoe Crabs Rescued	4
Horseshoe Crabs Rescued from Man-Made Impingement Hazards	5
Horseshoe Crabs Rescued from Natural Impingement Hazards	7
Additional Results	8
Conclusions	8
Acknowledgements	9
Literature Cited	9

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Overview

Background Information

Home to the densest spawning population of horseshoe crabs in the world, the Delaware Bay ecosystem plays an important role in many vital life history stages of the Atlantic Horseshoe Crab (*Limulus polyphemus*). Over 600,000 horseshoe crabs annually climb onto New Jersey beaches to spawn, typically within the intertidal zone during full and new moon high tides (Swan et al. 2013). But spawning activity can be hazardous, as crabs risk becoming stranded through two means: overturned due to wave action or impinged (caught) in man-made or natural structures. The risk of stranding is compounded by the fact that both male and female crabs come ashore to spawn numerous times each season. Strandings 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, especially during the peak spawning period (May-June).

While horseshoe crabs are breeding on Delaware Bay beaches, hundreds of thousands of shorebirds stopover on the shores of the Bay specifically to feed upon horseshoe crab eggs. These shorebirds, in the middle of northbound migrations to breeding grounds that can extend for 7,000 miles or more, depend on the presence of abundant horseshoe crab eggs so that they can gain the nutrition necessary to complete their migration and nest successfully.

But due to a combination of overharvest and habitat loss, the horseshoe crab population has declined by 90% over the last 15 years (Niles et al. 2009). As the number of horseshoe crabs spawning in the Delaware Bay has dropped, so too have the number of shorebirds. In response, many of New Jersey's important horseshoe crab spawning beaches are closed to the public from May 7 to June 7 each year so that shorebirds can forage undisturbed by people visiting the beach. Though the beach closures appear to benefit shorebird populations, horseshoe crabs that became stranded on closed beaches were inaccessible to aid for many years.

The reTURN the Favor program was initiated in the spring of 2013 as a means to lawfully reduce strandings and subsequent preventable losses of horseshoe crabs on New Jersey beaches while complying with New Jersey 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 several non-profit organizations that enables volunteers to rescue horseshoe crabs stranded on New Jersey's open and seasonally closed beaches.

The program is managed by a steering committee consisting of representatives from several member organizations (Conserve

Location	Partner
Sea Breeze	WHSRN
Money Island	Bayshore Center at Bivalve
Gandys Beach	Bayshore Center at Bivalve/The Nature Conservancy
Fortescue/Raybin's	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
Higbee Beach WMA	No sponsor
Sunset Beach	No sponsor

Table 1. Sponsoring organization(s) for each reTURN the Favor location in 2015.



Wildlife Foundation of New Jersey, NJDFW, Western Hemisphere Shorebird Reserve Network(WHSRN), and The Wetlands Institute) who develop and coordinate program logistics. reTURN the Favor's eight partner organizations 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 3, 2015.

Program Developments

The reTURN the Favor steering committee made several program updates for 2015 based on results and recommendations from 2013 and 2014.

We added coverage at two beaches, Sea Breeze and Thompsons, in 2015 as well as a new partner, Rutgers University. We incorporated a new category, "other", for crabs stranded in conditions they would not be able to remove themselves from. e.g. buried for long period at great distance from water. We also extended the permitted dates of rescue walks from April 15 to July 15. However, due in part to the federal listing of the Red Knot (*Calidris canutus*) as threatened, we required that volunteers only access the beach between sunset to sunrise during the shorebird closure season, May 7-June 7. This restriction reduces disturbance to shorebirds during their important migration season.

We used data collected in 2014 to identify and mitigate a small-scale, man-made impingement factor. This spring, the steering committee worked with state agencies and a partner organization, Citizens United to Protect the Maurice River and Its Tributaries, to acquire and place materials in gaps at the East Point Lighthouse boat ramp that regularly trapped crabs (77 crabs/walk in 2014). A volunteer day was organized to fill the gaps and decrease impingement hazards before the start of the spawning season (Figure 1).

108 volunteers participated in two recruitment and training workshops held in March and April, one at The Wetlands Institute in Stone Harbor, NJ, and one at the Bayshore Center at Bivalve in Bivalve, NJ. Workshop participants received information on the program, methods, and next steps for involvement.

