

Potential Controls Affecting Gastropod Biomass in the Intertidal Zone: A Comparison of Bathtub Rock and Dike Rock

Tiffany Schillereff

Sr. Thesis Advisors: Dr. Lindsey Leighton and Dr. Stephen Schellenberg

San Diego California's coastlines include rocky intertidal zones that contain an abundance of the Class Gastropoda. What are the potential controls on gastropod abundance and size? Do wave energy, anthropogenic impact, substrate lithology and predation play a role?

The locations in this study were Bathtub Rock and Dike Rock. Bathtub rock is located approximately 1 km south of the main parking lot at Torrey Pines State Beach. Dike Rock is located 1.1 km north of Scripps Institute of Oceanography pier and there is an approximate 3.3 km distance in between the two locations.

Bathtub rock is a medium grained sandstone sea stack that waves eroded from the Delmar Formation. Dike Rock is a basaltic andesite volcanic intrusion. Dike Rock is part of the Scripps Marine Coastal Reserve (no harvesting of specimens or shell collection allowed) and a submarine canyon (Scripps Canyon) is located off shore. Bathtub rock is not protected and no submarine canyon is located off shore.

Abundance counts, size measurements, and photographs (for identification) were collected in the upper middle to lower upper intertidal zones at laterally correlated MLLW's at the two locations. These counts and measurements were also collected on the south side and north side at each location. These data were collected over a four month interval from September to December 2008.

The observed gastropods in the study include: *Littorina planaxis*, *Collisella digitalis*, *Collisella scabra*, *Lottia gigantea* and *Nucella emarginata*. *N. emarginata* was only observed at Dike Rock. All species of gastropods in this study prefer the upper middle to lower upper intertidal habitat. All but *N. emarginata* are algae grazers. *N. emarginata* is predatory and feeds on mussels, barnacles and other gastropods.

Overall gastropod abundances were higher at Bathtub rock with an average abundance of 537 ± 268 (1 σ) gastropods/m² vs. an average abundance of 247 ± 56 (1 σ) gastropods/m² at Dike Rock. South side abundances were higher at both locations than the north side abundances. The south side of Bathtub Rock had an average of 727 ± 118 (1 σ) gastropods/m² whereas the south side of Dike Rock had an average of 288 ± 47 (1 σ) gastropods/m². The north side of Bathtub Rock had an average of 348 ± 58 (1 σ) gastropods/m² whereas the north side of Dike Rock had an average of 207 ± 26 (1 σ) gastropods/m². Overall gastropod size varied between the two locations with Dike Rock having an overall larger average size of 15 mm versus 7 mm at Bathtub Rock.

The higher abundance of gastropods at Bathtub rock could be due to the site's more easily bioeroded sandstone (facilitating more dwelling structures) and fewer predatory *N. emarginata* gastropods and sea stars. The higher abundances on the southern side of both sites could reflect the average west-northwest incoming wave energy, which might preferentially dislodge gastropods from the northern sides. Larger average specimen size at Dike Rock could be due to the presence of the submarine canyon which refracts wave energy away from the site, providing full growth potential. Gastropods at wave-swept sites due to the probability of dislodgement by mechanical

drag forces increases mortality rates before they can achieve maximum size (Denny et al. 1985.) Another factor that could be affecting the larger size at Dike Rock is that it is a protected marine reserve. Anthropogenic impacts such as harvesting specimens have contributed to size declination over time (K. Roy et al. 2007.) Larger gastropod species *Lottia gigantea* and *Nucella emarginata* are present at this site which could be another factor.