

Horseshoe Crabs on Beaches Near Active Oyster Aquaculture Farms on the New Jersey Delaware Bayshore

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Photo credit: David Bosco

Introduction

The beaches of the Delaware Bayshore provide important spawning habitat for the Atlantic horseshoe crab (*Limulus polyphemus*). Spawning peaks around new and full moons during late April to mid-June. A portion of these beaches are also home to several New Jersey oyster farms. In response to concerns that farms may impede access to nesting beaches, this study compared horseshoe crab (HSC) abundances on beaches with and without farms. This was done through an expansion of the ReTurn-The-Favor (RTF) volunteer program orchestrated by The Wetlands Institute of Stone Harbor, NJ. RTF counts only live flipped or trapped (impinged) crabs. Here, all live horseshoe crabs were counted on the beach.

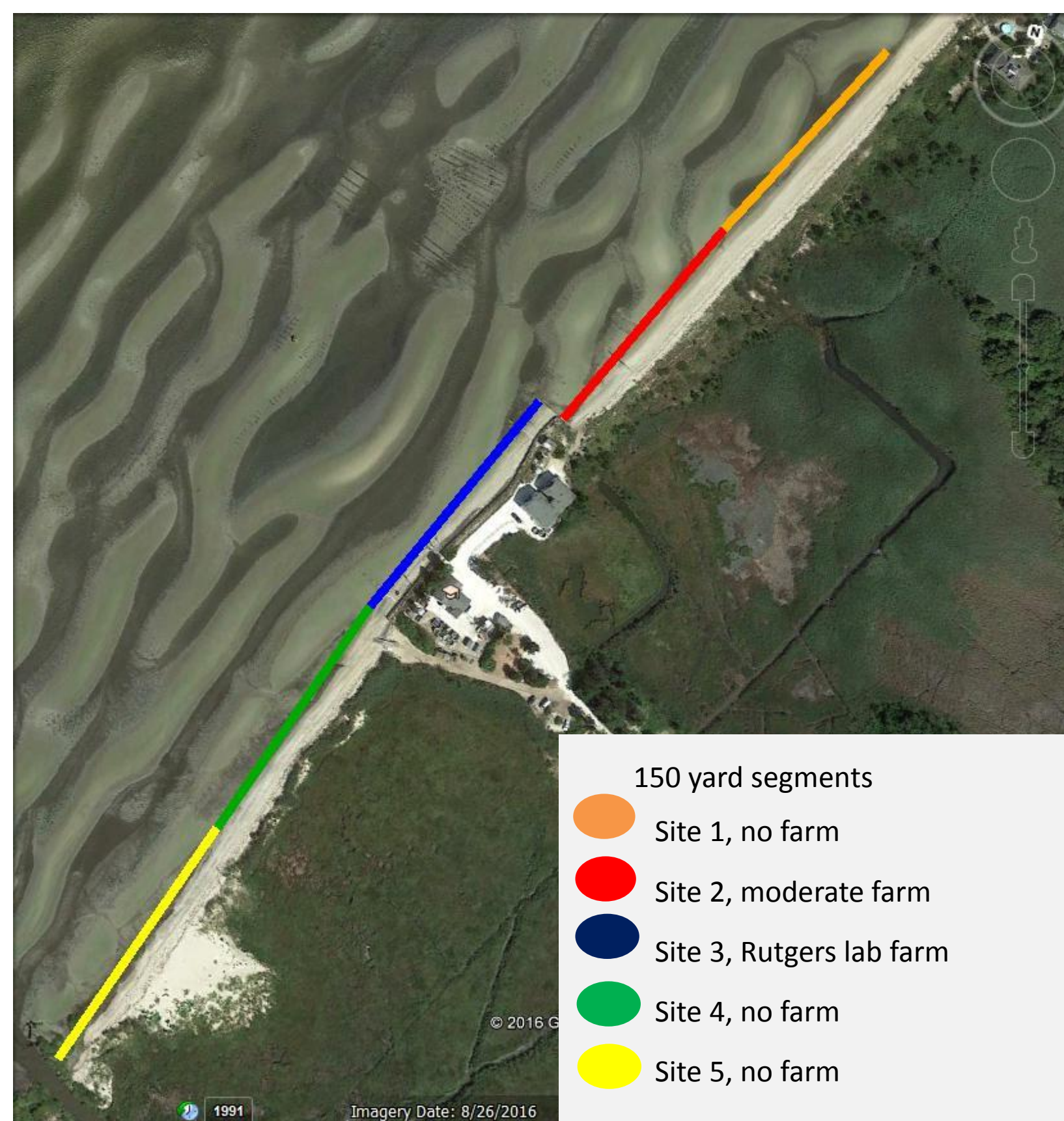


Photo of typical layout of rack and bag system used on oyster aquaculture farms.

