Inland Bays Volunteer Horseshoe Crab Spawning Survey Protocol

DELAWARE CENTER FOR THE INLAND BAYS
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Safety First!

Horseshoe crab surveys take place at night, on dark beaches. Thus, volunteers may encounter a variety of hard-to-see hazards, which could lead to falls, cuts, or other injuries.

To keep everyone as safe as possible, it is essential that all volunteers be familiar with and observe the following practices during the surveys. Team leaders will be responsible for enforcing safety rules, but all volunteers who see a safety issue should feel free to speak up. Volunteers who do not, or cannot, follow these rules will not be permitted to participate.

- All volunteers, including parents or guardians who accompany minors, must sign a liability waiver form. Minors must be supervised by their adult at all times. Team leaders are not appropriate supervisors for minor volunteers.
- If thunderstorms are in progress, do NOT go onto the beach.
- Bring a headlamp or flashlight. Headlamps are preferred because they free up both hands. [High lumen headlamps are best!] If you can set the headlamp to the red light setting, even better, as it causes less disturbance to nighttime wildlife.
- Wear appropriate clothing for weather and wet conditions at the water's edge. Closed-toe shoes with soles are REQUIRED. No bare feet, flip-flops, or neoprene booties will be allowed. We recommend rubber boots, waterproof shoes (with soles) or old sneakers.
- Work gloves are useful if there are high densities of horseshoe crabs on the beach. You may have to feel into the sand beneath crabs or carefully lift animals up to count those underneath. Be aware not to place your finger in the "hinge" of the horseshoe crabs' carapace/ shell; depending on placement, this could cause injury. In addition, when walking among the horseshoe crabs, use a foot shuffle motion instead of stepping where you can't see to avoid harming buried or partially buried crabs- the safety of the horseshoe crabs is important too.
- Keep an eye out for tripping hazards or debris that may cause injuries to you or your teammates.
- Bay water contains bacteria that may, in rare cases, lead to serious infections of cuts or puncture wounds. If you have any open cut or wound, we recommend that you not participate until it is healed.
- Inform your team leader immediately if you sustain any type of injury, even if it seems minor. All teams will have a first aid kit. Consult a medical provider if you have any concerns, particularly if you sustain a cut or puncture wound that could become infected. Team leaders should complete an incident report form.
- Use sunscreen during the day and insect repellent when needed.

- Do not take risks or do anything that makes you uncomfortable. Safety is always the most important consideration.

Survey Protocol

Arrival & Setup

- Contact your team leader to confirm or cancel your sampling date(s) or if any questions arise before the survey.
- Arrive at the survey site at least 30 minutes before peak high tide (the time shown in Better Impact and survey schedule is the high tide time). Allow for walking time to the survey area. Record the time you arrive on the Beach Site Data Sheet.
- Survey team leader will review safety information and collect liability waivers for new or renewing volunteers.
- Fill out the Beach Site Data Sheet as completely as possible before starting the survey, including water and air temperature and obtaining a water sample.
- If the weather prevents you from doing the survey, please fill out the top and survey cancelled box in the Beach Site Data Sheet with all possible information and explain why the survey could not be completed. If weather conditions allow, take water and air temperature and obtain a water sample.
- Observations and Comments: Note any special conditions at your site that might affect the count or would be interesting to report to the survey groups. Use the back of the sheet as necessary.
- Addresses and phone numbers of participating team leaders and members for each survey date are important in case we have questions about the data. Please enter information legibly.
- Determine starting point (coin flip): To survey horseshoe crabs, you will start at one end of a section of beach and walk to the other end. Along the way you will place quadrats to count crabs. Flip a coin to decide which end of the beach section you will start (flipping a coin gives a 50% chance and maintains our scientific rigor, it does matter). Record the starting point on the Beach Site Data Sheet.
- Determining survey start time: When you get to the starting location, stand a tall stick or other marker in the sand at the water line. Move the marker up the beach as the water rises higher. Begin the survey when the tide begins to recede and the water no longer reaches the stick. Record your starting time on the Beach Site Data Sheet where it says "Start time of Survey."
- While waiting for the tide to begin to recede, take your air temperature, water temperature and collect your water sample. The immersion thermometer should be immersed for several minutes to reach max temperature and then read the temperature while the thermometer is slightly under the water surface.
- Please completely fill one vial with bay water and cap tightly. Write beach and date on vial in permanent marker before collecting sample. These may be kept tightly sealed and unrefrigerated until our final meeting in late June/early July.

