

Inland Bays

Horseshoe Crab

Spawning Survey

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.
- 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 beneath crabs or lift animals up to count those underneath.
- Keep an eye out for tripping hazards or debris that may cause injuries.
- 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.

- 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

- Arrive at the survey site at least 30 minutes before high tide. Allow for walking time to 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 sheet as completely as possible. Even 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.
- 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 each survey team member are important in case we have questions about the data. Your address is also needed so we can send you a report of the survey findings for the season.
- 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."

Placing the Quadrats/Counting Crabs

- You will count a total of 100 quadrants along the length of the beach

- Starting at the end of the beach determined by the coin flip, have one person hold the rope with 1m tape marks. A second person should walk down the beach until the rope is fully extended.
- 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.
- For instance, if the numbers are 0 and 3, you would drop the near end of the quadrant down at your toes at the beginning of the rope, with the far end extending to the 1m mark on the rope. Place one side of the quadrat even with the line of horseshoe crabs and the opposite side towards the bay. The 'horseshoe crab line' you will follow is not a straight line, and may be above or below the water line. After counting all the crabs "in that quadrat", skip over meters 1 and 2, and place the near end of the quadrant down at meter 3, with the far end of the quadrant extending to the 4m mark on the rope. 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.
- After counting the two quadrants (whichever numbers are on the random number chart) the person holding the beginning of the rope walks to the person holding the end of the rope. The person holding the end of the rope walks down the beach until the rope is fully extended. Repeat the quadrant placement with the same numbers. Do this until you have sampled 100 quadrants.
- It is the observer's responsibility to make sure the recorder gets all tallies before pacing to the next quadrat.

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.
- 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.

Once You Are Done Surveying:

- Record the time in the space marked END OF SURVEY on the Beach Site Data Sheet.
- Return all of the following to the HSC Survey Coordinator: (Note: PLEASE DO NOT FAX! WE NEED ORIGINALS!)
 - Completed Beach Site Data Sheet
 - Completed Tally Sheet
 - Names and contact information for all volunteers
 - Liability waiver forms for all new volunteers and visitors
- Please fill one vial with bay water and cap tightly. Write beach and date on vial in permanent marker. These may be kept tightly sealed and unrefrigerated until our final meeting in late June/early July.

Horseshoe Crab Survey Contacts

Coordinators:

- **Dennis Bartow** (CIB), Survey Coordinator
Cell: 610-675-5026, Home: 302-539-4774, Email: bartoden@gmail.com
- **Andrew McGowan** (CIB), Environmental Scientist
Cell: 732-674-2368, Office: 302-226-8105x112, Email: environment@inlandbays.org

- **Marianne Walch**, CIB Science & Restoration Coordinator
Cell: 302-344-6608, Office: 302-226-8105 x105, Email: science@inlandbays.org

Site Team Leaders:

Tower Road	Bob Collins	302-448-6864	bcollins@mchsi.com
James Farm	Dennis Bartow	610-675-5026	bartoden@gmail.com
Bay Colony	Pat Drizd	302-381-9121	pdrizd@mediacombb.net
Coastal Kayak-LAB	Cheryl Rehrig	61-39-1535	rehrigca@gmail.com
The Peninsula	Val Ellenberger	240-401-4677	valellenberger@gmail.com

Equipment & Supplies

Kit Contents (5 Gal Bucket)

- Quadrat (PVC frame) - 1 m²
- Transect rope
- Clipboard case
- Datasheets
- Pencils w/erasers
- Extra headlamps for visitors & AAA Batteries
- Vials for water sample-labeled
- Air thermometer
- Immersion thermometer
- First Aid Kit
- Protocol sheets, data sheets & liability waivers

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

