



## reTURN the Favor: Horseshoe crab rescue program 2022 report

---

The reTURN the Favor program was initiated in 2013 to rescue American horseshoe crabs (*Limulus polyphemus*) stranded on Delaware Bay beaches in New Jersey, where large concentrations of crabs spawn every spring. 2022 marks the tenth season of the program. reTURN the Favor (RTF) is a collaboration of conservation organizations in partnership with New Jersey Fish and Wildlife and a network of trained volunteers who rescue stranded crabs at risk of dying from exposure and predation (Botton and Loveland 1989). Walks are scheduled around tides, spawning activity, and time of day restrictions to efficiently rescue and collect data on stranded crabs. Collectively, volunteers save crabs by the thousands, identify stranding hazards on the beaches, and make observations that inform conservation, restoration, and research. Program participants follow protocols to comply with New Jersey regulations to protect horseshoe crabs and other wildlife.

During spring and summer months, horseshoe crabs convene on sandy beaches to spawn during high tides. On the low-energy beaches of the Delaware Bay, spawning crabs are most numerous around the full and new moons in May and June. Female crabs can lay over 80,000 eggs over the course of a spawning season (Fredericks 2012). Sheltered in the sand, it takes two to four weeks for eggs to develop into larvae that enter the Bay for an extended maturation period of nine or more years. However, very few eggs will survive the incubation period. Eggs are brought to the surface of the sand by waves and spawning activity of other crabs, forestalling further development. These eggs on the surface are readily accessible to foraging shorebirds who are hungrily scouring the beaches for food during stopovers on their long migration routes, which can exceed 9,000 miles. The stopover in the Delaware Bay is timed perfectly with the peak of spawning season. Other coastal animals, including fish, turtles, and gulls, also take advantage of the abundance of crabs and crab eggs as food.

Pressures from various sources have positioned horseshoe crabs as “Vulnerable” by the [IUCN](#) (Smith et al. 2016) and harvest of the species is managed by the [Atlantic States Marine Fisheries Commission](#). The harvest of horseshoe crabs for eel and whelk bait was one of the primary drivers of the population decline in the Delaware Bay, and there continues to be concerns over pressures from the harvest of Delaware Bay horseshoe crabs. Crabs are also harvested by the biomedical industry for their blood, which is collected from live crabs before release back to the water, but these actions are not without impacts to survival and behavior (Anderson et al. 2013). A moratorium was imposed in New Jersey in 2008 to prohibit further harvest of horseshoe crabs for bait due to concern for recovery of the Delaware Bay population of horseshoe crabs and shorebird populations that visit the Bay (Niles et al. 2009). However, other local states continue to harvest from the Delaware Bay. Though the Delaware Bay population of horseshoe crabs is showing signs of recovery, these factors will continue to lengthen the recovery period.

Best conditions for spawning horseshoe crabs include beaches that are sandy, gently sloped, and free of obstacles. Eroding beaches, coastal development, and shoreline hardening infrastructure have diminished the quality of spawning habitat and increased stranding risks. As a result, more crabs become stranded on beaches, stuck in debris and structures on the shoreline, or washed into marshes and overwash areas. Providing further complications, closures of important spawning and shorebird foraging beaches from May 7- June 7 began in 2003 to reduce disturbance to foraging migratory shorebirds. These closures have proven beneficial for shorebirds, but limit the ability for people to



access beaches to rescue crabs. This is where the reTURN the Favor program steps in — to reduce the loss of mature stranded crabs — by connecting organizations; engaging new volunteers, community members, and children in conservation; creating an organized structure for rescue; and improving spawning habitat through debris removal, beach restoration, and revitalization of derelict structures on the Bay.

### 2022 reTURN the Favor Highlights

- **188** volunteers attended virtual and in-person trainings and **156** received materials by mail to lead walks. **54** new volunteers joined trainings, **32** received materials, and **25** became walk leaders. **14** new and **49** returning volunteers met our goal of leading three or more walks!
- **104** volunteers led and submitted data for **684** walks this season, for a total of **2,493** volunteer hours. The season ran May 1 – July 15, and **2 – 23** walks were conducted every day.
- **8** organizations and **3** individuals sponsored beaches and assisted the RTF program in Cape May and Cumberland Counties.
- **98,311** horseshoe crabs were rescued on **18** beaches, which included **61,269** overturned crabs, **22,034** crabs stuck in man-made impingements, and **15,008** crabs stranded by natural impingements and in overwash areas.
- From 2013-2021, **939,027** crabs have been rescued by RTF volunteers in **5,544** RTF walks.

