

Cove Point Horseshoe Crab Spawning Survey 2016

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Summary

In 2016, we surveyed spawning horseshoe crabs at Cove Point beach as a continuation of our long-term study. We observed a total of 263 females and 764 males over the course of four tide cycles, with a mean of 37 spawning groups per tide cycle. These data suggest that the elevated spawning numbers first observed in 2014 are continuing. As in previous years, spawning occurred primarily along the southern beach. In this year we also initiated a radio telemetry study, fitting 5 female and 5 male crab with radio/archival tag combinations. These tags allowed us to better detect animals returning to the beach and provided movement data between spawning nights. We obtained depth data from three males and one female. The data suggest that when spawning during a tide cycle, animals remain close to shore in 2 or 3 m water during the daytime. Between tide cycles, one male made repeated trips offshore into 8-10 m depth. We also detected tagged animals on the beach during one daytime high tide. This is contrary to previous observations, and suggests that daytime spawning may occur at Cove Point.

Introduction and Methods

Survey – As in previous years, a survey consisted of a single pass along a beach, within one hour of a nighttime high tide. Workers recorded 1) the GPS location of all females, males and spawning groups and 2) the number of males associated with each spawning female. The presence of any tagged animal was also noted. Cove Point was surveyed on four nights around four tide cycles in May, June and July. The first tide cycle was in May, with a high tide on May 21. Bad weather and time spent learning the new equipment prevented us from completing several surveys that cycle. We completed one survey on May 20. The second tide cycle involved a new moon on June 4. We completed surveys on June 3, 4, 5 and 6. The third tide cycle involved a full moon on June 20. We completed surveys on June 17, 19, 20 and 21. The third tide cycle involved a new moon on July 4. We completed surveys on July 2, 3, 4 and 5.

Tagging – A new element for 2016 was the use of radio telemetry to track crab movement. Five male and five female crabs were fitted with a radio telemetry tag and an archival tag (Fig. 1) The archival tag recorded pressure and temperature every 30 minutes. Pressure (dbar) is approximately equal to depth (meters) at shallow depths. Depth data reflected how far the animal moved away from the beach after tagging. This allowed us to estimate movement of a tagged animal from the time of tag attachment to the time of its return to the beach.

Radio waves do not travel through salt water, so the tag could not allow us to follow an animal that had left the beach. The purpose of the radiotelemetry tag was to alert us when the animal had returned to the beach. During survey nights, this allowed us to find the animal so that archival tag data could be downloaded. Students waited with a receiver and antenna near the lighthouse at the southern end of the beach (Fig. 2). Each radiotelemetry tag emitted a specific frequency, which the receiver would detect, alerting us to a tagged crab's presence on the beach. Students would then find the crab, download the archival data, and return the animal to the water.

The receiver remained at the beach between survey nights, continuously scanning tagging frequencies and recording any signals from our tagged crabs. This allowed us to determine if any tagged crab returned to the beach outside of our survey nights.



Figure 1. The larger radio telemetry tag is shown here next to the archival tag. Both were positioned on the dorsal prosoma as shown and attached with epoxy.

Results and Discussion

Over the course of the spawning season, we observed 263 spawning females and 764 associated males. These numbers are consistent with observations from 2014 and 2016, and support the conclusion that spawning numbers have recovered from a low point in 2013. This recovery is shown in Figure 3.

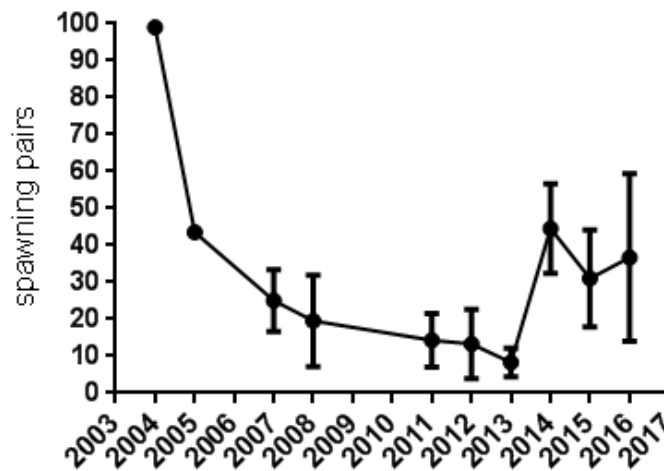


Figure 3. Mean number of spawning females at Cove Point Beach. The mean was calculated from the highest spawning night from each tide cycle.

