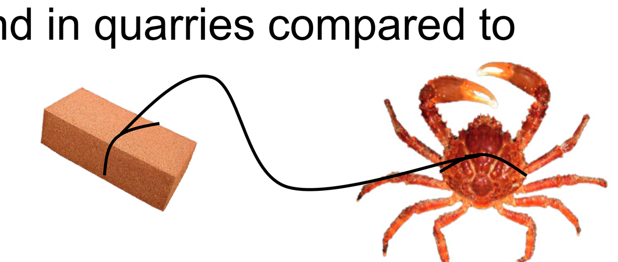
Finding the Best Habitat to Mass Produce Crabs and Save Coral Reefs

Jeannette Fantone
efanton@g.clemson.edu
Clemson University
Dr. Mark Butler - FIU

BACKGROUND

Caribbean coral reefs and those in the Florida Keys are overrun with macroalgae, one of many factors contributing to the decline of coral reef ecosystems. Previous research has shown that out-planting the native, herbivorous Caribbean King Crab (*Maguimithrax spinosissimus*) onto coral reefs overgrown by algae reduces algal cover by 50 - 85% and encourages the return of juvenile corals and reef fish (Spadaro and Butler, 2021). To aid in the restoration of coral reefs utilizing the Caribbean King Crab, we are seeking to create a sustainable source of crabs as an alternative to transplantation of crabs from other natural habitats. One intriguing possibility is the semi-wild aquaculture of crabs in saltwater quarries found throughout the Florida Keys but doing so requires information on their population dynamics compared to wild stocks, including their fecundity and mortality. I examined the size-specific reproductive success and risk of predation of crabs found in quarries compared to those in the wild.



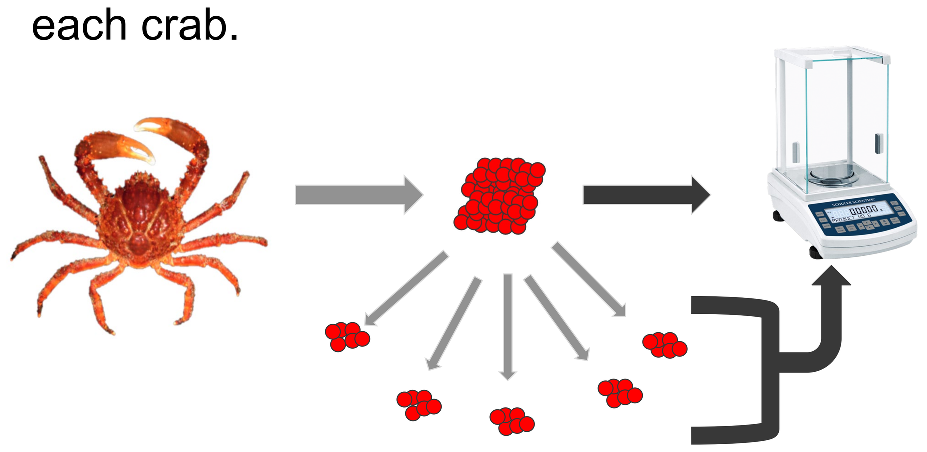
METHODS

Tethering - Survival Rate

- Twenty crabs were tethered to bricks via 25 lb fishing line and placed five meters apart.
- The presence or absence of the crabs was recorded after 24 hours.

Egg counting - Reproductive Success

- Carapace width of gravid crabs was measured, and eggs were removed.
- Total egg mass and the mass of five egg sub-samples were taken, then eggs in each sample were counted.
- The mass/egg ratio of the five samples were averaged to estimate the number of eggs for each crab.



Female Caribbean King Crabs in quarries are **more fecund** and **survive equally well** compared to crabs in the wild.

