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The radial forager patterns and population density of the *Scopimera inflata*

Background

- Live on sandy beaches in the tropical Indo-Pacific
- Grey-brown in color well matched to the color of sand where it lives
- Emerge at low tide (Three hours after low tide to first emerge and 5 -6 hours for last to emerge)
- During Low tide they burrow up to the surface to feed on detritus and other organic material left by the retreating water
- The burrow until the crab reaches the water table in the sand
  - The organic matter is taken from the pellet and is pushed down the burrow
- It begins to feed by scraping the surface of the sand
  - It is spooned into the mouth and rotated to form the pellet
- To discard the pellet the crab moves away from its burrow in a straight line for 20-30 cm (star like pattern) (It returns to the hole and repeats the same action at a different angle)
- While in the burrow waiting for the next tide it stores water in its gill cavities (to keep the gills moist and assist in feeding)

https://www.youtube.com/watch?v=6XJtq2d_IFs

Introduction

- Purpose
  - To examine the foraging pattern and population density of the *Scopimera inflata*.
- Question 1: Will the foraging lines have a longer radius further from shoreline?
  - Null hypothesis: There will be no difference in the *Scopimera inflata* foraging lines radius.
- Question 2: Will the population density change with distance from the shoreline?
  - Null hypothesis: There will be no change in the *Scopimera inflata* population density.

Methods & Materials

- Systematic approach at Considine Beach
  - Low tide
  - 0 m, 20 m, 40 m, 60 m, 80 m
    - Radius of 2.5 m
  - The number of holes present were counted
  - The radius of the furthest foraging line hole was measured (cm)
- Statistical Analysis
  - Regression lines were made using a scatter plot for both sets of data