Figure 4 shows spawning numbers of female and males by tide cycle. The first June cycle, June 3-6, had the greatest spawning activity. This was a new moon, not typically the most active period. It is in contrast to the previous year, 2015, where the May tide cycle has the greatest spawning activity.

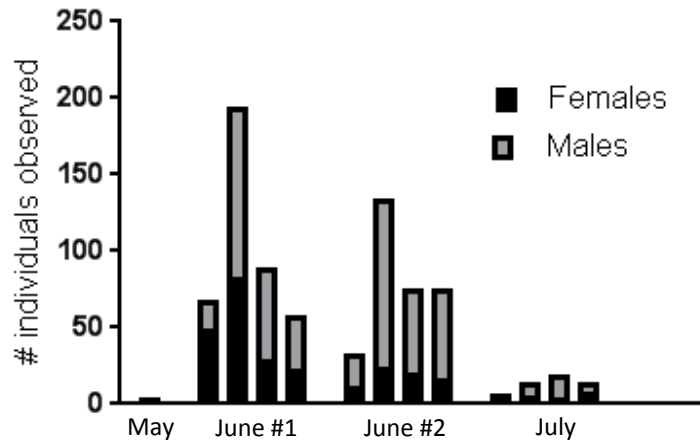
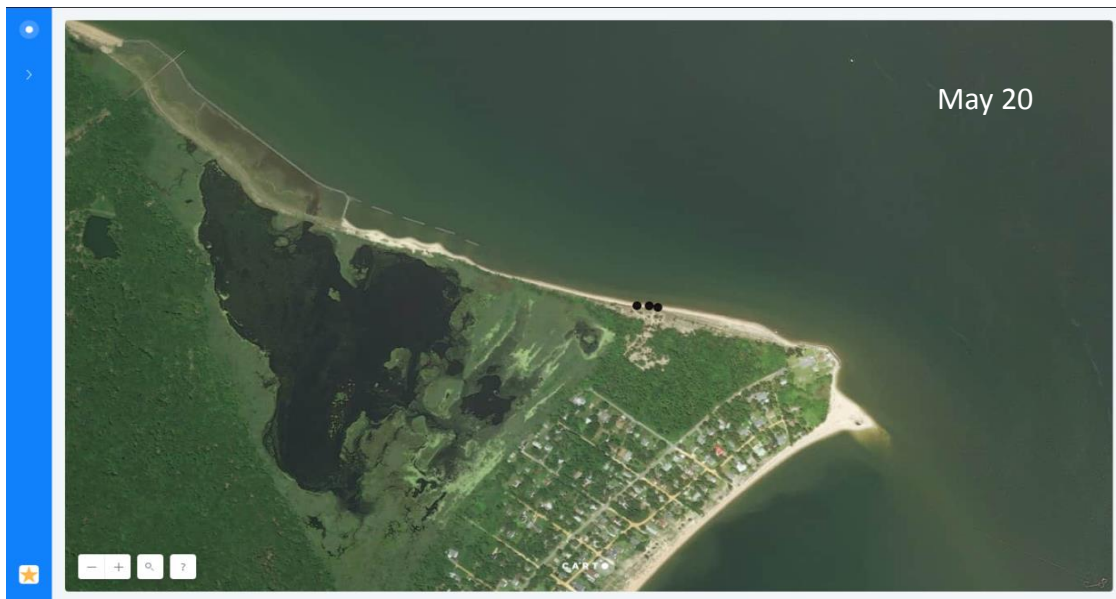


Figure 4. Male and female spawning numbers by tide cycle. May: a single night, May 20. June #1: June 3-6. June#2: June 17; 19-21. July: July 2-5

Cove Point Spawning Maps – The maps indicate that, as in previous years, the majority of spawning occurs along the southern beach. Although spawning numbers along the northern beach have slowly increased, few spawning females utilized the beach inside the breakwaters.

