Effects of Temperature and Salinity on the Burrowing Rates of Mole Crabs, *Emerita talpoida*

Drew O'Shea and Ashley Spring, Ph.D.
Eastern Florida State College

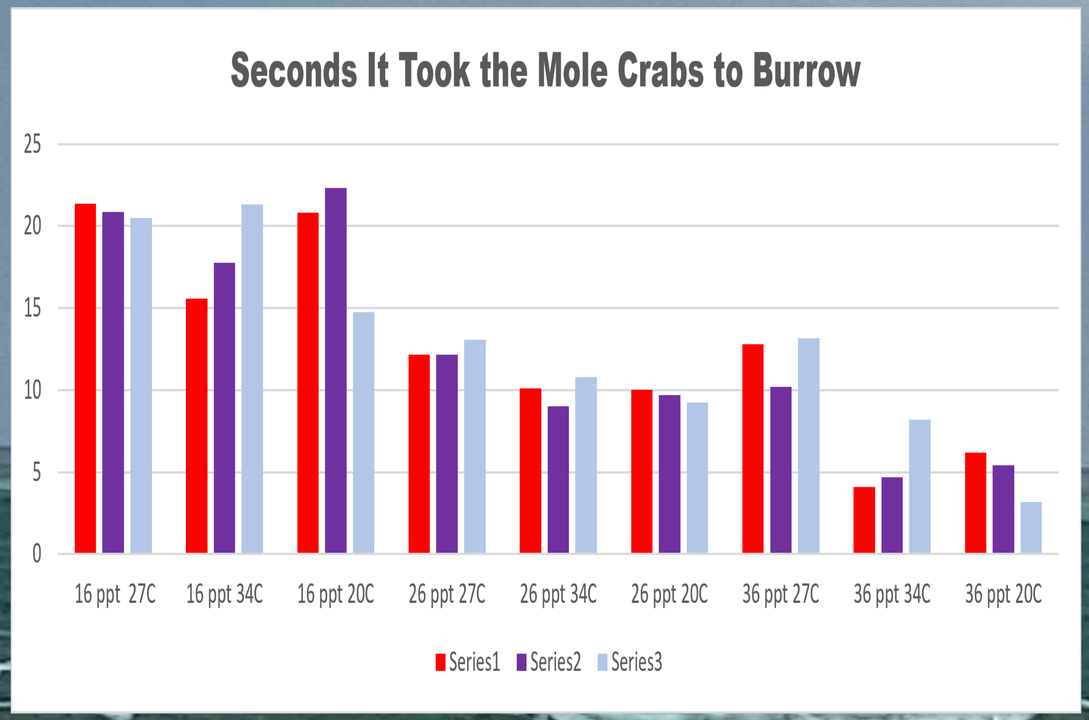
Introduction

Environmental changes in coastal ecosystems can influence the behavior and survival of organisms that depend on specific habitat conditions. Mole crabs (*Emerita talpoida*) inhabit sandy beach shorelines, where rapid burrowing helps them avoid waves and predators. Previous research showed that *E. talpodia* tolerate seawater salinities ranging from 15 ppt to 65 ppt and temperatures of 20°C and below; additionally, temperature influences crabs' responses to salinity changes (Bursey 1978, Horwith and Merz 2005). It was hypothesized that *E. talpodia* exposed to high salinity (36 ppt) and low temperature (20°C) would burrow more slowly than those exposed to lower salinities (16 and 26 ppt) and warmer temperatures (27 and 34 °C).

Materials and Methods

60 mole crabs (*Emerita talpoida*)
6 aquaria (38 L) with air pumps
Calcareous sand
Marine salt mix
Water heaters

Mole crabs were collected by hand via scooping sand from the beach and immediately placed in seawater. Aquaria were prepared with calcareus sand and saltwater with salinities of low (16 ppt), control (26 ppt), or high (36 ppt) with one temperature. The experiment was repeated at three temperatures of low (15 °C), control (27 °C), and high (32 °C). Thermometers and refractometers were used to ensure each tank stayed within its assigned parameters. To measure burrowing rate, the researcher placed five mole crabs on the sand in each aquaria and measured the time required for each crab to fully burrow beneath the sand. Each crab was tested only once.



Results

Burrowing times ranged from 3 to 22 seconds across all temperature and salinity treatments. The shortest burrowing times were recorded in the 36 ppt treatments, with times as low as 3 to 8 seconds, while the longest burrowing times were recorded in the 16 ppt treatments, with times reaching approximately 21 to 22 seconds. Differences in burrowing time were observed among the various combinations of temperature and salinity tested.



Discussion

The results of this experiment did not support the hypothesis. It was expected that mole crabs would burrow more slowly in colder temperatures and lower salinity levels, but the data showed that burrowing rates were faster in the higher temperature and higher salinity treatments. Because the burrowing speeds changed under different environmental conditions, the null hypothesis was rejected, indicating that temperature and salinity did affect burrowing behavior. Overall, the results suggest that the mole crabs tested were able to burrow most quickly in the warmest and most saline conditions used in this experiment.

Literature Cited

Bursey, Charles. "Temperature and Salinity Tolerance of the Mole Crab, *Emerita talpoida* (Say) (Crustacea, Anomura)." Comparative Biochemistry and Physiology Part A: Physiology, Elsevier BV, 1978.

Horwith, M. J., and R. A. Merz. "Sediment size and interspecies interaction affect burrowing times of *Emerita talpoida* in swash." *Integrative and Comparative Biology*. Vol. 45. No. 6. Oxford University Press Inc, 2005.

Image: Virginia State Parks staff, CC BY 2.0, via Wikimedia Commons.