ASSOCIATION FOR TROPICAL BIOLOGY AND CONSERVATION

# Preparing your First Scientific Paper

**Dr. Imma Oliveras**

**University of Oxford, UK**

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# How do I start?

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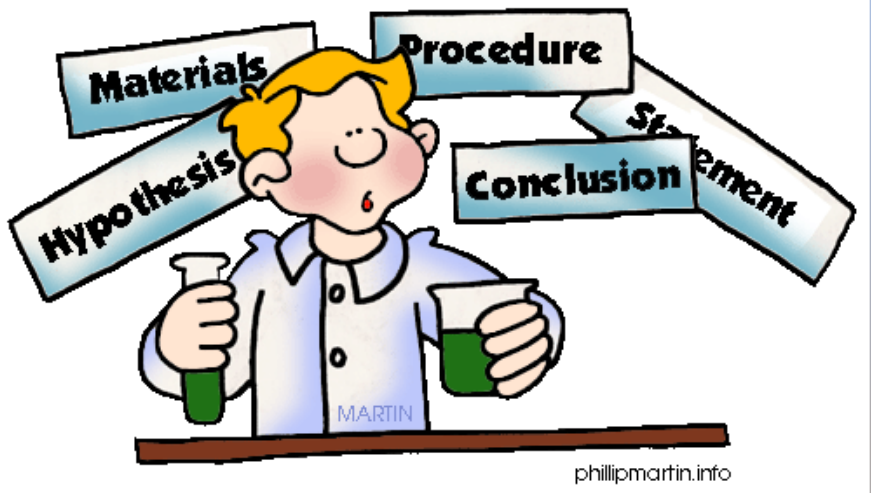
- A scientific article contains both **informative** and **persuasive content**: you want to inform your reader about the work you did, and then persuade the reader of the conclusions that you draw from the work you did.
- **Start early-on** – best practice is daily writing from the early days: write summaries, outlines, drawings on how to address questions, etc.
- Good academic writing requires learning how to write – **practice, practice, practice**!



# Typical structure of a scientific paper

- ✓Title
- ✓Keywords
- ✓Abstract
- ✓Introduction
- ✓Methods
- ✓Results
- ✓Discussion
- ✓Conclusions
- ✓Acknowledgments
- ✓References
- ✓Tables & Figures
- ✓Supplementary information

# Titles

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- Short, concise and directional better than long, generic ones
- Minimize number of words *(Biotropica recommends no more than 12 words, other journals even less!)*
- Avoid descriptive words, *"study of"*, *"observations on"*, *"exploring"*
- Where species names are given, it should be clear to general readers what type(s) of organism(s) are being referred to, either by using Family appellation or common name:

  *'Invasion of African savanna woodlands by the Jellyfish tree Medusagyne oppositifolia'*, ***OR***

  *'Invasion of African savanna woodlands by Medusagyne oppositifolia (Medusagynaceae)'*

- Titles that include a **geographic locality** should make sure that this is clear to the general reader:

  *'Effect of habitat fragmentation on pollination networks on Flores, Indonesia'*, ***NOT***

  *'Effect of habitat fragmentation and pollination networks on Flores'.*

# Titles

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- Usually good if summarizes results
  - Increased mortality of the Neotropical savanna tree *Kielmeyera rubiflora with a warmer climate*

- Good if state a question or problem but AVOID speculation

  ***NOT*** *'Climate change jeopardizes the future of the Neotropical savanna'*

  ***YES*** *'Is the Neotropical savanna tree Kielmeyera rubriflora resilient to a warmer climate?'*

- Avoid abbreviations

# Keywords

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- Need to focus on the content of the study to attract the readers' interest – think on *#hashtags*
- Choose words that are 'popular' and generic, likely 'search' words. Consider the terminology that other scholars might use to search the literature rather than using terminology that is unfamiliar to most researchers
- These will be used for indexing purposes as well.
- Avoid repeating words from title.
- Avoid  too method-specific keywords
- Better few good ones than too many 'bad' ones


Tip 2 - Title and abstract: sell your paper!