Placing the Quadrats/Counting Crabs

- You will count a total of 100 quadrats along the length of the beach and record them in the Tally Sheet. If you count fewer than 100 quadrats, please indicate in the comment section why the survey was stopped or incomplete.
- Team members tasks: One to two people will be responsible for counting crabs, one person will be responsible for moving the quadrat, and one person will record the data. Additional members of the team will search for tagged crabs or help relay information to the recorder. Tag search should not interfere with the survey and it should be performed behind the survey team. If necessary, hold on to the tagged horseshoe crabs found until the end of the survey and then relay the tag number to the recorder.
- Determine the volunteer recorder for the date. To address possible misinterpretation of the handwriting during data entry, the volunteer recorder will write from zero (0) to nine (9) on each data sheet before the start of data collection. This will give a handwriting comparison for the data entry staff or volunteer. It's the recorder's responsibility to write as clearly as possible and help the team leader tabulate the total number of males and females at the end of the survey.
- Starting at the end of the beach determined by the coin flip, the survey will be performed using the quadrat "roll method".
- Using the Random Number Sheet provided, find the column which corresponds to your site. Read the two numbers for the date at that site. Those are the two locations for quadrat placement you will be sampling for the entire night.
- When counting crabs place the top of the quadrat at your toes and the rest towards the bay. The "horseshoe crab line" you will follow is not a straight line, and will follow the crabs so long as you are not more than 1 square meter from the high tide line (the water line at the time of quadrat placement).
- To perform the roll method, you will roll the quadrat on its side along the crab line, skipping over the quadrat numbers till you get to your random numbers for the night. For instance, if your random numbers are 1 and 2, you position the quadrat at the crab line (even with the crabs within 1 square meter of the tide line), and you "roll" the quadrat over on its side once to skip over quadrat position 0, then you place the quadrat flat down and count the crabs inside quadrat position 1. The counter will count all crabs within the quadrat, giving the number of males first followed by the number of females.
- After recording the males and females (even if it is zero!). Put the quadrat back on its side (standing up), and roll it again once (to put it in quadrat position 2), then flatten it at that position and perform another count at quadrat position 2.
- Depending on your beach's maximum width, the number of times you will roll the quadrat again to get back to quadrat position 1. For example, the James Farm, Ellis Point, Camp Arrowhead, Little Assawoman, and Tower Road have a maximum number of 2, while Bay Colony goes up to 5. If you were at the James Farm, you would roll from position 2 to get to quadrat position 0, then again to get to position 1, now count.

  If you were at Bay Colony, you would roll from position 2 to get to position 3, again to position 4, again to position 5, and again to position 0, then roll once again to position 1 and count.

- The Peninsula counts 100 consecutive quadrats and does not use random numbers.

- Count all horseshoe crabs 'in the quadrat'. An animal is considered 'in the quadrat' if more than half of its body is inside the quadrat. Count and record males and females separately. If during your count, a HSC leaves the quadrat, it should be counted. Likewise if one enters, count it as well. It is suggested to start your count from the edges of the quadrat to count HSC that may leave first.
- Repeat the quadrat placement with the same numbers. Do this until you have sampled 100 quadrats and filled in all your quadrat boxes on the Tally Sheet.
- It is the counters' responsibility to make sure the recorder gets all tallies before rolling to the next quadrat. At this time, just one team member will relay the count of all crabs 'in the quadrat'. Call out male counts first, then female counts. Team leaders can assess their team members' interest in participating in different roles of the survey ('Quadrat roller' and 'Counter') and switch members' roles at the 50 quadrat mark, 'Recorder' must be the same person throughout the survey. Remember, rollers, counters and recorders should all have completed training - all other volunteers should be assigned other roles.

