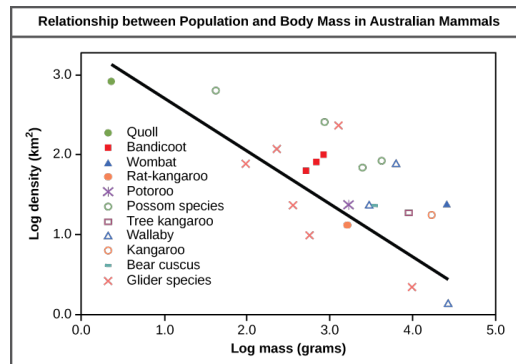


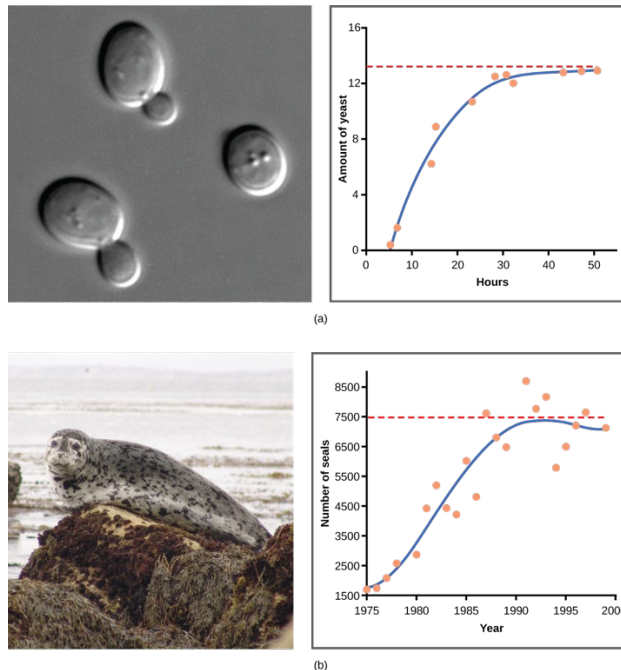
Biology 2eUnit 8: **Ecology**Chapter 45: **Population and Community Ecology****Visual Connection Questions**

1. As this graph shows, population density typically decreases with increasing body size. Why do you think this is the case?



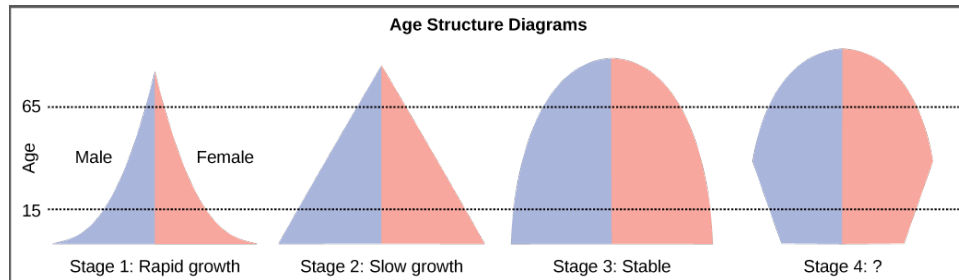
Smaller animals require less food and other resources, so the environment can support more of them.

2. If the major food source of the seals declines due to pollution or overfishing, which of the following would likely occur?



a. The carrying capacity of seals would decrease, as would the seal population.

3. Age structure diagrams for rapidly growing, slow growing and stable populations are shown in stages 1 through 3. What type of population change do you think stage 4 represents?



Stage 4 represents a population that is decreasing.

Review Questions

4. Which of the following methods will tell an ecologist about both the size and density of a population?

c. quadrat

5. Which of the following is best at showing the life expectancy of an individual within a population?

d. life table

6. Humans have which type of survivorship curve?

a. Type I

7. How is a clumped population distribution beneficial for prey animals?

a. Being a member of a larger group provides protection for each individual from predators.

