

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



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**[www.CornellMarineProgram.org](http://www.CornellMarineProgram.org)**



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Centerport, New York 11721  
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April 4, 2008

Dear Participant:

Thank you for your assistance with the 2008 horseshoe crab spawning survey on Long Island. This research and monitoring project is crucial in developing reliable sampling methods to acquire accurate data on spawning horseshoe crabs in New York's Marine District. In conjunction with New York State Department of Environmental Conservation, the data collected over the previous 2 years and in the upcoming months will enable us to better manage this important marine species in NYS.

This year we will complete our testing of different sampling methods to accurately assess the abundance of spawning horseshoe crabs at several representative sites on Long Island. The experimentation will be refined to resolve remaining sampling issues; particularly on the north shore of Long Island. In addition we are faced with logistical constraints that have directed our sampling efforts at the following 3 sites this year: West Meadow Beach (north shore), Flax Pond (north shore) and Pike's Beach (south shore). These locations, however, are subject to change pending on the status of our volunteers, and any unforeseen changes in scientific priorities. The proposed studies on the north shore sites will include continuous monitoring around the new/full moon high tides; while on the south shore we will be testing the feasibility of increasing our counting distance and tagging.

We have also tried to improve upon the logistics of field sampling and data transferal, as suggested by volunteers. This year, we will be distributing addressed (Cornell) and stamped envelopes to site coordinators along with the needed supplies for the study (ie: drills, tags, data sheets, ect.), to make data transferal quicker and smoother. After making backup copies of the data, site coordinators will send the original data sheets after every sample cycle (3 sampling nights) to Cornell Marine Program. We are also modifying some of our sampling equipment to make them as user friendly as possible.

As in previous years both Cornell Cooperative Extension of Suffolk County and the NYSDEC will be working with the volunteers, training and assisting them to properly and confidently collect the data and help complete this study. Without the selfless effort of all of you, this vital study could not be completed. Thank you again for all your time and hard work and we look forward to a fun and productive field season!

Sincerely,

The Horseshoe Crab Monitoring Team

## 2008 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. Specifically, by participating in this survey, you will be helping to collect measurements of spawning abundance, size, and tagging information around full and new moon events from May to July. Trained site coordinators will be present to teach you how to help with the survey, however, it is important that you take the time to read through this document beforehand. By doing so, you will come better prepared and help make the survey run efficiently.

### Contents:

1. This sheet of instructions.
2. Date of census and Sampling Schedules.
3. Data sheet 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. Additional monitoring program questions or comments can be directed to the lead project coordinators at Cornell University Cooperative Extension (631) 239-1800; and NYS DEC, (631)444-0441.

### PREPARATION FOR THE SURVEY:

#### Clothing and accessories

- Wear appropriate clothing for evening or night walks, foul weather, and wet conditions at the water's edge. 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. Use a red filter on headlamp/flashlight if needed (coordinators will provide them).
- 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.
- Do not go bare foot! Shoes are a necessity. We recommend rubber boots, water shoes, or old sneakers.
- An accurate wristwatch is needed for recording arrival time, as well as time survey is begun and finished.
- Cell phone for emergencies or calling lead coordinator(s) for assistance with problems.

## SURVEY PROTOCOL:

### Setup

Before you begin, you **must** fill out the Volunteer Forms for Cornell Cooperative Extension. These forms are available on our website: [www.CornellMarineProgram.org](http://www.CornellMarineProgram.org) or from the site coordinator.

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 **with at least two people** (e.g. minimum of a Site Coordinator and one volunteer).

*\* 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 before the scheduled time** to meet the Site Coordinator (see our website for sampling schedules). Please access the site from the appropriate areas as we have indicated on our website. The survey coordinators can also provide specific instructions for your location if needed. Record the time you arrive in the space marked ARRIVAL AT SITE on the Data Sheet.

- Fill out as much of the Data Sheet 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.**

- Each beach will be sampled along a 100 meter (~328 ft) transect that will be pre-marked/flagged by the site coordinators.

- To survey the horseshoe crabs, you will start at one end of the flagged 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 your site specific 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.

### I. Counting Horseshoe Crabs

- Although you will be walking the length of the 100 meter transect, you will probably not be walking a straight line, as you will have to walk close to the waterline, but **NEVER** below it. It is also important that you keep steadily moving forward toward the end point once you have started the survey to complete the 100 meter transect.