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# Abstract

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- This is perhaps the most important part of your study – most people only read the abstract!
- Key is readability – an abstract is self-sufficient and independent of the manuscript
- General template:
  - **Background**: Why are the problem and the results important and why should they be studied?
  - **Problem statement**: What problem specifically are you trying to solve?
  - **Methods**: How are you trying to solve the problem? Which methods did you use: simulation, manipulative experiments, or analysis of field data?
  - **Results**: What's are the key findings of the study?
  - **Conclusions**: What are the implications of these findings? (avoid being speculative)

# Introduction

In this section, you address the background of the problem.

- *What is the problem?*
- *Why do we even care about the problem you are studying?*
- *What is the state-of-art?*
- *What are the knowledge gaps?*
- *What are the practical implications of the topic you analyse theoretically or experimentally in this paper?*
- *How will you address these? (i.e. questions and/or hypotheses/predictions).*

# Introduction

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Tip 3 - Introduction: work on that funnel shape!

**1. Set up a domain**

- state the importance of the subject *and/or*
- present general statements about the subject *and/or*
- provide an overview on contemporary research on the subject.

**2. Set up a point of view**

- dispute a current concept *or*
- identify a research gap *or*
- develop a research question, hypothesis, or problem *or*
- continue a practice

**3. Implement a point of view**

- plan the purpose of the study *and/or*
- chart the critical qualities of the study
- define significant outcomes
- provide concise organization of the article

Renck Jalongo & Saracho (2016)

# Questions and hypotheses

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- Keep them clear and concise
  - Tip: Make an outline: think for each question/hypothesis on the statistical analyses to answer/test them and the graphical material (figure, table) to present results.
  - Keep it consistent through the manuscript

- Lead the reader to understand the hypothesis and means of testing it
  - Provide the context: think on the state-of-art to support/justify them and present it in the introduction
  - Hypothesis = tentative explanation
  - Remember that research is to prove a hypothesis false


https://online.stat.psu.edu/stat100/book/export/html/698

# Methods

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- Keep them contained but with sufficient details
- Repeatability – report what you did to repeat the findings

  No laundry list
- Usually written in past tense
- Structure:
  - Study site
  - Experimental design: subjects, variables
  - Data collection: procedures, materials
  - Lab/analytical analyses
  - Statistical analyses: describe the statistical analyses and how they address the study objectives/questions/hypotheses

# Methods


**Table 7.3** Methodology section for a quantitative study

| |
|---|
| Outline of the study design |
| Subjects |
| Method of sampling and recruitment; |
| Number of subjects; and |
| Justification of sample size |
| Inclusion, exclusion and withdrawal criteria; |
| Method of allocation to study groups |
| Variables |
| Independent, dependent, extraneous, controlled |
| Materials |
| Equipment, instruments or measurement tools (include model number and manufacturer) |
| Procedures |
| Detailed description, in chronological order, of exactly what was done and by whom |
| Data reduction/statistical analyses |
| Method of calculating derived variables, dealing with outlying values and missing data |
| Methods used to summarize data (present verb tense) |
| Statistical software (name, version or release number) |
| Statistical tests (cite a reference for less commonly used tests) and what was compared |
| Statistical significance |

Renck Jalongo & Saracho (2016)

# Results

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- Frame them within your questions/hypotheses and order them from most to least important
- Focus on describing the results with sufficient detail to establish their validity, and present them supported by analyses
- Usually written in past tense
- Refer to tables, figures and supplementary material
- Avoid:
  - Interpreting the results
  - Repeating results – e.g. do not include same data in a table and a figure
  - Describing obvious results
  - Presenting results that do not address the questions/hypotheses

# Tables and Figures

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- Usually journals have their own rules on how many tables and figures should a study have – check!
- Usually 2-3 tables and 4-5 figures
- **Make them self-explanatory** and visually attractive. **Use captions** to support the table/figure so the reader does not need to refer to the text to understand it.
- Keep figures and tables that directly address the questions and hypotheses in main text


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# Discussion

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- The discussion guides readers to understand the study and its significance to the field.
- Critically analyse, compare, and discuss their results based on the stated problem, research questions/hypotheses, and methods.
- Revisit the literature review.
- The discussion section needs to be carefully structured, because it is frequently the weakest component of the manuscript.
- Common mistakes:
  - Use too much ‘rethoric’
  - Overstate findings or “undersell” work
  - Speculation: generate assertions that go beyond what is supported by the data

# Discussion

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An example for a discussion template:

- State the study's major findings and restate your question, hypothesis, prediction
- Explain the meaning and importance of the findings
- Relate the findings to those of similar studies
- Consider alternative explanations of the findings
- State the relevance of the findings
- Acknowledge the study's limitations
- Make suggestions for further research


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# Conclusions

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- They are not another abstract
- Summarize what are the main take home messages of your study and the implications
- Some journals do not include it as a section, but good at least to devote last paragraph to concluding remarks.