Steering committee members hosted a partner workshop in February for organizations interested in participating in the program. Six additional organizations partnered on the project and each sponsored 1-4 beaches, with trained members of the public conducting independent walks at two additional beaches. (Table 1). Partners committed to develop a schedule for walk times, create public walk opportunities, recruit volunteers, and ensure data submission. Each partner had the flexibility to manage their own program walks. Some had staff conducting rescue walks, while others held public walks and/or utilized volunteer leaders.



Figure 1. Volunteer work project at East Point Lighthouse to minimize man-made impingement risk.



2015 Results and Discussion

Overall Results

In total, 30,526 horseshoe crabs were rescued during 252 rescue walks by reTURN the Favor partners and volunteers at 18 New Jersey spawning beaches between May and July 2015 (Figure 2, Table 2).

With the help of outreach materials, a NJDEP press release, the reTURN the Favor website and partner efforts, over 800 volunteers participated in program walks. In total, 1,270 hours were contributed by reTURN the Favor walk leaders and participants, almost doubling the 2014 total of 746 hours and exceeding our target of 1,000 hours for 2015. The average walk lasted one hour fifteen minutes and covered a distance of 1.2 km with an average of 4 participants. This year, 63 different walk leaders conducted rescue walks privately and/or led public walks for their associated organization, almost double the 2014 total of 32 leaders. In fact, we surpassed all effort-related goals for 2015.

Despite our increase in program participation, number of beaches, and duration of program, we did not reach our target of rescuing 50,000 crabs. This deficit may be due to habitat improvements at critical spawning beaches (e.g. East Point Lighthouse, Fortescue/Raybin's, and Thompsons Beach), decreased spawning activity, or timing of rescue walks.

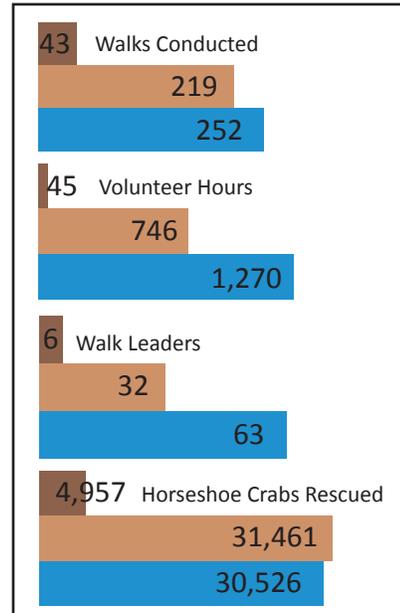


Figure 2. Comparison of results from 2013, 2014, and 2015.

Table 2. Results from the 2015 reTURN the Favor season by beach.

Location	Walks	Crabs Rescued				Total	Total Per Walk	Avg Crab/100m
		Overtaken	Man-Made Impingement	Natural Impingement	Total			
Sea Breeze	19	958	704	183	1,796	94.5	11	
Money Island	11	666	59	101	826	75.1	9	
Gandys Beach	10	78	1,173	0	1,251	125.1	22	
Fortescue/Raybin's	10	1,239	993	140	2,372	237.2	6	
East Point	27	630	277	179	1,086	40.2	4	
Thompsons Beach	23	3,637	245	234	4,116	179.0	12	
Moore's Beach	21	1,613	68	94	1,775	84.5	4	
Reeds Beach	47	8,966	232	326	9,524	202.6	25	
Cooks Beach	2	4	0	13	17	8.5	3	
Kimbles Beach	12	720	21	33	774	64.5	6	
Pierces Point	3	75	1	35	111	37.0	5	
Highs Beach	3	67	0	0	67	22.3	4	
Rutgers Beach	10	1,379	269	5	1,653	165.3	30	
Sunray/Norbury	1	34	13	0	47	47.0	9	
Villas	31	4,285	214	2	4,501	145.2	14	
North Cape May	17	358	8	0	366	21.5	2	
Higbee Beach WMA	1	111	11	0	122	122.0	8	
Sunset Beach	4	122	0	0	122	30.5	3	
Totals	252	24,942	4,288	1,345	30,526	94.6	11	



Overtured Horseshoe Crabs Rescued

A majority of the total rescued crabs (24,942 crabs, 81%) were stranded due to natural wave action or movements during spawning activity, similar to 2014 program results (23,401 crabs, 74%). When considering both total numbers and when controlling for effort by calculating per-walk averages, the sponsored spawning beaches with the most overturned crabs were Reeds Beach (8,966 crabs total or 190 crabs/walk), Villas Beach (4,285 crabs total or 138 crabs/walk), and Thompsons Beach (3,637 crabs total or 158 crabs/walk) (Figure 3, Table 2). The cause of naturally overturned horseshoe crabs may be due to local characteristics of the habitat such as beach slope, number of spawning horseshoe crabs, or of variation within the local spawning population.

