

2009 IWASH HORSESHOE CRAB SPAWNING SURVEY

CONTENTS:

1. This sheet of instructions
2. Date of census and Sampling Schedules
3. A 20 meter string for estimating pace length
4. Pacing trial form
5. Data sheets for recording data (Survey & Tagging and Size)
6. Beach site sheet for recording volunteer and physical information (names of observers and recorders, amount of cloud cover, etc.)

The 1 square meter quadrat used for sampling will be provided by survey coordinator: John Rowden (212.920.1883)

PREPARATION FOR THE SURVEY:

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

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

1. Lay the 20 meter string out straight on the ground. You will use this to fill out the Pacing Trial Form.
2. Count the number of paces it takes you to walk the length of the string using your normal stride. Remember that a pace is two steps. Enter this number in the space next to TRIAL 1 on the Pacing Trial Form.
3. Repeat this process twice more. Enter the second number next to TRIAL 2 and the third number next to TRIAL 3.
4. 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.
5. 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. 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 present or conditions are unsafe, do not go onto beach.**
 - Bring a headlamp or flashlight. Headlamps are the most useful 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 water shoes, 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.
 - Bring a cell phone for emergencies or calling for assistance with problems.
-

SURVEY PROTOCOL:

Setup

- Before you begin, you must fill out the Volunteer Form provided by the project coordinator.
- You will be surveying in groups of **at least two people**. Please note that children under the age of 18 must be accompanied by their parent or a legal guardian.
- Arrive at the beach **at least** 30 minutes before high tide. Please access the site by an appropriate route, the project coordinator can provide specific instructions for your location. 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. 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.
- To survey the horseshoe crabs, you will start at one end of a section of beach and walk to the other end placing quadrats along the way to count horseshoe crabs. Flip a coin to decide which end of the beach section you will start (Start point): if heads, start at the west or north end of the beach; if tails, start at the east or south end of the beach. Circle West/North or East/South on the Beach Site Sheet where it says STARTING LOCATION.

Placing the Quadrats

- You will be surveying in groups of at least two people.
- 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 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 Quadrat Data Sheet are numbered 1-100.
 2. To determine the distance between every other quadrat, we divide the length of the beach section by 50. For example, Plum Beach is ~800 m, $800/50 = 16$. Within each 16 m stretch of beach on Plum Beach you will place 2 quadrats. Choose 2 random numbers from 0 to 15 to locate the 1st and 2nd quadrats within the first 20 m stretch. Continue in this way until you have sampled 100 quadrats.

Plum Beach length: $800 \text{ meters}/50 = 16$

West Pond beach length: $600 \text{ meters}/50 = 12$ (random # between 1 and 11)

Big Egg Marsh beach length: $350 \text{ meters}/50 = 7$ (random # between 1 and 6)

Dubois Point beach length $550 \text{ meters}/50 = 11$ (random # between 1 and 10)

Bay Dunes beach length $500 \text{ meters}/50 = 10$ (random # between 1 and 9)

3. When you have arrived at the correct quadrat location, place the quadrat at the toe of your last step. Place one side of the quadrat even with the line of horseshoe crabs and the opposite side towards the water. Once the quadrat is in place, follow the instructions below under 'Counting Horseshoe Crabs'.
4. Once you are 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.
5. 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.
6. It is the observer's responsibility to make sure the recorder gets all the tallies before pacing to the next quadrat.

I. Counting Horseshoe Crabs

- Once the quadrat is in place try not to move it again 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 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. 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. See last page for diagram.
 - Report your count of each sex to the recorder who will record the information under TOTAL on the Survey Data Sheet. If the recorder is working with another observer, keep the tally in your head until the recorder can record the quadrat counts for you. Don't pick up the quadrat and move to the next quadrat location until you know the recorder has recorded all information for your present quadrat.
 - 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.
 - If you spot any previously tagged horseshoe crabs while counting, please check the number on the tag and record it on the Tagging and Size Data Sheet under the section "Recovered Tag ID #s".

II. Button Tagging and Measuring Horseshoe Crab Size:

Setup

1. After completing the spawning count, you can proceed to the button tagging and size (Carapace Width) measurements on horseshoe crabs.
2. When tagging and measuring horseshoe crab size please observe these general rules:
 - a. **Do NOT go in the water to collect animals.**
 - b. You can measure and possibly tag a female horseshoe crab that is partially buried in the sand and nesting, but do NOT remove her.
 - c. If you measure a mating pair, do NOT separate them.
 - d. NEVER lift or move a horseshoe crab by its tail.
 - e. Return any crabs that were moved during this process, facing down-slope in the "Surf Zone" with legs in sand.
3. 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. An ideal minimum number for size measurements and tagging is: 30 males and 30 females, but do as many as you can.
4. 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).