Citizens United for the Maurice River and its Tributaries • Conserve Wildlife Foundation of New Jersey • Friends of Cape May National Wildlife Refuge • New Jersey Audubon Society • New Jersey Fish and Wildlife • The Nature Conservancy • The Wetlands Institute • WHSRN Executive Office - Manomet

Table 1. Results from the 2022 reTURN the Favor season by beach, ordered north to south on Delaware Bay, NJ.

Location	Walks	Crabs Rescued				Total	Avg per walk
		Overturned	Man-made Impingement	Natural - Impingement	Natural - Overwashed		
Sea Breeze	24	1,285	1,110	268	413	3,076	128.2
Money Island	11	647	292	507	106	1,552	141.1
Gandys Beach	23	426	2,788	-	430	3,644	158.4
Dyer Cove	63	3,033	5,685	255	273	9,246	146.8
Fortescue/Raybins	77	8,985	7,901	374	881	18,141	235.6
East Point	51	2,163	1,127	1,308	1,174	5,772	113.2
Thompsons Beach	38	8,795	912	110	2,136	11,953	314.6
Moores Beach	30	5,542	547	1,576	1,478	9,143	304.8
Reeds Beach	73	15,770	281	449	651	17,151	234.9
Cooks Beach	15	72	7	2	-	81	5.4
Kimbles Beach	97	2,685	58	255	88	3,086	31.8
Pierces Point	26	876	198	273	1,224	2,571	98.9
Highs Beach	24	660	24	-	1	685	28.5
Sunray/Norburys	11	569	137	-	-	706	64.2
Villas Beach	90	7,943	461	120	652	9,176	102.0
North Cape May	27	1,736	287	-	-	2,023	74.9
Higbee Beach	3	82	7	-	4	93	31.0
Middle Township	1	-	212	-	-	212	212.0
<b>Total</b>	<b>684</b>	<b>61,269</b>	<b>22,034</b>	<b>5,497</b>	<b>9,511</b>	<b>98,311</b>	<b>143.7</b>



## 2022 reTURN the Favor Season in Detail

In 2022, reTURN the Favor continued its mission to rescue horseshoe crabs. Trainings included in-person and virtual workshops in April and May for new and returning volunteers. Experienced volunteers kicked off the season on May 1, and new volunteers were able to join activities on May 15 in time to help as spawning activity peaked in late May. Walks ended on July 15, as spawning activity slowed considerably. Together, volunteers conducted at least two walks per day over the course of the 75-day season, for a total of 684 walks covering approximately 28 km of coastline on the Delaware Bay in Cape May and Cumberland counties in New Jersey.

Beaches were sponsored by eight partner organizations and three volunteer beach captains: *Citizens United for the Maurice River and its Tributaries* (East Point), *Conserve Wildlife Foundation of New Jersey* (Pierces Point), *Friends of Cape May National Wildlife Refuge* (Kimbles), *New Jersey Audubon Society* (Cooks, Highs), *The Nature Conservancy* (Sunray/Norburys, Higbee), *The Wetlands Institute* (Reeds, Villas, North Cape May), *Western Hemisphere Shorebird Reserve Network (WHSRN)* Executive Office – Manomet (Dyer Cove, Sea Breeze, Thompsons), along with Meghan Wren, Sandra Anderson, and Melissa Bonham (Money Island, Moores, Fortescue/Raybins, Gandys).

