



A simple model relating habitat features to a diapause egg bank

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ABSTRACT: As a way to escape from adverse conditions, many zooplankton populations produce diapausing eggs that accumulate in the sediments and hatch when suitable environmental conditions are restored. While buried in the sediment, diapausing eggs may be affected by several processes (i.e., production, hatching, deterioration, and loss). We present a simple mathematical model for the dynamics of diapausing eggs in the sediment. We were mainly inspired by the model organism *Brachionus plicatilis*, a cyclical parthenogen rotifer, but the model is applicable to other zooplankters. Three diapausing egg categories are used as variables in our model: (1) healthy-looking eggs, assumed to represent the fraction of viable eggs; (2) deteriorated eggs, considered unviable; and (3) hatched eggs, shells remaining in the egg bank from past emergences. The model is used to relate the abundances of these egg categories to production, hatching, deterioration, and loss rates. Then, we propose how relationships between these variables are related to habitat features for temporary populations. Size of the egg bank, here considered as the summation of the three egg categories, is indicative of the quality conditions in the water column (i.e., high production of diapausing eggs). The ratio among deteriorated and healthy-looking eggs is indicative of deterioration rates in the sediment, and high ratios are expected when sediment adversity is high. Our analysis also indicates that the ratio among hatched and healthy-looking eggs is indicative of the hatching rate, which we hypothesize is positively related to both sediment adversity and water-column predictability.

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