Methods

- ❖ The beach was split into five adjacent 150 yard segments, creating five sites. Two of the sites had active farms, three did not. Beach quality decreased from site 1 to 5.
- ❖ Walks were scheduled around full and new moons in April, May and June to correspond with known periods of peak spawning.
- ❖ Walks were conducted at night three hours after high tide per RTF protocols except that counts included all live, not only flipped and impinged crabs.
- ❖ Observers recorded numbers of live flipped, impinged and right-side up crabs



Right side up HSC



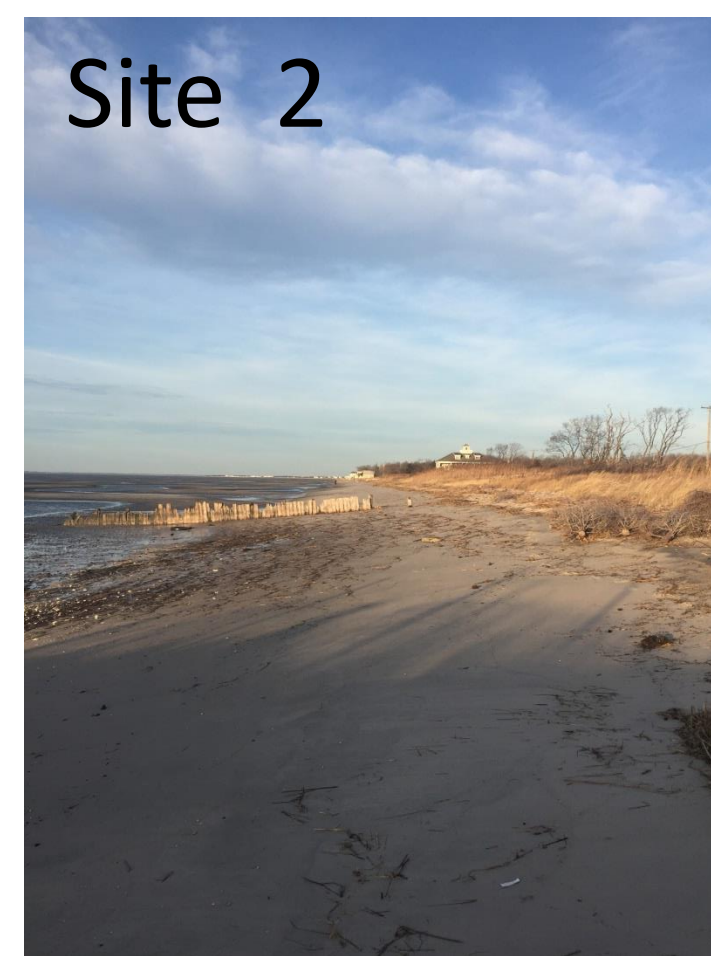
Flipped HSC



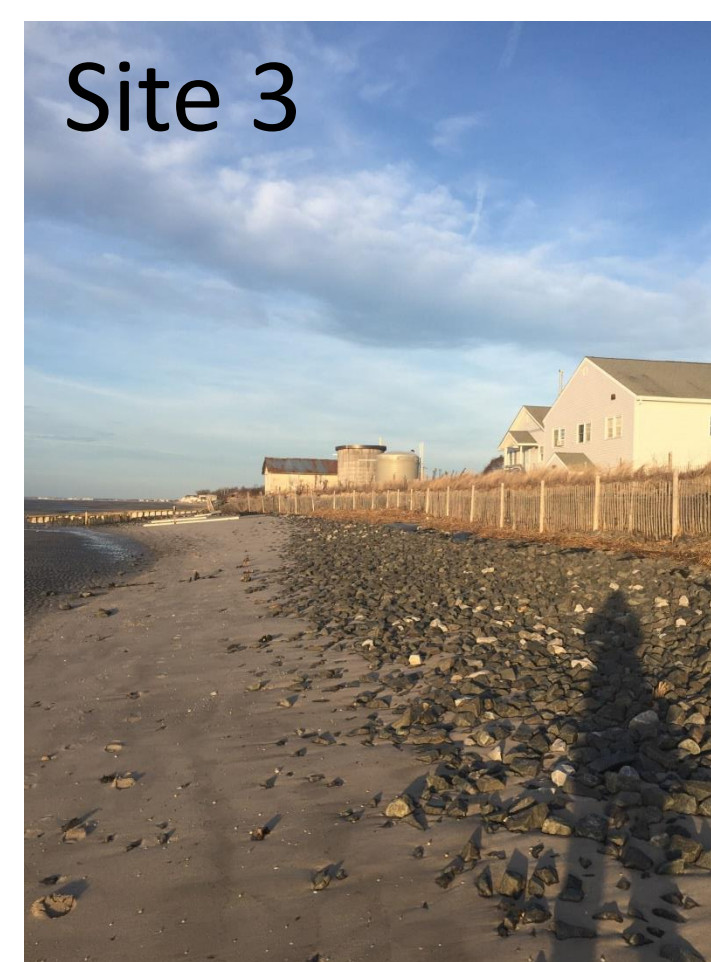
Two impinged HSC



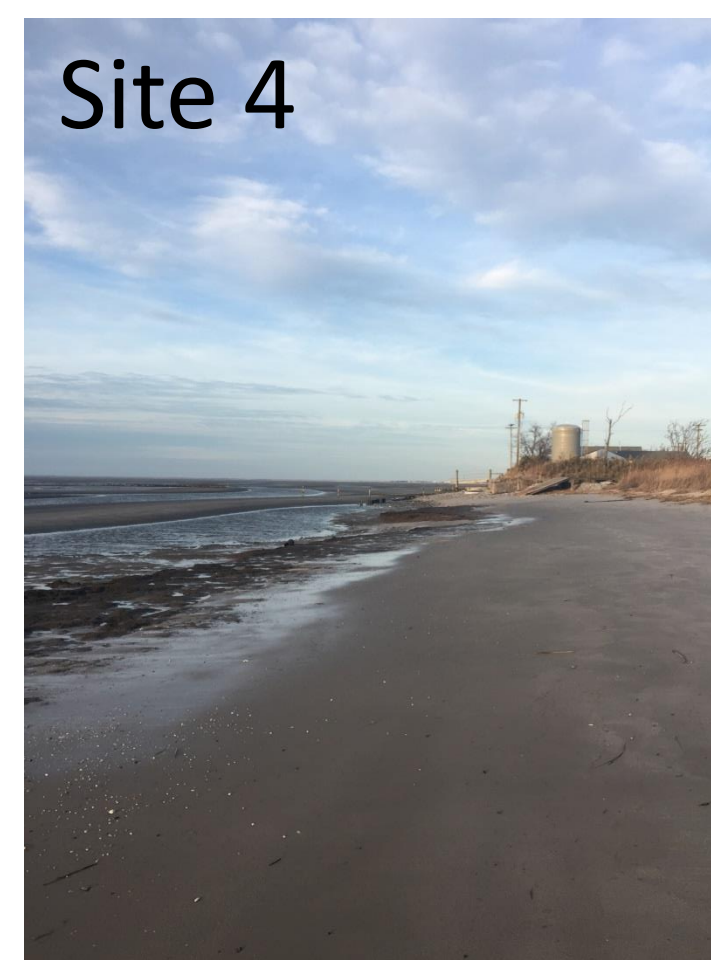
Site 1



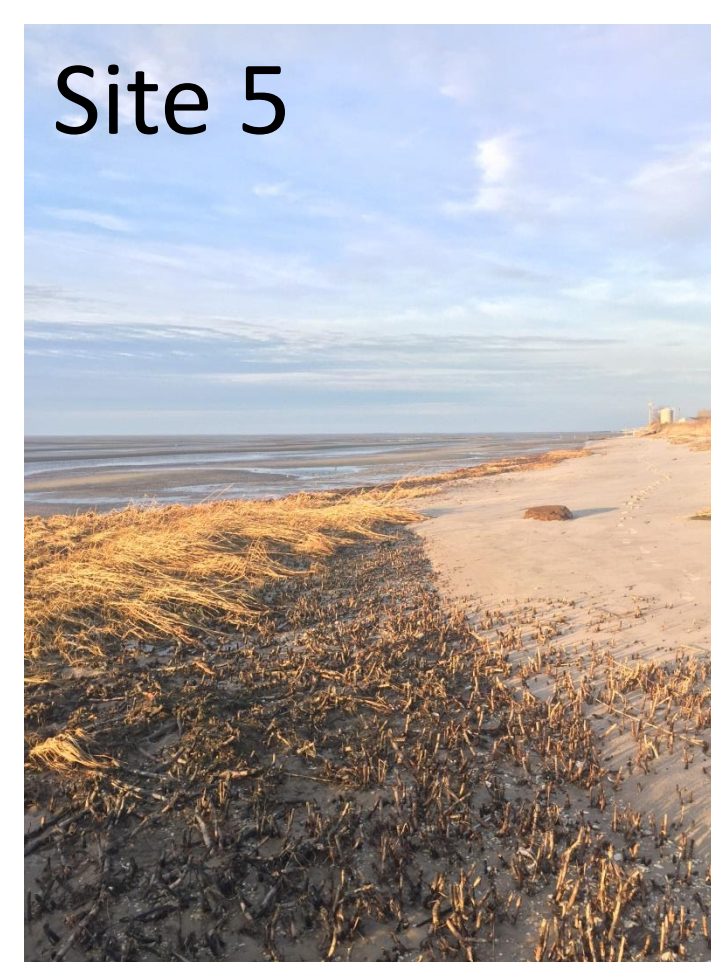
