



reTURN the Favor: Horseshoe crab rescue program 2018 report

The reTURN the Favor (RTF) program was initiated in 2013 to rescue American horseshoe crabs (*Limulus polyphemus*) stranded on beaches along the Delaware Bay in New Jersey, where large concentrations of crabs spawn every spring. With crabs at risk to dying from exposure and predation, this state partnership and collaboration among several New Jersey-based groups (non-profit organizations, consulting groups, and a university) formed to recruit and train volunteers to rescue crabs stranded during spawning. During walks scheduled around tides, spawning activity, and time of day restrictions, volunteers rescue and collect data on live stranded crabs. Program participants must follow protocols to comply with New Jersey regulations to protect horseshoe crabs and other wildlife. Collectively, volunteers save crabs by the thousands, identify problem areas on the beaches, and make observations that inform conservation, restoration, and research on the Bay.

Why rescue horseshoe crabs?

Most numerous around the high tides of full and new moons in May and June, horseshoe crabs crawl onto sandy beaches to lay clusters of eggs in shallow pits in the intertidal area of low-energy beaches of the Delaware Bay. Females can lay over 80,000 eggs over the course of a spawning season (Fredericks 2012). Under the sand, these eggs develop into larvae that enter the Bay for an extended period of >9 years before reaching sexual maturity, for the few that survive the duration. Other eggs are brought to the surface of the beach by waves and spawning activity of other crabs, forestalling further development. These eggs on the surface, are readily accessible to foraging shorebirds hungrily scouring the beaches for food during stopovers on their thousands miles long migration routes, timed perfectly with the peak of spawning season. Other animals, including fish, marine turtles, and gulls that live locally, take advantage of the abundance of crabs and crab eggs in the Bay.

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 (www.asmfc.org/species/horseshoe-crab). Though now considered stable, the harvest of horseshoe crabs for eel and whelk bait was a prime driver of population decline in the Delaware Bay in recent decades. Crabs are also harvested by the biomedical industry for their blood, which can be collected from live crabs before release back to the water, but not without impacts to survival. With so much of the Delaware Bay ecosystem tied to an abundant population of horseshoe crabs, and emerging concerns about drastic declines in the shorebirds that visit the Bay, a moratorium was imposed in New Jersey in 2008 to prohibit further harvest of horseshoe crabs for bait (Niles et al. 2009). In 2003, beaches where spawning and foraging shorebird activity was most numerous were closed to visitation from May 7- June 7 each year since.

The condition of beaches that increase stranding risk and loss of habitat to support spawning – beaches that are sandy, gently sloped, and free of obstacles and debris – is another threat to the population. Eroding beaches, housing and coastal development, and shoreline hardening infrastructure has diminished the quality of spawning habitat. As a result, mature crabs become stranded on beaches, stuck in debris and structure on the shoreline, or washed into marshes and overwash areas.



This is where the reTURN the Favor program steps in – reducing the loss of mature crabs; connecting organizations; engaging new volunteers, community members, and children in conservation of the Bay; improving spawning habitat through debris removal, beach restoration, and revitalization of derelict structures on the Bay.

2018 reTURN the Favor Highlights

- **95** new and returning volunteers attended **3** RTF training workshops in late April. Many more attended site-specific trainings or refresher trainings as returning volunteers.
- **10** organizations participated in RTF, covering beaches in Cape May and Cumberland Counties.
- **100** volunteers lead **698** walks, for total of **2,084** volunteer hours.
- **85,746** horseshoe crabs were rescued on **21** beaches, including **60,282** overturned crabs, **20,240** crabs stuck in man-made impingements, and **3,515** crabs stranded by natural impingements and in overwash areas.
- **361,755** crabs have been rescued by RTF volunteers in over **2,500** walks from 2013-2018.

