Independent Study in Fishery Biology - FW 495AV

Guidelines have been established to encourage fisheries students undertaking independent studies to properly plan and complete their proposal, research, and paper.

Deadlines
For independent study work during each semester, the deadlines are as follows:

Week 1 - Choose supervising professor and research topic, or drop course.
Week 4 - Turn in research proposal in final form.
Week 8 - Submit a midterm progress report, and discuss progress with supervising professor as needed.
Week 14 - Final research paper due Monday of last week of classes.

Grading Criteria

Proposal (75 pts)*	grading based mainly on study design, but also on objectives, need for study, and literature review.
Progress Report (25 pts)	graded on presentation of work completed to date.
Paper (100 pts)	equal emphasis on writing and scientific merit.
Penalties:	5% of points subtracted for each day that proposal, progress report, or final paper is late.

*The proposal for the research must be turned in before research is started, even if the research is done during the summer.

Credits
The advising professor will determine the credits allowed for an FW495 project. Most independent study projects will earn 1-2 credits. Advisors may approve additional credits for exceptionally involved and time-consuming projects.

Project Proposal and Study Plan
Purpose: By writing a research proposal and study plan you assure yourself and others that the study is well planned, carefully thought through, and fully understood before beginning to collect data. Writing your ideas and exposing them to review refines and clarifies them.

Format: A suggested format is given here, but should be modified to suit your particular study. Identify each section using bold subheadings. Make sure your proposal does not exceed two typed pages, with a third for schedule, budget, and literature cited.

1. **Title** -Include project title, and names, addresses, and telephone numbers of all investigators.

2. **Abstract** - This is a good idea, even in a brief proposal. Describe the essence of the sections of your proposal in one or two sentences.

3. **Introduction** -Specify the problem your research is being designed to study, and show how the information you will provide will help solve the problem. To clarify the problem in your own thinking, first ask yourself "Why am I doing this study?", and try to distill your answer into one concise sentence! Only then will you be able to write this section. Use only the pertinent literature as guideposts for the reader, and avoid including a review of all literature that is remotely connected to your research.

4. **Objectives** - You must state clearly and concisely one primary objective of your research. You may also include a secondary objective. Design your study to answer one very small question thoroughly, rather than "biting off more than you can chew." If possible, state your objectives as a statistical hypothesis that can be tested quantitatively.

5. **Methods** - Include relevant details about your study area, materials, methods, and statistical analysis. Describe concisely how you intend to lay out your experimental and control subjects, plots, etc.; apparatus used to collect data; precisely what data will be collected; intended sample size; and statistical analysis. Plan to collect only the data needed to answer your question, but to be alert to changing conditions during your experiments so that additional attributes can be measured. Above all, keep good records in a notebook of all your work. There is an old Chinese proverb: The strongest memory is weaker than the weakest ink.

6. **Products and Schedule** - Make a schedule of what reports you will produce, and when they will be presented. Work backward from your deadlines, allowing ample time for data analysis, writing, and typing, to see when your field or lab work must be completed, so you can plan accordingly. An adage often quoted regarding research planning is "Double the cost, but triple the time."

7. **Budget** - Prepare a short budget of the costs of the materials you will use (including those owned by the university), supplies, and travel. Consult appropriate catalogs and people for costs.

8. **Literature Cited** - List all references cited in the text using appropriate format for scientific journals.

Instructions for the Final Report

Format - The intent of independent study projects is to provide an introduction to research. Part of doing research is publishing the results not only to disseminate information but also to subject the research to peer review. Every scientific journal has a specific format that manuscripts must conform to before being sent to a typesetter for printing. You will win the admiration of the journal editor if your manuscript is in the correct format when it is received- fail to do so and the review process will be unnecessarily difficult.

To prepare you for the process of publishing in a scientific journal, you should discuss with your research supervisor an appropriate journal for your research subject. Once a journal has been selected, find a recent copy, and look for a "Guide for Authors" or similar heading usually in the back of the journal (usually first issue of the year). Read that section and make your final report conform to the best of your ability. Also read several articles for format (forget about content). See how references have been handled in the text as well as in the Literature Cited; look at how tables and figures are laid out; determine how detailed the methods were written, etc.

Writing - Now it is time to write. Just because this is not CO 150, do not ignore what you learned in that course. Start with an outline; you probably will never outgrow the need for an outline! Pay attention to topic sentences, paragraph development, transitions, etc. Perhaps most importantly, give yourself time to edit what you have written. Never make the first draft the only draft.