# References and citations

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- Check the journal's style for references
- When citing literature throughout the text, keep it concise

  **YES** '*Apples can be red, green or yellow (Oliveras et al 2020)*'

  **NOT** '*A study by Oliveras et al (2020) in the UK found that apples can be red, green or yellow*'

- *Choose citations wisely – not only the latest articles, many theories and evidence found before the 2000s too. Usually not more than 3-4 citation for a statement*

  ***YES*** *'trait syndromes are considered the result of natural selection' (Grime, 1977; Coley et al., 1985; Westoby et al., 2002; Violle et al 2007; Díaz et al., 2016).*

  ***NOT*** *'trait syndromes are considered the result of natural selection (Violle et al 2007, Diaz et al 2016)*

# Supplementary information

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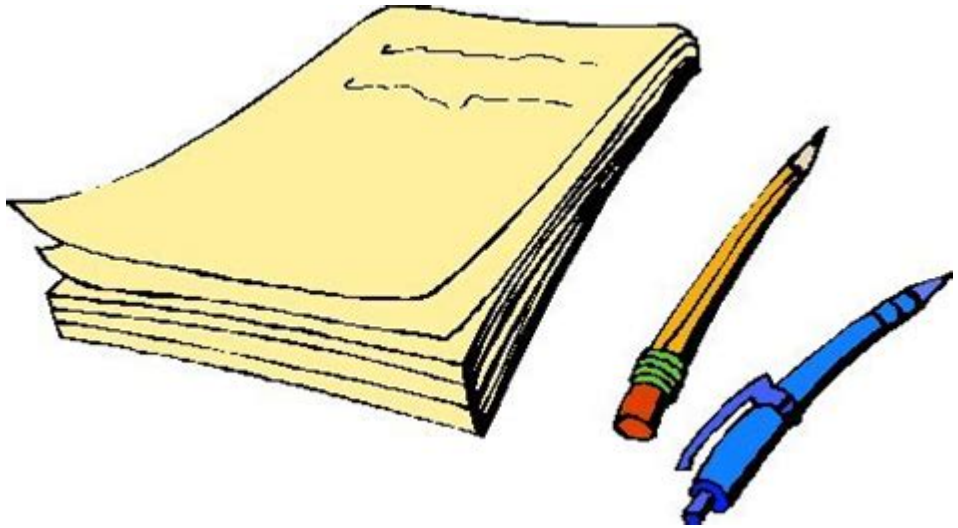
- Usually to include supporting material – tables and figures that are not core to the message but that they support and contribute to answering your questions and hypotheses
- Also used to expand methods section (e.g. inclusion of protocols), and statistical analyses
- Usually no length limit



# Authorship

- Find and download the authorship guidelines for your target journal
- **Discuss authorship order with the team/supervisor!** Generally first author who collected data/analysed and wrote paper, last author the PI/supervisor. But rules change by topic/region
- Author contribution statements usually very good practice and increasingly common

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Authors' contributions

All submissions with more than one author must include an Authors' contributions statement. All persons listed as authors on a paper are expected to meet ALL of the following criteria for authorship:

- substantial contributions to conception and design, or acquisition of data, or analysis and interpretation of data, or drafting the article or revising it critically for important intellectual content;
- final approval of the version to be published;
- agreement to be accountable for the aspects of the work that they conducted and ensuring that questions related to the accuracy or integrity of any part of their work are appropriately investigated and resolved.