Citizens United for the Maurice River and its Tributaries ● Conserve Wildlife Foundation of New Jersey
● Friends of Cape May National Wildlife Refuge ● M. Wren Consulting ● New Jersey Audubon Society
● New Jersey Division of Fish and Wildlife Service ● Rutgers University ● The Nature Conservancy ●
The Wetlands Institute ● Executive Office of Western Hemisphere Shorebird Reserve Network

Table 1. Results from the 2018 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	47	1,775	1,614	186	116	3,691	78.5
Money Island	32	2,134	2,311	658	216	5,319	166.2
Gandys Beach	39	1,260	3,181	30	-	4,471	114.6
Bradford	1	211	-	-	-	211	211.0
Dyers Cove	62	7,818	1,236	181	88	9,323	150.4
Sow & Pig	2	154	-	-	12	166	83.0
Fortescue/Raybins	107	11,620	6,827	554	18	19,019	177.7
East Point	70	4,533	2,142	1,143	73	7,891	112.7
Thompsons Beach	45	6,735	514	115	300	7,664	170.3
Moore's Beach	44	7,731	222	413	-	8,366	190.1
Goshen Beaches	2	220	-	30	700	950	475.0
Reeds Beach	64	5,839	229	4	77	6,149	96.1
Cooks Beach	6	12	-	1	5	18	3.0
Kimbles Beach	13	329	11	2	8	350	26.9
Pierces Point	7	132	118	77	80	407	58.1
Highs Beach	36	1,152	56	1	16	1,225	34.0
Rutgers Beach	13	875	110	27	-	1,012	77.8
Sunray/Norburys	36	1,675	1,357	82	-	3,114	86.5
Villas Beach	62	5,767	286	11	-	6,064	97.8
North Cape May	8	305	26	-	-	331	41.4
Higbee Beach	2	5	-	-	-	5	2.5
Total	698	60,282	20,240	3,515	1,709	85,746	122.8



2018 reTURN the Favor Season in Detail

reTURN the Favor volunteers rescued horseshoe crabs on 21 beaches, covering approximately 28 km of coastline on the Delaware Bay in Cape May and Cumberland counties in New Jersey. Of these, 18 beaches were sponsored by nine partner organizations: *Citizens United for the Maurice River and its Tributaries* (East Point), *Conserve Wildlife Foundation of New Jersey* (Dyer Cove), *Friends of Cape May National Wildlife Refuge* (Kimbles), *M. Wren Consulting* (Money Island, Moores, Fortescue/Raybins, Gandys), *New Jersey Audubon Society* (Cooks, Highs), *Rutgers University* (Rutgers), *The Nature Conservancy* (Sunray/Norburys), *The Wetlands Institute* (Reeds, Pierces Point, Villas, North Cape May), *Executive Office of Western Hemisphere Shorebird Reserve Network* (Sea Breeze, Thompsons).

The web-based volunteer management service, Sign-Up Genius (www.signupgenius.com), was used by volunteers to schedule 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 are only permitted after sunset or before sunrise due to NJ beach closures during shorebird migration (www.nj.gov/dep/fgw/ensp/beachclozmap.htm). In the field, volunteers collected data on standardized datasheets, then submitted data through returnthefavornj.org. During in-person trainings and refresher meetings, volunteers were supplied permits, permission letter, stickers, t-shirts, and vests to be easily identified as RTF volunteers. On certain beaches where crabs are known to strand in large numbers, volunteers were permitted to use labeled totes to rescue crabs this year, which helped volunteers maximize rescue efforts and stay safe in the process. Updated protocols, datasheets, and beach-specific fact sheets were provided to volunteers during trainings and through the website (<http://returnthefavornj.org/get-involved/resource-toolkit/>).

One hundred volunteers submitted data for 698 RTF walks conducted from late April through mid-July 2018 (there were only two days with no RTF walks from April 27-July 15). On average, walks lasted 1 hr and 18 min \pm 43 min with 2.4 ± 2.5 participants. Altogether, over 2,080 hours were spent rescuing crabs this year. An average of 126.6 ± 171.8 crabs were rescued per walk, for a total 88,367 crabs rescued. Peaks in the number of crabs rescued per walk followed the full and new moon phases, from mid-May to mid-June. Nearly 7,000 crabs were rescued during 18 walks on May 18 (Figure 1). This highlights the need to continue to target volunteer activities around the full and new moons.

Overtured Crabs

The majority of all crabs rescued were found upside down on the beaches (70.3%, 60,282 crabs) typically during falling to low tides. Volunteers turned these crabs right side up so they could return to the water to spawn again, and reduce risk of mortality from exposure and gull predation. Beaches with the greatest number of overturned crabs included Fortescue/Raybins, Dyer Cove, and Moores beaches, all in Cumberland County (Table 1). Accounting for walk effort on beaches with regular walks (>2), the beaches with the most overturned crabs rescued were Moores (190.1 crabs per walk), Fortescue/Raybins (177.1 crabs per walk), and Thompsons (170.3 crabs per walk; Figure 2).

