reTURN the Favor: Horseshoe crab rescue program 2024 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. 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 and harvest limits are subject to change. Though the Delaware Bay population of horseshoe crabs may be showing signs of recovery, these pressures 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.

2024 reTURN the Favor Highlights

- **164** volunteers attended virtual and in-person trainings and **151** received materials by email to lead walks. **44** new volunteers joined trainings, **39** received materials, and **12** became walk leaders. **60** volunteers, including **9** new volunteers, met our goal of leading 3 or more walks!
- **91** volunteers led and submitted data for **552** walks this season, for a total of **2,569** volunteer hours. The season ran May 1 – June 30, with **1 – 16** walks conducted every day.
- **7** organizations and **1** individual sponsored beaches and assisted the RTF program in Cape May and Cumberland Counties.
- **135,897** horseshoe crabs were rescued on **19** beaches, which included **92,869** overturned crabs, **28,289** crabs trapped in man-made impingements, and **14,739** crabs stranded by natural impingements and in overwash areas.
- From 2013-2024, **1,194,719** crabs have been rescued by RTF volunteers in **6,702** RTF walks.
- RTF and its volunteers were featured in **2** news stories about horseshoe crabs: NBC News New York and Philadelphia and CBS Sunday Morning, a national news program.

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

Table 1. Results from the 2024 reTURN the Favor season by beach, ordered north to south on Delaware Bay, NJ.

		Crabs Rescued					
Location	Walks	Overturned	Man-made Impingement	Natural - Impingement	Natural - Overwashed	Total	Avg per walk
Sea Breeze	20	1,752	2,304	905	481	5,442	268.6
Money Island	17	1,957	130	836	106	3,029	178.2
Gandys Beach	18	934	620	-	49	1,603	89.1
Dyer Cove	30	2,191	2,893	97	215	5,396	179.9
Fortescue/Raybins	58	19,541	13,177	431	1,285	34,434	593.7
East Point	43	2,410	6,321	2,861	795	12,387	288.1
Thompsons Beach	15	6,216	172	409	-	6,797	453.1
Moores Beach	8	2,151	5	154	1,045	3,355	419.4
Goshen Beach	1	117	-	-	-	117	117.0
Reeds Beach	74	25,499	846	81	131	26,557	358.9
Cooks Beach	6	106	-	22	-	128	21.3
Kimbles Beach	64	2,932	105	2,434	680	6,151	96.1
Pierces Point	30	1,527	244	194	1,107	3,072	102.4
Highs Beach	46	4,699	355	146	-	5,200	113.0
Sunray/Norburys	9	742	341	-	-	1,083	120.3
Villas Beach	73	14,538	527	-	188	15,253	208.9
North Cape May	34	5,292	246	-	81	5,619	165.3
Higbee Beach	5	183	3	-	6	192	38.4
Other	1	82	-	-	-	82	82.0
Total	**552**	**92,869**	**28,289**	**8,570**	**6,169**	**135,897**	**246.1**

2024 reTURN the Favor Season in Detail

To fulfill the program mission this year, we held in-person and virtual workshops in April to train new and returning volunteers. We shortened the season by 15 days this year to concentrate efforts in the timeframe when the rescue walks are most needed. All volunteers, new and returning, kicked off the season on May 1 instead of staggering the starts as we have done in past years. Walks ended on June 30 as spawning activity slowed, instead of July 15 as we have done in previous years. Together, volunteers conducted at least one walk per day over the course of the 61-day season, for a total of 552 walks covering approximately 28 km of coastline on the Delaware Bay in Cape May and Cumberland counties in New Jersey.

Beaches were sponsored by seven partner organizations and one volunteer beach captain: *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), *Horseshoe Crab Recovery Coalition* (Money Island, Thompsons), *New Jersey Audubon Society* (Cooks, Highs), *The Nature Conservancy* (Sunray/Norburys, Higbee), *The Wetlands Institute* (Sea Breeze, Moores, Reeds, Villas, North Cape May, Sunset Beach), along with Sandra Anderson (Gandy's, Dyer Cover, Fortescue/Raybin's).

