

SURVEYING SPAWNING HORSESHOE CRABS

CONTENTS:

1. These instruction sheets
2. Date of census and High Tide Times Tables '
3. A 20 meter string for estimating pace length
4. Pacing trial form
5. Tally sheet for recording data.
6. Beach site sheet for recording volunteer and physical information (names of observers and recorders, amount of cloud cover, etc.)

The 1 m² quadrat used for sampling will be provided by survey coordinators. (Benjie Swan (609) 465-6552 or Bill Hall (302) 645-4253)

PREPARATION FOR THE SURVEY:

*Determine your pace Follow **these instructions** before your first assigned time to survey and preferably on a beach since pace length is affected by the surface you are walking on. This should take 15 to 20 minutes to complete.*

*Note: Each person only has to determine their pace **ONCE** for the whole season.*

- Lay the 20 m string out straight on the ground. You will use this to fill out the Pacing Trial Form.
- Count the number of paces it takes you to walk the length of the string using your normal stride. Remember that a pace equals two steps. Enter this number in the space next to TRIAL 1 on the Pacing Trial Form.
- Repeat this process twice more. Enter the second number next to TRIAL 2 and the third number next to TRIAL 3.
- These three numbers are A, B, and C on the Pacing Trial Form. Add A, B, and C, and divide this number by three to find D, your average number of paces per 20 meters.
- Divide D by 20 to find your average number of paces per meter (E on the form).

Note: The average number of paces per meter is probably different for each person, because it depends on your stride length. So, it is important you do this yourself and know these numbers before you arrive at the beach.

Clothing and accessories

- Wear appropriate clothing for weather and wet conditions at the water's edge. Consider using sunscreen during the day and insect repellent when needed. *If thunderstorms are in progress, do not go onto beach.*
- Bring a headlamp or flashlight. Headlamps are preferred because they free up both hands.
- Bring a clipboard or hard surface to write on. Also, bring a couple of pencils and a means to sharpen the pencils.
- Work gloves may be useful if there are high densities of horseshoe crabs on the beach. You will have to lift animals up to count those underneath.
- Shoes are a necessity. We recommend watersheds, old sneakers, or boots. *Do not go barefoot.*
- An accurate wristwatch is needed for recording arrival time, as well as time survey is begun and finished.

SURVEY PROTOCOL

- At many beaches the endpoints of the survey area may be difficult to locate in the dark. You are strongly encouraged to visit your assigned beach during daylight hours before your scheduled survey time, to determine where these endpoints are.

Setup

- Arrive at the beach *at least* 30 minutes before high tide. Record the time you arrive in the space marked ARRIVAL AT SITE on the Beach Site Sheet.
- Fill out the beach site sheet as completely as possible. 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. Even if the weather prevents you from doing the survey, please fill out the Beach Site Sheet with all possible information and explain why the survey could not be completed.
- 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: if heads, start at the down-bay end; and if tails start at the up-bay end. Circle down-bay or up-bay on the Beach Site Sheet where it says STARTING LOCATION.
- Find the boundaries of the beach section by pacing from the beach access. The distance to pace depends on the beach you will be surveying. For example, if the beach access is at the midpoint of the beach section and the beach section is 1 km long, then you would pace 500 m from the access to the starting location you chose by flipping a coin. The survey coordinators, Benjie Swan and Bill Hall, will provide specific instructions for your particular beach.
- As you walk to the starting location find a stick (1 to 2 ft. long) that you can use to determine high tide. When you get to the starting location, stand the stick in the sand at the tide line. The tide line is the highest point on the beach that the water reaches. Move the stick 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 Sheet where it says START OF SURVEY.

Placing the Quadrats

- You will be surveying in groups with at least two people. A survey protocol diagram which is printed on the back of the Beach Site Sheet illustrates the placement of quadrats described below.
- The 'horseshoe crab line' you will follow is not a straight line, and may be above or below the water line.
- If there is an obstruction or discontinuation in the beach section (bulkhead, large boulder, etc), pace up to the obstruction, walk to the other side of it, and then continue your pace count on the other side. Do not include the width of the obstruction in your pace count.

1. The quadrats on the Tally Sheet are numbered 1-100.

If the beach section is 1 km: Choose 2 random numbers from 0 to 19 (Use the random number sheet and instructions to select the random numbers) to locate the 1st and 2nd quadrats within the first 20 m stretch. Then pace 20 m from each random starting point to place the 3rd and 4th quadrats in the next consecutive 20 m stretch. Continue in this way until you have sampled 100 quadrats. (See survey protocol diagram on reverse of beach site sheet.)

If the beach is shorter than 1 km: Divide the length of the beach by 50 to find the distance between every other quadrat. For example, if the beach is 400 m, $400/50 = 8$. Within each 8 m stretch of beach you will place 2 quadrats. Choose 2 random numbers from 0 to 7 to locate the 0 and 2nd quadrats within the first 8 m. Then pace 8 meters from each random starting point and place the 3rd and 4th quadrats in the next consecutive 8 m stretch. Continue in this way until you have sampled 100 quadrat locations. (See survey protocol diagram on reverse of beach site sheet.)

2. When you arrive at the quadrat location, place the quadrat at the toe of your foot on the last step. Place one side of the quadrat even with the line of horseshoe crabs and the opposite side towards the bay. Once the quadrat is in place, follow the instructions below under Counting Horseshoe Crabs.
3. Once you are each done counting and all information is recorded, pick up the quadrat, and pace to the next quadrat. Begin pacing from the toe of your last step.

Note: If there are 2 observers, it may be easier to leapfrog, so that each observer starts at one of the random starting points and then paces to every other quadrat. 4. It is the observer's responsibility to make sure the recorder gets all tallies before pacing to the next quadrat.

Counting Horseshoe Crabs

- Once the quadrat is in place, do not move it until you are done counting.
- You will count all horseshoe crabs 'in the quadrat'. A horseshoe crab is considered 'in the quadrat' if more than half of its body is inside the quadrat.
- 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. 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 You are done surveying,

- Record the time in the space marked END OF SURVEY on the Beach Site Sheet.
- Send all of the following to the address below: (Note: PLEASE DO NOT FAX! WE NEED ORIGINALS!)
 - Completed Beach Survey Sheet,
 - Completed Tally Sheet
 - Completed Pacing Trial Form for each survey team member

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