Site 2



Site 3



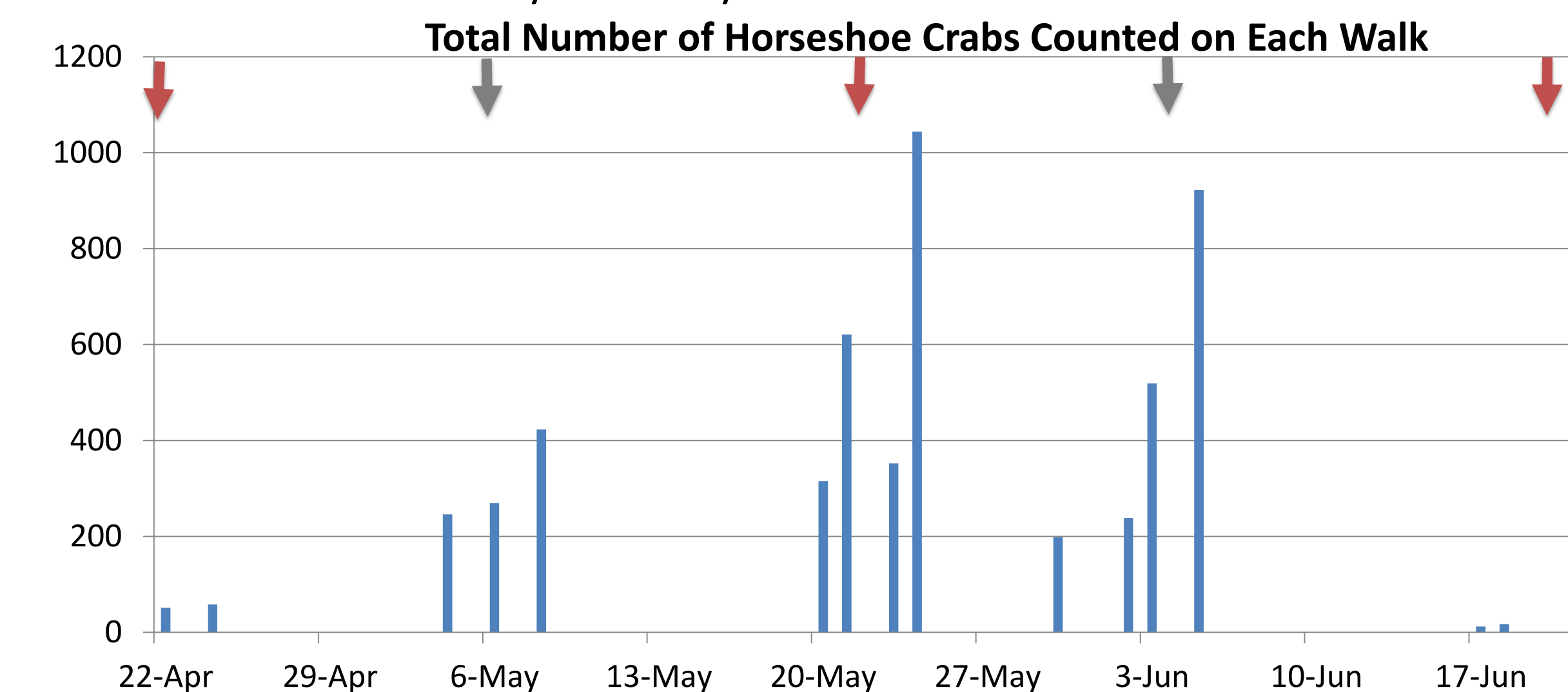
Site 4



Site 5

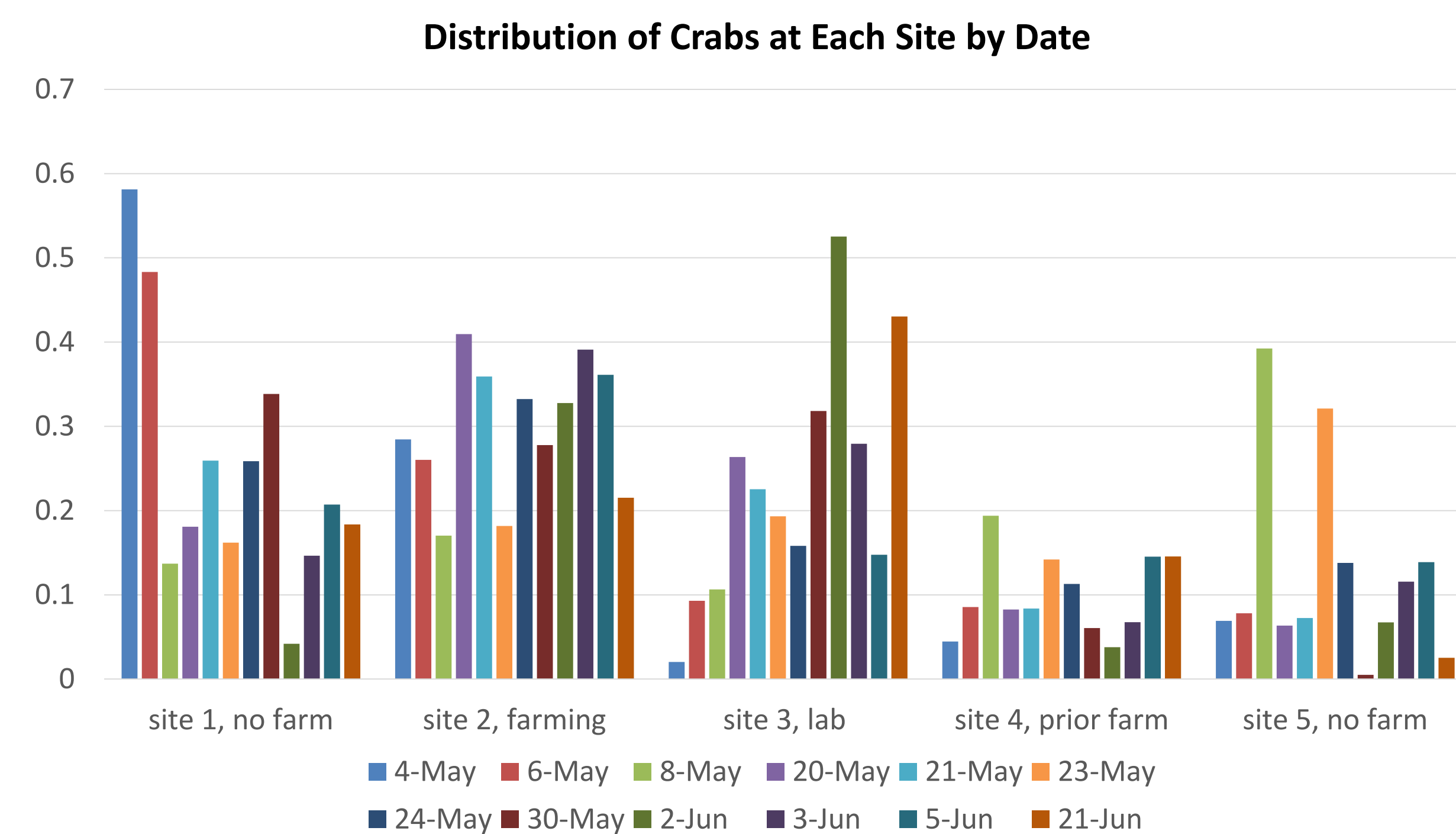
Results

- Sixteen walks were completed and over over 5,400 crabs counted with highest abundances in late May and Early June