1. Begin the survey at exactly the scheduled Start Time. You should start walking from the ‘Start Point’ flag and walk the 100 m transect toward the other flag (‘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. One person (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 and in the “Surf Zone” (which is where waves will typically be breaking), while the second person (Recorder) records the observations on the Data Sheet. See Figure 1 for description of “Surf Zone”.
3. The Observer should always focus on counting horseshoe crabs that are spawning on the beach and in the Surf Zone according to the following rules (Figure 1).
  - 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: 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 'clasped' or crowding on top of females. There also tends to be more males than females.

**Submerged Count:** If there is sufficient time and the water visibility permits, the site coordinator will determine if they will 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.

- The Site Coordinator will determine whether the submerged data will be collected, and lead the count.
  - If you choose to count submerged crabs, for safety purposes, please stay on the beach and **NEVER go in the water to search for submerged crabs**.
  - Remember that these counts 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.** 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 100 m 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”).
  - The Observer should also estimate the average distance off the beach that they can visibly detect/see the crabs just counted and then Record it.
  - **Please Remember that the “Surf-Zone” data is the MOST important data to collect accurately. If you are not comfortable with counting in the submerged areas, do not do them.**
4. Continue down the beach toward the ‘End Point’ and count spawning horseshoe crabs along the way. 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 (see also: Button Tagging section below) horseshoe crabs while counting, please check the number on the tag and record it on the data form under the

section: “Recovered Tag ID #'s”.

6. Once you are done counting please make sure all information is accurately recorded on the Data Sheet.

## II. Button Tagging and Measuring Horseshoe Crab Size:

### Setup

1. After completing the spawning count, the Site Coordinator will lead 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 100 m 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. The site coordinator will lead the tagging effort and be the ‘Observer’.
- b. The ‘Recorder’ will use the Data form entitled: “Tagging and Size” to record data.
- c. 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.
- d. 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.
- 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 (Figure 2). 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 Data form entitled “Size and Tagging” Data.
- 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 (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.**

#### **Additional Notes:**

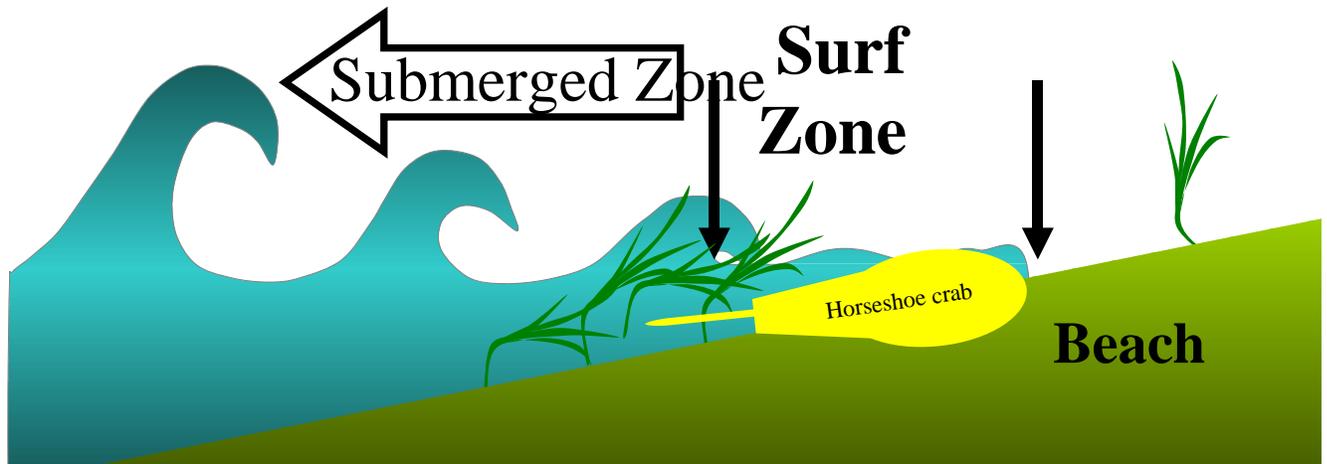
- When there are numerous animals, you may have to lift some up to assure you've counted all of those underneath. Heavy work gloves will be useful for this. Do **NOT** remove a spawning female that is buried in the sand, or lift horseshoe crabs by their tails.
- If there is an obstruction or discontinuation 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 help reflect changes in the population.