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 and permission letters, were emailed to trained volunteers, while identification materials (stickers, t-shirts, and vests to be easily identified as RTF volunteers) were made available at in-person trainings and 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.

The program website also provided a place for visitors to learn more about the program through learning resources, past reports, a data portal, and story map. These components were recently added to provide interactive, user-friendly access to program results to increase volunteer engagement, understanding of target issues, and the use of data for action.

Of the 164 volunteers who attended trainings this year, 91 volunteers led walks and submitted data, and 60 individuals conducted 3 or more walks. On average, walks lasted 1 hour and 27 min ± 52 min with 3.4 ± 5.4 participants. Altogether, volunteers spent 2,569 hours rescuing crabs this year and rescued an average of 246.1 ± 389.4 crabs per walk (Figure 1).

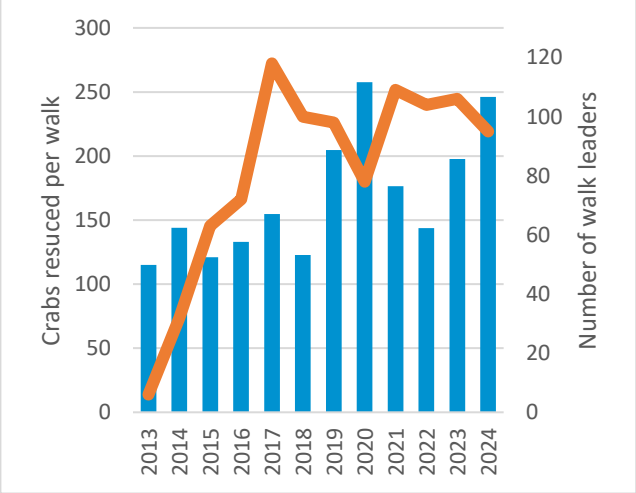


Figure 1.Total number of crabs rescued per walk (blue bars) and number of walk leaders (orange line) for each year of the reTURN the Favor program. Note that the duration of the program was reduced by two weeks in 2020 and 2024.

RTF volunteers rescued a total of 135,897 crabs this season. The peak number of crabs rescued was on May 11, with 9,918 crabs rescued during 12 walks across RTF beaches (Figure 2). This peak came after thunderstorms, high winds, and flooding a few days after the new moon that stranded thousands of crabs in overwash areas and up into streets. Peaks in the number of crabs rescued followed the full and new moon phases, in May and June, and volunteers were encouraged to schedule walks during these times. During walks, we categorized rescued crabs into two general categories: ***overturned*** (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.