The web-based volunteer management service, [Sign-Up Genius](#), was used to schedule volunteer walks in advance to align effort with the greatest time of need (falling to low tides) over the array of sponsored beaches to reduce redundant effort, and to comply with beach access and permit restrictions. From May 7 until June 7, walks on many beaches were only permitted after sunset or before sunrise due to [NJ beach closures](#). RTF materials, including permits, permission letters, and identification materials (stickers, t-shirts, and vests to be easily identified as RTF volunteers), were mailed or made available for pickup. Updated protocols, datasheets, and beach-specific fact sheets were provided to volunteers on request and through the online [RTF resource toolkit](#). In the field, volunteers collected data on RTF datasheets and submitted data online. Volunteers were permitted to use labeled totes to maximize rescue efforts and safety on certain beaches where crabs are known to be stranded in large numbers.

Several additional activities were conducted to commemorate the tenth year of RTF. The website was updated to provide easy access to volunteer tools, learning resources, and past reports. A [data portal](#) and [story map](#) were created to provide interactive, user-friendly access to program results to increase volunteer engagement, understanding of target issues, and the use of data for action. RTF joined the Horseshoe Crab Recovery Coalition and submitted a sign-on letter with over 100 volunteer signatures to urge the Atlantic States Marine Fisheries Commission not to adopt a new ecological model that could open the harvest of female horseshoe crabs from the Delaware Bay population. Previous models have recommended zero harvest of female horseshoe crabs.

Of the 188 volunteers who attended trainings this year, 104 volunteers led walks and submitted data, and 63 individuals conducted 3 or more walks. On average, walks lasted 1 hour and 18 min ± 53 min with 2.7 ± 3.1 participants. Altogether, volunteers spent 2,493 hours rescuing crabs this year and rescued an average of 143.7 ± 224.1 crabs per walk (Figure 1).

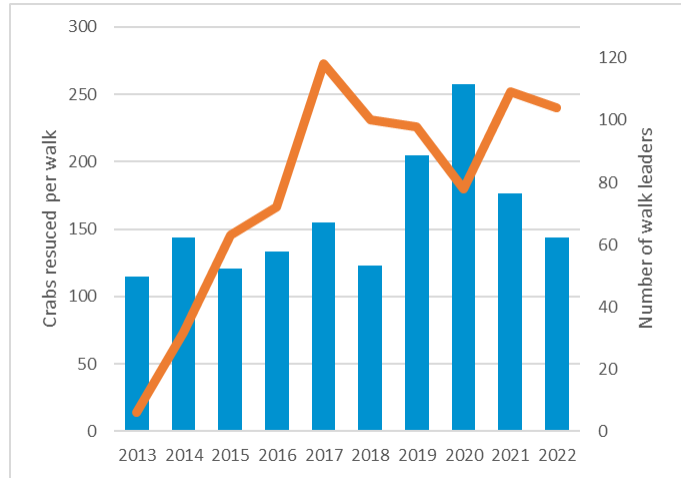


Figure 1. Total number of crabs rescued per walk (blue bars) and number of walk leaders (orange line) for each year of the reTURN the Favor program.

A total of 98,311 crabs were rescued, our second lowest total since 2017 when the number of walk leaders increased. The peak number of crabs rescued was on May 20, with 6,962 crabs rescued during 19 walks across RTF beaches (Figure 2). Peaks in the number of crabs rescued followed the full and new moon phases, in mid-May and June, and volunteers were encouraged to schedule walks during these times. During walks, we categorized rescued crabs into two general categories: **overtured** (upside down on the beach) and **impinged** (stuck in or obstructed by manmade or natural material or features) which are further grouped into descriptive categories.