May 20: Two females, one single male.



June 3: 47 females, 66 males.



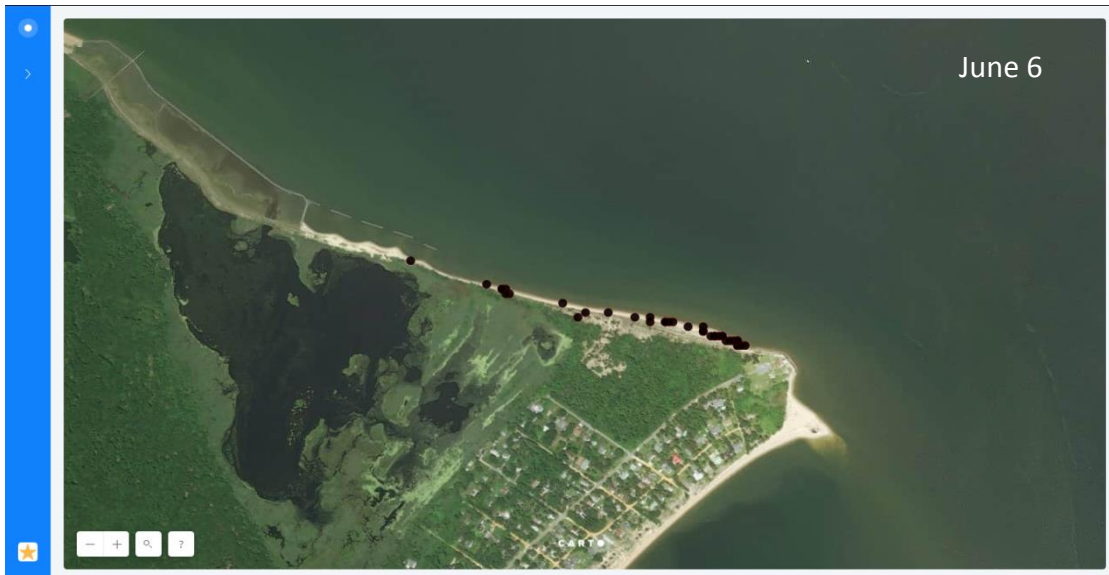
June 4: 81 females, 193 males.



June 5: 28 females, 88 males.



June 6: 21 females, 56 males.



June 17: 10 females, 31 males.



June 19: 21 females, 133 males.