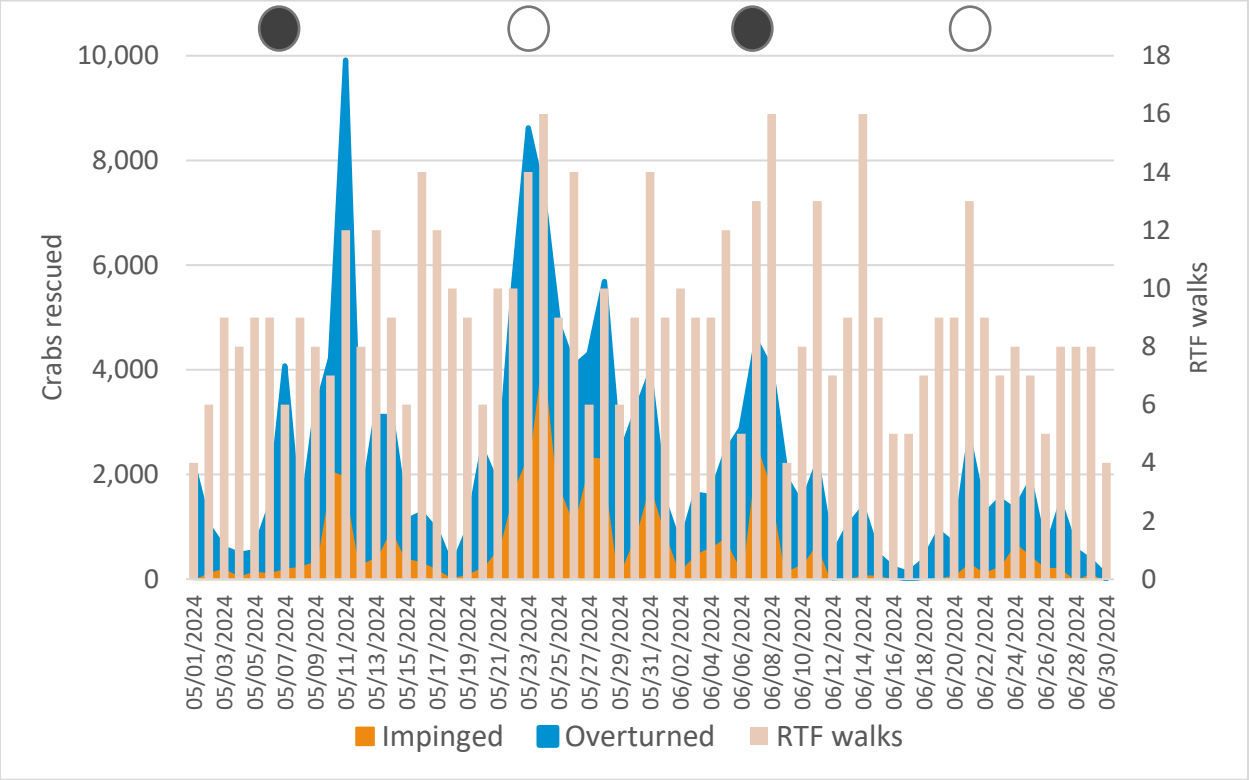


Figure 2. Total number of crabs rescued (stacked areas: overturned + impinged crabs) and RTF walks (bars) conducted by date, 2024. Moon phase is indicated above the graph by open circles (full moon) and filled circles (new moon).

Overturned Crabs

The majority of all crabs rescued this year were overturned (68.3%, 92,869 crabs). Over a quarter of all overturned crabs were rescued on Reeds Beach in Cape May County (Table 1). This year, sixteen walks surpassed 1,000 overturned crabs rescued. This is a 78% increase over nine walks in 2023. Most of these walks were concentrated during the May new moon and full moon and the June new moon. They occurred at Fortescue/Raybins, Villas, Reeds, and Thompsons Beaches. Two walks even surpassed 2,000 overturned crabs rescued (Thompsons and Fortescue/Raybins). 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.

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

Of all crabs rescued this year, 20.8% were freed from man-made impingements (28,289 crabs). The issue of man-made impingements is largely concentrated at Cumberland County beaches. In fact, 90.6% (25,622 crabs) of crabs rescued from man-made hazards this year were from eight beaches in Cumberland County. By contrast, 9.4% (2,667 crabs) of rescues in this category occurred across ten sites in Cape May County, showing a drastic difference in beach condition and hazards for spawning crabs. Several beaches in Cumberland County have significant hazards from rip-rap seawalls and large rubble fields that trap crabs, resulting in higher totals of rescued crabs. In Cape May County, hazards tend to be more localized, though these persistent problem areas can trap sizable numbers of crabs over time.

Fortescue/Raybins and East Point beaches had the most crabs freed from man-made impingements (Table 1), and also had the most crabs freed from man-made impingements per walk (Fortescue/Raybins: 227.2/walk, East Point: 147/walk). Dyer Cove had 2,893 crabs freed from man-made impingements, an improvement over 2023 when it was identified as the biggest hazard of the year with 7,975 crabs rescued from rubble on the shore (Figure 3). This year Dyer Cove had 96.4 crabs freed from man-made impingements per walk compared to 189.9 per walk in 2023.

The number of impinged crabs rescued at Money Island continued to decline this year (2022: 26.5 crabs/walk, 2023: 17.7 crabs/walk, 2024: 7.6 crabs/walk) from the pre-restoration impingement levels (2021: 51.5 crabs/walk) following a winter restoration project in 2021-2022 that removed rubble and added sand to the beach to cover remaining rubble.

Figure 3. Horseshoe crabs impinged in rubble at Dyer Cove in 2023 (Sandy Anderson).