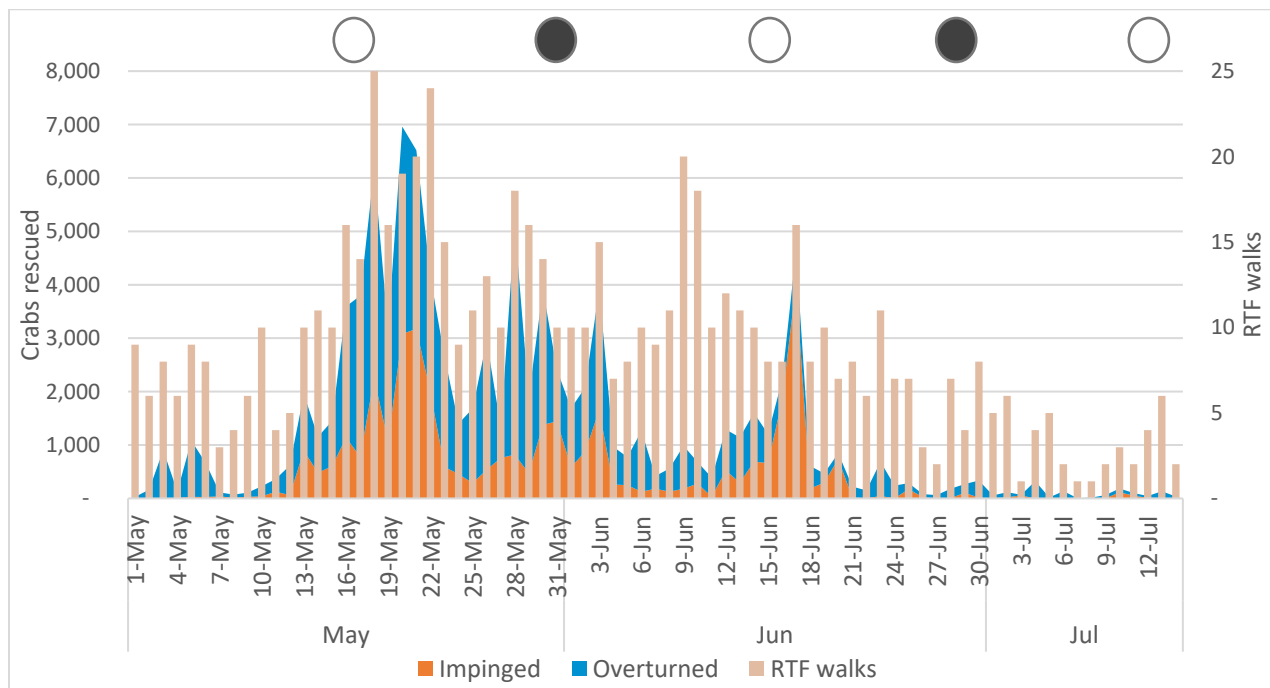


Figure 2. Total number of crabs rescued (stacked areas: overtured + impinged crabs) and RTF walks (bars) conducted by date, 2022. Moon phase is indicated above the graph by open circles (full moon) and filled circles (new moon).

### ***Overturned Crabs***

The majority of all crabs rescued were found upside down on the beaches (62.3%, 61,269 crabs), one of the lowest recorded over the ten-year program (range: 53.9 – 81.7%; mean: 69.1 ± 8.7%). Volunteers turned these crabs right side up so they could return to the water to spawn again, and reduce risk of adult mortality from exposure and gull predation.

Reeds Beach in Cape May County again had the most overturned crabs rescued by far (Table 1). In 2022, there were two walks with >1,000 overturned crabs rescued (compared to 17 walks in 2021), at Thompsons Beach and Reeds Beach, which both averaged > 200 overturned crabs rescued per walk this season. Overall, the number of overturned crabs rescued in June and July were much lower despite similar volunteer effort to previous years.

### ***Impinged Crabs***

Degraded conditions and marine debris at beaches exposed crabs to additional risks during spawning. Crabs became stuck in structures, debris, or shoreline features and were often unable to return to the water without assistance from volunteers. These stranded crabs were classified into three categories based on where they are found: man-made impingements (e.g. homes and infrastructure, seawalls, derelict houses, bulkheads, and boat ramps, accumulated rubble and marine debris), natural impingements (i.e. exposed peat and vegetation above or below the high tide line), and areas where high water or storms stranded crabs beyond their typical intertidal range (i.e. overwash areas). The program has previously documented many of these problems and problem areas, but the condition and degree of stranding risk can change over time with restoration projects, beach cleanups, extreme storms, and natural processes. Data documenting persistent problem areas, such as derelict structures, rubble debris, and overwash areas; or emerging issues can be used to prioritize and inform restoration needs on the Delaware Bay beaches.