8. Which of the following is associated with long-term parental care?

a. few offspring

9. Which of the following is associated with multiple reproductive episodes during a species' lifetime?

b. iteroparity

10. Which of the following is associated with the reproductive potential of a species?

d. fecundity

11. Species with limited resources usually exhibit a(n) _____ growth curve.

a. logistic

12. The maximum rate of increased characteristic of a species is called its _____.

c. biotic potential

13. The population size of a species capable of being supported by the environment is called its _____.

b. carrying capacity

14. Species that have many offspring at one time are usually:

a. *r*-selected

15. A forest fire is an example of _____ regulation.

b. density-independent

16. Primates are examples of:

d. *K*-selected species

17. Which of the following statements does not support the conclusion that giraffes are *k*-selected species?

c. Newborn giraffes are capable of coordinated walking within an hour of birth, and running within 24 hours of birth.

18. Which of the following events would **not** negatively impact Yellowstone's grey wolf carrying capacity?

a. snow in winter

19. A country with zero population growth is likely to be _____.

d. economically underdeveloped

20. Which type of country has the greatest proportion of young individuals?

b. economically underdeveloped

21. Which of the following is not a way that humans have increased the carrying capacity of the environment?

b. using large amounts of natural resources

22. The first species to live on new land, such as that formed from volcanic lava, are called _____.

d. pioneer species

23. Which type of mimicry involves multiple species with similar warning coloration that are all toxic to predators?

b. Müllerian mimicry

24. A symbiotic relationship where both of the coexisting species benefit from the interaction is called _____.

c. mutualism

25. Which of the following is **not** a mutualistic relationship?

b. A helminth feeding from its host

26. The ability of rats to learn how to run a maze is an example of _____.

d. cognitive learning

27. The training of animals usually involves _____.

c. operant conditioning

28. The sacrifice of the life of an individual so that the genes of relatives may be passed on is called _____.

b. kin selection

29. Why are polyandrous mating systems more rare than polygynous matings?

d. Females usually devote more energy to offspring production and development.

Critical Thinking Questions

30. Describe how a researcher would determine the size of a penguin population in Antarctica using the mark and release method.

The researcher would mark a certain number of penguins with a tag, release them back into the population, and, at a later time, recapture penguins to see what percentage of the recaptured penguins was tagged. This percentage would allow an estimation of the size of the penguin population.

31. The CDC released the following data in its 2013 Vital Statistics report.

Age interval	Number dying in age interval	Number surviving at beginning of age interval
0-10	756	100,000
11-20	292	99,244
21-30	890	98,953
31-40	1,234	98,164
41-50	2,457	96,811
51-60	5,564	94,352
61-70	10,479	88,788

Calculate the mortality rate for each age interval, and describe the trends in adult and childhood mortality per 100,000 births in the United States in 2013.

Mortality is calculated as $[(\text{Number Dying})/(\text{Number Surviving})] \times 1000$ so the completed life table should read:

Age interval	Number dying in age interval	Number surviving at beginning of age interval	Mortality rate
0-10	756	100,000	7.56
11-20	292	99,244	2.94
21-30	890	98,953	8.99
31-40	1,234	98,164	12.6
41-50	2,457	96,811	25.4
51-60	5,564	94,352	58.97
61-70	10,479	88,788	118.0

The table shows that mortality is high among very young children Americans (under age 10), then falls for teens and young adults. Mortality starts rising again in middle age, nearly doubling from the 50s to the 60s.

32. Why is long-term parental care not associated with having many offspring during a reproductive episode?

Parental care is not feasible for organisms having many offspring because they do not have the energy available to take care of offspring. Most of their energy budget is used in the formation of seeds or offspring, so there is little left for parental care. Also, the sheer number of offspring would make individual parental care impossible.

33. Describe the difference in evolutionary pressures experienced by an animal that begins reproducing early and an animal that reproduces late in its lifecycle.