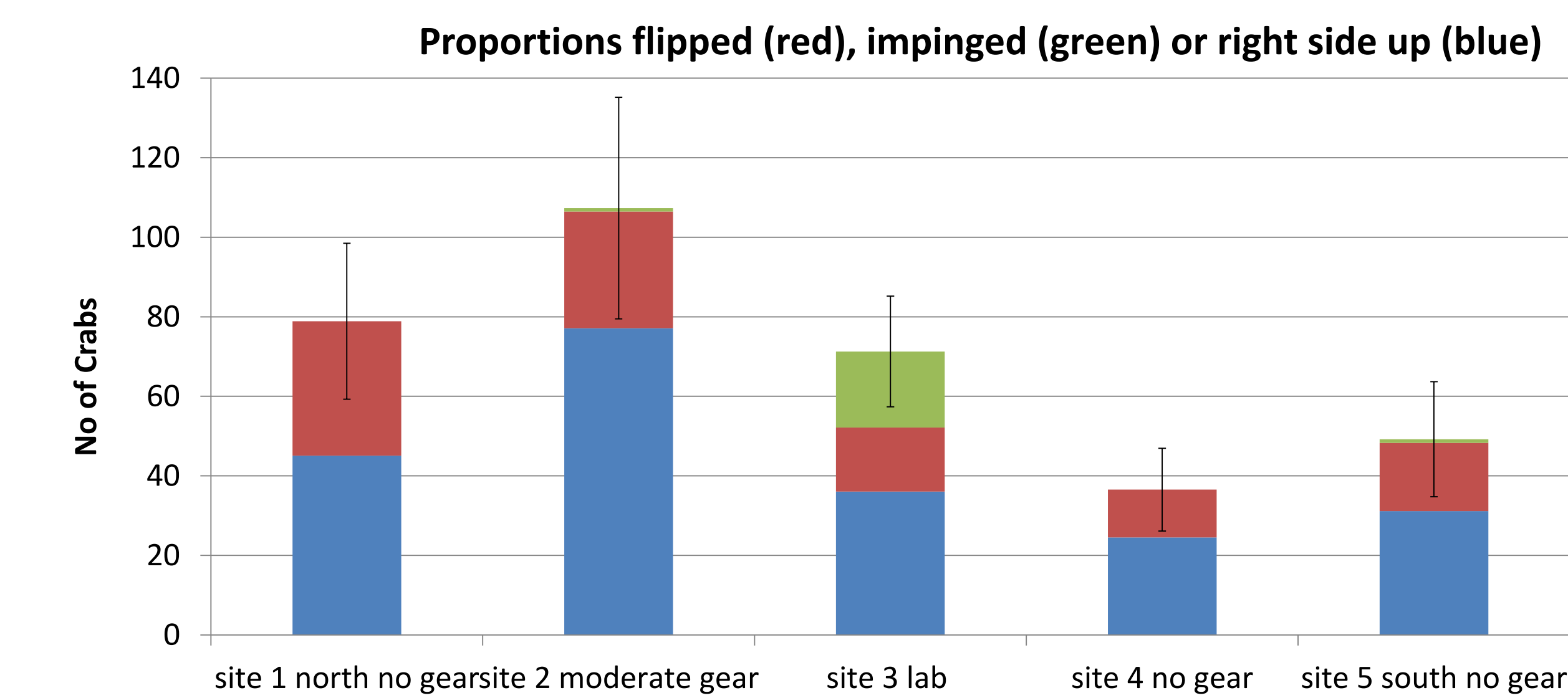


Total number of crabs counted per walk from April 22 to June 22, 2016. Red arrows indicate full moons, grey indicate new moons. Typically, the highest abundance of HSC is seen with the full moon in May. The highest count just after the full moon corresponded to a storm event on May 22nd. This is consistent with RTF information.

- Site 2, with the most farming gear, tended to have a higher proportion of crabs on any given date.

