What goes where and what goes wrong? A quick guide to writing and structuring scientific papers and reports

Common items that I can expect you to already know and do correctly as third year university students, and which will impact grades. If in doubt or uncertain, do not hesitate to ask during the labs.

Taxonomy:

A species name is always double barrel (genus plus species) and italicized with the genus being capitalized but the species name not. For example, *Gadus morhua*.

First mention of a species in any abstract and post-abstract text should always be fully spelled out, i.e., *Gadus morhua*, but subsequent mentioning can abbreviate the genus, i.e., *G. morhua*.

If you refer to all species within that genus, then the genus name is italicized but the spp. is not. For example, *Gadus* spp. implies all species within the genus *Gadus*. There also exists a single 'p' form of sp., such as '*Lutjanus* sp.'. This has a distinct meaning, as it describes one specific, unique species of lutjanid that has not yet been officially described in the taxonomic literature and therefore not yet been officially named. The use of that 'sp.' writing is rare, and almost never applies in fisheries.

Family names end in "ae" (e.g., Lutjanidae) and family names are always capitalized but never italicized. There is a generalized short-hand that is not capitalized, namely 'lutjanid' or the plural 'lutjanids' when talking about snappers in general. Higher taxonomic categories are also capitalized. Common names are not reliable, as they often differ in space and time, e.g., not all 'snappers' are lutjanids, i.e., not all snappers belong to the family Lutjanidae. One option is to first mention the scientific name, with the officially approved common name in brackets, and thereafter refer to the specific species only by that common name. Acceptable common names in this unit are those as listed in FishBase (www.fishbase.org) and SeaLifeBase (www.sealifebase.org), which are the standard reference sources for biodiversity in this unit. Local (i.e., Australian) common names should be avoided, unless the product is only for completely local use, in which case a link to the actual scientific species name still needs to be made. Confusion rains in common names, so avoid them in scientific dialogue.

In the occasional circumstances where italicizing is not possible (e.g., in already italicized text), italicized species names can be replaced with underlining. For example, "*in this already italicized text, the scientific species name for the North Atlantic cod Gadus morhua is underlined*."

Language:

Know the difference between:

effect and affect; i.e. and e.g.; your and you're; author's and authors'; and there and their and they're

As advanced university students, I do expect correct and proper English grammar and sentence structure in your writing. Do not fall into the trap of thinking that complex writing and complex sentences and vocabulary makes you sound smart or helps you get better marks. In scientific writing, the opposite is true, keep you language and sentence structure simple, concise and clear. Short sentences, please. Similarly, paragraphs should not be too long, and each should concern itself with one item/topic and have a lead-in topic sentence at the start that sets the scene for that paragraph.

Numerical units and data:

Metric units are the default.

Tonnes (t) is the correct unit in fisheries, and are 1000 kg. The imperial 'ton' is less than 1000 kg and incorrect. Some US based literature uses 'metric ton' to imply tonnes, but tonnes is better and internationally standard.

For numbers larger than thousands it is best to use commas, e.g., 9000 t is ok without comma in a pinch, but 9,000 is better, and use 12,000 t or 100,000 t, as it is easier and faster for readers to de-code and thus

understand. For anything larger use exponents, especially in figures and tables (to avoid wasting space with lots of zeroes), e.g., while in the text '5 million t' is good, in graphs and tables this should be presented as 5 x 10^6 t. Although correct scientific notations, I suggest you don't use 10^4 or 10^5, as these are 'odd' notations in terms of not being easy to internalize by readers. Be consistent throughout your report.

Decimals are indicators of precision, and are misused widely. Too many give the false impression of excessive precision of a number, thus 13,568.94 t is not useful, better would be 13,569 t in tables etc., but 'around 13,570 t' or even 'just under 13,600 t' in the text. Do not fall prey to the illusion of excessive precision in your numbers.

There is always a space between a number and the unit. Thus '5m' is wrong and should be '5 m'. Think of it as '5 metres' and not '5metres'. Remember that % is not a unit and thus there is no space between % and the number, i.e., '5%' and not '5 %'.

Be aware of and know the difference between 'precision' and 'accuracy' in a statistical sense. These describe distinctly different things. You may want to review your introductory stats reference books on this topic… or maybe Google "statistical precision versus statistical accuracy"?

Graphs:

There will be a specific lecture on bad and good graphing practises. There are also many good texts, but I recommend an old, trusty classic, now in its second edition:

Tufte ER (2001) The visual display of quantitative information, 2nd edition. Graphics Press, Cheshire, Connecticut. 190 p.
https://onesearch.library.uwa.edu.au/permalink/61UWA_INST/khft73/alma9987490402101

The key message is to think carefully about what exactly you want to show in a figure in support of your message….

