

MIDTERM I KEY

You will have 60 minutes (beginning at 1400) to complete the exam. The exam is worth 100 pts. and 15% of your final grade. Please budget your time accordingly. Good luck!

MULTIPLE CHOICE (Questions 1-10) Choose the BEST answer (2 pts each).

1. Which of the following body features would best indicate that a fish occurs in an epipelagic environment?
 - a. highly compressed body
 - b. highly depressed body
 - c. **forked tail**
 - d. large eyes
 - e. small mouth

2. Diversity of fishes is highest in what ocean zone?
 - a. epipelagic
 - b. mesopelagic
 - c. bathypelagic
 - d. **continental shelf**
 - e. abyssal plain

3. In the paper we discussed by Werner et al., what was the most important finding related to optimal foraging theory?
 - a. that fish switched habitats to forage on different prey
 - b. that prey responded to foragers
 - c. **that learning and experience influence foraging success**
 - d. the majority of bluegill fed on a mixed diet
 - e. foraging efficiency of generalists was higher than specialists

4. Finlets would most likely be found on what group of fishes?
 - a. deep-sea fishes
 - b. freshwater fishes
 - c. coral-reef fishes
 - d. kelp-bed fishes
 - e. **pelagic fishes**

5. Which of the following body colors would be most commonly found on fish from the bathypelagic zone?
 - a. blue
 - b. green
 - c. **red**
 - d. purple
 - e. muave

6. In the paper by Metcalfe et al., which were the factors that were manipulated to examine their effects of foraging efficiency?
 - a. body size, dominance
 - b. body size, age
 - c. light, vegetation
 - d. **light, current velocity**
 - e. current velocity, reactive distance

7. Homeostasis refers to the ability of a fish to
 - a. feed at a constant rate
 - b. escape from predators consistently
 - c. change its physiology with differences in temperature
 - d. **maintain a steady state or equilibrium inside the body**
 - e. none of the above

8. A fish that is a sit-and-wait piscivorous carnivore would likely have
- a terminal mouth, many long gill rakers, and forward-projecting teeth
 - a subterminal, inferior mouth, many long gill rakers and blunt teeth
 - a terminal mouth, few and short gill rakers, and backward-projecting teeth
 - a subterminal, inferior mouth, few and short gill rakers, and blunt teeth
 - a supraterminal mouth, few and short gill rakers, and no teeth
9. Most epipelagic fishes need to reduce their visibility to predators and thus have a color pattern that is
- dark below and light above
 - light below and dark above
 - generally light colored
 - generally dark colored
 - striped
10. Consider a bluefin tuna in the open ocean, an intertidal sculpin in San Diego, and a barracuda on a coral reef. In this order, what would you expect relative gill surface area to be, standardized to their body sizes?
- high, moderate, low
 - low, moderate high
 - high, low, moderate
 - moderate, low, high
 - low, high, moderate
11. What are the purposes or functions of each of the following fins in movement (locomotion)? (4 pts.)

Caudal: thrust; propulsion

Pelvic: steering, braking

Pectoral: maneuvering

Dorsal: stability

SHORT ANSWER / ESSAY

12. Name the (1) three main groups of fishes according to their taxonomic names, (2) provide one feature that characterizes the fishes in these groups, and (3) give a common name of a species in each group. (9 pts.)

Three main groups

1. Myxiniiformes → jawless fishes → hagfish

2. Chondrichthyes → jawed, cartilaginous fishes → blue shark

3. Osteichthyes → bony fishes → bluegill

13. (a) What are the five main trophic (feeding) categories of fishes? (5 pts)

1. Detritivores
2. Scavengers
3. Herbivores
4. Omnivores
5. Carnivores

(b) You have two individual fish in front of you; one is a planktivore and the other is a piscivore. Name and describe two morphological features that would give you strong evidence as to which fish belongs to which of the two subcategories. (6 pts.)

gill rakers: planktivore has long and many rakers placed close together (sieve)
piscivore has fewer, short rakers to force larger prey backward

teeth: planktivore has few or absent marginal teeth
piscivore has large, conspicuous marginal teeth

body shape: planktivore either deeply compressed or moderately compressed
piscivore has fusiform body

14. (a) Name the two main foraging patterns of fishes according to optimal foraging theory. (2pts.)