# Some basic rules…

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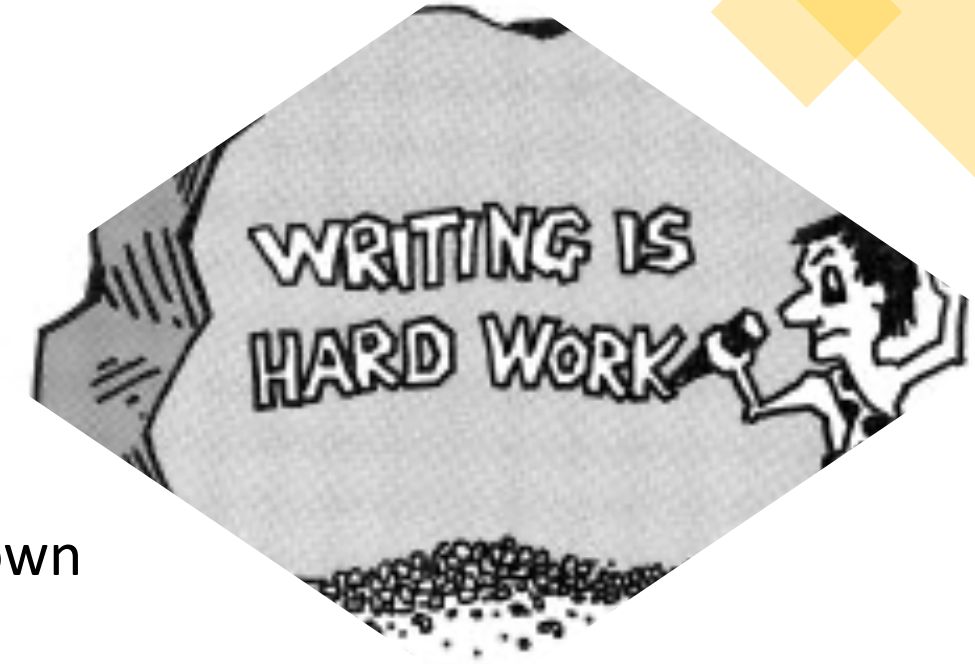
- Use first-person, ***active voice***
- ***Write concisely*** – review each sentence and try to reduce number of words
- Stick to your message
- Avoid too much repetition
- ***Use of past tense***:
  - Abstract
  - Methods
  - Results
  - Introduction and discussion when referring to your own work



# Seven tips for concise writing

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1. Take writing seriously – write every day, revise, revise, revise
2. Identify and stick to your message

   Think on : What is your paper's goal? Can you summarize the key points in a few sentences?

   Tip: Add summary sentences to the top of your working document.
3. Get to the point and do not repeat yourself (too often)

   Tip: Add keywords at the beginning of section paragraphs with the goal of your point, and make sentences as short as possible
4. Avoid unnecessary 'lead-ins'
5. Remove unnecessary words
6. Simplify your language
7. Seek and embrace feedback from supervisor and co-authors

# Tips for concise writing – ‘getting to the point’

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- To practice variable sentence length, without losing the flow of a paragraph and of the text:
  1. Write a paragraph using sentences that are as short as possible.
  2. Revise and vary sentence length by combining some of the shorter sentences.
  3. Re-read your paragraph to check if all sentences follow in a logical manner: a sentence links to the one before and after the considered sentence.
  4. Does your entire paragraph form one integrated text? Is it jumping on two ideas? Rewrite into two paragraphs. Does it feel too short? Combine paragraphs on the same topic.
  5. Repeat this method for every single paragraph in a section.
  6. Check that paragraphs follow in a logical manner

# Avoid unnecessary ‘lead-ins’

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**Box 1. Avoid unnecessary or inefficient “lead-ins.”**
Extra words often find their way into the beginnings of sentences, sometimes more than doubling their length with no added value. Here are three common types to avoid:

***1. Citation reference.***
You rarely need to reference cited work at the beginning of a sentence and doing so requires more words than citing it at the end. In the example, the issue is compounded by including “In a recent study” before getting to the inefficient reference.

In a recent study, Smith *et al.* (2015) showed that giraffes are larger than squirrels.
> Giraffes are larger than squirrels (Smith *et al.*, 2015). [6 words saved]

***2. Display item reference.***
The same premise applies to figures, tables, boxes, and other display items.

In Figure 1, we show that testosterone levels were higher in birds than fish.
> Testosterone levels were higher in birds than fish (Figure 1). [4 words saved]

***3. Inefficient lead-ins.***
Often, an inefficient lead-in can be fixed by reorganization. Below, by bringing the previous conclusion (sharks) to the beginning, it’s easier to get to the point and and tighten the sentence.