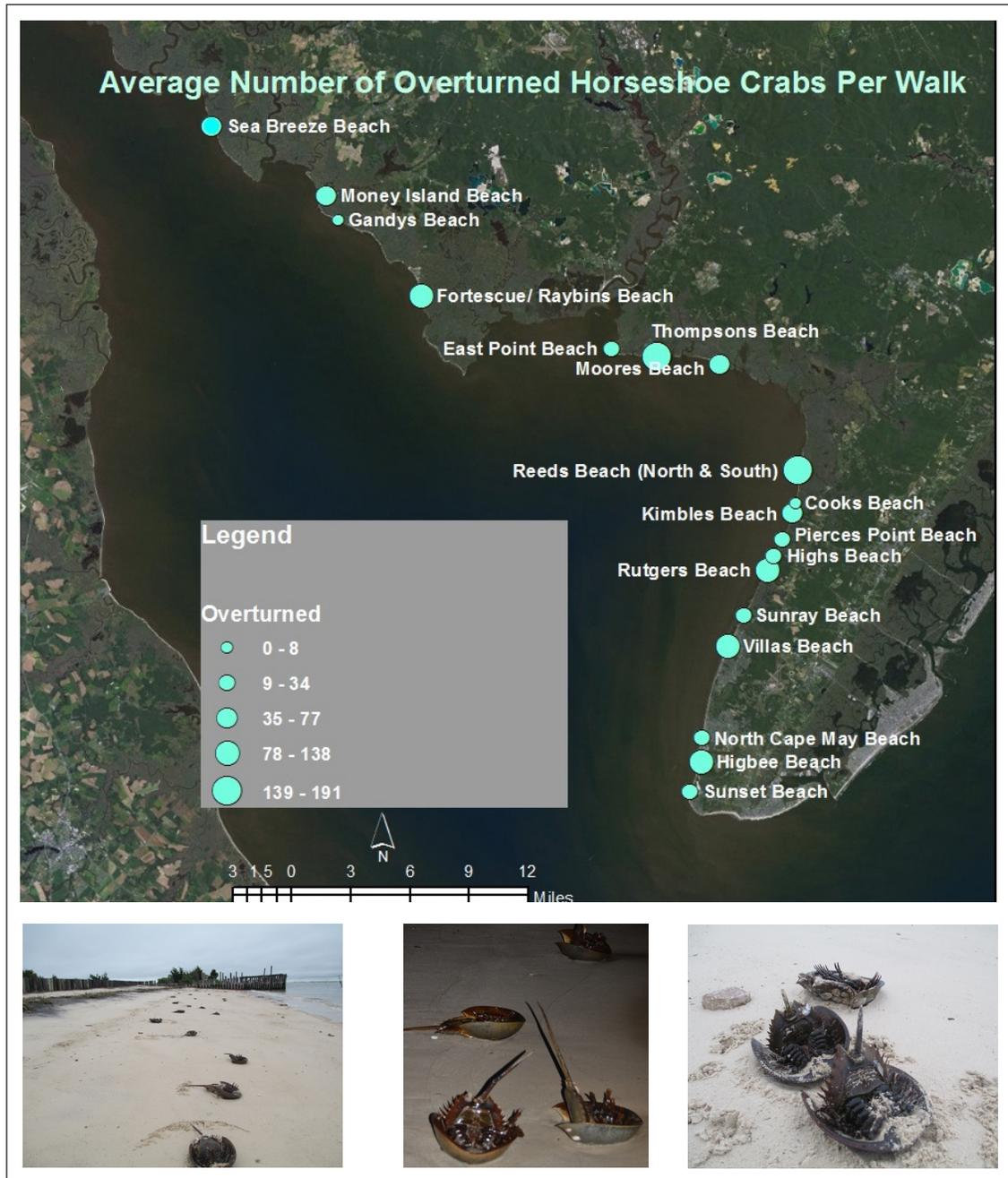


Figure 3. Map displays the number of overturned horseshoe crabs rescued on spawning beaches in 2015. Graduated symbols reflect the number of crabs that were rescued per reTURN the Favor walk at each location. Overtured crab photos: Chamberlin (left), Tedesco (middle), Chamberlin (right).



