**WFB 117 Tips for Scientific Writing**

(Some excerpts courtesy of Ellen Marsden, Derek Ogle, and Jason Stockwell)

The following are common areas of concern when writing for science. You will need to apply these principles to your writing for this course.

Guidelines

* Answer the questions that are asked. For example, if the question asks you to comment on the diet of the fish, the size distribution of the diet, and the diet selectivity, you are expected to provide answers to all three of these items.
* Do not ramble and write about every thought you had about a question; answer questions succinctly. Sort through your thoughts and put your final answer. Do not “throw darts”, hoping that at least one of their answers is correct. If you are uncertain about what the question is about, then ask the instructor or teaching assistant.
* Write and speak explicitly. Some examples include:
	+ “If mortality is included in the model then q and No are not estimated very accurately at all” is not an explicit statement. The inaccuracy needs to be stated explicitly – “If mortality is included in the model, then q is overestimated and No is underestimated.”
	+ “It appears that there is not a bias” is not explicit (and uses the word “it” inappropriately – see below). A better statement is, “no bias is apparent in q because the mean of q for the many samples (green line in Figure 2) is nearly equal to the true value of q (red line in Figure 2)” is much better.
	+ “The q and No are related” is not explicit. A better answer is, “The estimated catchability coefficient (q) and estimated initial population size (No) are inversely related, as evident by the negative relationship in Figure 3.”
	+ “The distribution is normal” is not an exact statement when examining a histogram. “The distribution appears to be approximately normal” may be a correct statement.
* The word “it” is generally not explicit. Some examples include:
	+ “It changed by a factor of two”, is not clear. “The growth rate changed by a factor of two” is clear.
	+ “It has been suggested…” is not clear. Who suggested it? “Hobbs et al. (1987) and Runzo (1992) suggested…” tells the reader where the hypothesis originated.
* More generally, specify the subject of your sentence.
	+ “These were the most likely to suffer mortality” is not specific. “The tagged fish were the most likely fish in the study population to suffer mortality” is good but “Tagged fish had higher mortality rates than untagged fish” is better.
* Defend your statements by basing them on evidence.
	+ “The initial consumption increased” is not a defended statement. Rather “The initial consumption increased, as can be seen in the early part of the time series in Figure 2 compared to later in the time series” is a defended statement.
	+ Avoid the temptation to preach about the ills of human’s influence on the environment unless you have data to support statements about negative impacts.
* Do not create statements that clearly rely on results that are not shown. If you write, “the line is steeper” then you need to include and refer to a figure or table in your write-up.
* Use effective captions for tables and figures.
* Define terms that may be unfamiliar to the reader. Use acronyms if they will be used more than once. In these cases, spell out the acronym the first time you use the acronym. For example, “Diel vertical migration (DVM) is a common phenomenon…”
* Trailing comparisons: if you use a comparison word such as “more”, complete the comparison with “than”. For example, “Lowland rivers tend to be more turbid *than headwater streams*”. Similarly, use of “-er” words (greater, lesser) requires a comparison. “Europeans are taller” is not a complete sentence.
* Start each paragraph with a good topic sentence. Let your reader know what this paragraph will cover.
* Subjects and verbs need to agree (singular vs. plural). For example, ‘none’ is a singular word and the following is proper grammar - “None of us is perfect”. Similarly, “The pail of frogs was heavy” is also correct.
* In the text, describe the data (e.g., “Fish tended to increase in weight linearly with increase in length (Figure 1)”); do not describe figures or tables (e.g., “Figure 1 shows the relationship between fish length and weight”).
* Double check your use of words that can be confusing:
	+ effect (noun) *vs* affect (verb; to influence); “the effect of the sun negatively affected my vision”
	+ its (possessive; “its tail”) *vs* it's (always and only an abbreviation for “it is” or “it has” - the apostrophe is not possessive, as in “Fred’s dog”)
	+ like *vs* such as – “Many fish like sturgeon are benthic” is incorrect because there are no other fish like sturgeon. Sturgeon is being used as an example. “Many fish such as sturgeon are benthic” is correct.
	+ they're (“they are”) *vs* their (possessive) *vs* there (at or in that place)
	+ principal (primary or chief) *vs* principle (doctrine, rule, law)
	+ presently (soon) *vs* currently (now)
	+ lead (noun – the heavy metal stuff), lead (verb - opposite of follow), led (verb, past tense of lead)
	+ freshwater (adjective) *vs* fresh water (adjective and noun). “Freshwater fish live in fresh water.” In general, two words combined into a single word create an adjective; ‘everyday’ is an adjective, though very commonly misused. “Every day we see everyday words misused” is correct.