**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 them to us at:

**Matthew Sclafani  
Cornell University Cooperative Extension  
180 Little Neck Rd.  
Centerport, NY 11721  
Phone: (631) 239-1800 Ext. 26,  
Fax: (631) 239-1797, Email: ms332@cornell.edu**

**Figure 1. Sampling zones and beach profile for horseshoe crab survey.**



**Figure 2. Placement of button tag and size measurements on horseshoe crabs.**



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

<b>Principal Project Coordinators</b>	Matthew Sclafani	631-239-1800, email: <a href="mailto:ms332@cornell.edu">ms332@cornell.edu</a>
	John Maniscalco	631-444-0469, email: <a href="mailto:jdmanisc@gw.dec.state.ny.us">jdmanisc@gw.dec.state.ny.us</a>
	Corey Humphrey	631-239-1800, email: <a href="mailto:ch425@cornell.edu">ch425@cornell.edu</a>

Sampling Sites	Coordinators	Contact Information
<b>Flax Pond, Stony Brook</b>	Wendy Fidao	631-941-9404, email: <a href="mailto:flaxpondfriends@gmail.com">flaxpondfriends@gmail.com</a>
<b>Pikes Beach, Westhampton</b>	Gina Mulhearn	631-288-8014, email: <a href="mailto:rmulhearn04@msn.com">rmulhearn04@msn.com</a>
	Mark Cappiello	631-288-8014, email: <a href="mailto:rmulhearn04@msn.com">rmulhearn04@msn.com</a>
	Corey Humphrey	631-239-1800, email: <a href="mailto:ch425@cornell.edu">ch425@cornell.edu</a>
<b>West Meadow Beach</b>	Frank Chin	631-689-1080, email: <a href="mailto:frank.chin@sunysb.edu">frank.chin@sunysb.edu</a>

**Table 2. Sampling Schedules and driving directions for each location.**

**WESTHAMPTON DUNES:** Pike’s Beach parking area, Dune Road (Moriches Bay side)

Date	Location	Start Time
4/18/2008	Pikes Beach	8:35 PM
4/20/2008	Pikes Beach	9:48 PM
4/22/2008	Pikes Beach	10:53 PM
5/3/2008	Pikes Beach	7:48 PM
5/5/2008	Pikes Beach	9:27 PM
5/7/2008	Pikes Beach	11:10 PM
5/17/2008	Pikes Beach	8:04 PM
5/19/2008	Pikes Beach	9:20 PM
5/21/2008	Pikes Beach	10:31 PM
6/1/2008	Pikes Beach	7:24 PM
6/3/2008	Pikes Beach	9:10 PM
6/5/2008	Pikes Beach	10:57 PM
6/16/2008	Pikes Beach	8:15 PM
6/18/2008	Pikes Beach	9:32 PM
6/20/2008	Pikes Beach	10:45 PM
6/30/2008	Pikes Beach	7:03 PM
7/2/2008	Pikes Beach	8:48 PM
7/4/2008	Pikes Beach	10:42 PM
7/16/2008	Pikes Beach	8:30 PM
7/18/2008	Pikes Beach	9:47 PM
7/20/2008	Pikes Beach	10:59 PM

**Directions to Pike’s Beach:** Sunrise Hwy (27) East to exit 63 South toward Westhampton. Continue South on Old Riverhead Rd. until you reach the traffic circle and head south following signs for “Ocean Beach”. This will turn into Jessup’s Lane and continue on it and go over a small drawbridge. After the bridge make a right at stop sign to head West on Dune Rd. toward Westhampton Dunes. Pikes Beach public parking area will be on the right side of the road (facing Moriches bay). Please pay close attention to speed limits on Dune Rd., as they are strictly enforced.

**STONY BROOK:** West Meadow Beach, Town Beach parking area

<b>Date</b>	<b>Location</b>	<b>Start Time</b>
4/18/2008	West Meadow Beach	11:14 PM
4/21/2008	West Meadow Beach	12:28 AM
4/23/2008	West Meadow Beach	1:40 AM
5/3/2008	West Meadow Beach	10:21 PM
5/6/2008	West Meadow Beach	12:00 AM
5/8/2008	West Meadow Beach	1:46 AM
5/17/2008	West Meadow Beach	10:45 PM
5/20/2008	West Meadow Beach	12:00 AM
5/22/2008	West Meadow Beach	1:13 AM
6/1/2008	West Meadow Beach	9:55 PM
6/3/2008	West Meadow Beach	11:44 PM
6/6/2008	West Meadow Beach	1:34 AM
6/16/2008	West Meadow Beach	10:55 PM
6/19/2008	West Meadow Beach	12:12 AM
6/20/2008	West Meadow Beach	12:49 AM
6/30/2008	West Meadow Beach	9:37 PM
7/2/2008	West Meadow Beach	11:32 PM
7/5/2008	West Meadow Beach	1:21 AM
7/16/2008	West Meadow Beach	11:07 PM
7/19/2008	West Meadow Beach	12:24 AM
7/21/2008	West Meadow Beach	1:40 AM

**Directions to West Meadow Beach:** LIE to exit 62 Nicholls Rd. (Route 97) North to end. At light, make a left onto Route 25A. Then right at next light on to Quakers Path. Continue on Quaker Path and make left on West Meadow Beach Rd. Turn right onto Town Beach Parking area.

