

UNIVERSITY OF CALIFORNIA, SAN DIEGO

Pattern in Space and Time of Clupeoid Fish Eggs in the
California Current Region

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by

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ABSTRACT OF THE DISSERTATION

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This dissertation examines spawning behavior and habitat in Pacific sardine (*Sardinops sagax*) and northern anchovy (*Engraulis mordax*) in the Southern California Bight (SCB). The fine-scale horizontal and vertical distributions of anchovy and sardine eggs are characterized and their potentials for interaction with the predator *Euphausia pacifica* are assessed under varying environmental conditions.

In Chapter 2, fine-scale horizontal pattern of sardine and anchovy eggs is characterized. Variograms for anchovy eggs have a higher nugget effect than those for sardine eggs, indicating that spatial structure of the distribution of sardine eggs is better resolved at the scales sampled. In light of other spatial studies of eggs of *Sardinops sagax* and *Engraulis* spp., I propose that the pattern is a function of species-specific life history, population size and age structure, spawning intensity, and physical scales of the spawning habitat.

Chapter 3 presents a model for vertical distribution of anchovy and sardine eggs, based on vertical mixing and ascent velocities of the eggs. The vertical mixing model that best predicts observed vertical distributions of anchovy eggs is different than that for sardine, and addition of a random error term to the terminal ascent velocity affects predictions of anchovy eggs, but not sardine eggs. Observed vertical distributions of sardine eggs are highly variable, perhaps due to horizontal patchiness or true vertical variability. The model does not improve prediction of integrated abundances from samples at 3-m depth over a simple regression of 3-m on integrated abundances.

In **Chapter 4**, distributions of sardine and anchovy eggs and adult and juvenile *Euphausia pacifica*, an abundant euphausiid predator on ichthyoplankton, are examined in geographic and T-S space in the SCB for 1953-1959 and 1995-2002. Variability in the relative distributions of the three species shows concordance with environmental change. Occurrence of significantly complementary distributions of anchovy eggs and *E. pacifica* provides supporting evidence for interaction between anchovy and euphausiids.

Spatial pattern in sardine and anchovy eggs is shown to be relevant to relationships between spawning behavior, spawning habitat, and population size. The potential importance of the dominant euphausiid species in influencing recruitment and spawning habitat selection is also supported.

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PUBLICATIONS

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