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Temporal and Spatial Dynamics of a Tidepool Fish Assemblage in San Diego, California

A dissertation submitted in partial satisfaction of the requirements for the degree Doctor of Philosophy in Oceanography

by

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ABSTRACT OF THE DISSERTATION

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In a rocky intertidal tidepool habitat, factors like temperature, salinity, oxygen, and wave energy fluctuate tidally, daily, seasonally, and interannually. Unlike sessile organisms, motile organisms can adjust their location in response to environmental fluctuations; therefore, they may not fit into general intertidal ecological models based on sessile emergent communities. Fish populations were sampled at several sites in San Diego, California, from 1996 to 2000 to test effects of temporal environmental variability on habitat use, assemblage structure, and population dynamics of the major tidepool fishes of San Diego, California: *Clinocottus analis* (woolly sculpin), *Gobiesox rhessodon* (California clingfish), *Hypsoblennius gilberti* (rockpool blenny), *Girella nigricans* (opaleye), *Gibbonsia elegans* (spotted kelpfish), and *Paraclinus integripinnus* (reef finspot). These fishes were found to spatially and temporally partition tidepool habitat among species and ontogenetically within species.

Habitat use and assemblage structure were variable on the three temporal scales addressed in the study (diel, seasonal, and El Niño Southern Oscillation). Middle intertidal fishes used high and low intertidal pool differently depending on time of day. Fishes used higher tidpool during the fall, when sea level is seasonally highest. Recruitment and growth were seasonal and were the main influence on temporal variability in population growth rate of the assemblage dominant, *C. analis*.

Changes in population dynamics and assemblage structure were observed during the 1997-98 El Niño event. *C. analis* population size declined due to changes in early life-history (larval and juvenile) processes, including a drop in recruitment. *P. integripinnus* population size increased during the El Niño event. The combination of these two changes led to higher species evenness during El Niño. One species, *G. nigricans*, experienced a morphological shift (increases in dorsal spot number) associated with El Niño. Because the study spanned only one El Niño event, generalization to other ENSO events is not possible. However, as ENSO predictability increases, future studies will be able to test the generality of these results.

Rocky intertidal fishes of San Diego do not conform to the density-dependent, space-limitation model proposed for many rocky intertidal taxa that are sessile and emergent. Rather, community and population regulation appear forced by pre-recruitment processes, like many tropical reef fishes. Future studies targeting the larval stage will enable further identification of specific larval vital rates important in controlling population dynamics.

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