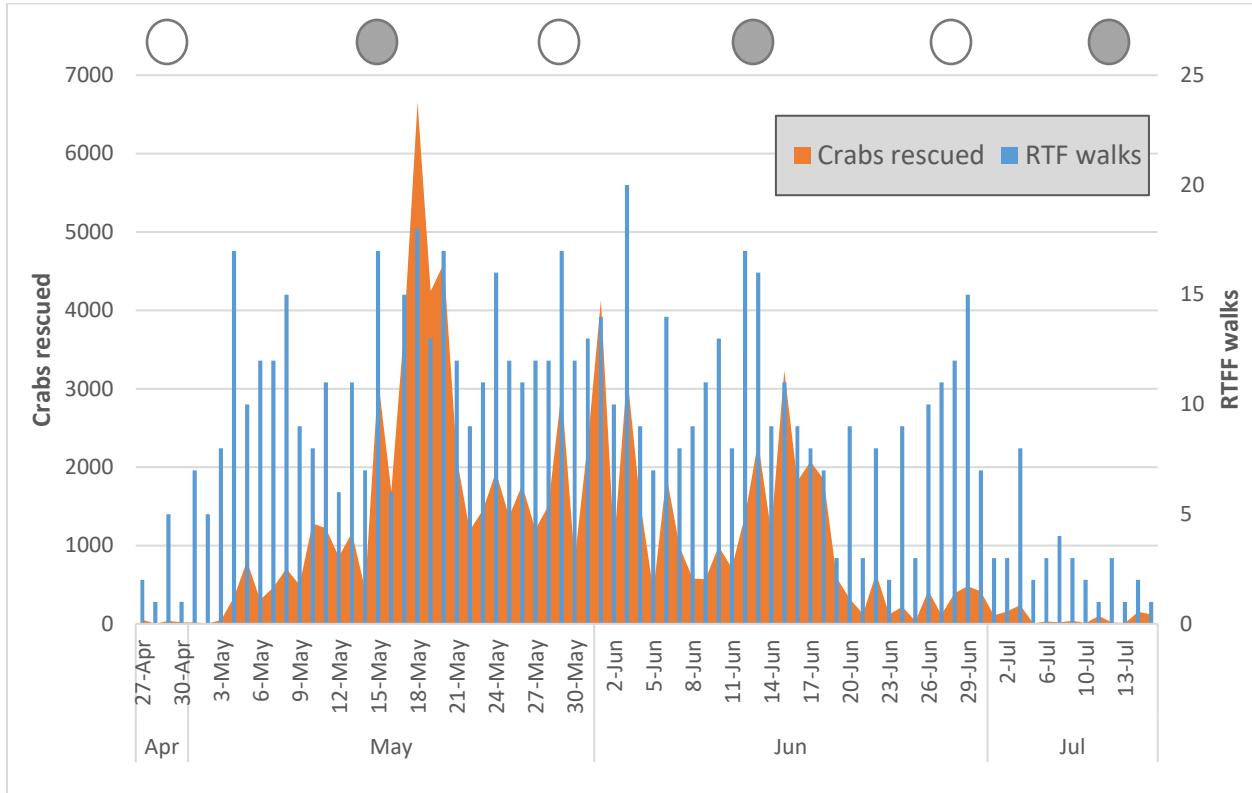


Figure 1. Total number of crabs rescued and RTFF walks conducted by date, 2018. No walks were conducted on July 5 and 8. Moon phase is indicated above the graph by open circles (full moon) and filled circles (new moon).

Impinged Crabs

Degraded conditions and marine debris at beaches expose crabs to additional risks during spawning. Crabs become stuck in structures, debris, or shoreline features and are often unable to return to the Bay without assistance from volunteers. These stranded crabs are 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 (e.g. exposed peat and vegetation above or below the high tide line), and overwash areas. Many of these problem areas have been previously documented by the program, but may worsen or improve over time with restoration projects, beach cleanups, and erosion and accretion at the beaches. Data documenting persistent problem areas, such as derelict structures, rubble and debris, and overwash areas, for crabs can be used to prioritize and inform restoration needs on the Delaware Bay beaches.

