Zoology 357 Evolutionary Ecology Name_____
First Exam – 5 March 1998

1. (6 pts) Three types of survivorship curves are generally recognized. Draw simple graphs depicting each these curves and label each curve and both axes.

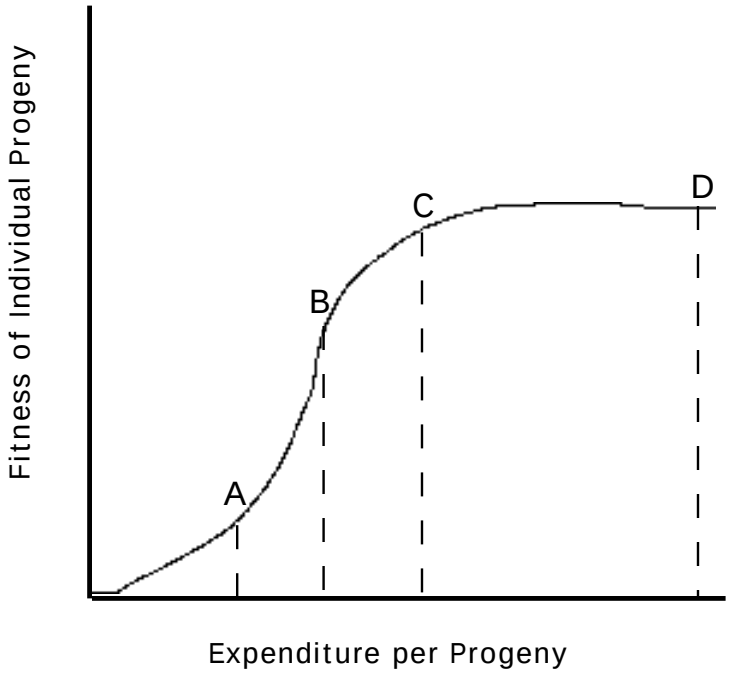
2. (3 pts) In words, describe each of the above 3 survivorship curves.

3. (5 pts) Below are listed several types of organisms. Next to each name indicate which survivorship curve would best fit that organism.

Golden-cheeked warbler (bird)
Human
Grizzly Bear
Mola mola
Salmon

4. (3 pts) What is Reproductive Effort? Why is it difficult to estimate reproductive effort in natural populations? In what sorts of situations can it be best approximated?

5. (4 pts) Which vertical dotted line (A, B, C, or D) corresponds to the optimal investment per progeny from a parental perspective? Explain why there is a conflict of interest between parents and offspring.



6. (5 pts) List 5 correlates of *r*-selected species and *K*-selected species.

	<u>*r*-selection</u>	<u>*K*-selection</u>
1.		
2.		
3.		
4.		
5.		

7. (10 pts) Write down the Verhulst-Pearl Logistic Equation and define all its constants, variables, and identify the density-dependent and density-independent terms.

8. (3 pts) The "Prey Diversity Hypothesis," "Spring Bloom Hypothesis," as well as several other hypotheses have been proposed to explain a certain phenomenon. Explicitly state the question that these hypotheses address and explain the Prey Diversity and Spring Bloom Hypotheses.

9. (6 pts) Suppose you observe two male lizards (of the same species) fighting in an aquarium. What sort of data could you collect from the field (where this species naturally occurs) in order to test whether or not this species is territorial? What would your data tell you if territoriality is supported?

10. (4 pts) The "Stress Phenomena Hypothesis" has been proposed to explain the population cycles of voles. Using demographic theory, explain what is meant by "sweepstakes" reproductive success in the context of the "Stress Phenomena Hypothesis."

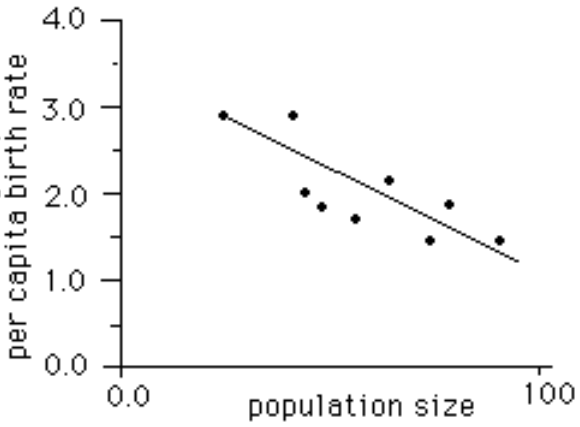
11. (4 pts) A particular species of migratory bird typically lays a clutch of 18 eggs (assume the average clutch size is around 8). Within the context of reproductive value, would you expect this species to nest in low or high latitudes? Why?

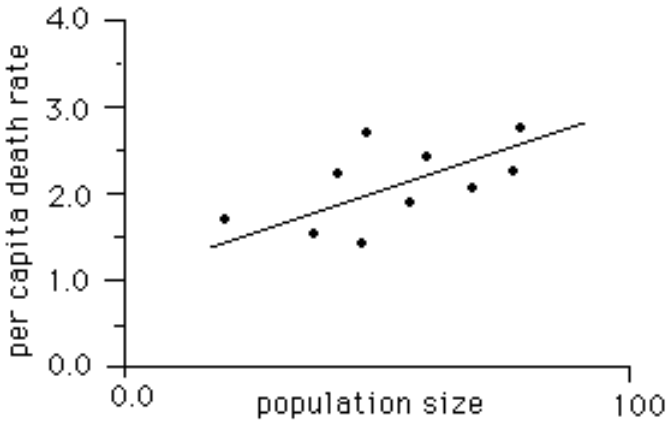
12. (3 pts) Explain how sex might have evolved.

13. (8 pts) Itemize the possible advantages and disadvantages, both to individuals and to populations, of sexual reproduction.

14. (4 pts) What is Anisogamy? Why does this lead to conflict of interests between males and females?

15. (6 pts) Estimate carrying capacity and intrinsic rate of increase (r_{max}) for the population shown in the following two graphs.





16. (5 pts) State Levin's mathematical model which describes the dynamics of metapopulations. Be sure to define any symbols. When is an equilibrium reached? (hint: solve for *p*)

17. (4 pts) How would Medawar's model for the evolution of senescence be altered if test tubes got nicked and scratched and became more brittle with age? How would the selection pressures on regulators be changed?

18. (10 pts) Calculate both l_X and m_x schedules from the following Leslie matrix (there are 4 age classes -- assume that age class zero is pre-reproductive)
Is this population stable, increasing, or decreasing?

$$\begin{bmatrix} 0.5 & 0.8 & 0.75 & 0 \\ 0.5 & 0 & 0 & 0 \\ 0 & 0.4 & 0 & 0 \\ 0 & 0 & 0.25 & 0 \end{bmatrix}$$

Age, x	l_X	m_x
0		
1		
2		
3		

19. (7 pts) Draw the probable trade-offs between current and future reproductive success for young, intermediate-aged, and older individuals in an iteroparous species. Label axes and mark all the optimal reproductive tactics with a dark dot. How do these differ in big bang reproducers?