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Larval versus adult dispersal: implications of two modes of dispersal on the spread rate and population structure at an invasion

Marine species can spread by both adult movement and through dispersal of pelagic larval stages or propagules. Optimal methods to control the spread of the species depend on which mechanism is dominant. However, measuring the scale of stage-specific dispersal is usually difficult, if not impossible. By comparison, sampling the population at the leading edge of an invasion is much easier logistically. Hence, we are interested in the relationship between the population structure at the leading edge of an invasion and the relative scales of dispersal between stages. To address this problem, we considered a deterministic, stage-structured integrodifference equation (IDE) model with dispersal by both larval and adult stages. The fractions of the population by stages at the wave front are predicted by the eigenvector corresponding to the principal eigenvalue of the linearized IDE model. Analysis of this eigenvector leads to a relationship between the fractions of the population by stages at the invasion wave front and the demographic parameters, the dispersal parameters and the spread rate.