Volunteers rescued 20,240 crabs from man-made impingements (23.6% of all crabs rescued). Beaches with the most crabs freed from man-made impingements, and the most crabs rescued per walk, were Fortescue/Raybins (63.8 crabs per walk), Gandys (81.6 crabs per walk), and Money Island (72.2 crabs per walk) beaches (Figures 3 and 4, Table 1). Bin blocks, concrete rubble, and rip rap constituted the greatest number and one of the most widespread category of man-made impingements, at 11,482 crabs on 13 beaches. Boat ramps were a more localized problem, with 5,317 crabs rescued at four beaches, Money Island, Dyer Cove, East Point, and Fortescue. Volunteers rescued 96 crabs per walk at the Fortescue boat ramp, up from 17 crabs per walk there in 2017. The increase in impinged crabs at the

Fortescue boat ramp is due in part to a pile of rubble that was left behind after the boat ramp was replaced. reTURN the Favor data were used to encourage a cleanup of that pile of rubble.

Figure 2. Number of overturned horseshoe crabs rescued per walk by RTF volunteers in 2018.

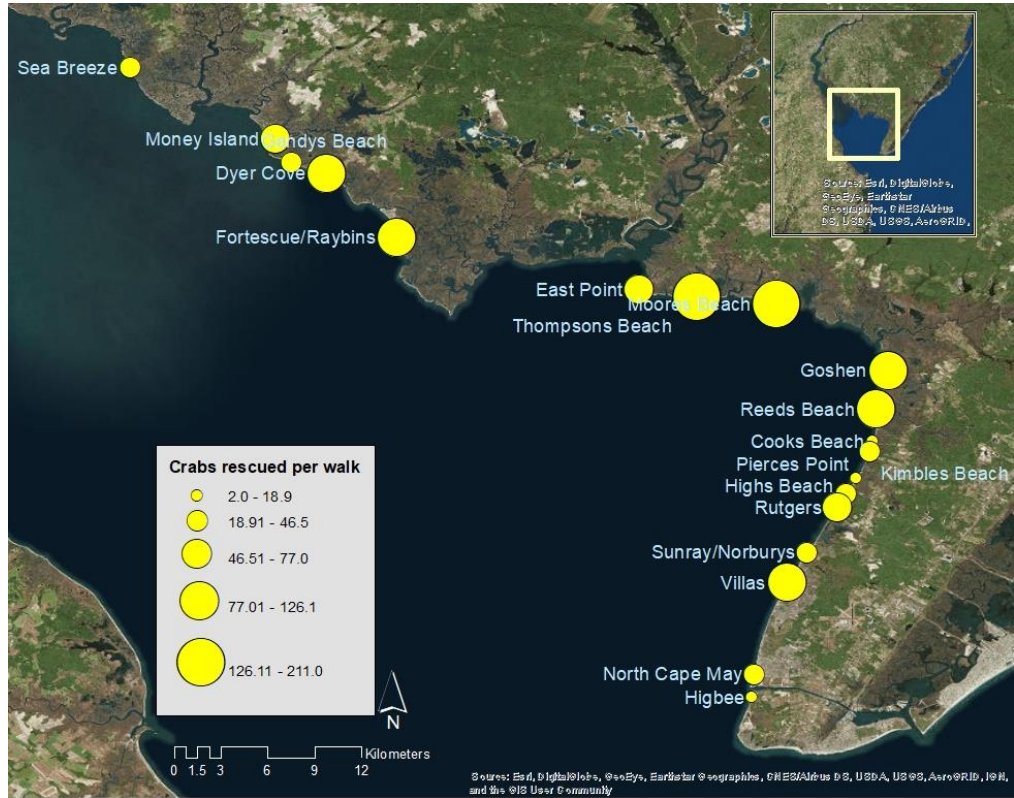
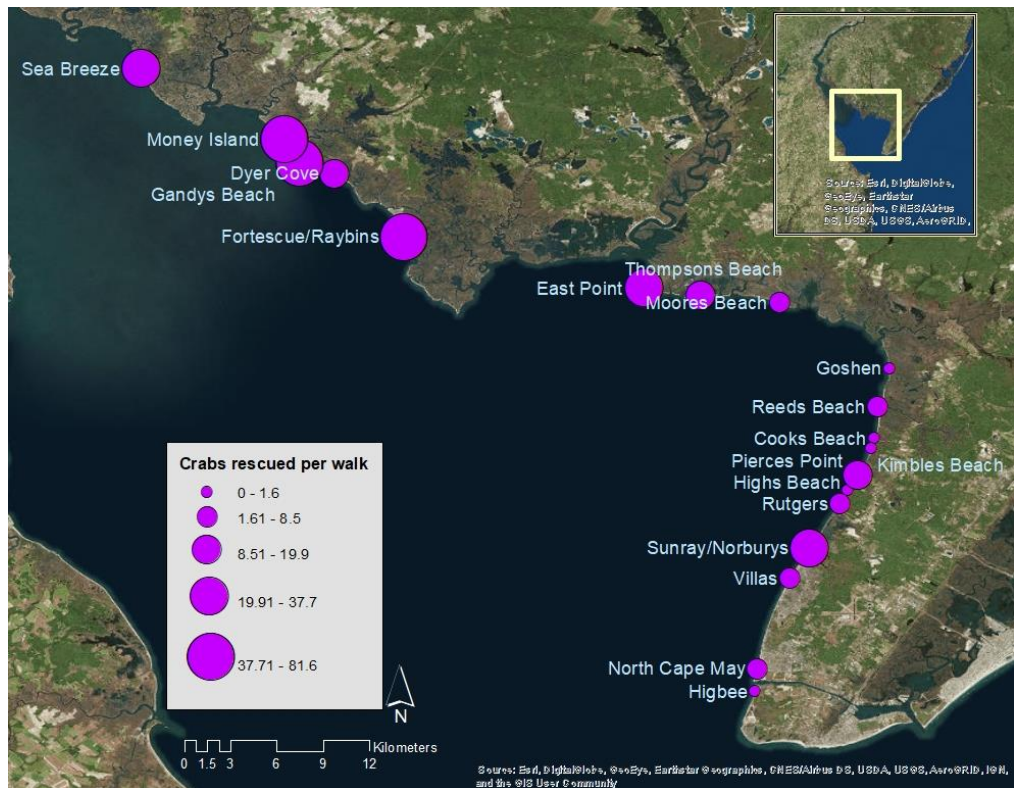


