

MexSIAM 2021 Junio 21

Threshold Parameters in Ecology and Epidemiology

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Target reproduction numbers are defined and shown to unify threshold parameters in population biology, including the net reproductive value used in ecology and the basic reproduction number used in epidemiology. Both algebraic (using matrices) and graphical (using weighted digraphs) approaches to computing target reproduction numbers are developed. Knowledge of these target reproduction numbers is demonstrated to aid in measuring the change of certain model parameters in order to protect endangered species (e.g., salmonoids), control invasive species (e.g., scentless camomile) and to determine disease control strategies (e.g., for cholera).