If you find yourself swimming in the ocean, be wary of sharks.
> Be wary of sharks when swimming in the ocean. [3 words saved]

Hotaling (2020)

# Simplify your language

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**Box 2. Remove unnecessary words.**
Many sentences contain filler that can be removed or condensed. Often, sentence filler stems from overused qualifiers, prepositional or multi-word phrases, and transitions.

***Overused qualifiers that can often be removed:***
Actually, basically, extremely, fairly, kind of, quite, rather, really, sort of, very.

***Multi-word phrases that can be condensed:***
In order to **>** To
As well as **>** And
Both of them **>** Both
Was found to be **>** Was
Substantially more **>** Greater
In spite of the fact **>** Although
There is no doubt that **>** Clearly
Around the world **>** Worldwide ***OR*** global
A recent study has shown **>** A recent study showed
In the paper, the conclusion is that **>** We conclude that

***Removing transitions and combining sentences where possible:***
Moreover, we show that sharks are larger than otters. Thus, sharks should be considered in global management plans. Finally, sharks are also faster swimmers than otters.

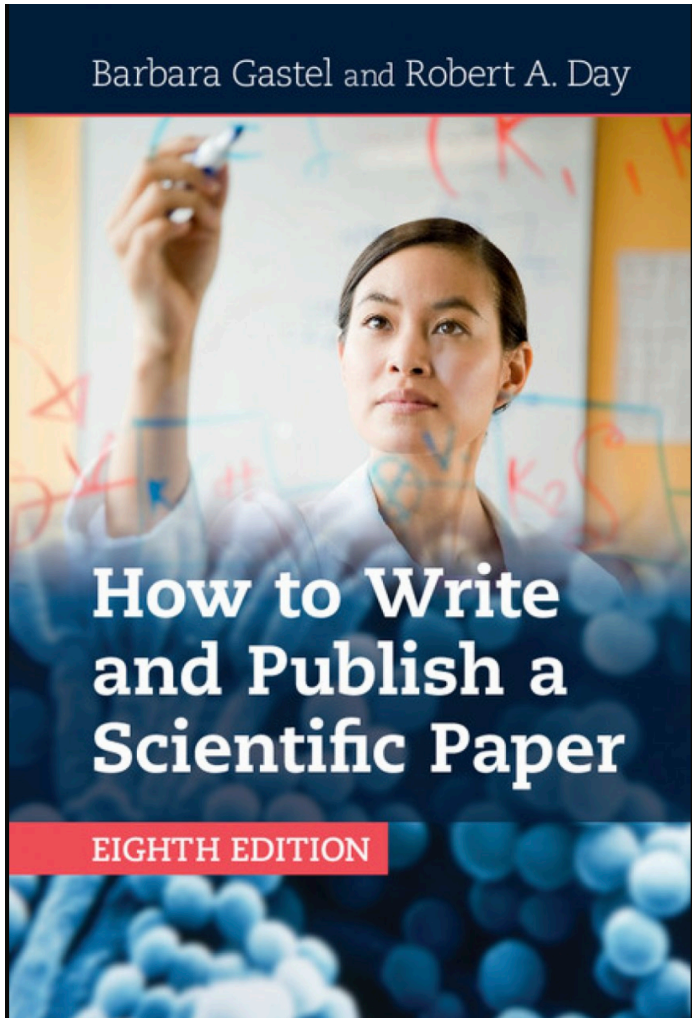
*Which can be tightened to...*
We show that sharks are larger than otters and should be considered in global management plans. Sharks also swim faster than otters.

**Box 3. Simplify your language.**
Using simpler language with fewer syllables and more straightforward phrasing will tighten your prose. Below are common multi-syllable words with shorter replacements.

Presents **>** is
Important **>** key
Supplement **>** add
Numerous **>** many
Utilize ***OR*** leverage **>** use
Frequently ***OR*** typically **>** often

Hotaling (2020)

# FURTHER RESOURCES





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# GOOD LUCK!