Figure 3. Number of horseshoe crabs rescued from man-made impingements per walk by RTF volunteers in 2018.



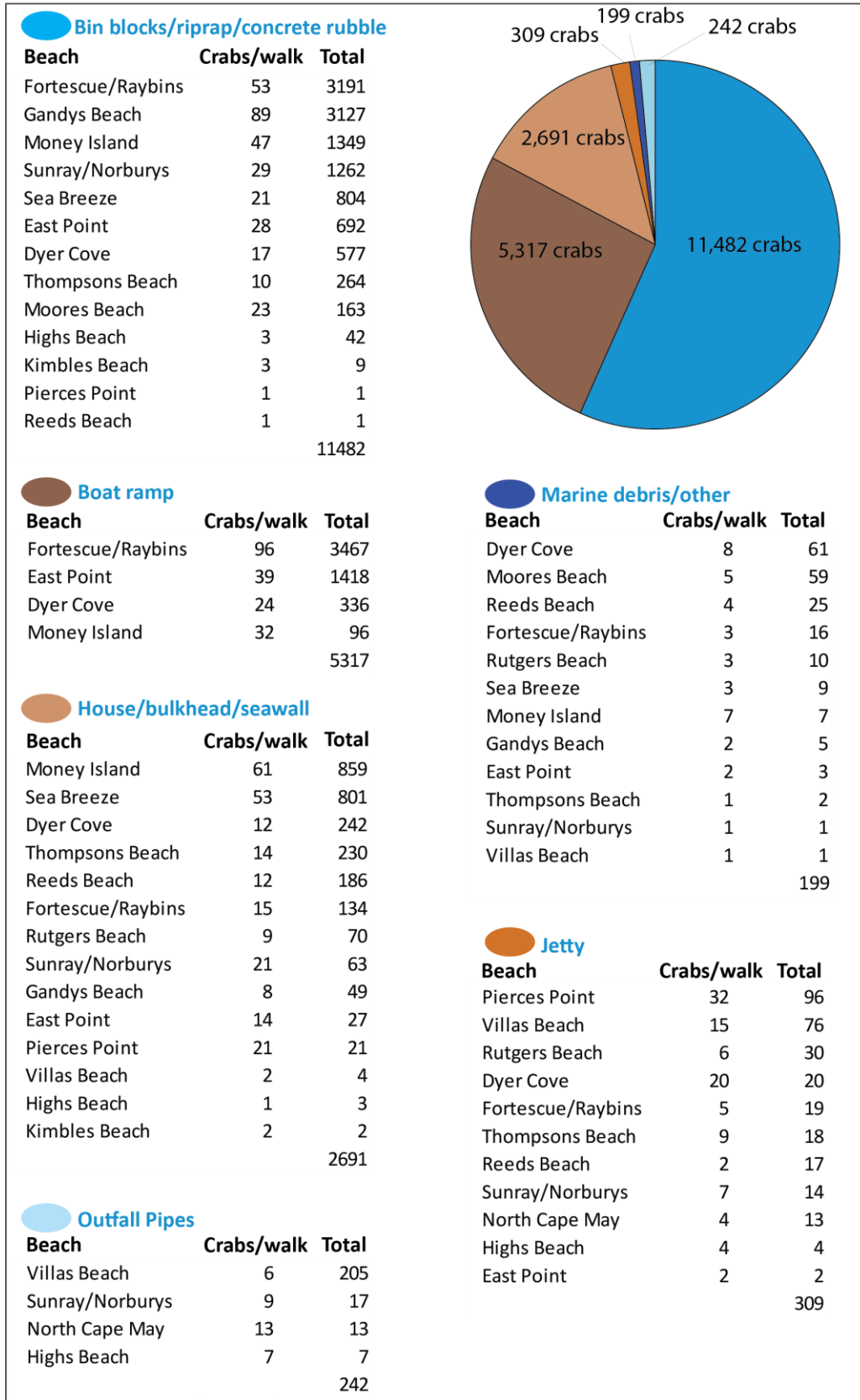