- a. One volunteer will lead the tagging effort and be the 'Observer'.
- b. The 'Recorder' will use the Tagging and Size Data Sheet.
- c. Tags will be attached to the left posterior (rear) point of the prosoma (first section of body, for both male and female horseshoe crabs. It may first be necessary to clean off any epibionts (barnacles, etc.) near the attachment site.
- d. The 'Observer' will indicate the sex of the individual and then state the "Tag Identification Number" for the Recorder to write on the Tagging and Size Data Sheet.
- e. 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.
- f. 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.

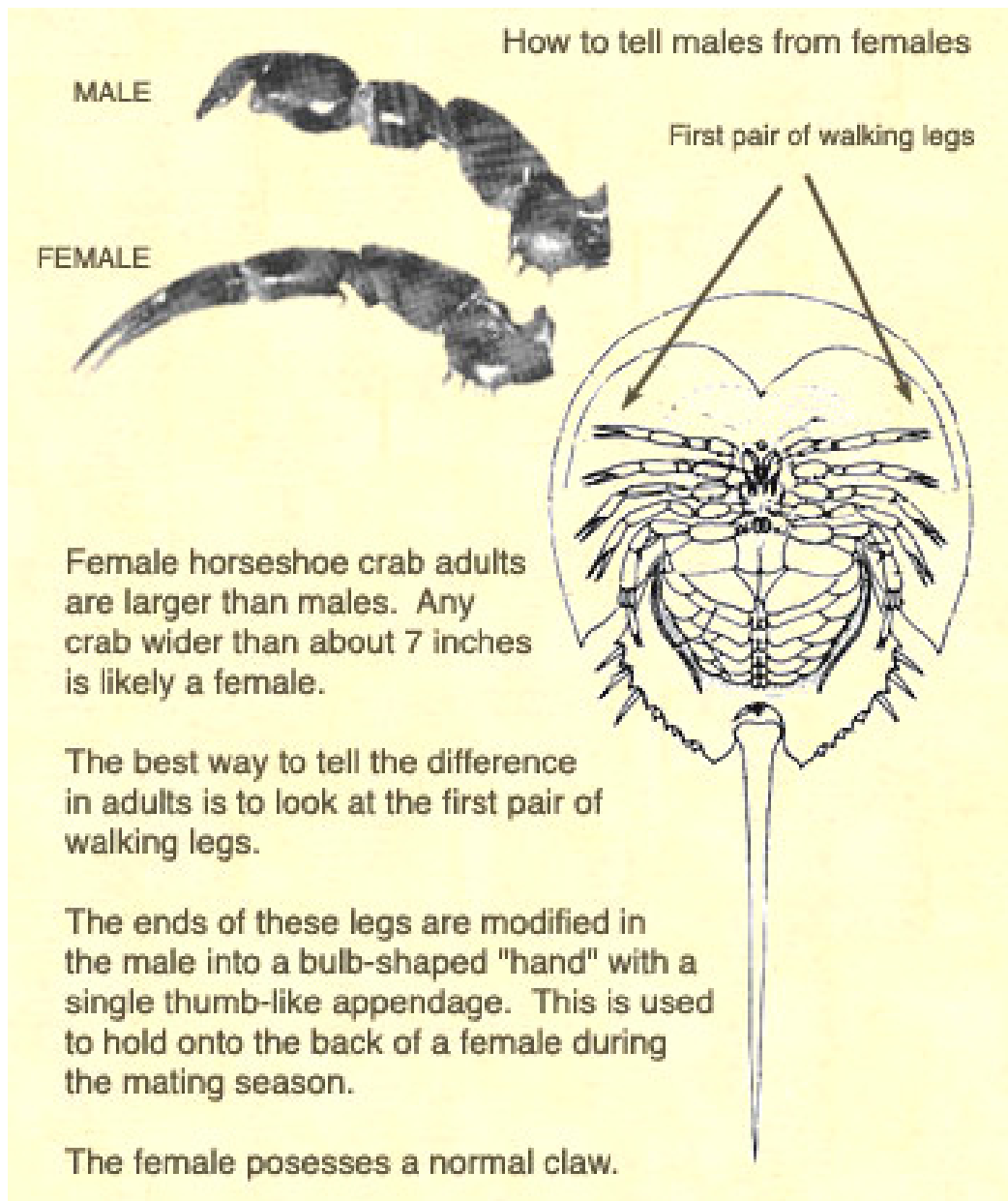
- a. The Recorder will use the Tagging and Size Data Sheet.
- b. The Observer will measure prosoma width (size) of the horseshoe crab.
- c. **Size:** The Observer will use calipers to measure (centimeters) the horseshoe crab's prosoma at the widest point (typically a little behind the large compound 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 (ideally 30 males and 30 females).

