

Biol 161/L – Kelp Forest Ecology - Fall 2007

I

Tips for Writing and Submitting Scientific Research Articles

Lecture overview: general to detailed (focus on general structure, actual writing tips addressed later)

1. Strategy and approach to publishing
2. Organization / Structure
3. Details by section

I. Strategy / approach

(1) Identify and know exactly what kind of articles a journal publishes.

Examples:

- Discipline-based: ecology vs. evolution vs. physiology vs. multidisciplinary
- Theoretical vs. empirical: American Naturalist vs. Marine Ecology Progress Series
- Environment: Terrestrial vs. marine vs. either

(2) Read one or more recent successful publications

(3) Discuss your ideas with established, experienced colleagues before you begin to write your manuscript.

(4) Objective of manuscript is four-fold; to convince reviewers and readers that:

- i. the question being addressed is fundamentally important to the interests of the audience of the journal (that your work will produce major advance in a discipline)
- ii. you have thought clearly about the problem and have developed the most appropriate approach (sampling design, analyses) to answer your question and test your hypotheses.
- iv. the results are well interpreted and conclusions are well substantiated
- v. conclusions are important to advancing the field

How do you accomplish these four objectives?

i. **the question being addressed is fundamentally important** to the interests of the journal's audience.

- Have to make a very convincing argument as to why the question you are addressing is fundamentally important in both a broad sense and to the specific interests of the journal.
- Reviewers are often not interested in or familiar with your specific question or interests. You have to educate the reviewers and readers why your question is important to them. Why is the work worth publishing?
- Indicate, when possible, that others have pointed out the importance of your question (from the literature).
- Introduction must provide a clear context for the proposed work, conceptually and chronologically.
 - What studies have led up to it?
 - Summarize very briefly the history of the question
 - Creates the impression this is an important question addressed by others
 - Indicates where our understanding stands and how your question moves the field forward
- Identify any applied implications (conservation, resource/environmental management).
 - However, don't be unrealistic in this context. Reviewers can spot overstatements very easily
 - E.g., "these results will be used by resource managers and contribute to the conservation of this species". Do not make such statements without stating explicitly how they would be used and how they would contribute.

ii. **you have thought clearly about the problem** and have developed the most appropriate approach and methodology.

- Your summary of the literature and the relevance of your questions will reflect your knowledge of the field (and this is reflected in the breadth and relevance of cited work).

- Hypothesis-driven research is mandatory. It is difficult to publish a study of strictly descriptive nature (“let’s see what’s out there”).
- State your hypotheses and state them clearly. Especially, present alternative hypotheses (helps to convey openness to alternative outcomes and interpretations).
 - The most common criticism in a negative review is “the author’s hypotheses weren’t clearly stated”.
 - State explicitly:
 - the predictions of your hypotheses
 - how the design of your study (observations or experiments) will directly test predictions of alternative hypotheses
 - how you will interpret your results to test alternative hypotheses.

Second most common criticism in a negative review is “it wasn’t clear how the design of the observations/experiments would test their hypotheses”.
- Indicate that you are using the most appropriate methods and reference previous studies that support this.

iii. Have colleagues both familiar and unfamiliar with your discipline critique an intermediate draft.

- Experienced colleagues may help you avoid mistakes (inappropriate study design or analyses) and gain clarity (experience in conveying concepts clearly and more tersely).
- Your intimate familiarity with your subject increases the gap between what you intend to convey and what the reader understands.
- Recall that the constitution of a journal’s readership (and reviewers) is diverse and have limited familiarity with your field.
 - Colleagues outside of your discipline are best at flagging jargon and the need to define terms.

II. Organization

- Often specified by the journal, we will provide you a format.

- Follow the guidelines of the journal “Guide to Authors” completely.
 - These guidelines specify focus, structure, length (# of pages per section), structure of tables and figures.
 - A manuscript that fails to follow these guidelines may be returned to you, unreviewed (and unpublished).

- Journals count figures and tables as part of the page limit, so you will need to strike an appropriate balance between words and data.
 - Figures can clearly convey complex concepts (theoretical or study design) and conserve space.
 - If you use figures, provide a legend that will allow the reader to understand what the data are all about.

- Be neat. Appearance does count.
 - A manuscript that is well prepared and easy to read will help to win over the reviewer.
 - A manuscript that is sloppy implies that the investigator has low standards—and this will reflect badly on the research.
 - Use your software’s spell-checking function (no excuses for misspellings!).

- Especially for longer manuscripts, use an **outline** format with headings, subheadings, and questions emphasized by specified fonts.