### ***Man-made Impingements***

Volunteers rescued 22,034 crabs from man-made impingements (22.4% of all crabs rescued), which is higher than 2021 but close to average over the ten-year program (range: 14.0 – 46.1%; mean: 22.5 ± 8.8%). Just 1,672 crabs (7.6%) were rescued from man-made hazards across all ten sites in Cape May County, compared to 20,362 (92.4%) crabs from eight beaches in Cumberland County, showing the drastic difference in beach condition and hazards for spawning crabs. Beaches in Cumberland County tend to have more extensive hazards like rip-rap seawalls or large rubble fields that trap crabs, resulting in higher totals of rescued crabs from these beaches. In Cape May County, hazards tend to be more localized, though these persistent problem areas can trap sizable numbers of crabs over time.

Gandys and Fortescue/Raybins beaches had the most crabs freed from man-made impingements per walk, 121.2 and 102.6 crabs/walk, respectively. Bin blocks and rip rap trapped many crabs at both sites and at Fortescue/Raybins, boat ramps, derelict bulkheads, and jetties were also significant hazards.

The number of impinged crabs at Money Island dropped by nearly half (2021: 51.5 crabs/walk, 2022: 26.5 crabs/walk) following a beach restoration project in winter of 2022 that removed rubble and added sand to the beach to cover remaining rubble (Figure 3). Prior seasons of RTF efforts and volunteer concern served to highlight large numbers of trapped crabs at Money Island following the demolition of several homes along the shoreline through New Jersey’s Blue Acres Buyout program that created debris on the beach.



*Figure 3. Money Island beach following home demolish (2019, left, Lisa Ferguson) and restoration (2022, right, Adrianna Zito-Livingston).*

Several beaches also experienced changes in the number of crabs per walk. Dyers Cove increased from 34.0 crabs/walk in 2021 to 90.2 crabs/walk in 2022, due in large part to newly exposed rubble uncovered by beach erosion. On the other hand, East Point rescues were down from 57.1 crabs/walk in 2021 to 22.1 crabs/walk in 2022. Hazards did not change at East Point, but there were fewer crabs rescued overall at this beach, like many beaches this year. Sea Breeze, which had its first year without a derelict seawall in 2021, stayed fairly similar from 2021 (59.6 crabs/walk) to 2022 (46.3 crabs/walk).

Overall, rubble from broken down homes, bulkheads, and roads constituted the greatest number of impinged crabs, 8,333 crabs (37.8% of all man-made impingements) on 13 beaches, and one of the most widespread categories of man-made impingements (Figure 4).