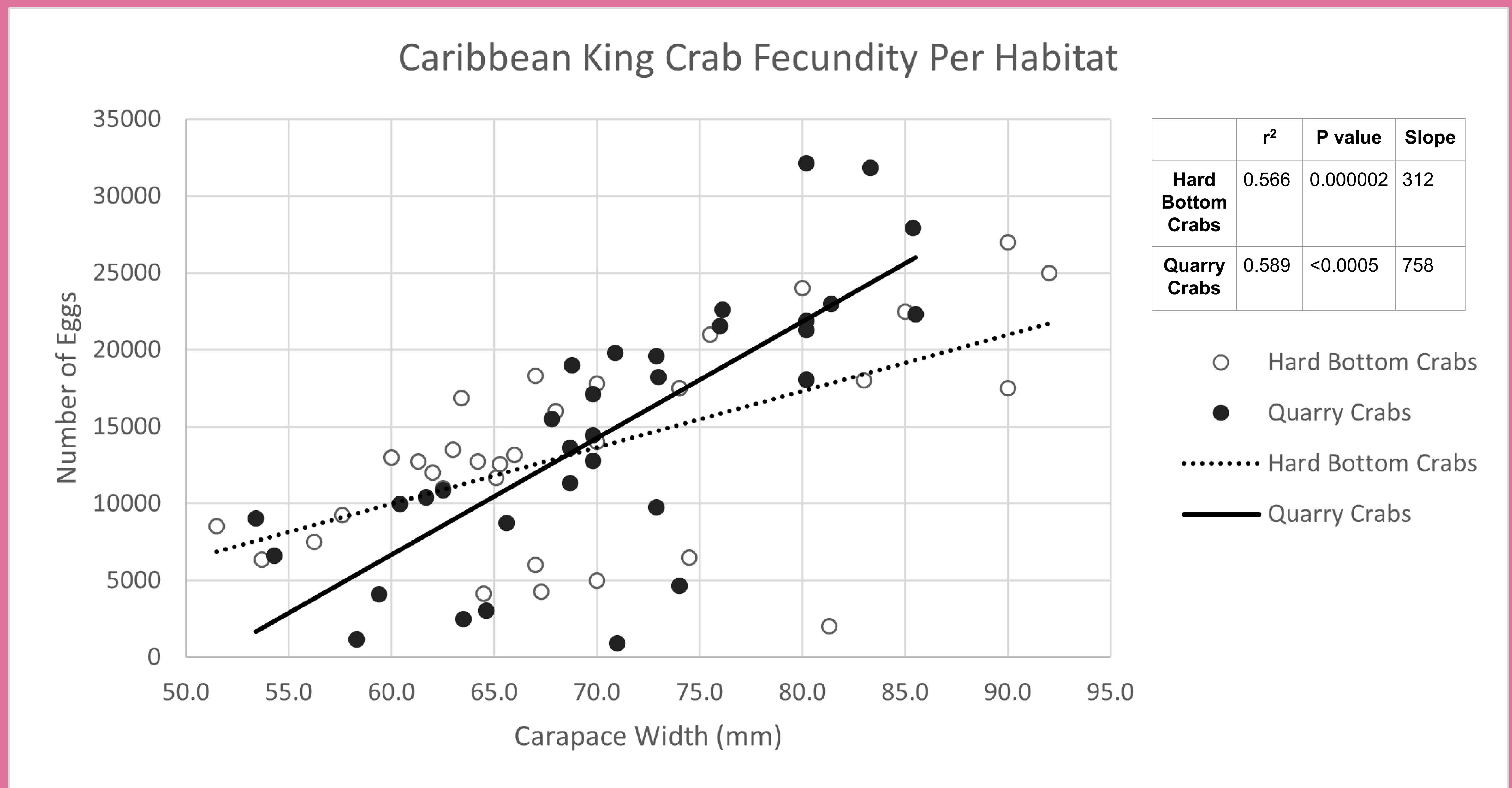


Figure 1: Relationship between carapace width and egg number in female crabs. White dots and black dots represent hard bottom and quarry crabs, respectively. Hard Bottom includes data from Baez A et al. (2015).

FIU Coastal Ecosystems REU Site

RESULTS

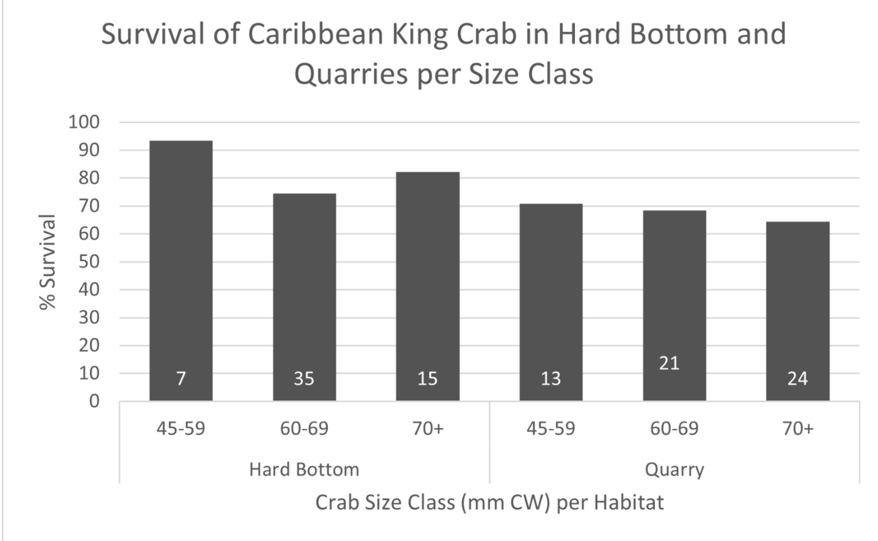


Figure 2: Percent survival of crabs tethered for 24 hours for each habitat per crab size class (mm CW); sample sizes for each site are indicated on each histogram.

Crab Size	45-59 mm	60-69 mm	70+ mm
P Value	0.491	0.275	0.491

Table 1: P-values from log-linear contingency table analysis testing the effect of habitat and crab size on susceptibility to predation.

IMPLICATIONS

- These are promising results with respect to the potential to utilize herbivorous crabs grown in saltwater quarries to scale-up efforts to stock crabs on coral reefs to reduce nuisance algae.
- The higher size-specific fecundity and equal or lower mortality of crabs from quarries indicates that higher population growth rates are possible for crabs already existing or introduced into quarries.
- An important next step is to compare the genomic structure of crabs from quarries as compared to wild populations, and that research is underway.

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