Report structure:

For early career scientists such as yourself, scientific papers and reports can be challenging to structure. As with all writing, it takes practise, practise and more practise. For your lab report assignment, you should consider and plan the "story" you wish to tell for your specific country. A "story" refers to the main theme of your paper and is based on the most important, most unusual or scientifically most interesting findings. It is also often referred to as the "hook" that makes a paper noteworthy and likely to succeed during peer-review. Once you have decided on your "story" you can begin planning and integrating the relevant information that you require to tell that "story". Remember, not everything you find may be part of the story you wish to tell. Make sure you read a number of the published reconstruction papers to get an idea of the structure, as most countries will be slightly different, and may not match your "hook" or "story" for your data set.

Title:

The title should be short and concise, but needs to be self-explanatory and comprehensive enough that a reader will know what the paper deals with. Jargon terms and abbreviations should be avoided, unless the term is globally well known to non-specialists (e.g., DNA).

Abstract:

This should be written last. It will need to summarize all the other sections, i.e., consist of 1-3 clear and concise summary sentences for each of the paper's components, i.e., summarizing the introduction, the methods, the results and the discussion. Focus should be on the main 1-2 findings, the main "story". Abstracts for papers should be around 200-300 words, never contain references, and abbreviations should be avoided. An abstract for a thesis, such as for Hons, MSc or PhD are longer and may need to be more comprehensive.

Introduction:

You should consider what the important background information is for the "story" you wish to tell about your country. This should go from the general/global to the regional/local and specific. It should "set the scene" for the study and hence for the rest of the report/paper, i.e., the background on what you did (elucidated in the Methods) and what you found (presented in Results). At the end of the introduction should be a short paragraph summarizing what this paper/report does, i.e., its aims or objectives. Some things you may wish to consider (but not all) for your introduction are:

- Setting the scene in the context of global fisheries and regional fisheries.
- Why are fish and fisheries important to the country?
- Why are catch reconstructions important, or why are they missing for you story highlight item?
- Role of marine fish in domestic food/livelihood security and/or economics.
- What is the problem/issue being examined/investigated in this report/paper…. i.e. your story or hook?
- Important and relevant history/geography/politics that impacted or influenced the fisheries of the country over time.
- Demographic and economic changes in the country that have influenced the marine fisheries, e.g., population growth, migration, emigration, reduced economic opportunities, war and conflict, subsidies, loan programs, etc.

Methods:

Logically document the data and information sources you used, provide proper and complete referencing for sources, and describe in clear and concise terms the steps that were taken to derive and summarize your findings and results. Explanations should be sufficient to allow someone else to *exactly* follow the same methods and obtain the same data. This is called *replicability* and is a core concept in science. Be very clear about ALL methodological steps taken. It may help to split this section into time periods and/or components (e.g., reported baseline data, discards, taxonomic composition, sectors). In cases where statistics are applied, these need to be listed and briefly justified, how underlying statistical assumptions were addressed, and what software package was used.

Note that you do not need to reiterate how the domestic catches were reconstructed (data layer 1). That is already described in the associated papers or reports available on the country webpage, and can be cited.

Results:

Describe your findings, your story, your hook. Do not reiterate or recycle the domestic catch reconstruction here, but the outcome of your data exploration… your story. Methods and Results should generally follow the same sequence of topics and sub-headings, and thus this needs to be considered before Methods is drafted. Generally, there should be no references cited in Results, as this section is about YOUR findings, not someone else's findings. Subheadings may be useful for structure, but not if the associated text is only one paragraph long.

Discussion:

A good discussion does not necessarily follow the same topic sequence as Methods/Results. In a discussion, the most important finding is discussed first (even if it was a later section in Methods/Results), the second most important finding is discussed second… etc. This also relates to your "story" line which is driven by the importance of your various findings. Provide an explanation behind the observed results: why did you see the trends and patterns that you did in the results? What are the implications of these trends and patterns? How to they relate to what happened elsewhere… i.e., cross referenced to the literature. What is the future outlook? Where can improvements be made? Is anything being done particularly well? Is there any further work needed on any specific topic?

Remember: Structure and clarity can be difficult to get right but they are the most important aspects of good scientific writing. Feel free to discuss your assignment structure with your peers and demonstrators in the lab sessions.

Careful spell checking, and correct grammar as well as sentence structure is crucial and assessable, don't skip on proof-reading, editing and revising. A good scientific writer allocates at least 50% or more of the entire production time to proof-reading, editing and revising. A trusted peer, friend or family member should also proof-read advanced versions of each report/paper well before the due date, as this often provides insights into things that are not clear to another reader.

I strongly recommend you also read this: https://www.sciencemag.org/careers/2019/06/struggling-your-academic-writing-try-these-experiments-get-words-flowing