

SS POSSIBLE + 3 EC

Exam 2

Take your time, read each question fully, and answer it succinctly to the best of your ability. The point value of each part of each question is shown in parentheses. Budget your time wisely. This exam counts for 20% of your final grade. Good luck!

1. Speciation. A. Briefly define (2 each):

Biological species concept: BIOLOGICAL SPECIES ARE GROUPS OF NATURAL POPULATIONS THAT FREELY INTERBREED WITH EACH OTHER, BUT NOT OUTSIDE THE GROUP.

2 BARREN IS THE KEY ISSUE!

Phylogenetic species concept: SPECIES ARE RECOGNIZED ON THE BASIS OF SHARED,

2 DERIVED TRAITS NOT SHARED WITH OTHER LINEAGES. (EVOLUTIONARY LINEAGE IS THE KEY ISSUE!)

B. Briefly give three examples of how humans interfere with speciation processes (3):

- CHANGE SELECTIVE REGIMES

3 - REMOVE GENETIC DIVERSITY

- HATCHLING + STOCKING PROGRAMS

2 2. Predation. A. Which of the following apply to **compensatory** predation (2)? Circle the appropriate letters.

1 POINT FOR EACH CORRECT ANSWER - 2 FOR EACH WRONG ANSWER.

- a) predator eats more prey when prey are abundant
- b. cannot set carrying capacity for prey population
- c. predators eat prey to extinction
- d) can set carrying capacity for prey population if other factors are near-limiting
- e. predator eats prey only when prey are very abundant
- f. may occur when predator and prey have not co-evolved

B. Briefly define and contrast dominant species and keystone species (3).

3 DOMINANT SPECIES - VERY ABUNDANT, CONTROL AS TOP PREDATOR, EFFECTS ON COMMUNITY STEM FROM MANY INTERACTIONS WITH OTHER COMMUNITY MEMBERS

KEystone SPECIES - NOT ESP. ABUNDANT, BUT INTERACT STRONGLY WITH OTHER COMMUNITY MEMBERS, OFTEN BY PREDATION.

C. Predation has a direct lethal effect on prey consumed, but can also have indirect effects on fish species, populations, and communities. Briefly describe three such effects (3):

- *↓ pop. size, ↓ growth rate, ↓ fecundity, ↓ survival*
- *↑ pop. size, ↓ competition*
- *↑ pop. size, ↓ competition*

3. Competition. A. Briefly define and contrast fundamental niche and realized niche (3).

Fundamental niche: the whole range of conditions in which a species can survive and reproduce
Realized niche: range of conditions in which a species actually survives in given situation

B. Which of the following apply to **scramble** competition (3)? Circle the appropriate letters.

- a. territorial behavior
- b. ghost of competition past
- c. cannot be intraspecific
- d. depends on resource availability and competitor density
- e. resource segregation always implies competition
- f. competitive ability of all participants is similar

C. Briefly, how would I demonstrate that sunfish species compete for space (2)?

compare space use of potential competitors
look for differences in growth, survival, fecundity, etc. w/
substituted space
compare habitat use of sunfish w/ other species resource availability
for each habitat

4. Determinants of community structure. A. What factors determine the pool of fish species on a given continent (3)?

- *area of continent*
- *latitude*
- *altitude*

B. What factors determine the pool of fish species in a given region of a continent (3)?

- GEOLOGY /
- 3 - ISOLATION
- CLIMATES (E.G., ALTITUDE)
- SPECIATION

C. What factors determine the member species in a given local community of a region (3)?

- PRODUCTIVITY
 - 3 - DISTANCE
 - PHYSICO-CHEMICAL CONDITIONS
- AND ACCEPTED:
- COMPETITION
 - PREDATION
 - RECRUITMENT

5. Stream and river communities. Within the river continuum concept, as a stream or river goes downstream, there are changes in channel form, water quality, and production processes. Briefly fill out this table (1 pt per cell):