**CRANE NECK:** Flax Pond (SUNY Stony Brook Flax Pond parking area next to Child's Mansion)

<b>Date</b>	<b>Location</b>	<b>Start Time</b>
4/18/2008	Flax Pond	11:39 PM
4/21/2008	Flax Pond	12:53 AM
4/23/2008	Flax Pond	2:05 AM
5/3/2008	Flax Pond	10:46 PM
5/6/2008	Flax Pond	12:25 AM
5/8/2008	Flax Pond	2:11 AM
5/17/2008	Flax Pond	11:10 PM

5/20/2008	Flax Pond	12:25 AM
5/22/2008	Flax Pond	1:38 AM
6/1/2008	Flax Pond	10:20 PM
6/3/2008	Flax Pond	12:09 AM
6/6/2008	Flax Pond	1:59 AM
6/16/2008	Flax Pond	11:10 AM
6/19/2008	Flax Pond	12:37 AM
6/20/2008	Flax Pond	1:14 AM
6/30/2008	Flax Pond	10:02 PM
7/2/2008	Flax Pond	11:57 PM
7/5/2008	Flax Pond	1:46 AM
7/16/2008	Flax Pond	11:32 PM
7/19/2008	Flax Pond	12:49 AM
7/21/2008	Flax Pond	2:05 AM

**Directions to Flax Pond:** Nicholls Road (County Rte. 97) north to Rte. 25A. Left (west) on 25A to first traffic light (Quaker Path) across from Stony Brook Railroad Station. Right on to Quaker Path. At fourth stop sign on Quaker Path, bear left onto Mt. Grey Road. Stay on Mt. Grey Rd about a mile. Go left onto Crane Neck Road. Follow Crane Neck Road for ~1/2 mile; turn right towards Child's Mansion and go to the end of road to SUNY Stony Brook's Flax Pond Lab parking area. Please contact site coordinator prior to meeting at this site.

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## 2008 HORSESHOE CRAB SPAWNING SURVEY DATA SHEET

**DATE:** \_\_\_\_\_ **ARRIVAL TIME:** \_\_\_\_\_ **LOCATION:** \_\_\_\_\_  
**OBSERVER NAME:** \_\_\_\_\_ **PHONE #:** \_\_\_\_\_  
**RECORDER NAME:** \_\_\_\_\_ **PHONE #:** \_\_\_\_\_  
**WEATHER DESCRIPTION:** \_\_\_\_\_ **WIND DIREC:** \_\_\_\_\_ (e.g. wind from NE, etc.)  
**WAVE DESCRIPTION** (circle one): No waves, Light-chop, Med-heavy chop, White caps, Swells  
**WAVE HEIGHT** (circle one): 0 ft, 0-½ ft, ½ -1 ft, 1 – ½ ft, 1<sup>1/2</sup>- 2 ft, 2 – 2<sup>1/2</sup> ft, 2<sup>1/2</sup> – 3 ft, > 3 ft  
**WATER TEMP** (Celcius): \_\_\_\_\_  
**TIME (START SURVEY):** \_\_\_\_\_ **START POINT LOCATION** (circle one): North South East West

Sex	SURF-ZONE Counts Only	Totals
<b>Males</b>		
<b>Females</b>		

Sex	SUBMERGED-ZONE Counts Only*	Totals
<b>Males</b>		
<b>Females</b>		

**TIME (END SURVEY):** \_\_\_\_\_ **DISTANCE SAMPLED:** \_\_\_\_\_ (meters)  
*\* If counted in submerged zone, please estimate how far from the waterline you could see crabs \_\_\_\_\_ (ft)*

**RECOVERED TAG ID #'s:** \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

**COMMENTS:** \_\_\_\_\_  
 \_\_\_\_\_

## 2007 HORSESHOE CRAB TAGGING & SIZE DATA SHEET

**DATE:** \_\_\_\_\_ **LOCATION:** \_\_\_\_\_  
**OBSERVER NAME:** \_\_\_\_\_ **PHONE #:** \_\_\_\_\_  
**RECORDER NAME:** \_\_\_\_\_ **PHONE #:** \_\_\_\_\_  
**TIME (START):** \_\_\_\_\_ **START POINT LOCATION** (circle one): North South East West

Count	Sex	Tag I.D. #	Size: Carapace Width (cm)	Comments		Recovered Tag I.D. #	Comments
1							
2							
3							
4							
5							
6							
7							
8							
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**TIME (FINISH)** \_\_\_\_\_