- The instructions to authors for Ecology include the statement: “Write with precision, clarity, and economy.” This wonderfully self-illustrative sentence contains some of the most important instructions given to prospective authors, yet it is probably the most overlooked.
 - You will always face page limits and good manuscripts convey more information per page.

- Superfluous words slow down comprehension. We often write with the same verbosity permissible in conversational English.
 - a conscientious author can easily eliminate these crutches from his/her manuscripts: Strunk and White (1979) in their excellent “The Elements of Style”, as well as Hart (1976), Day (1983), and Pechenik (1987). All illustrate superfluous expressions.

- Revisit sentences to see if you can’t reduce them.

III. Details by Section

Abstract

- The Summary or Abstract section of the proposal is **critical**.
 - The first (and maybe ONLY) thing that the reader reads is your Abstract.
 - Must be clearly written so that even a non-specialist can see why the research is exciting and important.
 - Summarizes the question, approach/methods, results and conclusions.
 - Usually one paragraph and no more than 200 words

Introduction / Background

- Here is where you lay out the big question, it's importance and background leading to the question.
- Present the system you will use to address the question and why that is a “model” or “most appropriate” system and state why (i.e. advantages of this system over others).
- Present the more specific questions and hypotheses generated from those questions and a brief summary of your approach.

(2 and 3 not necessarily in this order!)

Methods

- As defined by good science, methods must describe how the research was conducted with sufficient detail for someone to repeat your work.
- Re-state the hypotheses you are testing (you introduced in the Introduction) and provide a general overview of your approach.
- Summarize the study system and give spatial and temporal context of the study (where and when it was conducted).
- Organize the Methods sections in an outline format with each hypothesis as a subheading. This should be mirrored in the Results section.
- Link methods to questions and tests of hypotheses!! State **why** before you ever state *what* or *how!!!* You have no idea how much this irritates me!

Justify your methods. A critical aspect of a manuscript concerns the methods you employed to test your hypotheses. Need to convince reader that you used the most appropriate methods to test you hypotheses.

- Briefly provide necessary background for methods (technology or analyses) that are new to the discipline.
- Integrate the sampling and experimental design with the analytical / statistical design.
 - Link the methods with how they will be used in a statistical analysis.
 - describe the observational or experimental design, what constitutes a replicate sample and how the data will be treated, based on that design, in an analysis to test your hypotheses.
- Integrate the above with how you will interpret the results of an analysis for testing you hypothesis.
- Feel free to use figures to describe experimental designs.

Results

- Start with overview of the general results of the test of you hypotheses.
- Present in outline format (by hypothesis) that mirrors the methods section.
- Summarize results in text and refer to supporting figures and tables parenthetically at end of sentence.

Ex. “Survival of recently settled black-eyed gobies was significantly greater in plots from which piscivorous fishes were excluded (Figure X).

- All figures and Tables require legends that describe...(1) the result that the table or figure is conveying (your interpretation) and (2) the components of the figure or table (i.e. the axes, what a point on a graph is based on, any column headings).

Discussion and Conclusions

- Summarize the results of the research
- Identify caveats and how the study could have been enhanced (e.g., statistical power of tests when fail to detect differences).

- Describe the implications of the results for advancing our understanding of the problem and the field.

Literature Cited

- Follow very carefully the guidelines of the journal.
- Look at articles published in the journal
- Generally,

Last, First Initial., First Initial. Last, and First Initial. Last. YEAR. Article title. Name of journal. Volume:start-end pages.

Raimondi, P. and M. Carr. 1909. Marine ecology is fun. *The Botswanian Naturalist* 2:1-2.

- See how book chapters and books are structured.

Some Writing References:

British Ecological Society. 1978. A guide for contributors to the journals and symposia of the British Ecological Society. *Journal of Ecology* 66:1-13.

CBE Style Manual Committee. 1983. CBE style manual. Fifth edition. Council of Biology Editors, Bethesda, Maryland, USA.

Day, R. A. 1983. How to write and publish a scientific paper. Second edition. ISI, Philadelphia, Pennsylvania, USA.

Hart, J. F. 1976. Ruminations of a dyspeptic ex-editor. *Professional Geographer* 28:225-232.

Hurlbert, S. H. 1984. Pseudoreplication and the design of ecological field experiments. *Ecological Monographs* 54:187-211.

Pechenik, J. A. 1987. A short guide to writing about biology. Little, Brown and Company, Boston, Massachusetts, USA.

Strunk, W., and E. B. White. 1979. The elements of style. Third edition. Macmillan, New York, New York, USA.