Important Notes on Counting

- When animals are numerous, you may have to lift some up to assure you've counted all of those underneath. Heavy work gloves will be useful for this. Try to minimize disturbance to the spawning horseshoe crabs.
- If crabs are very numerous and moving around, start your count on the edges of the quadrat to count the crabs before they exit the quadrat, then work your way towards the middle.
- Spawning females will be partially buried in the sand while laying eggs. *Do not lift up a partially buried horseshoe crab*.
- Count the animals of each sex separately. If a horseshoe crab is not buried, the two most common ways to determine its sex are its size and position. Males are for the most part smaller and clasped or crowding on top of females. There also tends to be more males than females.
- Report your count of each sex to the recorder who will record the information under TOTAL. Report zero (0) when there are no horseshoe crabs within the quadrat. Do not try to move the quadrat from the preselected quadrat location just to include one or more nearby animals. Empty quadrats are just as important as those with horseshoe crabs because they will help reflect changes in the population.
- Once the tide begins to recede, horseshoe crab spawning activity begins to wane. Therefore, it is critical to complete the survey as quickly as possible to ensure reliable data. Any other activities (e.g., recording of tags or additional counting) must be done behind the survey team. No animals should be disturbed before the surveyors have completed their count. Additional team members may scout for tagged HSCs outside the quadrats.

Important Notes to the Team Leaders

- We need to be aware that people may come out and want to help or tag along. If additional individuals not previously registered for the sampling or tagging date arrive on site:
    - As with everyone else, they will need to sign the volunteer liability waiver.

- Team members that sign-up ahead of time will have priority to perform roles of the survey (Recorder, Quadrat roller, and Counter).
- Be welcoming and if possible allow for the team to continue the survey and focus your attention on providing a welcoming environment to everyone present by answering questions or providing information about the survey process.

Once You Are Done Surveying

- Record the time in the space marked "End of Survey" on the Beach Site Data Sheet.
- Once everyone has left the beach and all materials are secure, record the "Departure Time" in the space marked on the Beach Site Data Sheet.
- Return all of the following to the Manager of Community Science after each survey cycle (one moon cycle of three survey dates). Note: PLEASE DO NOT FAX! WE NEED ORIGINALS!)
  - Completed Beach Site Data Sheet
  - Completed Tally Sheet
  - Names and contact information for all volunteers (sign-in sheet)
  - Liability waiver forms for all new volunteers and visitors
  - Water samples

Horseshoe Crab Survey Contacts

Coordinators

- Nivette Pérez-Pérez (Center), Manager of Community Science
  Office: 302-226-8105 x709, Email: nperezperez@inlandbays.org

- Mary Kunst (Center), Participatory Science Technician
  Office: 302-226-8105 x722, Email: volunteer@inlandbays.org

Site Team Leaders

Site	Team Leader (s)	Phone Number	Email
Tower Road	Isabel Benson	302-228-2383	issy1to4@comcast.net
James Farm	Lori & Tom Whitehaus	717-571-6284/ 717-673-6975	ljwhitehaus@gmail.com/ tomwhitehaus@gmail.com
Bay Colony	Bridget OShaughnessey	301-467-0237	bridgetoshaughnesseyusa@gmail.com
The Peninsula	Rosemary and Ed Hoffmann	973-300-5325	hoffmannrosemary@yahoo.com; edhoffmann713@yahoo.com
Ellis Point	Terry Shuchart	717-586-4043	tshuchart713@gmail.com
Camp Arrowhead	Gary Nennstiehl Kristin Peters	410-251-0477	garynenn@gmail.com adultsknowbetter@gmail.com

Equipment & Supplies

Kit Contents

- Five-gallon buckets
- Quadrat (PVC frame) - 1 m^2
- Clipboard case w/Pencils and sharpie
- Data Sheets: Quadrat Tally and Beach Site
- Extra headlamps for visitors and AAA Batteries
- Vials for water sample-labeled
- Air thermometer
- Immersion thermometer (read thermometer underwater!)
- First Aid Kit
- Protocol sheets, sign-in, liability waivers, incident reports & Scientific Collection Permits/ Special Use Permit (Tower Road Only)

Personal Things to Bring

- Headlamps or flashlights
- Insect repellant
- Closed-toe shoes w/ soles (no bare feet or flip flops)!
- Mobile phone with Team members and emergency numbers
- Camera in Ziploc bag for water resistant storage
- Gloves