Editing - Editing will be most productive if you do it from a typed copy that has been set aside for a few days. A typed copy is less personal than a handwritten one, and consequently you will be more objective when you try to improve it. Also, you probably can read a typed copy more easily than your handwritten scribbles and will be better able to detect misspelled words. If what you have written has a chance to become "cold", you will stumble over unclear passages just like readers of your article would do if your report were published without editing. However, if you write your report one afternoon and try to edit that evening, your mind will not be able to distinguish between what you wrote and what you meant to write. To do the kind of editing that should be done on your report, the first draft should be written at least one week (not one night) before the final draft is due.

Common Errors - Here are some common errors seen in FW 495A reports- don't let yours be among them.

1. Poor organization - outline and have a reason for the order (chronological, biological, etc.).
2. Incomplete sentences - proofread and read aloud
3. Misspelled words - proofread and use a dictionary or computer spellchecker.
4. Discrepancies between citations in text and Literature Cited
   a. Appear in one place and not the other
   b. Dates differ-check carefully
   c. Author spelling and number of authors differ
5. Use of present tense with literature - always use past tense; anything published was done in the past. Methods also generally use past tense.

6. Overuse of "the" - try reading without and delete if possible
7. English units of measure - most journals require metric which may mean old references will need conversion
8. Incorrect use of words and numerals - any number with a unit of measure should be a numeral; numbers less than 10 should be written out; numbers $10 are written as numerals; any number at the start of a sentence must be written out (often better to change sentence order to get rid of the problem)
9. Inconsistent abbreviations and symbols *(e.g.*, journal names, units of measure, etc.) - often there is only one correct way, but if more than one, be consistent.
10. Weak abstracts - summarize highlights of results; do not make a "table of contents"; make it informative not indicative
11. Non-conventional tables - use CBE Style Manual and imitate published tables in the journal

Top Twelve Grammatical Rules

1. Don't use contractions.
2. Don't never use double negatives.
3. Don't use a preposition to end a sentence with.
4. Try to always avoid splitting infinitives.
5. Use the proper relative pronouns for animals, who don't care, and for persons, which should.
6. Its useful to know the possessive case, which has it's uses. Your going to be misunderstood unless you're grammar is correct.
7. Choose correct Latin abbreviations, *i.e.*, in expository writing (*e.g.*, do not confuse similar abbreviations).
8. Be sure the subject and verb agrees in number.
9. Use adverbs sparing, but correct.
10. It is aufull to mispel words.
11. Avoid noun string construction grammar.
12. Sentences should be written in active voice.

Guidelines for Preparing Graphs and Tables for Scientific Reports

Graphs should be computer-generated (in spreadsheet or graphics software) and imported into your word processing document. Each graph must be numbered and must have the following features:

a) A descriptive figure caption at the bottom of the figure that completely describes the figure, including symbol, lines, and abbreviations used. In short, a figure must stand on its own, allowing the reader to understand and interpret the figure without consulting the text of the report.

b) Completely labeled axes, with units of measure shown.

c) If multiple data ranges are presented, clearly label each with unique markers and line types, and define each in the figure caption.

d) If regressions lines are presented then report the r^2, the equation, and sample size.

Tables should be numbered and include a descriptive table heading at the top of the table that completely describes the table, including symbol definitions, abbreviations used, and units of measure.

See examples of appropriate technical figures and tables below.

Example of appropriately labeled and captioned figure, suitable for scientific publications and technical reports.

