TESTING DEMOGRAPHIC METHODS USING FIELD STUDIES OF FIVE DISSIMILAR SPECIES

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Study Description

We analyzed how the choice of different modeling frameworks influences the results of demographic analyses, with the goal of assessing how robust population predictions are to different methods and assumptions. Our simulation tests use data we have collected during field studies of five different species that span a wide range of life histories, habitats, and taxonomic groups. We found that some modeling decisions thought to be important are not particularly influential on results, while others are. Most broadly we found that integral projection models (IPMs) and matrix models are not clearly separate in their structure or predictions.

Photo 1. Habitats of the focal species and populations used in this study. (A) Niwot Ridge, Colorado, United States, site of data collection for *Polygonum viviparum,* the alpine bistort. (B) Noguera Ribagorzana Valley, Spain, the study site and the only natural population of *Borderea chouardii*. (C) Boreal forest in the Wrangell Mountains of Alaska, United States, site of the *Vulpicida pinastri* study. (D) Montgrí, Illes Medes, and Baix Ter Marine Natural Park in the Spanish Mediterranean sea, one of three locations of our fieldwork on *Paramuricea clavata*, the Mediterranean red gorgonian. (E) The Marianne River, Trinidad, one of the sites for data collection on *Poecilia reticulata*, the guppy. Photo credits: Daniel F. Doak (A, C), María Begoña García (B), Cristina Linares (D), and Sarah W. Fitzpatrick (E).
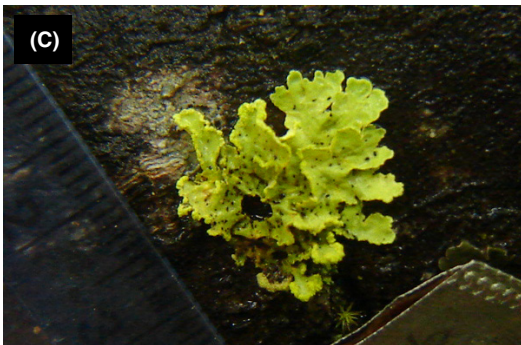
Photo 2. Portraits of each study species. (A) *Polygonum viviparum*. (B) *Borderea chouardii*. (C) *Vulpicida pinastri*. (D) *Paramuricea clavata*. (E) *Poecilia reticulata*. Photo credits: Ellen Waddle (A) María Begoña García (B), Daniel F. Doak (C), Cristina Linares (D), and David Herasimtschuk (E).

Photo 3. Examples of field methods used in each demographic study. (A) Individual *Polygonum viviparum* are marked using multi-colored party toothpicks. (B) Many *Borderea chouardii* exist on high cliffs and must be censused and measured using scaffolding and ladders. (C) Each *Vulpicida pinastri* thallus is marked with a tree tag stapled below it on an alder stem. (D) *Paramuricea clavata* colonies are relocated and measured by research divers who must be careful to not damage the colonies as they work. (E) *Poecilia reticulata* are relocated by intensive capture efforts in each stream section. Photo credits: Daniel F. Doak (A, C), Ramon Antor (B), Cristina Linares (D), and Courtney L. Fitzpatrick (E).