Horseshoe Crabs Rescued from Man-Made Impingement Hazards

An additional 4,288 (14%) horseshoe crabs were impinged or stuck in man-made impingement hazards such as rubble, bulkheads, rip rap, trash or other debris, and dilapidated housing structures (Table 2, Table 3). When considering both total numbers and when controlling for effort by calculating per-walk averages, beaches with the most total crabs rescued from man-made hazards include Gandys Beach (1,173 crabs or 117 crabs/ walk), Fortescue/Raybins (993 crabs or 99 crabs/walk) and Sea Breeze (704 crabs or 37 crabs/walk) (Figure 4, Table 2). The high impingement numbers at Gandys Beach and Sea Breeze are attributed to concrete rubble. Fortescue/Raybins Beach impingement numbers are attributed to abandoned structures, retaining structures, and boat ramp rocks and pilings, but decreased from 245 crabs/walk in 2014. Overall, the 2015 results represent an improvement from 2014, when 22% of rescued crabs (6,829 crabs) were impinged in man-made structures.

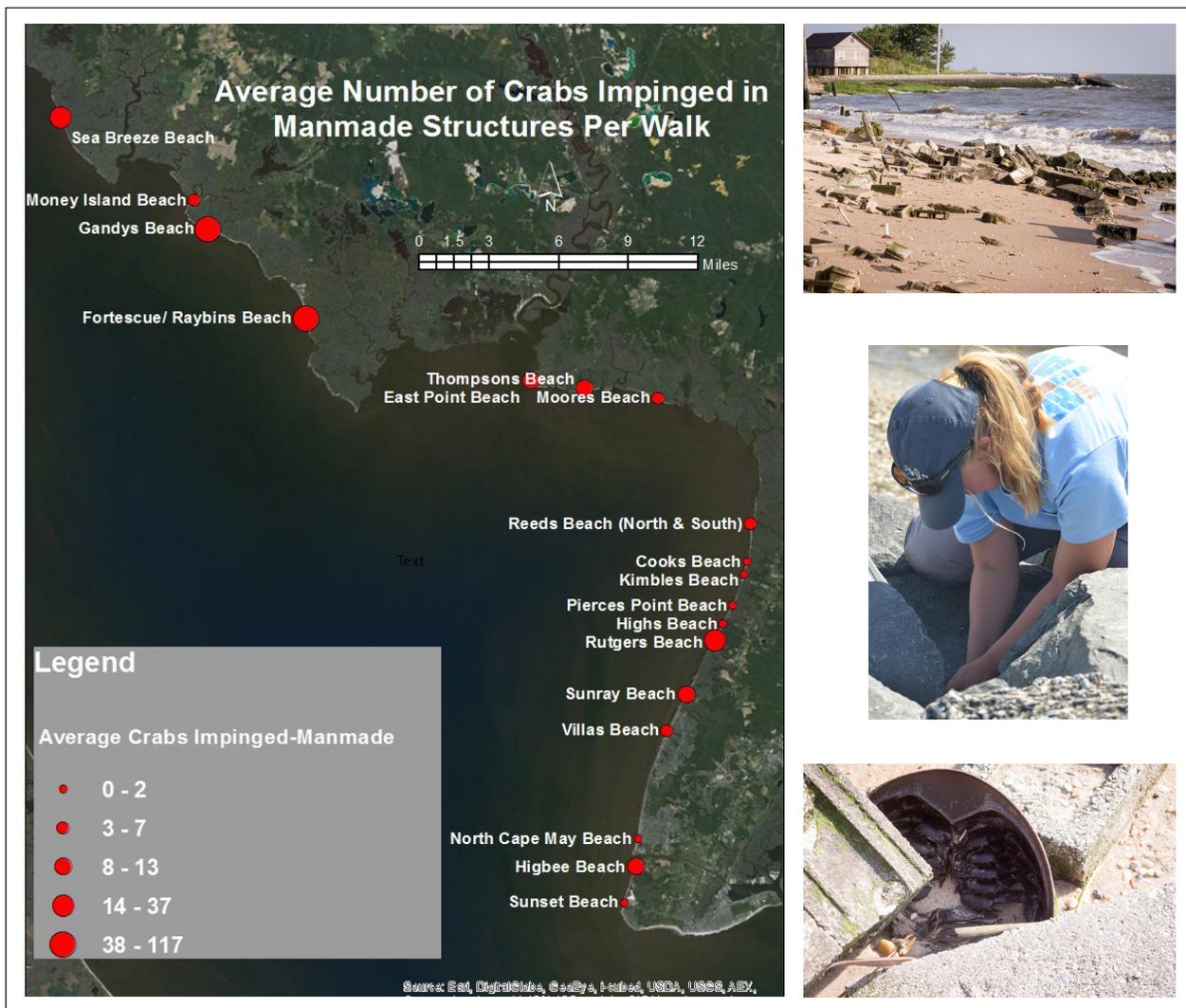


Figure 4. Map displays the number of horseshoe crabs rescued from man-made impingements on spawning beaches in 2015. Graduated symbols reflect the number of crabs that were rescued per reTURN the Favor walk at each location. Man-made impingement photos: Sea Breeze, Stangle (top); removing impinged crab, Tedesco (middle); impinged crab, Stangle (bottom).

Table 3. Number of horseshoe crabs rescued from man-made impingement hazards by impingement hazard type and reTURN the Favor location in 2015.

MAN-MADE IMPINGEMENTS CATEGORY & LOCATION	CRABS RESCUED PER WALK	CRABS RESCUED TOTAL
bin blocks/concrete rubble/riprap		1,980
East Point	6	171
Gandys Beach	98	983
Money Island	5	59
Moore's Beach	3	68
Rutgers Beach	27	269
Sea Breeze	21	405
Thompsons Beach	1	25
boat ramp- rocks, pilings		597
East Point	3	80
Fortescue/Raybin's	52	517
outfall pipes		187
North Cape May	<1	8
Villas	6	179
abandoned structure - house, bulkhead, boat ramp, docks		571
Fortescue/Raybin's	13	126
Sea Breeze	12	225
Thompsons Beach	10	220
house - pilings/bulkhead/fencing/steps		124
Reeds Beach	2	111
Sunray/Norbury's Landing	13	13
jetty		370
Fortescue/Raybin's	31	309
Kimble's Beach	1	13
Reeds Beach	<1	16
Villas	1	21
Higbee Beach WMA	11	11
debris		257
East Point (tire, fence, crab pot, monofilament)	<1	3
Fortescue/Raybin's	4	41
Gandys Beach	19	190
Pierces Point (sandbag)	<1	1
Reeds Beach (mattress coils, monofilament, tire)	<1	10
Sea Breeze (rope, roadway)	<1	2
Villas (monofilament)	<1	1
undescribed		202
East Point	1	15
Kimble's Beach	1	9
Reeds Beach	2	95
Sea Breeze	13	72
Villas	<1	11
GRAND TOTAL		4,288



