

# Inland Bays Horseshoe Crab Spawning Survey



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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. Volunteers who do not, or cannot, follow these rules will not be permitted to participate.

- All volunteers must sign a liability waiver form, including parents or guardians who accompany minors. Minors must be supervised by an adult at all times.
- 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!]
- 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 lift animals up to count those underneath.
- 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 secure and confirm your sampling date(s).
- Arrive at the survey site at least 30 minutes before peak high tide. 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.
- Fill out the Beach Site Data Sheet as completely as possible, including water and air temp and obtaining a water sample.
- If the weather prevents you from doing the survey, please fill out the Beach Site Data Sheet with all possible information and explain why the survey could not be completed. If possible take water and air temp and obtain 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 back of 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.
- Determine starting point (coin flip): To survey horseshoe crabs, you will start at one end of a section of beach, walk to the other end, and along the way place quadrats to count crabs. Flip a coin to decide which end of the beach section you will start. 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 tide line. The tide line is the highest point on the beach that the water reaches. Move the marker up the beach as the water reaches higher on the beach. 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 temp and then read the temperature while the thermometer is slightly under the 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 quadrants along the length of the beach and record them in the Tally Sheet.
- Team members tasks: One to two people will be responsible for counting crabs, one person will be responsible for moving the quadrat, one person will record the data, and the fourth member of the team will search for tagged crabs or help relay information to the recorder.

- Starting at the end of the beach determined by the coin flip, the survey will be performed using the quadrant “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 quadrant 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.
- 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 3, 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. Put the quadrat back on its side (standing up), and roll it again once (to put it in quadrat position 2), again a second time (quadrat position 3), then flatten it at that position and perform another count at quadrat position 3.
- Depending on your beaches maximum number 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 3, while Bay Colony goes up to 5. If you were at the James Farm you would roll from position 3 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 3 to get to position 4, again to position 5, again to position 0, and again to position 1, then count.
- The Peninsula counts 100 consecutive quadrats and does not use the 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.
- Repeat the quadrant placement with the same numbers. Do this until you have sampled 100 quadrants and filled in all your quadrat boxes on the [Tally Sheet](#).
- It is the counter’s responsibility to make sure the recorder gets all tallies before rolling to the next quadrat. At this time just one team member will count all crabs ‘in the quadrat’. Call out [male counts first, then female counts](#). Team leaders can assess their team member’s interest in participating in different roles of the survey (‘Quadrat roller’ and ‘Counter’) and switch member’s roles at the 50 quadrant mark, ‘Recorder’ must be the same person throughout the survey.

## 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).

## Once You Are Done Surveying

- Record the time in the space marked END OF SURVEY on the Beach Site Data Sheet. If you are tagging immediately after the count, there is a line for the stop time after tagging.
- Return all of the following to the Manager of Community Science: (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 (CIB), Manager of Community Science  
Office: 302-226-8105 x709, Email: [volunteer@inlandbays.org](mailto:volunteer@inlandbays.org)
- Dennis Bartow (CIB), Survey Coordinator  
Email: [bartoden@gmail.com](mailto:bartoden@gmail.com)
- Karen Ritgert (CIB), Survey Co-Coordinator  
Email: [kritgert@hotmail.com](mailto:kritgert@hotmail.com)

### Site Team Leaders

Tower Road	Susan Ball	610-299-9328	balldel@comcast.net
James Farm	Dennis Bartow	610-675-5026	bartoden@gmail.com
Bay Colony	Sue Cummings	302-824-9494	susie238@comcast.net
The Peninsula	Rosemary and Ed Hoffmann	973-300-5325	hoffmannrosemary@yahoo.com; edhoffmann713@yahoo.com
Ellis Point	Karen Ritgert	410-967-4592	kritgert@hotmail.com
Camp Arrowhead	Gary Nennstiehl Kristin Peters	410-251-0477	garynenn@gmail.com adultsknowbetter@gmail.com
Little Assawoman	Bob Collins	302-226-8105 ext. 711	jamesfarm@inlandbays.org

## Equipment & Supplies

### Kit Contents (5 Gal Bucket)

- Quadrat (PVC frame) - 1 m<sup>2</sup>
- Clipboard case
- Datasheets & Tagging Sheets
- Pencils w/erasers
- 3 Extra headlamps for visitors & AAA Batteries
- Vials for water sample-labeled
- Air thermometer
- Immersion thermometer (read thermometer underwater!)
- First Aid Kit
- Sanitizing wipes
- Protocol sheets, liability waivers, incident reports & Scientific Collection Permits / Special Use Permit (Tower Road Only)

### Personal Things to Bring

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