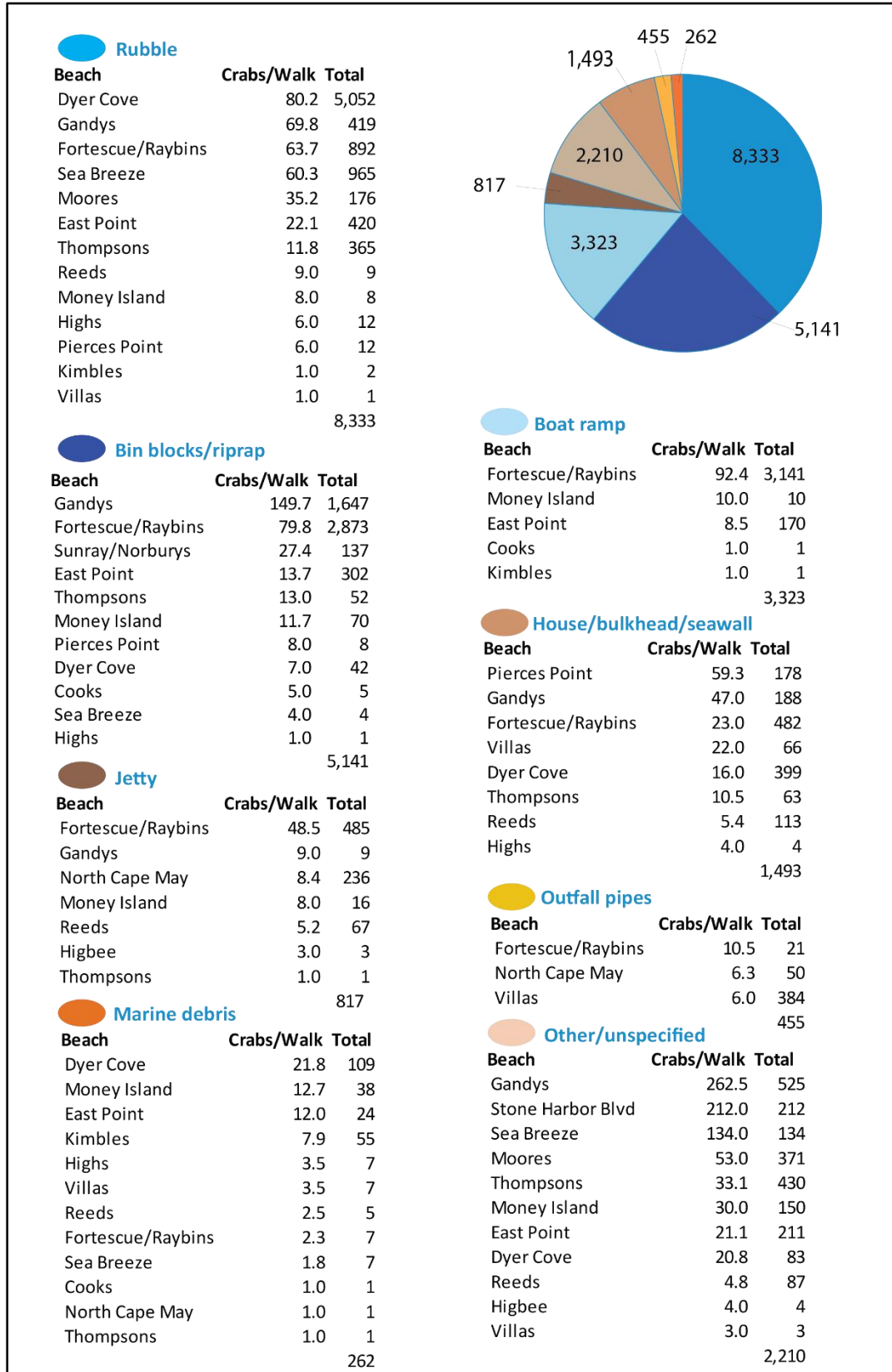


Figure 4. Number of crabs rescued from man-made impingements in 2022 by hazard type and beach.

**Natural Impingements**

Crabs become impinged in natural hazards due to degraded and eroded beach conditions and/or high tides that transport crabs to dunes or marshes adjoining the spawning beaches. Stranded crabs rescued from natural impingements and overwash areas totaled 15,008 crabs in 2022 (15.3% of all crabs rescued). Natural impingements are also more prevalent on Cumberland County beaches (75.2%, 11,289 crabs) compared to Cape May County (24.8%, 3,719 crabs), supporting the difference in beach condition and hazards for spawning crabs.

Beaches with the most crabs rescued from natural impingements and overwash areas per effort included Moores (101.8 crabs/walk), Thompsons (59.1 crabs/walk), Money Island (55.7 crabs/walk), Pierces Point (57.6 crabs/walk), and East Point (48.7 crabs/walk); Table 1, Figure 5). Moores Beach is characterized by several overwash areas and degraded dunes that can strand large numbers of crabs. These features were the primary driver for high natural impingements at Moores Beach again this season. Efforts to reduce these issues for crabs, such as the construction of berms at Pierces Point, can be effective initially but overwash issues have persisted at the beach.