A species that reproduces early in its life cycle is under evolutionary pressure to reach sexual maturity as soon as possible. Animals that mature earliest will be able to reproduce the most times, and therefore more of the next generation will carry their early maturation genes. A species that reproduces late in its life cycle will only generate offspring from parents that were able to survive in their habitats. This increases the likelihood that the next generation will be well-adapted to its environment.

34. Describe the rate of population growth that would be expected at various parts of the S-shaped curve of logistic growth.

In the first part of the curve, when few individuals of the species are present and resources are plentiful, growth is exponential, similar to a J-shaped curve. Later, growth slows due to the species using up resources. Finally, the population levels off at the carrying capacity of the environment, and it is relatively stable over time.

35. Describe how the population of a species that survives a mass extinction event would change in size and growth pattern over time beginning immediately after the extinction event.

Following a mass extinction event, the few surviving species can be considered to have access to unlimited natural resources since there would be minimal competition (due to low organism density). This means that the species would initially experience rapid exponential population growth, and the number of species members in the environment would rapidly increase over time. However, the further time progresses past the mass extinction event, the more the environment becomes populated by the species and its competitors. As resource availability

declines the population growth rate will slow and enter logistic growth. Eventually, the population will meet the carrying capacity of the environment and stop increasing.

36. Give an example of how density-dependent and density-independent factors might interact. If a natural disaster such as a fire happened in the winter, when populations are low, it would have a greater effect on the overall population and its recovery than if the same disaster occurred during the summer, when population levels are high.

37. Describe the age structures in rapidly growing countries, slowly growing countries, and countries with zero population growth.

Rapidly growing countries have a large segment of the population at a reproductive age or younger. Slower growing populations have a lower percentage of these individuals, and countries with zero population growth have an even lower percentage. On the other hand, a high proportion of older individuals is seen mostly in countries with zero growth, and a low proportion is most common in rapidly growing countries.

38. Since the introduction of the Endangered Species Act the number of species on the protected list has more than doubled. Describe how the human population's growth pattern contributes to the rise in endangered species.

Continued exponential human population growth results in the human population requiring more resources to sustain itself. These resources are usually taken at the expense of the environment and the organisms that rely on the resources in that environment (ex. habitat destruction for human development, water re-routing for irrigation, etc.). The continued use of fossil fuels to generate power for human activities also contributes to climate change, changing climates in some areas so that certain species can no longer survive there.

39. Describe the competitive exclusion principle and its effects on competing species.

The competitive exclusion principle states that no two species competing for the same resources at the same time and place can coexist over time. Thus, one of the competing species will eventually dominate. On the other hand, if the species evolve such that they use resources from different parts of the habitat or at different times of day, the two species can exist together indefinitely.

40. Jaguars are a keystone species in the Amazon. Describe how they can be so essential to the ecosystem despite being significantly less abundant than many other species.

Jaguars are an apex predator in the Amazon, eating a variety of prey animals and not serving as prey to any other predators. Through predation, they control the population sizes of the smaller herbivores and omnivores. If jaguars were to disappear from the ecosystem, the smaller herbivore populations would dramatically increase, and could over-consume the plant populations.

41. Describe Pavlov's dog experiments as an example of classical conditioning.

Dogs salivated in response to food. This was the unconditioned stimulus and response. Dogs exposed to food had a bell rung repeatedly at the same time, eventually learning to associate

the bell with food. Over time, the dogs would salivate when the bell was rung, even in the absence of food. Thus, the bell became the conditioned stimulus, and the salivation in response to the bell became the conditioned response.

42. Describe the advantage of using an aural or pheromone signal to attract a mate as opposed to a visual signal. How might the population density contribute to the evolution of aural or visual mating rituals?

Animals that use aural or pheromone signals to communicate with potential mates are able to signal over longer distances. Sound waves and chemicals can diffuse out into an environment while visual cues require a direct line of sight between the sender and receiver. Animals that use aural cues to acquire mates probably exhibit a lower population density than animals that use visual cues.