L-Università ta' Malta
Faculty of Science
Department of Biology

Guidelines for Biology Practicals

A. Introduction

Practical biology classes are held at the Department of Biology or other designated sites throughout the four years of study. All the practical work sessions have an associated assessment that contributes to the final mark for the study-unit (in most cases this amounts to 25% of the total mark). Attendance for practicals sessions is compulsory. A grade may be awarded to a particular study-unit only if the student's attendance at lectures, practicals and other scheduled sessions has been regular, and all other course requirements have been satisfied.

B. Different Biology Practical Classes.

Practical classes in Biology can take different forms, including:

1. Preparation/handling of specimens for detailed visual/microscopic observation and drawing *e.g. practicals related to identification and classification of organisms*
2. Experiments of various types:
   - Some practicals may involve assembly of apparatus, preparation of solutions or dilutions before observations can be made, followed by data collection and analysis. Very often an experiment is carried out in order to generate a set of readings which may then be analysed and presented in summary form, for example, as line graphs or histograms. Some calculations may be required during the practical or at the end of a practical. Students may also be required to answer specific questions based on the practical in their report. *e.g. measuring the rate of photosynthesis in a marine algal species under specified conditions.*
   - Some practicals may require students to initiate the work during the scheduled session but then to take readings or carry out further work for a number of days following the scheduled session.
   - Other types of practical may involve mastering specific techniques.
3. Fieldwork-based investigations that also require collection of data and analysis of results.
4. Site visits to illustrate or extend topics and case studies discussed during lectures. *e.g. visits such as those related to the fish farming industry and guided nature walks.*

Note that for specific practicals, the tutor or demonstrator may suggest changes to the report writing guidelines that now follow. It is important that students note these changes and follow the tutor's instructions carefully.

C. Report Writing

At the end of a practical session a report must be presented which is then assessed and marked. This report can take different forms depending on the type of practical.

For **most practicals** involving **experimental work a complete report should include**:

1. Aim/s
2. Procedure (Material and methods)
3. Results (Recording, processing and analysis of data)
4. Discussion and Conclusion and
5. Bibliography and references cited.

For certain practicals some of the above headings may not be necessary e.g.: **reports involving drawing of prepared specimen**s need not include sections 2, 3 and 4 above. In these types of practical reports, the main emphasis will be on quality of drawings, annotations (which extend your observations) and other deliverables as directed by the tutor.

Reports of site visits are expected to be concise write-ups relating and applying biological principles to the observations made during the visit. The uncritical downloading of information about the theme being studied amounts to plagiarism and **will be penalised**

You are reminded about the correct use of English (UK) throughout the report and to spell check the report before presentation. The correct spelling of scientific names is imperative and non-adherence to the rules of biological nomenclature (e.g. *Euphorbia officinarum* or *E. officinarum* BUT NOT Euphorbia Officinarum or EUPHORBIA OFFICINARUM) will be penalised. Ensure that all units used are metric and as much as possible follow the SI system.

The following are some guidelines on what to include in the different sections.

1. AIM/S: Just one sentence to clearly indicate or outline the purpose of the practical.

2. MATERIAL AND METHODS:
This section should avoid long drawn out descriptions – therefore it is recommended to:

- Append a copy of the practical schedule **OR** reduce method to a number of bulleted points that concisely explain the procedure;
- Use similar bulleted lists to indicate apparatus, equipment and materials used if the practical schedule is not appended.

- Highlight any changes from the original instructions and any precautions taken.
- Specify statistical procedures used (if any).

3. RESULTS:
This section should include:

- Observations and measurements carried out;
- Presentation of data as tables, graphs, drawings or other illustration.
- The results of processing and analysis of data can be illustrated in various forms, such as descriptive statistics and other calculations. Some specific comments on these are given below.
- **NB The significance of these results or what the data imply should not be treated in this section.**

***Tables*:**
- Tables consist of text and numbers in column and row format with headings and units used;
- Numerical data given should reflect the degree of accuracy used in obtaining the measurements. e.g. 2.354 mm for a measurement made with a simple ruler does not make sense but may do so if measured with a micrometer;
- Tables should be numbered and carry a legend that makes them understandable without reference to the text.

Figures:
- Any kind of pictorial presentation such as graphs, photos, maps, sketches etc;
- Graphical representation can take the form of line graphs, histograms, or pie charts amongst others;
- Figures must be numbered consecutively and must bear a full legend underneath;
- Axes of graphs must be labelled and units must be shown;
- In the case of photos, maps and sketches, a scale needs to be included.