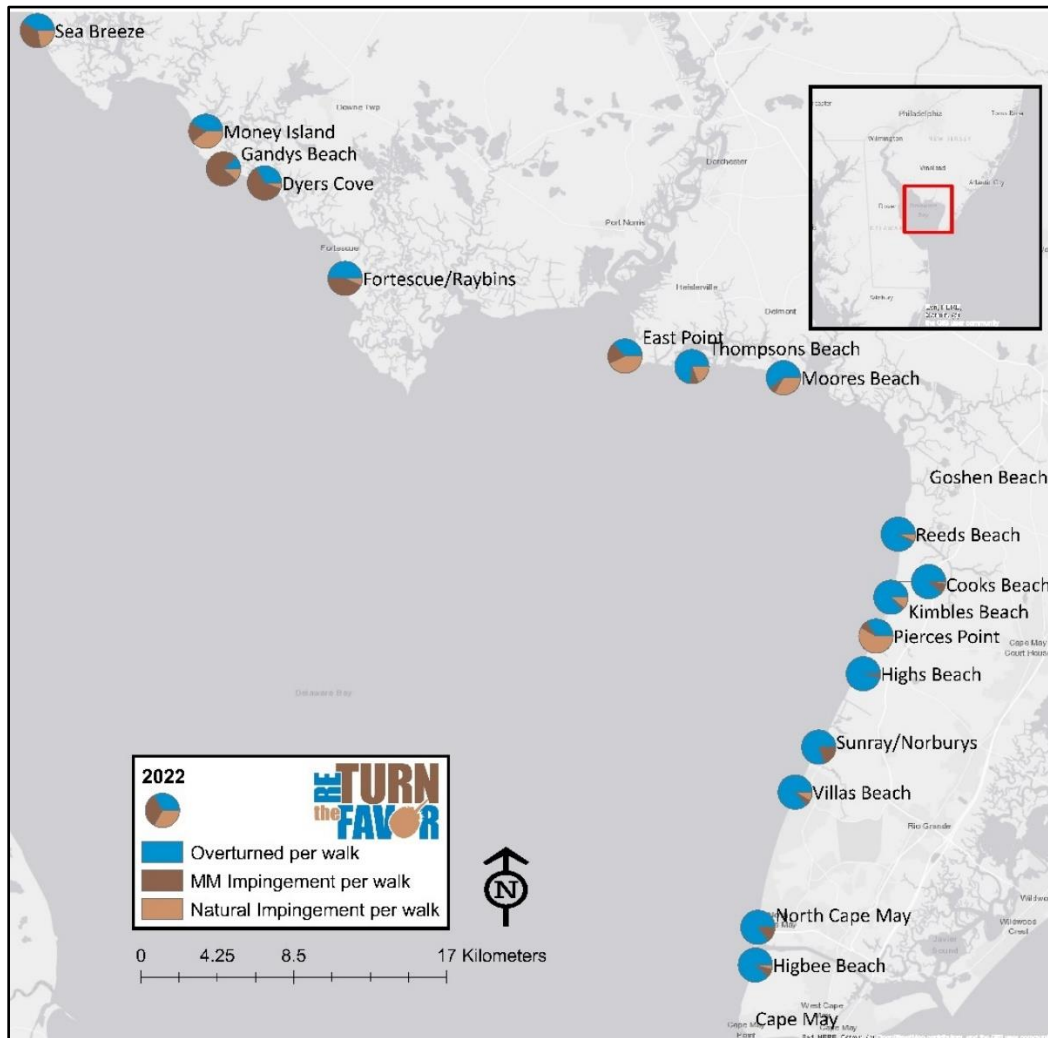


Figure 5. Each symbol indicates the proportion of rescued horseshoe crabs that were overturned or stranded in man-made (MM) or natural impingements per walk by RTF volunteers in 2022.





### **Other results**

Of all crabs rescued, 73,068 or 74.3% were male, and 25,243 or 25.7% were female, a 2.89 M:F sex ratio, which is a fairly consistent ratio among years (2013-2021 average  $2.61 \pm 0.34$ ). Tagged crabs were reported during walks; 156 observations of 143 horseshoe crab tags from 12 beaches were made. Data will be reported to U.S. Fish and Wildlife Service to contribute to studies of population trends and movements.

Volunteers incidentally recorded observations of other stranded species and notable wildlife observed at the beaches they walked. Notably, hundreds of dead diamondback terrapins (*Malaclemys terrapin*), numbering as high as 66 carcasses on one walk, were found on 13 of the monitored beaches. The bloated or partially decayed condition of the terrapins indicated likely drowning in crab traps. A trap was found on Moores Beach containing at least 47 dead terrapins and 2 live terrapins that were released. Terrapin carcass data from volunteers are being analyzed and results will be reported separately.