As opposed to 2014 results, no single beach stood out for man-made impingement hazards this year. This is likely due in part to the restoration activities that took place before the start of the spawning season. For example, reTURN the Favor's East Point Lighthouse project to improve impingement conditions on the boat ramp resulted in a substantial decrease in crabs rescued from impingements (77 crabs/walk in 2014 to 10 crabs/walk in 2015). Improvements to impinged crabs at Fortescue and Thompsons Beaches were also evident with the addition of sand prior to the spawning season and an increase in number of walks at Thompsons Beach (1 walk in 2014 to 23 walks in 2015). In 2014 Fortescue had the highest number of crabs impinged, with 3,913 crabs rescued. Most of these crabs were trapped within a length of beach that primarily consisted of concrete rubble used as a retaining structure for a beachside road. This year that significant hazard was ameliorated prior to the spawning season through restoration and sand replenishment. With this major hazard resolved, volunteers were able to identify other areas of concern on this large beach including abandoned structures, rock jetty, and boat ramp. Ongoing data collected through reTURN the Favor will be beneficial for evaluating the persistence of benefits of these project to spawning horseshoe crabs.

Sea Breeze Beach, which was identified last year as a beach which could benefit from sponsorship in reTURN the Favor, had a high number of impinged crabs. The major impingement hazard at Sea Breeze Beach was concrete rubble from abandoned house foundations, as well as additional crabs becoming trapped in a retaining structure.

The presence of man-made impingement 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 benefits to the horseshoe crab population are measureable. As the East Point project showed, even small, temporary solutions can reduce lethal risks to crabs.

Horseshoe Crabs Rescued from Natural Impingement Hazards

Natural impingements such as marsh grasses and peat outcrops accounted for 1,345 (5%) crabs rescued. Reeds Beach (326 crabs), Thompsons Beach (234 crabs), and Sea Breeze (183 crabs) had the most crabs rescued from natural impingements. When controlling for effort, Pierces Point (11 crabs/walk), Thompsons Beach (10 crabs/walk), Sea Breeze (10 crabs/walk) and Money Island (9 crabs/walk) had the most crabs rescued from natural impingements (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, 449 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 30,526 rescued horseshoe crabs, 21,687 (71%) were male and 8,751 (29%) were female. The 3:1 male to female ratio of stranded crabs is representative of the ratio within the Delaware Bay spawning population (Swan et al. 2013).

