

Horseshoe Crab (*Limulus polyphemus*) Spawning Activity Survey Protocol for the New York State Marine District

Total Count Protocol



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www.NYhorseshoecrab.org



Cornell University
Cooperative Extension
of Suffolk County



New York State Department of
Environmental Conservation

HORSESHOE CRAB SPAWNING SURVEY FOR NY MARINE DISTRICT

Thank you for choosing to participate in our annual survey of spawning horseshoe crabs. Your help with this project is crucial to reaching our goals of developing reliable sampling methods for data collection, and to acquire biological information on horseshoe crabs in New York's Marine District. This data will be used by the NYS Department of Environmental Conservation to help assess the status of horseshoe crabs in the NY Marine District and assist with the management and conservation of this important species. By participating in this survey, you will be helping to measure spawning abundance, size, and gather tagging data around full and new moon events from May to July. Trained site coordinators will be present to teach you how to assist with the survey, however, it is important that you take the time to read through this document beforehand. By doing so, you will come properly prepared and allow the survey to run efficiently.

Contents:

1. This set of instructions.
2. Date of census and Sampling Schedules.
3. Data sheets for recording observations.

Additional field monitoring equipment that is required for this project will be provided by site coordinators (Table 1) on the night of sampling. Monitoring program questions or comments can be directed to the lead project coordinators at Cornell University Cooperative Extension (631) 727-7850 x353; and NYS DEC, (631) 444-0469. Also, visit our website: www.NYhorseshoecrab.org

PREPARATION FOR THE SURVEY

If you are participating directly through Cornell Cooperative Extension or the NYS DEC, you **MUST** fill out the "Risk Waiver Forms" that are available on our website: www.NYhorseshoecrab.org or from the site coordinator. If you plan to participate in the survey more than one night, you must also fill out the consent form for a background check (also found on the website). If you are participating through another organization, please be sure to fill out any of their required forms too.

Clothing and Accessories:

- Wear appropriate clothing for night walks. Foul weather, and wet conditions at the water's edge may require appropriate attire. Consider using sunscreen during the day and insect repellent at night.
- **IF THUNDERSTORMS ARE PRESENT, OR CONDITIONS ARE UNSAFE, DO NOT GO ONTO BEACH.** The site coordinator will determine if the survey should be cancelled.
- Bring a headlamp or flashlight. Headlamps are useful because they free up both hands.
- Bring a clipboard or hard surface to write on. Also, bring a couple of pencils and a sharpener.
- Work gloves may be useful if there are high densities of horseshoe crabs on the beach, as you may have to occasionally lift animals up to count those underneath.
- NO BARE FEET! Shoes are a necessity. We recommend rubber boots, water shoes, or old sneakers.
- An accurate wristwatch is needed for recording arrival time, survey starting and finishing times.
- Cell phone for emergencies or calling lead coordinator(s) for assistance with problems.

SURVEY PROTOCOL

SETUP:

If you are participating directly through Cornell Cooperative Extension or the NYS DEC, you **MUST** fill out the “Risk Waiver Forms” that are available on our website: www.NYhorseshoecrab.org or from the site coordinator. If, however, you are participating through another organization, please be sure to fill out any of their required forms too.

The survey protocol, aerial photo and driving directions to the survey sites are also available on our website and from the site coordinator.

You will be surveying in groups of **at least two people** (e.g. minimum of a Site Coordinator and one participant).

Please note that children under the age of 18 must be accompanied by their parent or a legal guardian.

Arrive at the designated beach **at least 30 minutes prior to** the scheduled sample time to meet the Site Coordinator (see our website for sampling schedules). Please access the sample locations from the appropriate areas we have indicated on our website. The site coordinators can also provide any specific instructions for your location if needed. Record the time you arrive in the space marked ARRIVAL TIME on the Data Sheets.

When surveying, fill out as much of the Survey Data forms as possible. Addresses and phone numbers of each survey team member are important in case we have questions about the data. **Note: even if the weather prevents you from doing the survey, please fill out the survey sheet with all possible information and explain why the survey could not be completed.**

Enter the required environmental data on the Survey Data Form before starting the horseshoe crab counts.

Each beach will be sampled along a transect that will be pre-marked with signs posts indicating the beginning and end points of the survey site.

To survey the horseshoe crabs, you will start at one end of the marked section of beach. Flip a coin to decide which end of the beach you will start (Start Point): if heads, start at the stake furthest west (or north); if tails, start at the stake furthest east (or south). Circle Starting Point Location on the Data Sheet.

At exactly the scheduled “start time” (See site tables), you should begin counting spawning horseshoe crabs at the ‘Start Point’. Record your start time on the Data Sheet where it says START OF SURVEY.