### **Conclusions**

In 2022 RTF celebrated 10 years of volunteer passion and dedication. Volunteers and coordinators reflected on these ten years throughout the season. Many volunteers have participated every year for 8-9 years and new volunteers are finding the program each year. This year, volunteer effort was comparable to recent years, but numbers of total crabs rescued, 98,611, was less than recent years. There are several factors that could contribute to this result including lower numbers of spawning crabs, fewer extreme weather events, and changes in timing of spawning activity and/or volunteer walks. Spawning survey data for 2022 is not available so it is unknown if this was one of the factors but can be explored further.

### **Acknowledgements**

The successes of the reTURN the Favor program are due to the dedication of so many volunteers and program partners who contribute time, miles, late nights, and sunny days to horseshoe crabs and the Delaware Bay. We are grateful to every person who joins to help, who spreads the word about horseshoe crab conservation, and supports this program. Special thanks to Carolyn Richards for assisting with volunteer packet preparations. We extend thanks to NJ Fish and Wildlife for providing a scientific collecting permit and permission to the program. In 2022, partners participating in the program supported their efforts through various means through their organization, including but not limited to grants, donations, foundations, and general operating funds. Funding for programmatic and volunteer support provided by: Ocean Wind - An Orsted & PSEG Project, the Marshall Reynolds Foundation, and private donations.



Report prepared by:

Lisa Ferguson and Meghan Kolk, The Wetlands Institute

Laura Chamberlin, Western Hemisphere Shorebird Reserve Network Executive Office

November 2022

Ferguson, L., L. Chamberlin, and M. Kolk. 2022. reTURN the Favor: Horseshoe crab rescue program 2022 report.

## References

Anderson, R.L., W.H. Watson III, and C. Chabot. 2013. Sublethal Behavioral and Physiological Effects of the Biomedical Bleeding Process on the American Horseshoe Crab, *Limulus polyphemus*. *Biol. Bull.* 225: 137-151.

Botton, M.L. and R.E. Loveland. 1989. Reproductive risk: high mortality associated with spawning by horseshoe crabs (*Limulus polyphemus*) in Delaware Bay, USA. *Marine Biology* 101: 143-151.

Fredericks, A. D. 2012. *Horseshoe Crab: Biography of a Survivor*. Washington, DC: Ruka Press.

Penn, D. and J. Brockmann. 1995. Age-biased stranding and righting in male horseshoe crabs, *Limulus polyphemus*. *Animal Behavior* 49: 1531-1539.

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.

Smith, D.R., Beekey, M.A., Brockmann, H.J., King, T.L., Millard, M.J. & Zaldivar-Rae, J.A. 2016. *Limulus polyphemus*. The IUCN Red List of Threatened Species 2016: e.T11987A80159830.

<http://dx.doi.org/10.2305/IUCN.UK.2016-1.RLTS.T11987A80159830.en>. Downloaded on 29 October 2018.

## Previous reTURN the Favor reports can be found at [returnthefavornj.org](http://returnthefavornj.org)

Danihel, M.S., L.M. O'Donnell, and T.R. Catania. 2014. reTURN the Favor Horseshoe Crab Rescue Project Pilot Year Summary Report.

Ferguson, L., L. Chamberlin, K. Sellers, and M. Danihel. 2014. reTURN the Favor Horseshoe Crab Rescue Project 2014 Season Summary Report.

Ferguson, L., L. Chamberlin, and A. Anholt. 2015. reTURN the Favor Horseshoe Crab Rescue Project 2015 Season Summary Report.

Ferguson, L., L. Chamberlin, and A. Anholt. 2016. reTURN the Favor New Jersey's Horseshoe Crab Rescue Program: 2016 Summary Report.

Ferguson, L., L. Chamberlin, and A. Anholt. 2017. reTURN the Favor New Jersey's Horseshoe Crab Rescue Program: 2017 Summary Report.

Ferguson, L. and L. Chamberlin. 2018. reTURN the Favor: Horseshoe crab rescue program 2018 report.

Ferguson, L. and L. Chamberlin. 2019. reTURN the Favor: Horseshoe crab rescue program 2019 report.

Ferguson, L. and L. Chamberlin. 2020. reTURN the Favor: Horseshoe crab rescue program 2020 report.

Ferguson, L. and L. Chamberlin. 2021. reTURN the Favor: Horseshoe crab rescue program 2021 report.