Simple Tips to Instantly Improve Your Writing

* Data is a plural word and datum is the singular. “The data were analyzed” is correct. “The data was analyzed” is incorrect.
* Do not use the word “since” unless you are referring to time. It is common in everyday language to use the word “since” in place of “because” – e.g., “since it is cloudy and thundering it is likely to rain.” The word “since” should be reserved for when referring to time – e.g., “since yesterday it has rained 1 cm.” The word “because” is reserved for when an explanation is being offered – e.g., “because it is cloudy and thundering it is likely to rain.”
* Do not use “in order to” or “in order for”; simply use “to” or “for”. For example, “To make ends meet,…” is more economical than “In order to make ends meet,…”
* Capital letters are frequently misused. Do not capitalize a common name (e.g., Largemouth Bass) unless it is at the beginning of a sentence or it contains a word that would otherwise be capitalized – e.g., Caspian carp or Atlantic salmon. Random capital letters within a sentence is a sure sign of absence of proof-reading.
* When referring to a species for the first time in your writing, give the scientific (Latin) name in parentheses after the common name; thereafter, use only the common name. The genus is always capitalized, species is lowercase, and both must be in *italics*. For example, “We applied this test to rainbow smelt (*Osmerus mordax*) that were collected…”
* In science writing, always use metric units.
* Any two words used together to modify a noun should be hyphenated (e.g., snow-covered mountain, sun-drenched beach, trophy-sized perch).
* The phrase “*et al*.” is an abbreviation for the Latin “*et alia*” meaning “and others”. This phrase is used in citations such as “…the paper by Smith *et al*. (1993)…” Thus “*al*.” is an abbreviation and has a period after it. “*et al*.” should be italicized.
* “e.g.,” means “for example”; “Many studies found strong correlations between X and Y (e.g., Marks and Plenny 2010, Lui *et al*. 2011).”

Referencing and Reference Lists

When citing someone else’s work, ideas, results, etc., you need to acknowledge them by making a reference. This comes in the form of citing their last name and year of the published work you are citing. Here are some examples:

“Our results are consistent with those of Murphy and Abdul (2009)” or “Our results do not differ from previous work in this system (Murphy and Abdul 2009).”

“Rangu et al. (1984) first hypothesized that… However, their hypothesis was rejected by a number of highly-replicated experiments (Chang 1986; Barnaby *et al*. 1987, 1990; Livens 1994).” **[NOTE: only use authors in the text of sentence if the authors are the focus of your point; otherwise, we are typically more interested in the process being discussed.]**

“In a series of experimental lakes in northern Minnesota, walleye grew faster in lakes with cisco than lakes without cisco (Willow *et al*. 1922, 1924; Pugle (1962).”

When possible, avoid breaking up a sentence with series of parenthetical references. In most instances, the references can be placed at the beginning of the sentence or at the end.

There are many formats for making a reference list. Each journal often has its own format which can be found under “Guidelines for Authors” or “Instructions for Authors” on their website. Detail is very important. For example, compare the following two references for the same journal article. The first is from the ICES Journal of Marine Science and the second is from the Journal of Great Lakes Research.

Jech, J.M., and Michaels, W.L. 2006. A multifrequency method to classify and evaluate fisheries acoustics data. Canadian Journal of Fisheries and Aquatic Sciences, 63: 2225-2235.

Jech, J.M., Michaels, W.L., 2006. A multifrequency method to classify and evaluate fisheries acoustics data. Can. J. Fish. Aquat. Sci. 63, 2225-2235.

Differences include: 1) “and” between authors in former but not in latter; 2) a comma between the second author and the year in latter but not former; 3) journal title is spelled out in former but abbreviated in latter; 4) comma after the journal title in former; 5) colon after the volume number of former but a comma after the volume number in latter.

Note that there are different formats within a journal for different types of reference materials (e.g., journal articles, books, chapters in books, personal communications).

Although this may appear to be minutiae, it is important when writing documents for work reports, for research publications, and job applications. One of the quickest ways to not get an interview for a job is to not pay attention to details in your application.

See <http://www.functionalecology.org/view/0/guidetowriting.html> for great tips for writing for a journal.