During reTURN the Favor walks, 61 observations of 59 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.

The project received a great deal of positive feedback from partners, volunteers, residents, and others.



The personal connection that volunteers make is equally as valuable an outcome as the rescued crabs themselves, as it cultivates a person connected to the conservation needs of the horseshoe crab. This has become evident in the third year, with several volunteers asking about what more can be done to resolve impingement hazards, including requests to aid in raising money for restoration projects.

Conclusions

The 2015 reTURN the Favor season resulted in nearly the same amount of crabs rescued as in 2014, though by all measures rescue efforts increased from 2014 (see Figure 1). The pre-season goals for number of crabs rescued were not met, and crab numbers were lower in all categories. This result may indicate that restoration projects, both large and small scale, including sand additions to Fortescue and Thompsons beaches and the boat ramp improvements at East Point Lighthouse, are in fact reducing risks to spawning crabs. Last year, impinged crabs represented 26% of the total number of crabs rescued. In 2015, only 19% of total number of crabs rescued were from impingements – an overall decrease of over 50%, from 26 crabs/walk in 2014 to only 12 crabs/walk this year. In addition to a decrease in impinged crabs, the average overturned crabs per walk was lower in 2015 (71 crabs/walk) than last year (90 crabs/walk). We await results of the 2015 Delaware Bay spawning surveys to assess how our results compare.

Most strandings (81%) were due to natural wave actions or movements during spawning. While this is a natural part of the risk of spawning on beaches, with the population struggling to recover, it is important that as many breeding-age crabs as possible survive spawning activity and return to the water. Through rescue walks, this program enables them to potentially spawn more times during the season and for years to come, making reTURN the Favor an important part of the recovery process. For 2016, program partners will work to identify resources and develop targeted strategies for reducing loss of stranded crabs during times when there is a critical need for rescue walks. These include high tides, storms, or reports of large numbers of crabs, as well as at beaches with high numbers of impinged crabs.

Data gained from the reTURN the Favor program provides a unique opportunity to better understand the stranding issue and, where possible, guide restoration activities along the Delaware Bay to improve habitat quality. Tallying the numbers of horseshoe crabs found in man-made and natural impingement hazards as well as describing and gathering waypoints of these hazards will enable restoration activities to be focused to areas of greatest need and/or impact. The density of rescued crabs per beach (Table 2) can also help to guide program efforts.

The reTURN the Favor program provides a critical structure to limit short-term losses of horseshoe crabs, but also to collect data to identify hazards and prioritize habitat management and restoration efforts for the long-term population recovery of the species. In upcoming years, reTURN the Favor will continue to put our rescued crab data and accumulated volunteer interest to use to improve conditions for spawning horseshoe crabs in New Jersey. We will work with municipalities to organize debris removal projects on several beaches, including Reeds Beach and Fortescue/Raybins. We will also identify small-scale improvements for projects that can be organized through reTURN the Favor. For example, we will explore sites with boat ramp and rubble hazards to identify those that can be improved with limited funds and a network of enthusiastic volunteers. Others, such as the large amounts of man-made structures at Fortescue, Raybins, Reeds Beach, Sea Breeze, and East Point, will require a combination of short and long-term approaches to minimize crab loss. To tackle these issues, we will continue to work with others involved in improving conditions at spawning sites for horseshoe crabs.



The reTURN the Favor program continues to demonstrate that the simple act of rescuing stranded crabs can become an impactful one, as high numbers of crabs can be helped with a unified effort. So far, it appears to be succeeding – through two seasons, the program has already rescued over 60,000 horseshoe crabs that otherwise may have been lost. In 2015 alone, 4,288 impinged crabs were rescued from near-certain death from man-made impingements if not for the efforts of reTURN the Favor participants. For the diminished horseshoe crab population in New Jersey, these numbers count. The reTURN the Favor program also provides an opportunity to engage in meaningful conservation activity for audiences near and far, as it reaches both local community members and seasonal tourists. The large draw of volunteers and walk participants in 2015 – who contributed over 1,200 volunteer hours! – demonstrates the interest and dedication of those wanting to actively help horseshoe crabs.

Acknowledgements

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