Remember: Do NOT go into the water to collect animals, Do NOT remove a female that is nesting (buried in the sand), do NOT separate mating pairs, and place any crabs back in the Surf Zone if they were moved during these measurements.

- Report zero (0) if 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.

When you are done surveying: Record the time in the space marked END OF SURVEY on the Beach Site Sheet.

Return all of the ORIGINALS to NYC Audubon. (Note: PLEASE DO NOT SEND BY FAX! WE NEED THE ORIGINAL DATA SHEETS!).



IWASH HORSESHOE CRAB MONITORING BEACH SITE SHEET

Date _____

Arrival at site _____

Survey team names and contact information:

Name	Address	Phone #
1. _____	_____	(____) ____ - ____
2. _____	_____	(____) ____ - ____
3. _____	_____	(____) ____ - ____
4. _____	_____	(____) ____ - ____

Survey location: _____

Time: Start of survey _____ am pm (circle one)

End of survey _____ am pm (circle one)

Weather Conditions: _____

Wave height (circle one): < 6 inches 6 -12 inches > 1 foot
(The height of waves striking the beach)

Relative amount of natural light (circle all that apply):

cloudy partial clouds clear full sunlight
partial sunlight dusk moonlight full darkness

Comments: _____

Other observations and comments: _____

Starting location: West/North East/South

Starting quadrat location numbers: _____

HSC PACING TRIAL FORM

Date: _____

Name: _____

Number of paces it takes to walk 20 meters or approximately 66 feet:

Trial 1 = _____ (A)

Trial 2 = _____ (B)

Trial 3 = _____ (C)

Average paces per 20 meters:

Total (A+B+C) = _____ / 3 = _____ (D) Paces per 20 meters

Number of paces per meter:

(D) _____ / 20 = _____ (E) Paces per meter.

Return this form with Data Sheets and Beach Site Sheet to:
John Rowden at NYC Audubon

2009 IWASH Horseshoe crab spawning survey

Quadrat data sheet

Date:

Location:

Observer:

Recorder:

1	M	
	F	
2	M	
	F	
3	M	
	F	
4	M	
	F	
5	M	
	F	
6	M	
	F	
7	M	
	F	
8	M	
	F	
9	M	
	F	
10	M	
	F	
11	M	
	F	
12	M	
	F	
13	M	
	F	
14	M	
	F	
15	M	
	F	
16	M	
	F	
17	M	
	F	
18	M	
	F	
19	M	
	F	
20	M	
	F	
21	M	
	F	
22	M	
	F	
23	M	
	F	
24	M	
	F	
25	M	
	F	

26	M	
	F	
27	M	
	F	
28	M	
	F	
29	M	
	F	
30	M	
	F	
31	M	
	F	
32	M	
	F	
33	M	
	F	
34	M	
	F	
35	M	
	F	
36	M	
	F	
37	M	
	F	
38	M	
	F	
39	M	
	F	
40	M	
	F	
41	M	
	F	
42	M	
	F	
43	M	
	F	
44	M	
	F	
45	M	
	F	
46	M	
	F	
47	M	
	F	
48	M	
	F	
49	M	
	F	
50	M	
	F	

51	M	
	F	
52	M	
	F	
53	M	
	F	
54	M	
	F	
55	M	
	F	
56	M	
	F	
57	M	
	F	
58	M	
	F	
59	M	
	F	
60	M	
	F	
61	M	
	F	
62	M	
	F	
63	M	
	F	
64	M	
	F	
65	M	
	F	
66	M	
	F	
67	M	
	F	
68	M	
	F	
69	M	
	F	
70	M	
	F	
71	M	
	F	
72	M	
	F	
73	M	
	F	
74	M	
	F	
75	M	
	F	

76	M	
	F	
77	M	
	F	
78	M	
	F	
79	M	
	F	
80	M	
	F	
81	M	
	F	
82	M	
	F	
83	M	
	F	
84	M	
	F	
85	M	
	F	
86	M	
	F	
87	M	
	F	
88	M	
	F	
89	M	
	F	
90	M	
	F	
91	M	
	F	
92	M	
	F	
93	M	
	F	
94	M	
	F	
95	M	
	F	
96	M	
	F	
97	M	
	F	
98	M	
	F	
99	M	
	F	
100	M	
	F	

Recovered Tag ID #s/Comments:

2009 IWASH Horseshoe crab spawning survey

Date:

Location:

Observer:

Recorder:

Count	Sex	Tag ID #	Size (cm)	Comments
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				

Recovered Tag ID #s:

Tagging and Size data sheet

Start Time:

End Time:

Count	Sex	Tag ID #	Size (cm)	Comments
21				
22				
23				
24				
25				
26				
27				
28				
29				
30				
31				
32				
33				
34				
35				
36				
37				
38				
39				
40				