Overall, rubble and bin blocks/riprap were responsible for over half (56.0%, 15,839 crabs) of all man-made impingements this year across 12 beaches (Figure 4). Boat ramps at three beaches were responsible for another 26.8% (7,586 crabs) of all man-made impingements this year.

Bin blocks/riprap

Beach	Crabs/Walk	Total
Fortescue/Raybins	134.9	4,586
East Point	104.4	2,506
Sunray/Norburys	48.6	340
Dyer Cove	25.2	126
Gandys	10.0	80
Highs	9.2	110
Sea Breeze	5.0	10
		7,758

Boat ramp

Beach	Crabs/Walk	Total
Fortescue/Raybins	168.4	4,547
East Point	143.5	3,013
Dyer Cove	8.7	26
		7,586

House

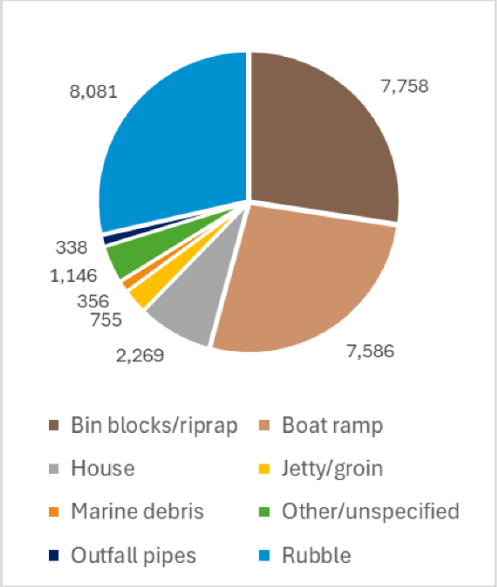
Beach	Crabs/Walk	Total
Fortescue/Raybins	59.9	1,138
Gandys	22.8	342
Pierces Point	15.8	126
Highs	11.7	105
Reeds	11.6	419
Villas	8.4	67
Dyer Cove	5.1	71
East Point	1.0	1
		2,269

Jetty/groin

Beach	Crabs/Walk	Total
Fortescue/Raybins	32.8	394
Highs	8.2	49
North Cape May	6.9	206
Villas	6.3	19
Reeds	6.0	84
Higbee	3.0	3
		755

Marine debris

Beach	Crabs/Walk	Total
Dyer Cove	31.5	252
Kimbles	15.7	47
Pierces Point	5.8	35
Moores	5.0	5
Fortescue/Raybins	2.0	2
Villas	2.0	2
Highs	1.6	8
Thompsons	1.5	3
Gandys	1.0	1
Sea Breeze	1.0	1
		356



Other/unspecified

Beach	Crabs/Walk	Total
Reeds	163.0	326
East Point	149.5	598
Villas	34.5	138
Fortescue/Raybins	23.5	47
Highs	11.0	33
North Cape May	1.5	3
Pierces Point	1.0	1
		1,146

Outfall pipes

Beach	Crabs/Walk	Total
Villas	8.6	301
North Cape May	3.1	37
		338

Rubble

Beach	Crabs/Walk	Total
Fortescue/Raybins	164.2	2,463
Sea Breeze	143.3	2,293
Dyer Cove	73.3	2,418
East Point	33.8	203
Money Island	32.5	130
Gandys	28.1	197
Thompsons	18.8	169
Reeds	17.0	17
Pierces Point	13.7	82
Kimbles	7.3	58
Highs	3.8	50
Sunray/Norburys	1.0	1
		8,081

Figure 4. Number of crabs rescued from man-made impingements in 2024 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 accounted for 10.8% (14,739 crabs), down from 23.9% of all crabs rescued last year. Natural impingements were more prevalent on Cumberland County beaches (65.6%, 9,669 crabs) compared to Cape May County (34.4%, 5,070 crabs), supporting the trend in larger scale differences in spawning hazards for crabs.

Beaches with the most crabs rescued from natural impingements and overwash areas included East Point, Kimbles, and Fortescue/Raybins beaches (Table 1, Figure 5). Moores Beach is characterized by several overwash areas and degraded dunes that can strand large numbers of crabs, and in past years has had a large coordinated effort to rescue these stranded crabs. This year, however, the condition of the road to Moores Beach was too unsafe for travel and efforts for rescue walks were greatly reduced. Efforts to build protective dune features, such as the berms constructed at Pierces Point in 2021-2022, have the potential to reduce overwash potential from storms initially but may require additional restoration or management to resolve the issue long term.