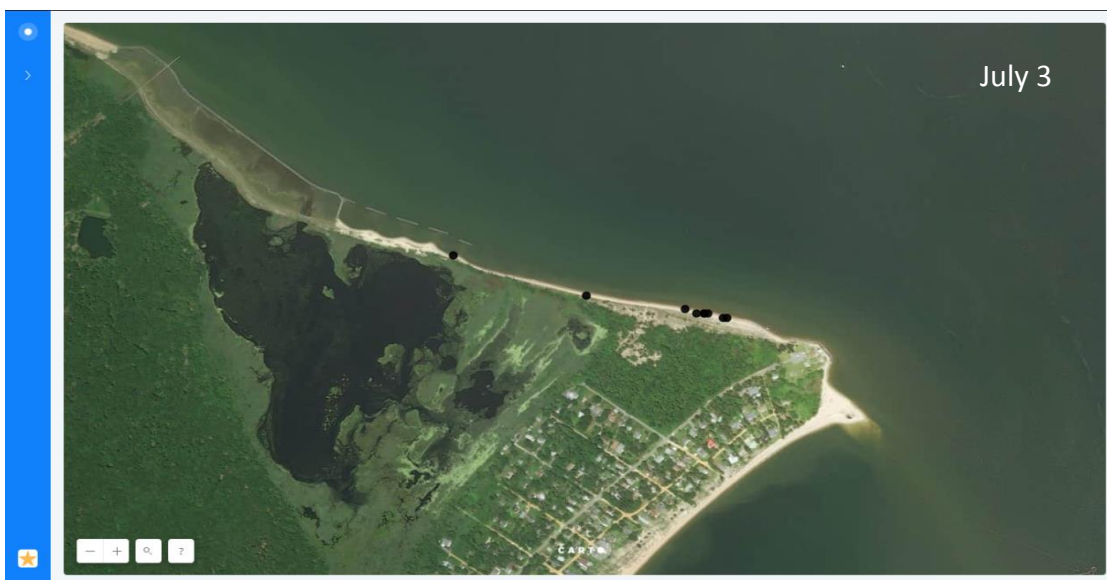


June 20: 19 females, 74 males. June 21: 15 females, 74 males. The GPS unit failed during these two surveys. The students making the survey used their cell phones as replacement, but the coordinates were not accurate. The counts presented here for these dates were not plotted onto maps.

July 2: 4 females, 5 males.



July 3: 4 females, 12 males.



July 4: 3 females, 18 males.



July 5: 6 females, 13 males.



Radio telemetry - Table 1 shows the results of the radio telemetry study. We resighted and obtained pressure data from four of ten tagged animals. Three females and one male were not resighted.

Sex	Frequency	Date Tagged	FWS Tag	Date Resight	Day/Night	Data Download
F	150.271	5/20/2016	376509	-		
F	150.150	5/20/2016	376513	-		
M	150.190	5/20/2016	376503	6/3/2016	Night	Yes
				6/6/2016	Night	No
F	150.290	6/3/2016	376511	-		
F	150.130	6/3/2016	376507	6/4/2016	Night	Yes
				6/5/2016	Night	No
M	150.210	6/3/2016	376504	-		
M	150.170	6/3/2016	376512	6/4/2016	Night	Yes
M	150.249	6/3/2016	376502	6/5/2016	Night	Yes
				6/21/2016	Day	No
M	150.110	6/3/2016	376514	6/4/2016	Night	No
				6/6/2016	Night	No
				6/21/2016	Day	
F	150.309	6/3/2016	376510	6/21/2016	Day	No

1. Resight female 130. She was tagged late on June 3 and resighted about 24 hrs. later on June 4. Her depth record is shown below. After tagging, she appeared to move away from the beach to a depth of about 3 m, where she remained until her return to the beach the following night. The slight increase in depth during the day probably was due to the daytime high tide.

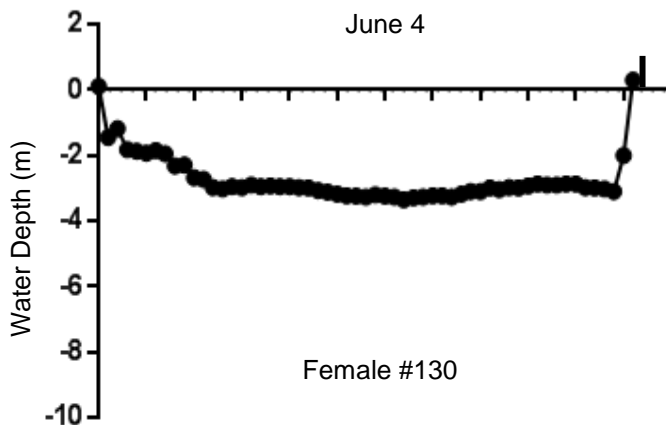


Figure 5. Depth profile for female 130. The horizontal axis shows approximately one day, from midnight June 3 to midnight June 4.

