Population Assignment Guidelines Population Ecology BMSC Fall 2020
Due Friday, November 6th @ 9am on Moodle

Context

In this assignment, you will practice taking the long view of populations and their conservation/management by delving into the history and future of an ecologically important marine species. Scientists often form a perspective of what constitutes 'normal' for a species' population based largely on their own experience when they began their careers. However, this baseline often represents the state of a population or species long after it was first impacted by humans. To counteract this "shifting baseline syndrome", scientists must use all available sources of evidence to gain a more representative picture of population change over time, and must extend the search for evidence beyond the time they started their careers as scientists. We also have the opportunity to use quantitative modeling tools (such as structured demographic [i.e. matrix] population models) to forecast how a population may change into the future under particular conditions—and especially, in response to management and conservation actions.

Assignment Overview

The assignment consists of two components, which will be completed in teams of two (you and a peer from class, with one submission for each pair):

1) Summarize the long-term population trend (and/or size/age structure) of an important marine species, and the role of human-mediated stresses on the population, incorporated through evidence unearthed through research in primary literature sources.
2) Create a simple matrix model that estimates future abundances for your population of interest, under different potential management or conservation actions that address the stressor(s) you've identified in Part 1.

To ensure the necessary demographic (i.e. life table) data are available for Part 2, each pair will focus on one of the populations listed here: https://docs.google.com/spreadsheets/d/1PdqeQrMvyK_7zFYcewNI8NdzavVYSlUjZT9XX81QC-Q/edit?usp=sharing The instructors will solicit your input on preference for focal species, and try to accommodate requests (more information on this in Friday, Oct 30th afternoon).

Assignment Components

You will complete a report that details your research and analysis for Parts 1 and 2, and a brief (8-10min) oral presentation summarizing your findings, to be shared in class on Friday, November 6th (last day of class!).

Report (60 marks)

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Part 1: A summary of historical data presenting a clear case for the long-term and short-term population trends. This part will address two different timeframes: *[1,00 words max.]*

a. Basic description of your species (taxonomic group, ecological/trophic role, geographic distribution and habitat use).

b. Long-term trend in adult size, abundance, population size, population range etc. going back as far as possible. This part should also describe the level of uncertainty associated with each piece of evidence. You may choose to present this evidence visually, and/or in writing as appropriate. In other words, you should make a case for a long-term trend, and be clear about how certain the reader should be based on the amount and quality of the available evidence. Sources of evidence may range from population sampling, records of resource use, historical ecology or archaeological approaches, or local or indigenous knowledge (as it has been made accessible in written literature through collaboration with western scholars; e.g. such as some of the papers we have discussed in class).

b. Description and graph of the more recent population trend based on available population numbers. This figure should make clear the source(s) of information used, should contain an appropriate and complete caption, and the data should be presented professionally, concisely, and without any unnecessary information. In other words, this figure should be as close to publication-quality as possible. Evidence for this graph could come from changes in CPUE, or changes in population estimates through scientific censuses. Any measures of uncertainty in the original data should be communicated clearly in this figure/caption (e.g. 95% CIs if available, or descriptions of possible sources of error in censuses).

c. Short summary of the likely drivers of change in population (e.g. harvesting, habitat loss, changing climate, decrease in prey for the species), and any information on the status of those drivers at the present time.

c. A one-page table that describes your search effort. Each line of the table should include a description of a specific search technique (including a list of search terms used, and databases or other resources searched), and the # of results of the search (we will discuss a sample in class on Monday, Nov 2nd- does not count toward word limit).

Part 2: An age-based or stage-based population matrix model of your chosen species parameterized from the available literature). This section will have multiple components:

a. Description of your model. ***[500 words max.]***

b. A diagram showing the age/stage classes used, showing all transition probabilities.

c. A table showing your transition matrix containing appropriate transition values as shown in the preceding figure.

d. A table showing the stable age distribution as the proportion of individuals in the population belonging to each age class.

e. A copy of the working model. If using excel, attach an excel spreadsheet. If using R, include a (#well-annotated) copy of the script necessary to perform your analysis that includes any parameter values and starting population vector as part of the script).

f. A page presenting the results of an analysis that asks and answers a question of your matrix model by projecting your population into the future under different scenarios. We'll go over some examples of the types of questions you might ask in class. Feel free to talk with your instructors about ideas once you've done some thinking on your own. ***[750 words max.]***

g. A complete list of references and sources cited in the text in Parts 1 and 2.

Presentation (30 marks)

A brief oral presentation with accompanying visuals (e.g. PowerPoint) that summarizes:

- Your species' ecology and geographic range
- Historical tends in abundance, and current population status
- Drivers of change in population abundance/structure over time
- The structure of your demographic model, and estimates for the vital rates in your model
- Population management/conservation 'scenarios' investigated with your model, and their results (e.g. effects on population growth).
- Management/conservation recommendations based on your analyses.

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