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BI 471

1. Hastings Problems 6.1, 6.3.

   6.1:

   The concept of stability is a useful approach to understand the communities we see in nature today because it allows us to predict the state that the species are at right now and the state they are likely to return to if disturbed. From stability, we can examine the affect one species has on another and what affect that might play into the community as a whole. This model takes into account that species can have different stable states which allows us to examine all of the different possibilities.

   6.3

   Predator-prey: one species will have a positive effect on the other (the prey), while the other species will have a negative effect on the first species (the predator). As prey population's per capita growth rate increases, the predator population per capita growth rate will increase. As predator population's per capita growth rate increases, the prey population per capita growth rate will decrease and eventually so will the predators.

   Competition: each species will have a negative effect on the other species. As population of one species per capita growth rate goes up, the other will go down. As population of one species per capita growth rate goes down, the other will go up.

   Mutualism: each species will have a positive effect on the other species. As population of one species per capita growth rate goes up, the other will go up as well.

2. In class we went through equilibrium and stability analysis for two species, following the notation in Hastings Box 6.1. We then began discussing a two-species competition model, following the notation in Hastings Chapter 7. Both discussions use the notation α_{ij}, but in each case α_{ij} means something different. Explain how α_{ij} differs between Chapter 6 and Chapter 7 of Hastings. Propose a different notation that would improve the book. For those who opt-in, we will send your ideas to Alan Hastings.

   In Chapter 6 of Hastings' book, alpha is used to represent the dn/dt equations for species 1 and 2 which will be evaluated in the matrix in order to determine the eigenvalues of stability and equilibria. In Chapter 7 of Hastings' book, alpha is used to represent the effects of species 1 on species 1, species 1 on species 2, species 2 on species 2, and species 2 on species 1 in order to determine the effect of competition on our two species model. Instead of changing the way matrices are represented, perhaps an uppercase alpha (A) or a lowercase beta (β) could be used in the competition equation to represent the effect of one species on the other.

3. Work through this interactive demo on eigenvalues. In the model under the section marked `Steady States`, what is ultimate result of increasing the `p` parameter?

   When the p parameter was increased to almost one or one, the population in New York depended almost entirely on the population that was coming from California, the q parameter. This means that California had an extremely large effect on the population of New York.

4. Assemble a 1-page "pitch" for a population ecology topic that you would be enthusiastic to learn about, teach, and generate wikipedia content on. Assemble your pitch in an openly accessible Google Doc, and provide the link. Pitches will be shared with the entire class. After reading through all of the pitches, students will get to select a topic. Students will have the opportunity to work solo or to work in groups/teams on a topic. Detailed information about the wiki-a-thon and team-teaching will be provided in class on May 6.

   https://docs.google.com/document/d/1mphAxllhvza-FprZNqA425ij3xdjEK_1rOAovJWRgkw/edit?usp=sharing