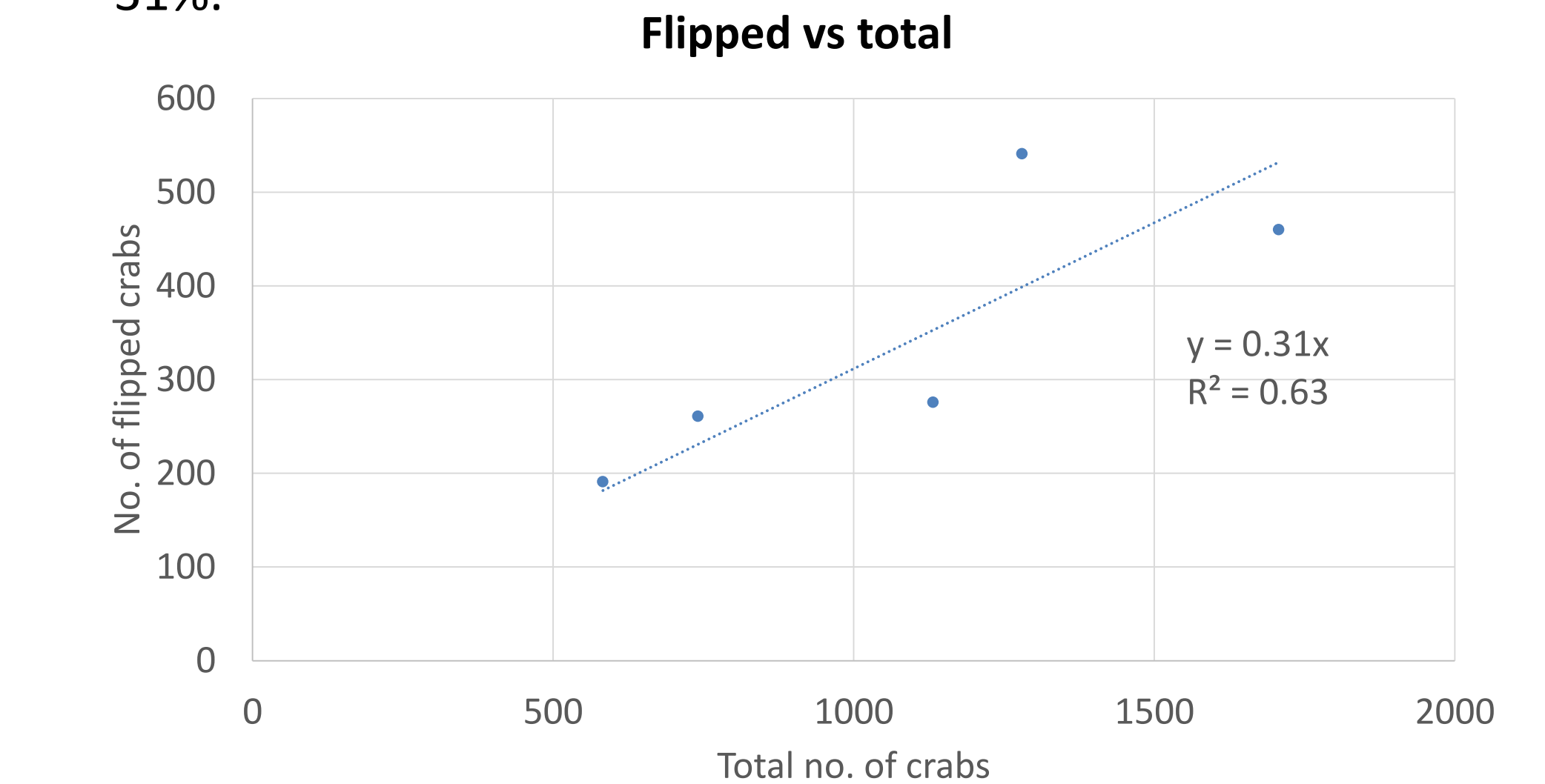


- Impinged crabs were most abundant at the Rutgers Lab where Hurricane Sandy exposed and damaged a gabion wall protecting the dune.



Total bars represent the average number of horseshoe crabs counted over the time series with one standard error shown. Despite apparent differences among some sites, a single factor ANOVA was not significant ($p = 0.06$) and a Tukey's post-hoc multiple comparison found no differences among site pairs.

- The proportion of flipped crabs was relatively constant across sites averaging 31%.



A regression of the number of flipped vs total number of crabs indicated that the number of crabs flipped was related to the number of crabs that were present. Because wind-induced waves flip crabs, the more crabs present during storms, the more that are found flipped. This is consistent with RTF observations and strategy to increase rescue efforts during periods of high wind.