Estimating Offshore Visibility to Count Submerged Crabs

- It is **very important** that we accurately estimate the distance from the shore that participants are able to visually detect and count horseshoe crabs in the submerged zone. Site coordinators are provided with a sinking ball that has a line attached and is demarcated in meters (Double lines, black color) and ½ meters (Single lines, red). Be sure to take these measures at **both the Start and Finish** of the survey.

- Hold the end of the line in your non-throwing hand, then stand at the water's edge and throw the ball (with your other hand) perpendicular to the shoreline into the water. The ball will sink to the bottom. Once the ball settles on the bottom, slowly retrieve it by pulling the attached line and focusing your flashlight/headlamps (used to count the horseshoe crabs) into the water in the vicinity of the thrown ball to find it.
- Once the ball is visually observed with the flashlight, use the increments on the line to count the linear distance into the water that you were able to see the ball (count to the ball). This information is recorded on the data forms before the survey begins. (See Data Form).
- *Note: For participants who do not have this gear, please do your best to estimate the distance at which you can accurately count the submerged horseshoe crabs with your flashlights, but **do not go in the water to do this.***

I. Counting Horseshoe Crabs

A) Total Counting Method

- Although you will be walking the length of the transect, you will not be walking a straight line. You will have to walk close to the waterline, but **NEVER** below it. It is also important that you steadily move forward toward the end point once you have started the survey to complete the entire sample area. Try to maintain your pace.
- After flipping the coin start at either boundary marker (i.e. start of finish sign posts or other designated markers).

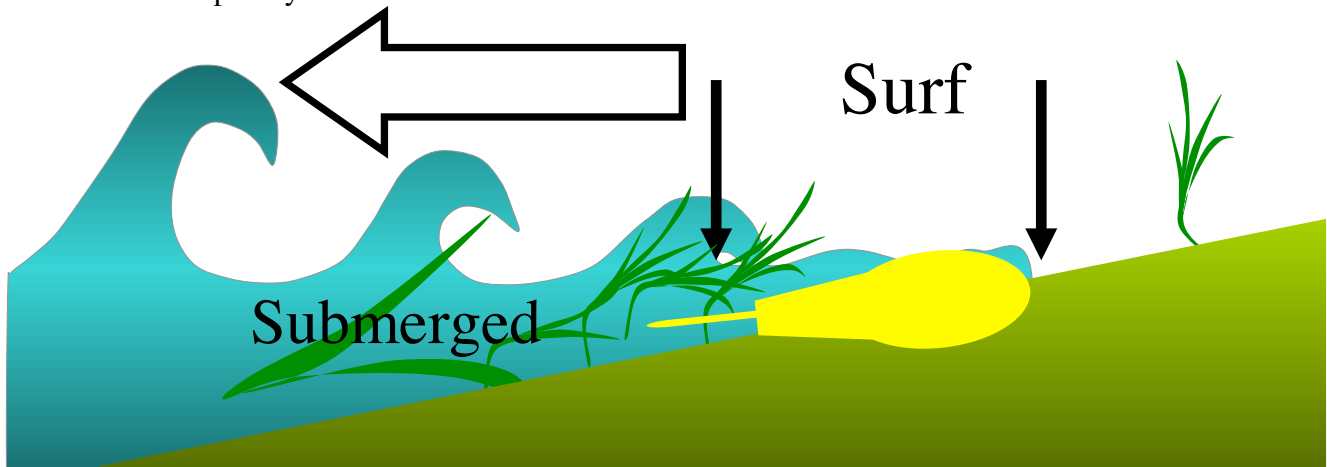
1. Begin the survey at the exact scheduled Start Time. You should start walking from the 'Start Point' marker and walk the beach toward the other marker ('End Point') while counting crabs along the way. You can stop while counting, but do not walk backwards and re-count. Your flashlights should also be utilized to assist in your counting and recording.

2. The Observer will walk near the high tide line and count out loud the number of horseshoe crabs (Males and Females; described below) on the beach in the "**Surf Zone**" (typically the area where the waves break and wash over the horseshoe crabs, Figure 1), and the Recorder (second person) records these observations on the Data Sheet. The Observer should always focus on counting horseshoe crabs that are spawning on the beach according to the following rules:

- a. Crabs above the Surf Zone (on beach): Count all that are present.
- b. Crabs in the Surf Zone: Count all that are present.
- c. If a spawning cluster is partially in the Surf Zone and some of the attached members are also submerged (Figure 1): Count all individuals in the Surf Zone and include the submerged crabs that are obviously part of the spawning cluster as a Surf Zone count.

- Count the animals of each sex separately. Female horseshoe crabs can be easily identified since they are buried. If, however, 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 'clapsed' or crowding on top of females. There also tends to be more males than females.