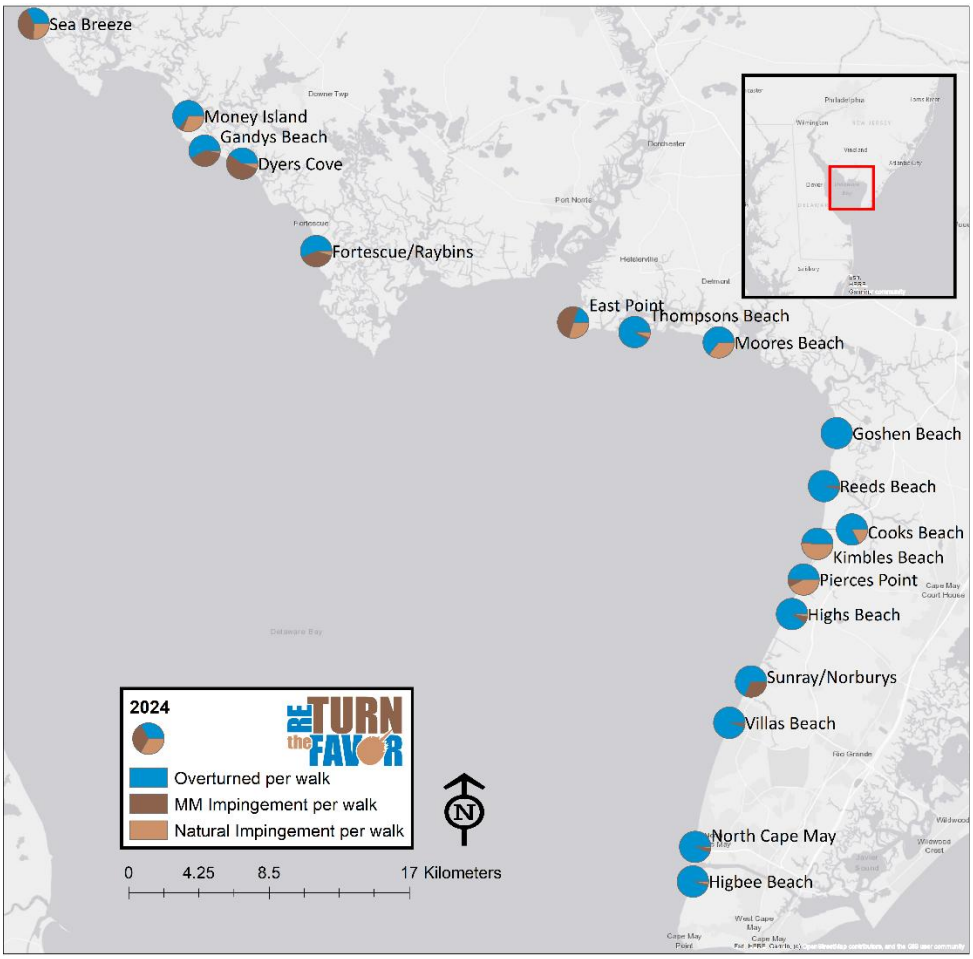


Figure 5. Each symbol indicates the proportion of rescued horseshoe crabs that were overturned or stranded in man-made (MM) or natural impingements per walk by RTF volunteers in 2024.

Other results

Of all crabs rescued in 2024, 96,092 or 70.7% were male, and 39,805 or 29.3% were female, a 2.41 M:F sex ratio, which is at the lower bound of the ratio among years (2013-2023 average 2.61 ± 0.33). Ratios were similar for crabs overturned (M:F=2.43) and rescued from impingements (M:F=2.37). Tagged crabs from 14 beaches were reported during 91 walks for reporting 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, including sea turtle and sturgeon species which were reported to NJ FW and USFWS. Volunteers in 2024 were not asked to take pictures of dead diamondback terrapins (*Malaclemys terrapin*) as they were in 2020-2022, and tallying carcasses often found dead on the beaches was optional. In total, 367 observations of carcasses were reported from 17 of the monitored beaches over 128 walks, with as many as 28 terrapin carcasses on one walk. The bloated or partially decayed condition of the terrapins indicated likely drowning in crab traps. The results of terrapin carcass data collected by volunteers in previous years are being analyzed presently.