2. Resight male 170. He was tagged late on June 3 and resighted about 24 hrs. later on June 4. His depth record is shown below. After tagging, he appeared to move away from the beach to a depth of slightly less than 2 m, where he remained until his return to the beach the following night. The daytime high tide produced a similar pattern of depth increase during the day.

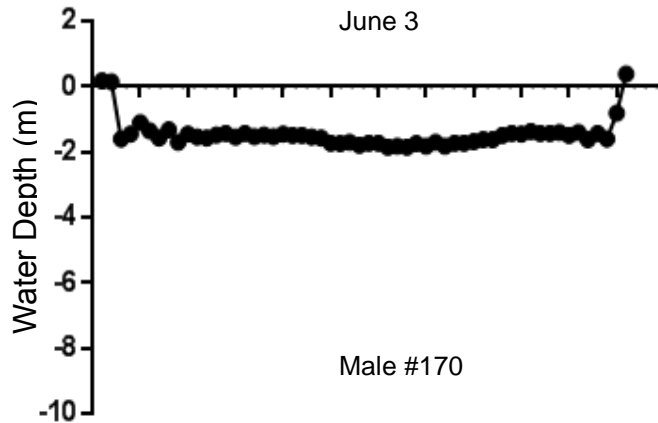


Figure 6. Depth profile for male 170. The horizontal axis shows approximately one day, from midnight June 3 to midnight June 4.

3. Resight male 249. A depth record for this male was obtained two days after tagging. He showed a pattern similar to male 170. After leaving the beach, he moved to a depth of about 2 m during the day on June 3 and remained there until moving back onto the beach at night. He followed a similar pattern on June 4, and then returned to the beach at night where he was resighted.

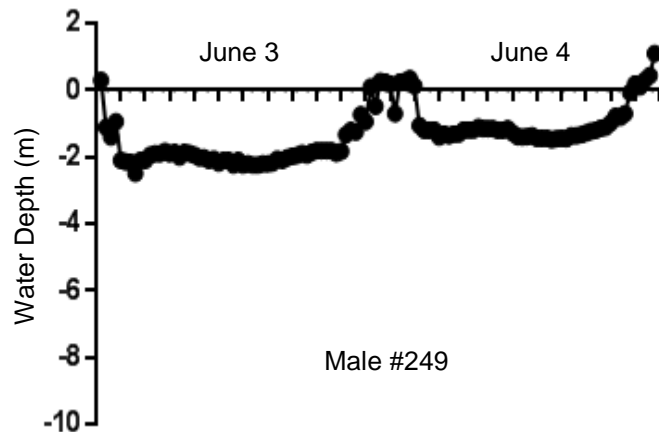


Figure 6. Depth profile for male 249. The horizontal axis shows approximately two days, from midnight June 3 to midnight June 5.