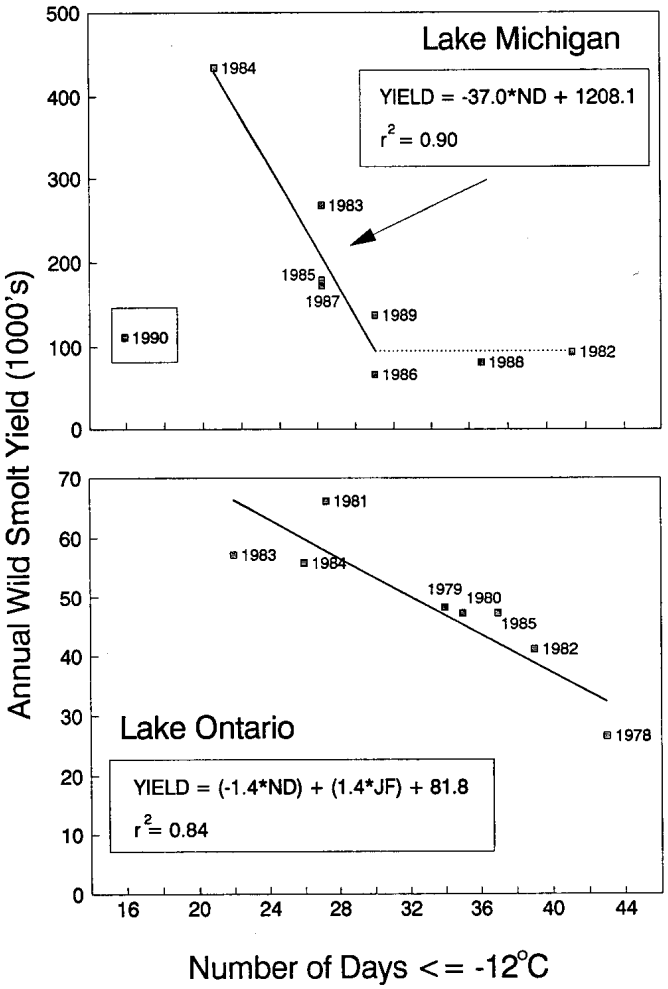

FIGURE 3.—Estimates of annual steelhead smolt yield in Lakes Michigan and Ontario based on an examination of scales taken from adults caught in the sport fishery. The data were regressed against a winter severity index (ND, number of days with air temperatures of −12°C or below). The estimate for the 1990 year-class was excluded from the Lake Michigan regression model because returns were incomplete for that cohort. Lake Ontario wild smolt yield varied as a function of winter severity and mean July stream flow (JF) in the year previous to smolting.

(From: Rand, P. S., D. J. Stewart, P. W. Seelbach, M. L. Jones, and L. R. Wedge. 1993. Modeling steelhead population energetics in Lakes Michigan and Ontario. Trahsactions of the American Fisheries Society 122:977-1001.)

Example of an appropriately labeled and captioned table, suitable for scientific publications and technical reports.

TABLE 3.—Estimates of hatchery and wild steelhead smolt equivalents (in thousands) for Lakes Michigan and Ontario from 1975 to 1990. Estimates are provided for the proportion (with 95% confidence interval, CI) of each smolt year-class that was wild (P_W). These estimates were based on examinations of scales from adult fish taken in the sport fisheries in both lakes. Proportions were multiplied by the number (N) of hatchery smolt equivalents (FS = fall–spring run; SU = summer run) to estimate whole-lake yield of wild smolts (N_W).

	Lake Michigan					Lake Ontario			
Year	Number of scales	P_W (95% CI[a])	N_{FS}	N_{SU}	N_W	Number of scales	P_W (95% CI[a])	N_{FS}	N_W
1975			449	0	320[b]			0	70[c]
1976			609	125	283[b]			67	60[c]
1977			548	45	98[b]	147	0.33 (0.15)	112	50
1978			359	104	98[b]	319	0.20 (0.09)	113	29
1979			795	127	98[b]	255	0.29 (0.11)	144	39
1980			856	3	98[b]	285	0.18 (0.09)	231	39
1981			473	114	209[b]	142	0.29 (0.15)	233	58
1982	26	0.21 (0.29)	311	123	93	202	0.24 (0.12)	210	49
1983	35	0.44 (0.34)	543	71	267	238	0.29 (0.11)	219	70
1984	54	0.41 (0.27)	877	177	434	128	0.34 (0.16)	163	58
1985	95	0.22 (0.16)	667	131	178	42	0.29 (0.27)	175	45
1986	105	0.06 (0.09)	782	350	65			206	57[c]
1987	182	0.17 (0.10)	705	329	172			437	83[c]
1988	116	0.12 (0.11)	392	252	80			411	60[c]
1989	150	0.17 (0.11)	437	351	137			415	61[c]
1990	117	0.13 (0.11)	475	351	111			480	78[c]

[a] Calculated as in Seelbach and Whelan (1988).
[b] Estimate based on winter severity–wild smolt yield model for Lake Michigan.
[c] Estimate based on winter severity, July flow–wild smolt yield model for Lake Ontario..

From: Rand, P. S., D. J. Stewart, P. W. Seelbach, M. L. Jones, and L. R. Wedge. 1993. Modeling steelhead population energetics in Lakes Michigan and Ontario. Trahsactions of the American Fisheries Society 122:977-1001.

Helpful References

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writer: publishing a scientific paper.

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