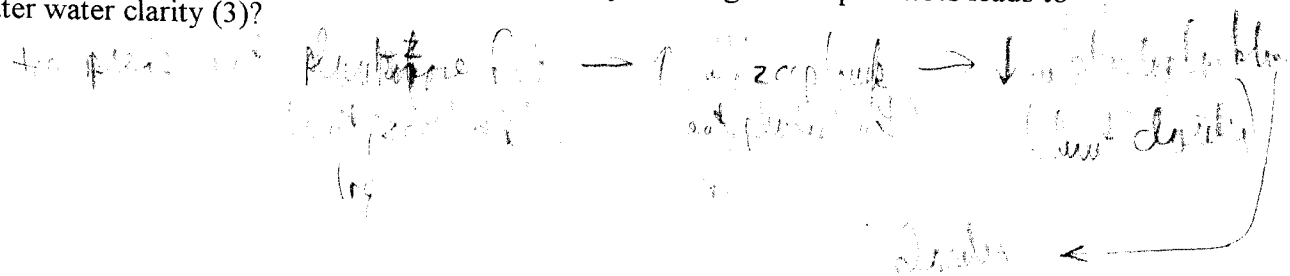
	Upstream	Downstream
Where does the system get most of its carbon?	ALLOCTHONOUS	AUTOCHTHONOUS
8 What limits production?	SUNLIGHT	TURBIDITY
What are the feeding niches of the dominant fishes?	INVERTIBRATES INSECTARIA	OMNIVORES, CARNIVORES
Which (upstream or downstream) has high and which has low fish species diversity?	LOW	HIGH

6. Lake and reservoir communities. A. Ecological communities in lakes or reservoirs may be regulated by "bottom-up" or "top-down" controls. Briefly explain -- include explanation of what "top" and "bottom" mean, mechanisms of control, and who the regulated and regulators are (2 ea.):

Bottom-up control: ^{bottom} nutrient, primary production control above of phytoplankton, zooplankton, fish, etc. (fish, zooplankton, etc.)
 increased energy transfer limits herbivores

Top-down control: top predator control plant abundance, zooplankton, phytoplankton, which limit plants

B. How can top-down control processes explain why stocking of fish predators leads to greater water clarity (3)?



C. Extra credit. Explain how it is that pH, winter oxygen concentration, and predation determine the dominant fish species in Wisconsin lakes (3).

Handwritten notes: "summer oxygen concentration", "winter oxygen", "pH", "predation", "dominant fish species", "Wisconsin lakes".

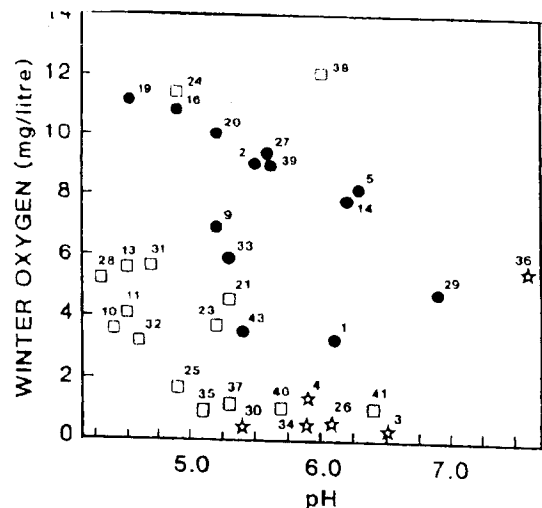


Figure 10.3. Winter oxygen concentration and pH for 34 lakes in Wisconsin. Assemblages dominated by centrarchids (solid circles), Umbra-Perca (open squares), or cyprinids (stars). [From Rahel (1984).]

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7. Marine communities. A. Why is it that the nearshore marine community is dominated by species such as flatfishes, rays, and drums (3)?

3 THE NEARSHORE COMMUNITY HAS HIGH INDI-TER-GRASS PRODUCTION, AND TENDS TOWARD SAND + SILT BOTTOMS. THESE GROUPS DIFFERENTIALLY EXPLOIT THE ECOSYSTEM WITH:

- FLATFISHES GRAB FR PRODUCTION FROM SURFACE
- RAYS + DRUMS ARE VERY DIFFERENT INDICATORS

B. Why is it that commercially important aggregations of fishes occur in such places as the coasts of Peru, Alaska, the Maritime provinces of Canada, Greenland, and Iceland (3)?

3 THESE ARE MAJOR UPWELLING AREAS → HIGH PHYTOPLANKTON PRODUCTIVITY → HIGH ECOPRODUCTIVITY → HIGH ~~PR~~ CONCENTRATIONS OF PLANKTONIC FOOD → HIGH CONCENTRATIONS OF PREDATORS. IT'S ALL "BOTTOM-UP" PRODUCTION

C. What regulates production in marine bathypelagic and abyssal fish communities (2)?

2 IT'S THE DOWNWARD FLOW OF PRODUCTION FROM WATERS ABOVE!