**Paper Analysis for Primary Source Papers**

**Marine Biology**

The written paper analyses are designed to stimulate critical reading of papers and to prepare you for the class discussion by getting you to think about the paper. I encourage you to read through papers at least twice in advance of the discussion.

The language on these assignments should be informal. The goal is not to have you spend hours of the perfect phrasing or paragraph construction. The goal is to have you spend time thinking about the study and to describe it in your own words. I want to see that you have understood the methods and results, and I want to hear what you think of the methods, results, and the author's analysis of the results in the discussion. Make sure you put enough detail in your descriptions to really show that you have thought about the study and really express and explain your opinions. Never re-type or lift sentences of phrases from the paper for this assignment. Unless you have been moonlighting as a marine biologist incognito style, those are not your words. Sections in which text has been 'borrowed' from the paper will receive a grade of 0.

Paper analysis must be typed, double spaced with pages stapled together. Please use heading to separate the sections of your analysis - do not turn in one long essay. Make it clear which question/section you are addressing in each section of your paper.

The assignment - this should be completed separately for each paper we discuss

1. **In one sentence, state the main point of the paper (1pt)**
   1. This sentence gives the punch line – what did this paper contribute to the field of marine ecology?
2. **In one sentence state the main ecological question they are trying to address (1pt)** 
   1. Think broadly here. This goes beyond a single study species or their particular hypothesis. What is the larger theoretical question they are trying answer.
3. **Summarize the introduction to the paper (5 pt)**
   1. Talk about the background knowledge that the authors are bringing forward. Think about why this content was chosen over others.
   2. Talk about any other groups, studies, government agencies, etc that help focus the paper and/or shape the audience of the paper.
      1. For example; a paper written about drilling for oil by someone hired by an oil company will be different than the same topic written about by someone hired by an environmental group.
   3. Why does it matter that this study was completed?
   4. Be sure to describe and define any unique terminology to the experiment OR any terminology that you might not understand.
4. **Describe the general methods they used to test their hypothesis.** What were their treatments, and how did they set them up? What were their sample units? What did they measure - what were their responding variables? **(5pts)**
   1. For papers that describe more than one experiment/observational study, please complete a separate paragraph for each component study.
   2. Hit the main points here; do not worry about the sample size or minor details.
   3. Do not talk about stats. Focus on the biology.
   4. Describe each of the treatments and explain how they set them up. ex: if they measured UV, how many levels of UV did they have, and what were their controls? Did they use separate lamps for each level of the treatment, or did they use filters to create treatments form a single light source? If they compared something between sites, how many sites? How did they choose the sites?
   5. What were their sample units? ex: did they test the whole organism, part of the body, or a single cell?
   6. What data did they collect? ex: did they measure oxygen consumption or change in biomass?
   7. What other things did they measure to control for confounding factors?
   8. *Hints to help with the methods section:* First, read the methods section text (and figures, if there are any). Then draw a diagram that explains the set-up for each component study. Describe their methods from the diagram, and then go back to the text to make sure you included all of the elements. But drawing the diagram helps to distill the important information. Make sure you describe their results in your words.
5. **Evaluate the results (6pts)** – note I am not asking you to summarize their results, but to think about them and to address the following questions for each of the studies you described in the methods.
   1. Are the results presented in the paper convincing? Why or why not? (This is a yes, no question. You cannot argue both sides)
      1. *Hint: This set of questions asks you to think about the paper* – you are not telling me what the authors said. Instead, you are thinking about the data and explaining your thoughts about it. To get credit for this section, **you** need to come up with an opinion about the results and then **you** need to back that up with the data in the paper. (Note the bold **you** here, your opinions might be the same as those of the authors, and they might not. Either way, you need to justify them.)
      2. Do not talk about the statistics. Talk about the biology.
      3. As you think through this, be realistic. No study can address every question. Do not look for perfection, but instead for comprehensive coverage of the question(s) they have posed.
   2. If they are NOT convincing, explain why they did not convince you. Again, be complete.
      1. What about the paper was not convincing? For example, was enough detail provided? If not, what other details could be in the paper to help convince you.
6. **Evaluate the discussion (5pts).** Do you agree with the conclusions they draw on the basis of their data?
   1. If you agree, what conclusions specifically do you agree with, and why do you agree?
   2. If you do not agree with some of their conclusions, again, which ones and why?
   3. Again, this set of questions asks for your thoughts on the study. It does not ask for a report on the discussion section. It is all about **your** thoughts.
7. **Suggest some ideas for follow-up study** **(2 pts).**
   1. What do you think would be interesting subjects of further research, given what you have learned from this paper? Explain why you think those subjects are interesting.
   2. Do not simply suggest more replicates of the same study. Do not re-type what the authors suggest. The idea here is for you to think about what they did and what it means. Relate it to the course material and what you learned in other science classes. Be creative and explore the subject.

**Words of advice:**

1. Think critically about the study. By critical, I mean be thoughtful, but not nit-picky. It is often easy to criticize scientific studies, but it is more valuable to consider their contributions in light of practical considerations and the state of the field. These are good papers, and there should be much more to your evaluations than just a list of their shortcomings.
2. Even good papers will have shortcomings. But as you think about the faults of a study, consider this: even if the study is imperfect, do we know more than we did before it was conducted? Even with the flaws, can it lead us in new directions?
3. Your critiques should focus on the study, not the language used to present it. Unless the presentation is so obtuse that you cannot evaluate the study, do not discuss the language.
4. Although I hope you understand the statistics (I try to choose papers with limited math background needed) you should not talk about the statistical analysis in your responses. Focus on the biology.
5. Even if you think these are the most perfect papers ever written, you need to explain what is so great about them. Just saying, “this experiment was perfect, and I agree with all the points they made” will not be enough. Explain why you feel the paper was perfect.
6. Make sure you define any vocabulary from the paper so it is clear you understand what it means
7. If you have any questions either while you are writing the analyses or when you are reading my comments when I return them, please ask.