Figure 1. Sampling zones and beach profile for horseshoe crab survey. The “Surf Zone” is typically the area where the waves break & wash over horseshoe crabs spawning on the beach. The “Submerged Zone” is where the animals are completely underwater.



3. **Submerged Count** Simultaneously count the number of horseshoe crabs that are fully submerged and not part of a spawning cluster in the surf zone as described above.

NEVER go in the water to search for submerged crabs.

Remember that the “Submerged Zone” tallies ONLY include crabs that are not part of a spawning cluster in the “Surf-Zone” or beach (see previous section and Figure 1).

It is VERY important that the Observer CLEARLY indicate to the Recorder which zone was just counted: 1) Surf Zone or 2) Submerged Zone. It is recommended that the Observer always start with the “Surf Zone” count, and then secondarily count in the “Submerged Zone”. Regardless, once an Observation pattern is established it should remain consistent for the duration of the survey to reduce confusion and error. The Recorder must carefully keep track of this on the Data Sheet and record them in the proper data sections (“Surf” or “Submerged”; along with the corresponding transect number).

The Observer should also estimate and record the average distance off the beach that they can visibly detect/see the crabs counted in the “Submerged Zone”.

Please remember that the counting data is the most important data to collect accurately, so please take your time to do these tallies correctly.

4. Continue down the beach toward the ‘End Point’ and count spawning horseshoe crabs along the way in each transect area. It is the Observer's responsibility to make sure the Recorder gets all the tallies before walking further down the beach.

5. If you spot any previously tagged horseshoe crabs (see: Button Tagging section below) while counting, please check the number on the tag and record it on the Data form under the section: “Recovered Tag ID #’s”.

6. When finished counting please make sure all information is accurately recorded on the Data Sheet.

II. Button Tagging and Measuring Horseshoe Crab Size

Setup:

After completing the spawning count, the Site Coordinator will lead the button tagging and size (prosoma width) measurements on horseshoe crabs.

- The HORSESHOE CRAB TAGGING & SIZE DATA FORM must be used to record all size and tagging information.
- When tagging and measuring horseshoe crab size please observe these general rules:
 - **Do NOT go in the water to collect animals.**
 - You can measure and possibly tag a female horseshoe crab that is partially buried in the sand and not yet depositing eggs (i.e. starting to nest only), but do not move her.
 - If you measure a mating pair, do not separate them.
 - NEVER lift or move a horseshoe crab by its' tail.
 - Return any crabs that were moved during this process, facing down-slope in the “Surf Zone” with legs in sand.
- The team will walk from the “End Point” back toward the “Start Point” and try to tag and size as many male and female horseshoe crabs along the transect as possible, or as time permits. A recommended minimum number for size measurements and tagging is: 20 males and 20 females, but do as many as the team feels they can manage or permitted to do by a regulatory agency
- ONLY consider tagging and measuring crabs that are above or within the Surf Zone. NEVER collect any crabs that are fully submerged to tag or size.

Button Tagging Protocol: Crabs that will be tagged and sized can gently be manipulated, but using only the prosoma (head region).

1. The site coordinator will lead the tagging effort and be the ‘Observer’.
2. The ‘Recorder’ will use the Data form entitled: “Tagging and Size” to record data.
3. Tags will be attached to the left posterior (rear) point of the prosoma (first section of body, see Figure 2) for both male and female horseshoe crabs. It may first be necessary to clean off any epibionts (barnacles, etc.) near the attachment site.
4. The ‘Observer’ will indicate the sex of the individual and then state the “Tag Identification Number” for the Recorder to write on the data form.
5. The button **Tag** is attached by carefully creating a small (5/32") hole on the **LEFT** side of the prosoma near the dorsal edge with a hand driver. The tag is then pushed into the hole as far as it will go (it should NOT go all the way through the prosoma and come out the other side). Only attach one tag per animal. If the animal is damaged near the attachment area, attach the tag to the opposite side, or do not tag it.
6. The Observer will then measure the **Size** of the tagged individual as described below (Please note that you can measure size first and then tag).

Size Protocol: Size can be recorded as part of the tagging process, and also if no animals are going to be tagged that evening.

- a. The Recorder will use the Data form entitled “Tagging and Size”.
- b. The Observer will measure prosoma width (size) of the horseshoe crab (Figure 2).
- c. **Size:** The Observer will use calipers to measure (centimeters) the horseshoe crab’s prosoma at the widest point (Figure 2, typically a little behind the large compound eyes) on the dorsal side (i.e. crab’s legs facing down in sand).
- d. The Recorder will write the size (centimeters) on the appropriate data sheet.

- e. If a female is buried, use your hands to gently excavate enough sand around the prosoma to measure with the calipers, and then replace the sand. However, do NOT remove the crabs from the sand to attain a measurement.
- f. Repeat this process on all crabs that were tagged. If no tagging was done, size measures should be recorded on as many individuals as time allows (e.g. 20 males and 20 females).

