FW662 -- Final Exam

March 10, 1993

1. (20 pts) The model of acorn woodpecker population persistence developed by Stacey and Taper (1992) assumes that the observed annual survival rates for adults and juveniles and reproduction rates are independent. As a result, they select the three variables at random from the observed values. As you saw in class (and can verify from the data), the observed adult survival rates correlate with population size ($\underline{P}$ = 0.0576) and reproduction possibly correlates with population size ($\underline{P}$ = 0.0944). Hence, there might be some underlying relationship between adult survival and reproduction, although their direct correlation is not significant ($\underline{P}$ = 0.3916). Modify the population model (PERSIST.WB1) to pick the triplet (adult survival, juvenile survival, and reproduction) from the observed values to simulate a year's dynamics instead of as the model currently works where the values are picked independently from the observed values. *What difference does this modification make to median persistence time?* Bring your model to your oral examination on a 3 1/2" disk so that I can examine your changes.

2. (20 pts) Most wild ungulate populations in the lower 48 states are harvested by man to control their population levels as opposed to the system under which they evolved where they would have been "harvested" by predators. Discuss the implications of this alteration.

> What changes to the functional and numerical responses, prey selection, predator avoidance behavior by prey, and so forth would you expect?
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> What are some long-term (i.e., evolutionary time scale) changes you would expect to occur?

3. (20 pts) A rancher in northeast Colorado has begun raising Barbary sheep (*Ammotragus lervia*). There is a very high probability that these animals will eventually escape, and exist in the wild. In addition, an immense fear is that this exotic species will compete with the native mule deer.

> What traits of Barbary sheep would you examine in a literature review to determine if competition with mule deer might be a real possibility?
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> In an ideal "research" world, what experiments would you conduct to verify the hypotheses suggested by your literature review?

4. (20 pts) Human populations have increased dramatically in the last 200 years, with habitat fragmentation a result. Some species have been able to adapt to this fragmentation, other have not.

> Give examples of species that have successfully adapted to habitat fragmentation, and species that have not been able to adapt to habitat fragmentation.
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> What changes would you expect in a population that has successfully adapted to habitat fragmentation?
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> What management tools would you propose to assist a population that has not been able to adapt to habitat fragmentation?
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> Is the metapopulation model proposed by Levins appropriate as a conceptual view of the habitat fragmentation caused by humans? Why or why not?

5. (20 pts) The attached article by Lacava and Hughes (1984) describes how the minimum viable population size was estimated for northern goshawks and elk on the Willamette National Forest in Oregon. Suppose you had been asked to review this procedure. What criticisms and/or compliments would you have provided the authors? What additional factors would you include in an analysis of population persistence?

Answers

1. This change to the model increases persistence time from a median of about 26 years to a median of 35 years. Hence, they would have generated significantly different answers had they implemented the model in this manner.

2. The functional response of the predator (hunters) will depend on the learning curve of hunters, plus the number of licenses allocated. I would expect a Type III functional response because of the learning curve of hunters to a new huntable species. Numerical responses will depend on these same factors. Because professional wildlife managers are probably attempting to stabilize the prey population, I would not expect any type of cyclic relationship between prey and hunters. Hunters have other prey if a particular species is in short supply. Predator avoidance behavior by prey will have to adapt to this new predator. For example, use of tree stands means that human predators may have a very different strategy than natural predators. Prey selection tends to be just the opposite of natural predators, because the biggest and highest quality prey are selected for instead of the weak and sick.

In the long term, hunter selection of prey could lead to smaller antler sizes and other undesirable characteristics because these animals will have the greatest fitness. This will depend on the timing of the hunt.

3. I would first evaluate the amount of diet overlap between the 2 species to see if competition for food (consumptive competition) is likely. Particularly important is how much of the mule deer diet is considered inedible for Barbary sheep. Another area of competition is territorial competition and encounter competition. Are barbary sheep aggressive towards mule deer, and able to drive them away from food sources?

Experiments to be conducted would be enclosures where each species and combinations of both of them are conducted. Behavioral observations would contribute to an overall evaluation.

4. This article only evaluates minimum viable population size based on simplistic genetic arguments. No consideration is given to environmental or demographic stochasticity, the major weaknesses of the model. Finally, the genetic models are incorrectly applied in that the WNF population is not demographically separated from the surrounding areas. The idea of a minimum viable population for a geographic area that is not demographically separated seems unreasonable.

5. White-tail deer, Norway rats, House mouse, starling, fox squirrels, turkeys, pheasants, Canada goose have all have adapted. Unable to adapt -- prairie chickens, bison, passenger pigeon(?).
Changes to adapt -- increased dispersal, nocturnal movements.
Management tools -- corridors, movement of animals occasionally to insure genetic transfers.