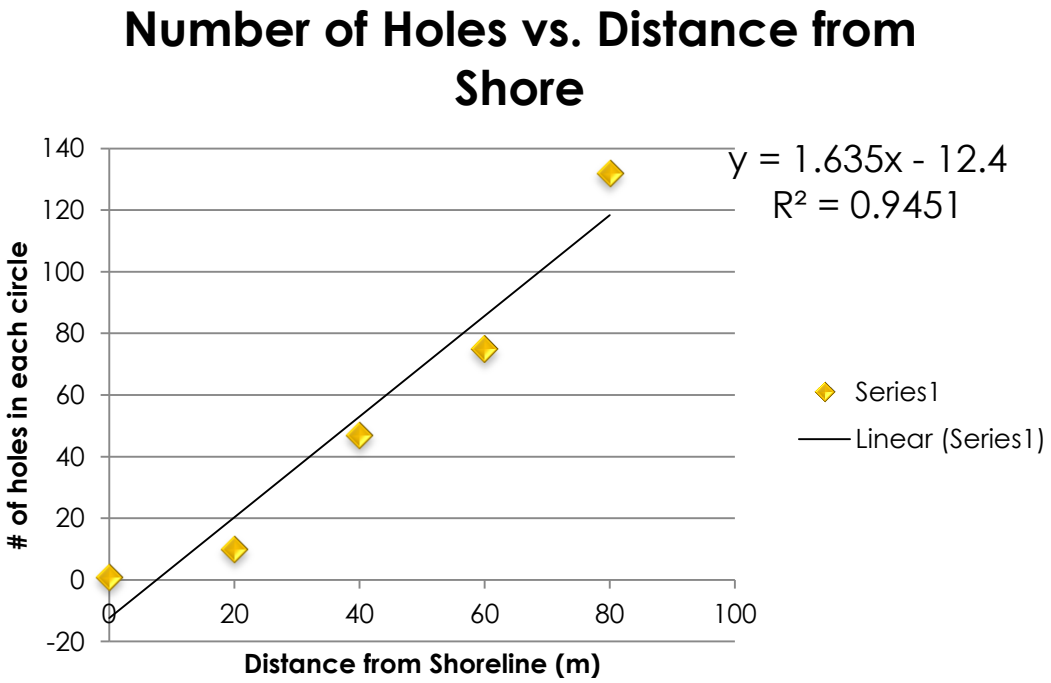
Results – population density

Statistical analysis

- Rejected Null
- R value: 0.972
- P ≤ 0.01

Number of holes

- 0 m = 1
- 20 m = 10
- 40 m = 47
- 60 m = 75
- 80 m = 132



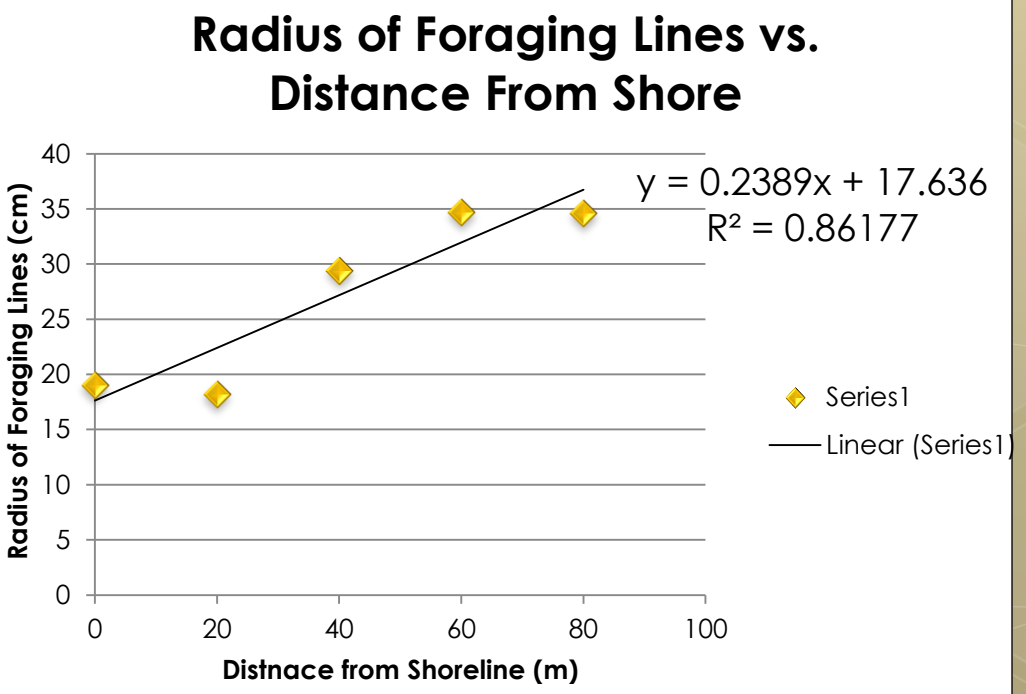
Results – Radius

Statistical analysis

- Rejected Null
- R value: 0.927
- $P \leq 0.05$

Average radii

- 0 m = 19
- 20 m = 18.2
- 40 m = 29.4
- 60 m = 34.7
- 80 m = 34.6



Discussion – Population Density

- Highest in autumn, lowest in summer (after breeding periods)

Breeding

- Significant factor in location and density.
- Sex Ratio biased towards males in the burrow area (land) and females towards water saturated area.
  - Spent females found in burrow areas (used for foraging)
  - Pregnant females found in water saturated areas (used for mating, incubation, etc)
    - We thought females being closer to coastline aids in protection and nutrients

Age

- A high proportion of larger, older, crabs of both sexes stayed in the burrowed area during reproductive season (autumn)
- Smaller, younger crabs spent most of their time in the water saturated area for growth

"For other population categories the choice will depend on the richness in edible organic content of the substrate in the area and the balance between the risk of being preyed upon and the benefits of foraging over rich substrata" (Gheradi, 2002).

Discussion – Radius

Distance from shore

- Time
  - More time → more pellets → longer radii
- Could relate back to sex &/or age of crab in area
- Also relates back to original hypothesis of shorter radii (pellet rows) due to quicker return of the tide in that area

- Nutrients
  - There are more nutrients closer to shore therefore they would need to make less pellets because they would be more nutrient dense

Overall

- The population density of bubbler crabs was greater farther off shore…
  - Our thoughts: not mating season, lack of females by the waters edge, tidal change
- The radius of the foraging lines was longer farther off shore…
  - Our thoughts: less nutrients, have to sift through more pellets to obtain sufficient nutrients, tidal change takes longer to reach (more time)

For next time…

Errors

- More significant way to distinguish the foraging lines to their hole.
- Waiting until the end of low tide.
- Have more 20 m increments for more data

Further Studies

- Measure the number of pellets for each hole.
- Study the crab to get a better understanding of the time it takes to make and finish the foraging lines.
- Study the crabs at a beach with a longer shoreline.

Literature Cited

- Fielder, DR (1971) . Some aspects of distribution and population structure in the sand bubbler crab Scopimera inflata Milne Edwards, 1873 (Decapoda, Ocypodidae). Australian Journal of Marine and Freshwater Research 22 , 41–48.
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- Gheradi, Francesca. The function of wandering in the sand bubbler crab, 2002. Journal of Crustacean Biology, 22, 520-522.