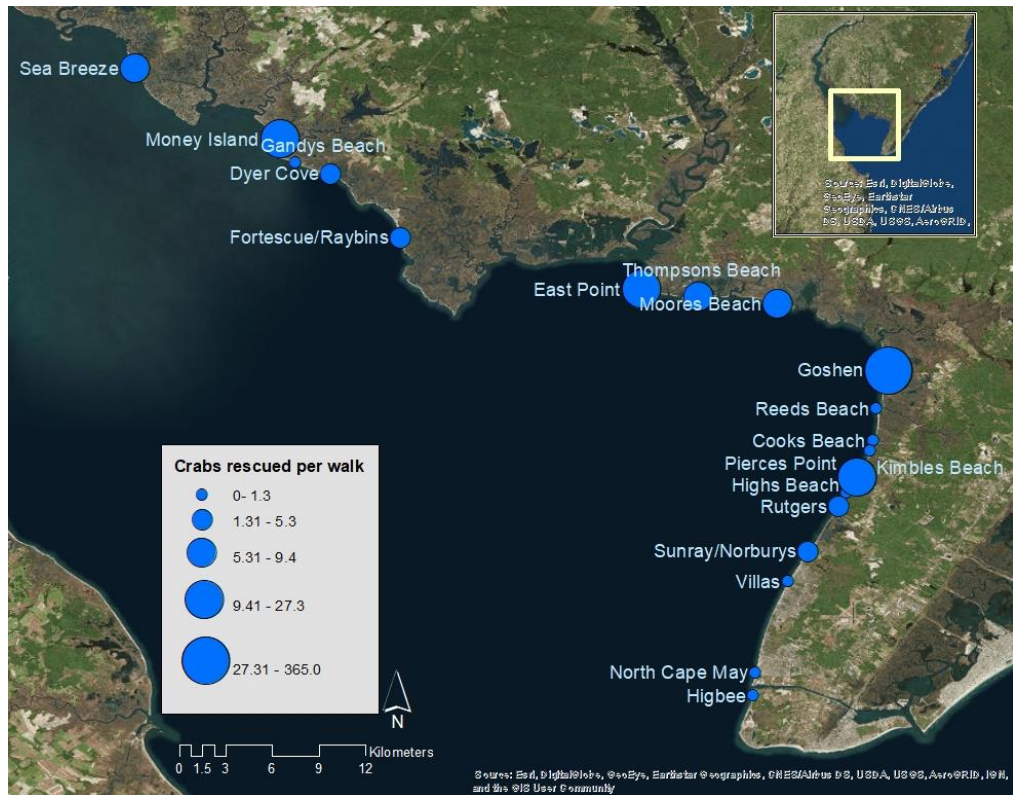


Figure 4. Number of crabs rescued from man-made impingements in 2018, by hazard type and beach.