4. Resight male 190.

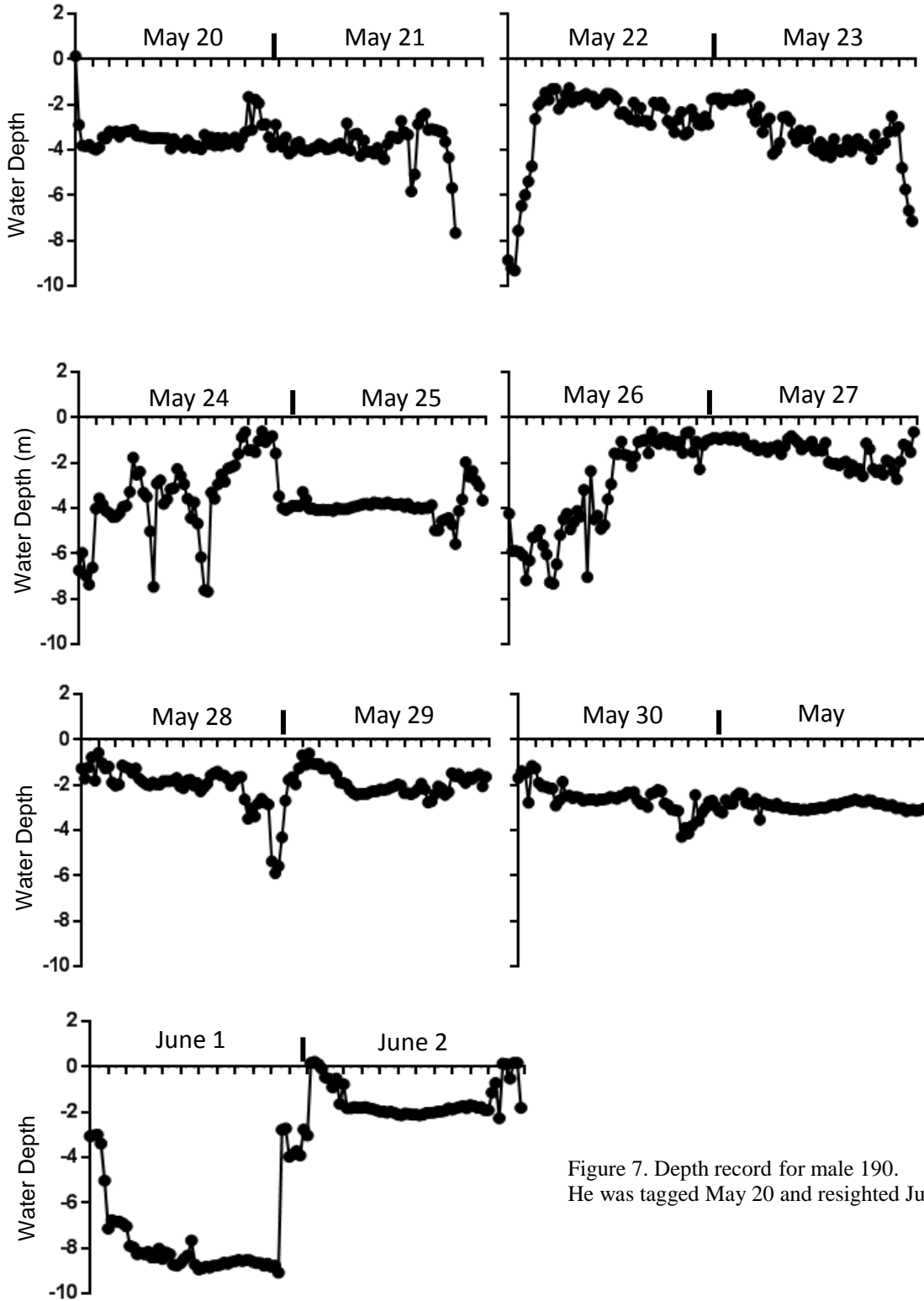


Figure 7. Depth record for male 190. He was tagged May 20 and resighted June 3.

This male was tagged on May 20 and resighted on June 3. His record thus shows his movement between tide cycles. After leaving the beach on May 20, he stayed at about 4 m for two days, and then moved further offshore, into about 10 m depth. His movement between tide cycles shows an alternation between short term movement into deeper water and longer periods where he was apparently closer to shore in 1-2 m depth. He moved offshore, into 8-9 m depth, on June 1, then that evening moved quickly to shore and onto the beach early June 2. He spent daytime June 2 in about 2 m water, similar to other male records. He moved back onto the beach early on June 3 where he was resighted.

5. Daytime spawning. The radio receiver was capable of detecting and logging a tagged crab on the beach outside of our survey hours. It did so on June 21. At 4:29 pm, it logged male 110 on the beach. At 4:35 pm, it logged male 249 on the beach. At 4:36 pm, it logged female 309 on the beach. These times correspond to the highest daytime high tide for that tide cycle. The presence of female 309 suggests that at least one, and probably more, females were spawning during this period. This record is our first evidence that spawning occurs at Cove Point during daytime. Daytime spawning has long been observed in other areas, but previous daytime surveys at Cove Point have not found crabs on the beach.