

Name: _____

For the final exam, you will be graded on the accuracy of your answer (facts and errors), your ability to synthesize concepts, and the clarity of your answers. The amount of space given for each answer indicates the approximate expected length, but you should feel free to use as little or as much space as you require to adequately answer the question.

Section I: Short definitions or concepts. A sentence or two is generally enough information. Describe or define the following (4 pts each):

1) Bipartite lifestyle

2) Deep Scattering Layer

3) acridine orange

4) Reynolds number

5) *Riftia*

Section II. Short answer. Answer each question with a drawing, paragraph, etc. (not an essay; 6 pts).

6) What is a “harmful algal bloom”? Is it the same thing as a red tide?

7) Both Eppley and Huntley-Lopez have proposed that increasing temperatures result in increasing growth rates for biological organisms in the ocean. However, recent evidence

suggests that increasing temperatures (global warming) is resulting in decreasing biomass. Why?

8) Discuss three types of disturbance and how they influence the structure of planktonic and benthic communities.

9) What is the difference between the “microbial loop” and the “microbial web”? Who cares about all these little organisms anyway, since they don’t contribute to carbon fixation?

10) Based on what you know about biological oceanography, defend the use of NPZ models. Why do we use such simple models when we know the ocean is more complex? What would you add first, if you could add another box?

Essay Question. Answer ONE of the following questions. Your response will be graded on content, clarity, and critical thinking (50 pts).

- 1) You are an ecologist trying to predict the effects of global warming on kelp forests and coral reefs off the coast of North and Central America. To make these predictions you will attempt to extrapolate from El Niño effects on these habitats. Discuss how El Niño conditions change the physical environment, and how these changes affect the biological properties of these habitats, and whether extrapolating from these events to long-term global warming is reasonable.

- 2) The Governor has announced a new commitment to marine protection and research, based on his (admittedly poor) understanding of the coastal ocean. He was listening to NPR the other day, and heard about the massive “red tide” that closed the shellfishery from Maine to Massachusetts. He also read in the paper about a sea lion mortality event in Southern California, earlier this spring. Based on these reports, he has decided to reallocate \$10 million from the Census of Marine Life to fix the “red tide problem”. His task for you is to:
 - a. Describe how you would develop a monitoring program for HABs in Monterey. This includes identifying the most important potential problem species, and giving specific examples of what you would monitor for.
 - b. Explain to him why the shellfish closures and “red tide” problem on the east coast is unlikely to happen on the west coast (it’s being caused by *Alexandrium*, which produces paralytic shellfish poisoning, and is associated this year with the intrusion of cells far up into the bays and estuaries).
 - c. Describe how you would ultimately “fix” the “red tide” problem in Monterey, and whether \$10 million would be enough to do so.