4. DISCUSSION and CONCLUSION:
The discussion should:
- Assess and interpret your results in the light of the aim of the practical;
- Account for any results which are at variance with those expected;
- Relate the results to current knowledge;
- Review the biological implications of the results;
- Give sources of error and suggest possible improvements to the methods used.
- Include one or several conclusions, which should be very brief and concise statements.

The discussion should **always** cover the first and last points above; the other points can be covered at your discretion. It should be **brief** and only include information of direct relevance to the topic in question.

6. REFERENCES:
Texts and papers used during the practical or referred to in the report must be listed in alphabetical order by first author's surname and initials. The most commonly used method to cite literature used follows the rules set out by the APA Style guide

[Publication Manual of the American Psychological Association] and formats (see APA guide 5th edition, at the Library)

- For a journal citation, give author/s, year date, title of paper, title of journal, volume and pages. Do not use quotation marks around title of paper. Capitalise first word of title and any proper nouns. Do not underline or italicise title of journal.
- For a book citation, give author/s, year date, title of book, publisher, city, number of pages. Capitalise first word of book title and any proper nouns. Do not underline or italicise book title

Examples of Literature Cited:

Greene, E., Orsak, L. J. and Whitman. D. W. 1987. A tephritid fly mimics the territorial displays of its jumping spider predators. *Science* 236:310 312.

Merritt, J. F. 1987. *Guide to the mammals of Pennsylvania*. University of Pittsburgh Press, Pittsburgh.

D. Hints to help you with your drawing

Drawing is an essential skill for the biologist. "I am not good at drawing" is not a valid excuse for poor work – practice and learning from experience is the key!

A biological drawing is a detailed and accurate representation of a specimen. It must be to scale and reflect accurate proportions, it must show the relationship between the form of a structure and its function; it must record accurate observations. **A biological diagram** is accurate in its general proportions, but only shows important regions of the specimen e.g. a tissue plan or sketch. When making a biological drawing or diagram please note the following points:

- Always use a sharp HB pencil, which produces clear lines, which are easy to erase if mistakes are made.
- Get into the habit of drawing large diagrams but leave room for the name of the drawing, labelling or annotations and scale of the drawing.
- Make sure that the relationships and proportions of the parts are correct. You may have to enlarge what is being observed, for example, when drawing from a microscope, or reduce the size if the specimen is very large. Whatever the case a scale must be included. This indicates by how much your drawing is larger than the actual specimen e.g. X0.5, X2, X10. You can calculate this by measuring your specimen and your final drawing. For microscope drawings distinguish between microscope magnification and scale of the final drawing. This can only be obtained if an eyepiece graticule is used which has been suitably calibrated on a stage micrometer.
- Draw firm continuous lines. If you have to lift your hand from the paper while drawing, see that when you continue the new line continues from where you have left off.
- Labelling or annotations (short explanatory notes in brackets below the labels) should ideally be in pencil. DO not write on the drawing but place labelling well away from

it. Connect the drawing by leader lines which should not cross one another. The point to which the label refers should be shown precisely by means of a large dot at the end of the leader line. All writing should be horizontal. Avoid the use of ruler to guide you in your writing as the end result is not very attractive. **Labelling should be done in the laboratory during the practical session with the specimen in front of you for comparison to textbook figures, otherwise labelling is likely to be partly fictitious!**

- Drawings should be in pencil and shading should only be used when absolutely necessary. Important features may be highlighted better by an annotation. Each drawing is to be properly titled: i.e. name of specimen in full, magnification used together with the orientation of the specimen, i.e. transverse or longitudinal section, dorsal view etc. Annotations differ from one practical to another and so it is important to follow your tutor's instructions on this matter. When drawing specimens that are symmetrical (radially or bilaterally) there is no need to draw the entire specimen. Instead of a small portion showing gross structure show a small rough outline and indicate on this which sector is to be drawn in further detail.
- DRAW ONLY WHAT YOU SEE – DRAWINGS WHOLLY OR PARTLY COPIED FROM BOOKS AND PASSED OFF AS 'FROM LIFE' CONSTITUTE PLAGIARISM.
- **Additional or alternative notes on drawings may be provided by your tutor.**

E. FINAL NOTE

Unless otherwise specified, practical reports are expected to show the effort of an individual student. In cases where it is noted that part of the report has been copied, the students involved may be called for an interview about their work and disciplinary action may be taken if work presented is found to be plagiarised. The Faculty of Science has issued guidelines on plagiarism and collusion. You are advised to be familiar with such guidelines. You may view these guidelines at
http://home.um.edu.mt/biology/09_notice_general.html

Specimen table and figure.

(Both from: Sciberras & Schembri (2008) *Marine Biology Research* 4: 321-332.)

Table II. The mean population density, depth range, general habitat and microhabitat of *Percnon gibbesi* at 23 sites in the Maltese Islands.

