Abstract

The most pressing issues of our time are all characterized by sudden regime shifts: the collapse of marine fisheries or stock-markets, the overthrow of governments, shifts in global climate. Regime shifts, or sudden transitions in dynamical behavior of a system, underly many important phenomena in ecological and evolutionary problems. How do they arise? How can we identify when a shift has occurred? Can we forecast these shifts? Here I address each of these central questions in the context of a particular system. First, I show how stochasticity in eco-evolutionary dynamics can give rise two different domains, or regimes, governing the behavior of evolutionary trajectories (Boettiger et al., 2010). In the next chapter, I turn to the question of identifying evolutionary shifts from data using phylogenetic trees and morphological trait data of extant species (Boettiger et al., 2012). In the last chapter, I adapt the approach of the previous section which allowed me to quantify the information available in a given data set that could detect a shift into an approach for detecting regime shifts in ecological time series data before the occur (Boettiger and Hastings, 2012).