Energy maximizing
Time minimizing

(b) Under what conditions would one pattern be favored over the other? (2 pts.)

Time minimizers would forage over short periods of time and be relatively non-selective in obtaining prey because these fishes are vulnerable to predators or conditions of high physical disturbance

Energy maximizers do not have constraints of strong predation risk or high disturbance and select the most profitable prey

(c) List two assumptions of optimal foraging theory. (4 pts.)

1. Animal can evaluate energy return of prey instantaneously
2. Search time for prey is unimportant
3. Handling time is a good indicator of energy costs
4. Predator has knowledge of environment and prey density

15. (a) A researcher collected several spiny blue-headed mudsuckers and found that on average, this fish had 80% of its diet composed of nematode worms. The researcher also sampled the benthic environment and found that the following composition of prey in the environment was 60% nematode worms. Using Ivlev's Electivity Index, compute the value obtained using the index formula (4 pts.)

$$E = (0.80 - 0.60) / (0.80 + 0.60) = 0.14 \text{ or } \sim 1/7$$

- (b) Based on this value, conclude whether the fish is showing prey selectivity for worms or not, and explain your reasoning. (2 pts.)

The value is positive but very close to zero, so the conclusion is that the fish is not showing prey selectivity

16. (a) Define semelparity and iteroparity (2 pts).

semelparity = reproducing once

iteroparity = reproducing multiple times

- (b) Name two conditions that would favor iteroparity over semelparity. (4 pts).

Iteroparity would be favored when the survival of young is unpredictable and adult survival is high

17. (a) According to an energy budget, the energy coming from food consumed by an an adult fish is allocated for at least four different purposes. Name them. (4 pts.)

Respiration (or metabolism)
Growth & Reproduction
Fecal losses
Excretory losses (ammonia, urea)

(b) Is assimilation efficiency higher or lower for a herbivore vs. a carnivore, and why is this the case? (2 pts.)

Lower in an herbivore because it is more difficult to digest plant material (cellulose)

18. Name and describe the three feeding modes (not trophic categories) of fishes (6 pts.)

1. inertial suction: water containing food is sucked into the mouth by a rapid increase of the buccal cavity as the mouth opens
2. ram feeding: fish swims with mouth open and overtakes the food
3. manipulation: biting, scraping, gripping food

19. What is the difference between 'open' vs. 'closed' populations? (4 pts.)

Open populations are connected by dispersal, generally of larvae, in which immigration and emigration occurs among local populations

Closed populations do not have dispersal of individuals (no immigration or emigration)

20. The metabolic rate is described by three types of metabolism: Name and define the three types (6 pts.)

Standard – basal metabolism by an unfed fish at rest

Routine or active – metabolism by a fish during normal activities. Within this category, there can be maximum active metabolism, which is the energy expenditure at maximum sustainable swimming speed

Apparent specific dynamic action = increase in metabolic rate while feeding

21. (a) Define anisogamy. (2 pts.)

Difference in the size of gametes between males and females

(b) How can anisogamy result in a conflict between males and females in maximizing lifetime reproduction? (4 pts.)

Males are limited by females because the cost of reproduction is low (sperm). Females are limited by egg production (high energy cost). So, male strategy is to be promiscuous to maximize fitness; female strategy is to mate with the 'best' male to maximize fitness.

22. What are four factors that may be used by female fish in mate selection? (4 pts.)

Body size
Coloration
Territory Size
Nest Quality
Mating Behavior

23. Contrast prey selection by size vs. 'apparent size' and how smaller items actually could be selected for over larger ones (4 pts.).

Size of prey is the actual size, whereas apparent size is the perceived size of the prey by the predator.

Apparent size is a function of distance (how close prey is to the predator) and coloration

A smaller item could be selected over a larger one if the smaller one was closer to the predator than the larger one; the smaller one 'appears' to be larger because it is closer