Conclusions

The decision made in 2024 to end RTF walks on June 30 rather than July 15 helped to concentrate effort at the height of crab spawning when it was needed most and did not appear to significantly affect overall outcomes of the program (Figure 6). Volunteer effort tends to drop off as crabs spawn in lower numbers, temperatures increase, and other factors affect availability. Crabs rescued on walks not reported through RTF are omitted from program totals, so our 2024 results do not reflect crabs that were rescued through public efforts in July or other times of the year. We anticipate maintaining the May 1 – June 30 duration for the program for the upcoming year to maintain the benefits of RTF.

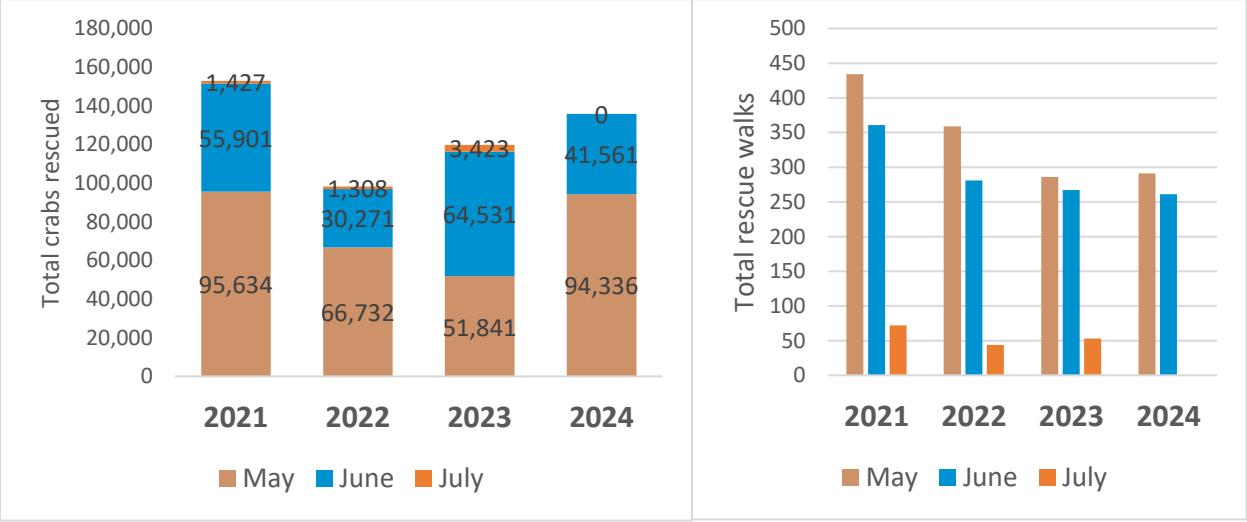


Figure 6. Total number of crabs rescued (left graph) and RTF walks conducted (right graph) by month (May 1 – May 31, June 1 – June 30, July 1 – July 15) for each year 2021-2024. No walks were conducted in July 2024.

Acknowledgements

The successes of the reTURN the Favor program are due to the dedication of so many volunteers and program partners who contribute to horseshoe crabs and the Delaware Bay in so many ways. 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 volunteers who took on beach coordination role, behind the scenes coordination roles, and spread the word through social media engagement and organizing groups, troops, families, friends, and students. We extend thanks to NJ Fish and Wildlife for providing a scientific collecting permit and permission to the program. In 2024, The Wetlands Institute and partners participating in the program supported their efforts through their organization, including but not limited to grants, donations, foundations, and general operating funds.

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January 2025

Ferguson, L. and M. Kolk. 2025. reTURN the Favor: Horseshoe crab rescue program 2024 report.

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Previous reTURN the Favor reports can be found at returnthefavornj.org