Figure ChangeK: **Performance of Regime Shift Detector Script under conditions of varying K.** Proportion of results with a given outcome under varying % changes in the K constant in the Ricker model at four simulated break point scenarios. Sets of 0, 1, 2 and 3 break points were randomly generated from within the set of possible values, and data were simulated with random 5% sampling error and a 20% shift of r at the given break point. Each series consisted of 25 years of simulated data and each scenario was iterated 500 times. Lines joining points represent a third order polynomial GAM representing the best fit, with standard error. Possible outcomes were A) Successful identification of all break points; B) One extra break point identified; C) One break point missed; D) Correct number of breaks found, but one or more break points misidentified; and E) Complete failure to identify the correct break point combination by the regime shift detector script.

Figure ChangeR: **Performance of Regime Shift Detector Script under conditions of varying r.** Proportion of results with a given outcome under varying % changes in the r constant in the Ricker model at four simulated break point scenarios. Sets of 0, 1, 2 and 3 break points were randomly generated from within the set of possible values, and data were simulated with random 5% sampling error and a 40% shift of K at the given break point. Each series consisted of 25 years of simulated data and each scenario was iterated 500 times. Lines joining points represent a third order polynomial GAM representing the best fit, with standard error. Possible outcomes were A) Successful identification of all break points; B) One extra break point identified; C) One break point missed; D) Correct number of breaks found, but one or more break points misidentified; and E) Complete failure to identify the correct break point combination by the regime shift detector script.

Figure noise\_sim: **Performance of Regime Shift Detector Script under conditions of varying sampling error.** Proportion of results with a given outcome under varying % in sampling error (‘noise’), modeled as randomly generated values selected from a continuous interval within a given % noise, for each observation generated in a simulation. Sets of 0, 1, 2 and 3 break points were randomly generated from within the set of possible values, and data were simulated with a 20% shift of r and a 40% shift of K at the given break point. Each series consisted of 25 years of simulated data and each scenario was iterated 500 times. Lines joining points represent a third order polynomial GAM representing the best fit, with standard error. Possible outcomes were A) Successful identification of all break points; B) One extra break point identified; C) One break point missed; D) Correct number of breaks found, but one or more break points misidentified; and E) Complete failure to identify the correct break point combination by the regime shift detector script.

Figure Nyears: **Performance of Regime Shift Detector Script under varied time series length.** Proportion of results with a given outcome under varied simulation length in years. Sets of 0, 1, 2 and 3 break points were randomly generated from within the set of possible values, and data were simulated with a 20% shift of r and a 40% shift of K at the given break point, generated with a 5% random noise to simulate sampling error. Each series consisted of 25 to 33 years of simulated data and each scenario was iterated 500 times. Lines joining points represent a third order polynomial GAM representing the best fit, with standard error. Possible outcomes were A) Successful identification of all break points; B) One extra break point identified; C) One break point missed; D) Correct number of breaks found, but one or more break points misidentified; and E) Complete failure to identify the correct break point combination by the regime shift detector script.

Figure obs\_outcomes: **Observed outcomes of Regime Shift Detector Script relative to simulation conditions.** Proportion of results with a given outcome under varied simulation length in years. Sets of 0, 1, 2 and 3 break points were randomly generated from within the set of possible values, and data were simulated with a 20% shift of r and a 40% shift of K at the given break point. Each series consisted of 25 years of simulated data and each scenario was iterated 500 times. Lines joining points represent a third order polynomial GAM representing the best fit, with standard error. Data are plotted here by output of the regime shift detector script under varied sampling error (i.e. % noise) and input break point combination conditions, where A) proportion of scenarios where zero breaks were detected; B) proportion of scenarios where one break was identified; C) scenarios with two break points identified; and D) scenarios where three breaks were identified by the regime shift detector script.

Figure Harmonia: **Regime shift detector breaks and Ricker model fits for an invasive ladybeetle**. Population data documentis the invasion of *Harmonia axyridis*, a ladybeetle native to eastern Asia, to plots at the Kellogg Biological Station in southwestern Michigan, USA, 1994-2015 A) Time series documenting average number of adults captured, per trap, per year. Vertical blue lines indicate timings pf apparent regime shifts as observed by Bahlai et al 2015. When data from 2014-2015 are included in the analysis (data following the black dashed line), the shift after 2005 is no longer detected by the model. B) Ricker fits of phases of population dynamics as determined by Bahlai et al 2015 (solid lines) and the new fit indicated by two additional years of sampling data (black dashed line).

Figure Monarch: **Regime shift detector breaks and Ricker model fits for a species of conservation concern.** Population data documents the area occupied by overwintering Monarch butterflies in their winter habitat in the Mexico, 1995-2016 A) Time series documenting raw data of estimated area occupied by overwintering monarchs by year. Vertical blue lines indicate timings of apparent regime shifts as indicated by the regime shift detector script. B) Ricker fits of phases of population dynamics as indicated by the regime shift detector script. Between each phase, the carrying capacity K decreased by about 50% from its former value, while r increased slightly in the transition from phase A to phase B