Remember: Do not go into the water to collect animals, do not move a female that is nesting (buried in the sand), do not separate mating pairs. Please also place the crabs back in the “Surf Zone” facing down-slope if they were moved above the water line during these measurements.

Figure 2. Size measurements and placement of button tag on horseshoe crabs.



Additional Notes:

- When there are numerous animals, you may have to lift some up to assure you've counted all of those underneath. Heavy work gloves will be useful for this. Do NOT remove a spawning female that is buried in the sand, or lift horseshoe crabs by their tails.
- If there is an obstruction or discontinuation in the beach section (large debris, large boulder, etc), pace up to the obstruction, walk to the other side of it, and then continue your survey count on the other side. Please indicate the type of obstruction and size on the Data Sheet.

Report zero (0) when there are no horseshoe crabs on the beach. If you observe horseshoe crabs that are fully submerged and not part of the spawning cluster in the “Surf Zone”, you can choose to record the information, but **NEVER** go into the ‘Submerged’ Areas to count. Zero counts are just as important as those with horseshoe crabs present because they will reflect changes in the abundance.

When you are finished surveying: Record the time in the space marked END OF SURVEY on the Data Sheet. Send all ORIGINAL Data sheets to the address below (Note: PLEASE DO NOT SEND A FAX ONLY. WE NEED THE ORIGINAL DATA SHEETS!). Please make a backup photocopy of the Data Sheet before mailing the original to us at:

Matthew Sclafani
Cornell University Cooperative Extension
423 Griffing Ave.
Riverhead, NY 11901
Phone: (631) 727-7850
Fax: (631) 727-7130
Email: ms332@cornell.edu

Table 1. Site Coordinator contacts. Please contact the site coordinators for the locations that you wish to volunteer at prior to the night of sampling. If you have any difficulties, please contact any of the principal coordinators.

Principal Project Coordinators	Barry Udelson Sherryll Jones Matthew Sclafani	631-727-7850, x365; bu25@cornell.edu 631-727-7850, x353; sj497@cornell.edu 631-727-7850, x377; ms332@cornell.edu
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Sampling Sites	Coordinators	Contact Information
Big Egg, Brooklyn	Debra Kriensky	617-835-3000; email: dkriensky@nycaudubon.org
Calvert Vaux & Kaiser Park, Brooklyn	Ellen Hartig	212-360-1481; email: Ellen.Hartig@parks.nyc.gov
Captree, Babylon	Peter Walsh Enrico Nardone	631-581-6908; email: Pwalsh@seatuck.org 631-487-0071; email: egnardone@seatuck.org
Centerport Yacht Club	Susan Hirshman	hirschmarine@aim.com
Conference House Park, Staten Island	Karen Roos John Kilcullen	718-667-7475 ext 1; email: Karen.Roos@parks.nyc.gov email: john.kilcullen@parks.nyc.gov
Crab Meadow	Virginia Mallon-Ackerman	631-262-1487; email: virginiamallon@yahoo.com
Dead Horse Bay, Brooklyn	Christine Nealy Debra Kriensky	646-648-2326; email: Christine.Nealy@trinityschoolnyc.org 617-835-3000; email: dkriensky@nycaudubon.org
Fishers Island	Carol Giles	email: c.giles@fischool.com
Great Kills Park, Staten Island	Kathy Garofalo	718-354-4655; email: kathy_garofalo@nps.gov
Jones Beach, Wantagh	Suzanne Montefinise	516-780-3295; email: Suzanne.Montefinise@parks.ny.gov
Mt. Sinai Harbor	Patrick McKeown	email: pmckeown214@gmail.com
Oyster Bay (Beekman & TR)	Cameron Jenness	516-922-7245 ext 24; email: Cameron@thewaterfrontcenter.org
Pikes Beach, Westhampton	Gina Mulhearn Mark Cappiello	631-288-8014; email: ginamulhearn@gmail.com cappiellomark@yahoo.com
Plum Beach East, Brooklyn	Debra Kriensky	617-835-3000; email: dkriensky@nycaudubon.org
Plum Beach West, Brooklyn	Phil Cusimano	Email: philip_cusimano@msn.com
South Harbor Rd., Southold	Jessica Kennelly Christine Tylee	631-765-6450 ext215; email: jkennelly@eastendenvironment.org 631-765-6450 ext208; email: ctylee@eastendenvironment.org
Squire Pond, Hampton Bays	Brian Frank	631- 324-2178; email: brifrank@optonline.net
West Meadow Beach, Stony Brook	Phylis Chin Frank Chin	PChin@theofficeworx.com 631-689-1080; email: frank.chin@sunysb.edu