Stranded crabs rescued from natural impingements and overwash areas totaled 5,224 crabs in 2018 (6.1% of all crabs rescued). This was a decrease from 2017, when >7% of all crabs rescued from natural impediments, but still up from 3.7-4.4% rescued in 2014-2016. Crabs can become impinged in these hazards due to degraded and eroded beach conditions and/or high tides that transport crabs to dunes or marshes adjoining the spawning beaches. Beaches with the most crabs rescued from natural impingements and overwash areas included East Point, Fortescue/Raybins, and Money Island (Table 1), while the beaches with the most crabs rescued when accounting for effort on beaches with regular walks (>2) were Money Island (27.3 crabs per walk), Pierces Point (22.4 crabs per walk), and East Point (17.4 crabs per walk; Figure 5). Overwash areas on Goshen, Money Island, and Thompsons beaches stranded the most crabs this year (Table 1), though overall numbers of overwashed crabs were down from 2017 when a storm event stranded an exceptionally large number of crabs in late May.

Figure 5. Number of horseshoe crabs rescued from natural impingements and overwash areas per walk by RTF volunteers in 2018.



Other information

Of all crabs rescued, 65,647 or 76.3% were male, and 20,279 or 23.7% were female, a 3.24 sex ratio. Females comprised 24.2% of overturned and 22.4% of impinged crabs rescued. These results are consistent with previous years of the program. Sex-ratios based on spawning surveys tend to be more male biased (Swan et al. 2017). This suggests that proportionally more females may become stranded on the beaches during spawning compared to males, though results may vary by factors such as beach and date. Data on tail length and age were not recorded, though these factors likely contribute to stranding and mortality risk and could be investigated further (Bottom and Loveland 1989, Penn and Brockmann 1995, Smith et al. 2010). Tagged crabs were also reported during walks; 107 observations of 102 tagged crabs were made this year. Data are reported to US Fish and Wildlife Service to contribute to federal and state efforts to study horseshoe crab population trends and movements.



Other Wildlife

Program volunteers also recorded observations of other stranded species and notable wildlife observed incidentally at the beaches they walked. Notably, dead diamondback terrapins (*Malaclemys terrapin*) have been regularly encountered during walks of the intertidal areas, often bloated or partially decayed, suggestive of drowning in crab traps. Volunteers recorded dead terrapins this season, classifying the carcasses as small (<6 inch shell length) or large (>6 inch shell length; likely to be mature females), and took photos and moved terrapins above the high tide line whenever possible. Photos, locations, and dates of terrapin reports were reviewed to reduce the possibility of double-counted individuals, but it is likely some error remains. Dead terrapins were reported on 17 beaches of Delaware Bay from late-April through mid-July this year. The most carcasses were found at Thompsons and Moores beaches, and the maximum number reported from a single walk was 45 dead terrapins (42 small, 3 large) from Thompson Beach in early June. The overall estimate of dead terrapins ranged between 732 (486 small, 246 large) and 597 (405 small, 192 large). Maximum estimates were derived by omitting reports of the same size class terrapins from the same date and beach, and minimum estimates were derived by also removing reports of the same size class terrapin from consecutive days. Marking of shells would improve estimates in future years to better understand the extent of terrapin loss on the Bay.

Other notable observations made by volunteers included three dead sea turtles on Sea Breeze, Moores, and Villas beaches with one turtle at each beach, and a dead dolphin on Villas beach.

Conclusion

The 2018 season was another successful year for reTURN the Favor, with program volunteers and partners making meaningful contributions to horseshoe crab conservation in New Jersey. Through continued efforts each year, the program has been able to rescue over 360,000 stranded horseshoe crabs, educated and engaged residents and visitors in conservation for the Bay, and documented areas for restoration and habitat improvement. The program will continue to put the data to work by seeking opportunities for small-scale, volunteer-based habitat improvement projects and contributing to development of large-scale restoration projects.

Acknowledgements

The successes of the reTURN the Favor program are wholly due to the dedication of so many volunteers and program partners who contribute time, miles, and late nights to horseshoe crabs and the Delaware Bay. We are so grateful to every person who joins to help, who spreads the word about horseshoe crab conservation, and supports this program. This program is also indebted to NJ DFW for providing permits, permission, guidance and communication for keeping this program operational. In 2018, partner groups 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.

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