

Horseshoe Crab Spawning Survey Protocol

Adopted from Cape Cod and Delaware Bay Survey Protocols

SPAWNING SURVEY METHOD – SIMPLE COUNT METHOD

Supplies needed for each site:

- Thermometer
- Pencils
- **Total Count Spawning Data Sheet** and clipboard

Clothing and accessories

- Wear appropriate clothing for the weather and wet conditions at the water's edge. Consider using sunscreen during the day. If thunderstorms are present do not go onto the beach. If the surf is extremely choppy, wait until the next tidal cycle to complete the survey.
- Hip or knee boots or good water shoes, Do not go barefoot!
- **For night surveys bring a headlamp or flashlight (preferably waterproof).**
- An accurate wristwatch is needed for recording start and stop times of the survey.

SURVEY PROTOCOL

- Arrive at the beach at least 30 minutes prior to the high tide.
- Fill out the **Total Count Spawning Data Sheet** as completely as possible. Even if the weather/water conditions 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.
- Record the **Beach Name, Town, and Date.**
- Record the **Surveyor name**
- Record **DAY OR NIGHT** for your survey time
- Record **Beach Length** and circle **meters** or **yards**

- Record the **Survey Start Point East/West** based on coin toss. Flip a coin to decide which end of the beach section you will start. If heads, start at the south or west end of the beach; if tails, start at the north or east end of the beach.
- Record **Start Time** and circle **AM** or **PM**.
- Record the **Air** and **Water Temperature**. For the water temperature, stick the thermometer in the water 3 meters from shore (use the 3m rope)
- Record your best guess of **Wind Speed** and **Direction** (direction wind is coming from!).
- If the survey is at night, **mark an 'X'** next to one of the following: **Complete darkness, Moonlight, or Artificial Light**. (you may mark more than one if there is a moon out and lights on the beach)
- **Mark an 'X'** next to the appropriate **Wave Height** using your best judgment (**less than 6 inches, 6-12 inches, or more than 1 foot**)
- **Mark an 'X'** next to **Precipitation (None, Light Rain, Heavy Rain)**
- **Mark an 'X'** next to indicate whether harvesters are present or not (**YES** or **NO**)

Counting Crabs

Start your survey at HIGH TIDE. It is best to survey in groups with usually 2-3 people. If there are more people with you, the others may start tagging as soon as you finish counting crabs in one particular area. You will be recording the number of horseshoe crabs along the **ENTIRE LENGTH of the beach going out about 3 meters into the water**. It is best to use a pre-measured length of rope, 3 meters long. One person holds one end of the rope and stays at the water's edge, another person holds the other end of the rope and walks into the water until it is taught. The two people walk, staying parallel the entire length of the beach (as far as you have time for, this length should be pre-measured and marked ahead of time).

- 1) If you conduct more than one survey, we hope you will conduct at least 3 surveys during two different lunar cycles (i.e. new or full moons) alternate which end of the beach you start your count. The site will be either marked by a pole or described to the team members before the surveys. Specific instructions will be provided for each particular beach. Dr. Mattei will go out with you on your first count.

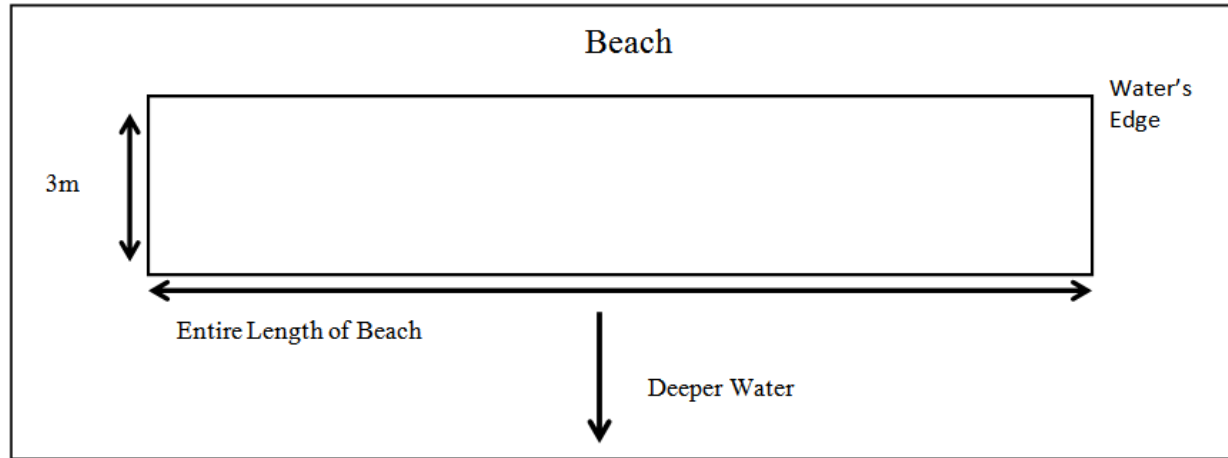


Figure 1: Diagram outlining simple count protocol

- 2) Counting the horseshoe crabs along the beach
- Count all horseshoe crabs along the entire length of the beach going out 3 meters into the water
 - If a female is partially buried in the sand, and you can be 90% sure she is a female (because a male is clasped on to her and she is bigger). Use your hand to feel if she has a tag on either side. If no tag leave her in buried, if you feel a tag, lift her and her mate up far enough to read the tag and then put her back down.
 - Report the crab count on the **Total Count Spawning Data Sheet** in the specified tables using tally marks in the following manner:
 - Single M's - solitary males
 - Single F's – solitary females
 - Pair - One Female and One Male
 - F+2M - One Female and Two Males
 - F+3M - One Female and Three Males
 - F+ __M – Enter number of males touching the female (i.e., 4, 5, 6)

- 3) If you see a horseshoe crab with a tag record the tag number on the **Recapture Data Sheet** provided. Be sure to write down the numbers **ACCURATELY**. Tags may either be yellow cinch tags or White disc tags. Record the tag number of either (or both) tags.



Figure 2: Yellow cinch tags at the back right OR left of the carapace



Figure 3: Or use WHITE disc tags shown

- 4) When you are finished the survey, please total the number of tally marks for each quadrat and enter the number in the total column.
- 5) Start Tagging! Make sure to record the tag numbers, sex, and mate tags on the **Tagging Data Sheet**.

Dates and Times to Census:

Spawning surveys should be conducted within 2 days of the FULL and NEW moon. This gives a ~5 day period (2 days prior, the day of, and 2 days after the moon) window to complete the surveys for each lunar period. It is desirable to survey each location 2 to 3 times during each moon, preferably both day and night (4 to 6 surveys) at each location.

We realize that time can be limiting therefore we would like to establish priorities for conducting the spawning surveys. Therefore, priority for surveys should be given to those dates closer to or on the full or new moon. The minimum number of surveys for a location and moon is 1 DAY and 1 NIGHT survey.

- 1) The **highest priority** survey times are **night high tides on the full or new moon**.
- 2) The **second highest priority** survey times are **night surveys 2 days before and 2 days after the full or new moon**.
- 3) The **third highest priority** survey times are **daytime surveys on the full moon, 2 days before and 2 days after the full or new moon**.