Discussion

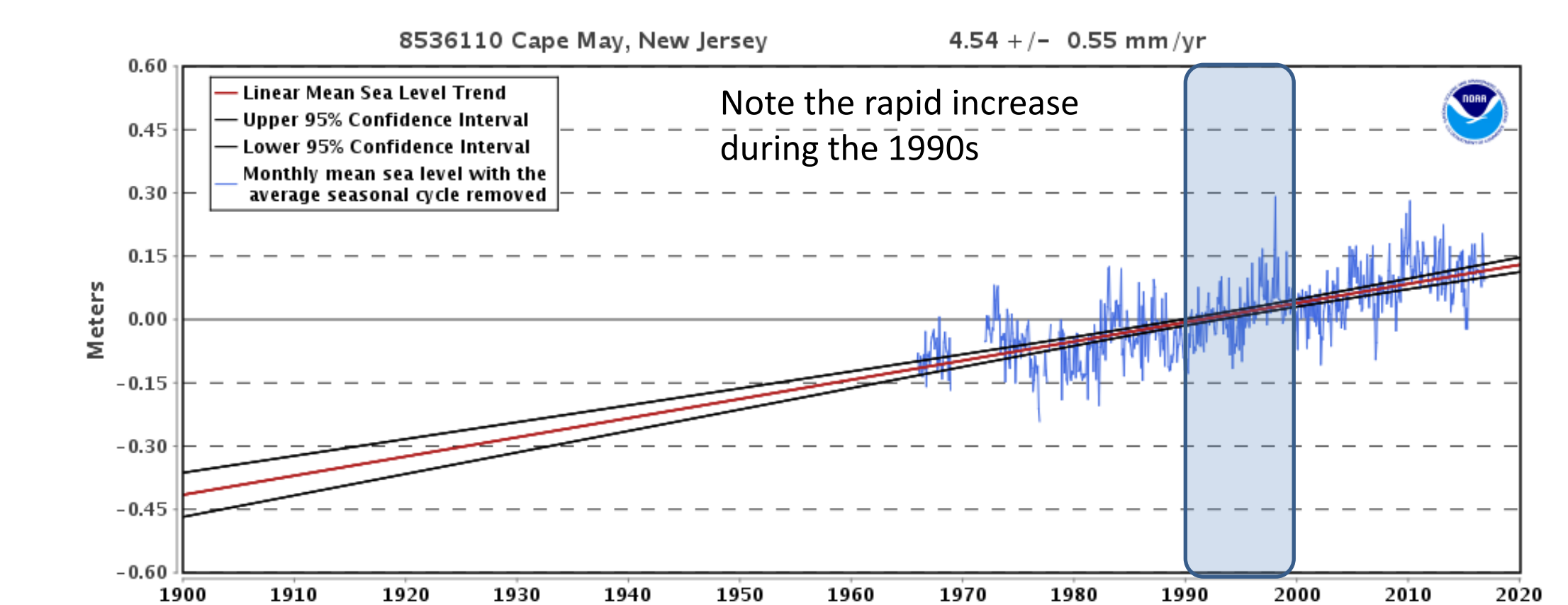
Farming gear did not reduce the presence of horseshoe crabs on spawning beaches. In fact, the trend was for more crabs to be present on beaches where farming was occurring. This was true even on the two higher quality beach sites (one and two). The primary factor that did appear to have an impact on the presence of crabs was beach condition. Beaches south of the Cape Shore Laboratory, where horseshoe crab spawning was historically abundant, have eroded to peat layers leaving little spawning habitat. Beaches to the north have eroded as well and continue to erode but sufficient sand and slope remain to maintain higher levels of HSC spawning. These conditions are likely the result of recent changes in sea level and do not appear to be related to current or historical farming of oysters in the intertidal zone.



1989



2016



Acknowledgments:

- ✓ A big thanks to the fearless field crew that helped count crabs at all odd hours of the night: Mike Acquafredda, Sarah Borsetti, Jennifer Gius, Ricky Klie, Horst Lehmann, Lauren O'Neil, Nicole Pray, Jenny Shinn and Mike Whiteside
- ✓ Thanks also to Joe Caracappa, Jessica Mikus and Jenny Shinn for helping with statistical programs
- ✓ And thanks to The Wetlands Institute RTF program for all their great work and assistance