Site	N"	Mean population density ±SD (crabs m^{-2})	Depth range (m)	Habitat description[b]	Microhabitat preference[c]
Cirkewwa	19	3.4 ±2.2	0.6-4.0	1; 2; 4	a; b; c; d
L-Ahrax tal-Mellieha	21	5.5 ±3.5	1.4– 3.0	2	a; b; c
Mellieha Bay	14	4.8 ±3.0	0.3-0.6	3	a; b
l-Imgiebah	16	4.5 ±2.2	3.0	2	a; b
St. Paul's Bay	10	4.3 ±2.0	1.5– 2.5	2	b; c
Fra Ben	7	3.9 ±2.4	0.5– 1.5	2	a; c; d
Pembroke	43	5.4 ±3.9	0.6– 2.6	2	a; b; c
St. Julians	32	2.4 ±1.7	1.2– 3.0	2	a; b; c
Ghar id-Dud	43	5.2 ±2.4	1.5-4.0	2	a; b; c; e
Marsascala	21	11.9 ±7.1	0.3-4.0	2	a; b; c
Xrobb 1-Ghagin	29	5.5 ±2.5	0.5– 2.0	2	a; e
Birzebbugia	6	4.5 ±3.3	0.3-0.6	1; 2	b; c; d
Ghar Lapsi	17	5.7 ±5.2	0.1– 3.0	2	a; b; c; d
Golden Bay	8	4.6 ±3.1	1.5– 2.0	3	a; b; c
Gha jn Tuffieha	5	1.6 ±0.6	2.0	3	a; b
Paradise Bay	25	5.8 ±2.5	0.3– 2.0	3	a; b; c
Mgarr ix-Xini	9	3.7 ±2.1	0.6	1; 2	a; b; c; d
Mgarr Harbour	12	3.3 ±2.6	1.0– 1.5	2	a; b
Hondoq ir-Rummien	20	10.0 ±6.0	0.6– 3.6	2	a; b; c; d
Dahlet Qorrot	49	8.9 ±5.2	0.05– 2.0	2	a; b; c
Ramla il-Hamra Bay				3	a; b
Wied il-Ghasri				4	a; b; c
Dwejra (Ghar Zerqa)				4	b; c

N" is the number of replicate quadrats used for estimation of population density. No population counts were made at Ramla il-Hamra Bay, Wied il-Ghasri and Dwejra (Ghar Zerqa) due to high water turbidity and poor visibility at the time of observation.

[b]Key to general habitat types: 1 =vertical rock faces with cre, ces that merge into a rocky bottom with dense cover of macroalgae at depths Jess than 4 m; 2 =boulder field which merges into a bare rocky bottom covered by dense macroalgae or seagrass meadows at depths Jess than 4 m; 3 =boulder field which merges into a sandy bottom at depths Jess than 4 m; 4 =boulder field which extends beyond a depth of4 m.

[c]Key to microhabitats in which *Percnon gibbesi* were observed: a = boulders with surface bare of sessile macrobenthos, but with a cover of microalgae; b = boulders covered by encrusting algae or algal turf;c = boulders with a moderate cover of erect macroalgae; d = rock ledges or crevices in rock faces which are either bare of vegetation or have a cover of encrusting algae or algal turf; e = vertical rock faces bare of sessile macrobenthos but with a cover of microalgae.

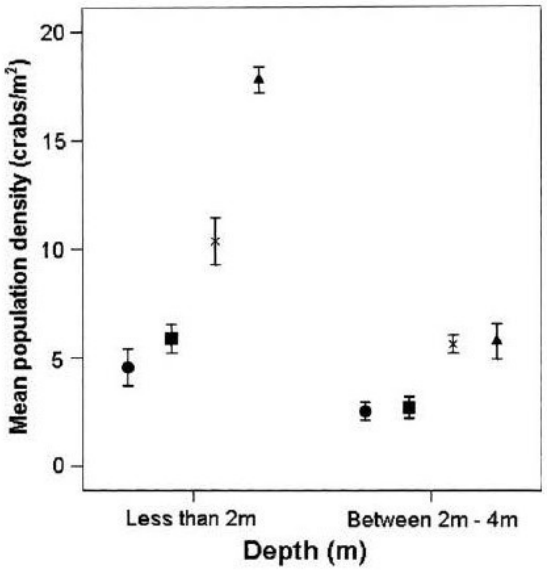

Figure 2. Mean population density (individuals per m^2) of *Percnon gibbesi* at depths above 2 m and between 2 and 4 m, at St Julians (●), Cirkewwa (■), Hondoq ir-Rummien (×) and Marsascala (▲). The population density was estimated between 10.30 and 13.30 h. Error bars represent the 95% confidence interval above and below the mean.