BIOL90002 Biometry

## Assignment 2: Interpreting Analyses

Part of working as a scientist involves reading published material and using the results. You may be synthesising the results from other papers as part of planning your own study or to make overall recommendations to another group. You may look at the published material to interpret your own data, and to decide what to do next. If you continue in science, you may also find yourself reviewing manuscripts for publication and assessing proposals for funding. In these cases, you need to look at the claims made by authors, generally in abstracts, media releases, etc., and decide whether the data support those claims.

How closely you scrutinize those claims will depend on why you are reading the material. If it’s very close to your own research, the results may influence the direction your research takes, and you’ll want to be very sure that you should trust the results. If, on the other hand, you’re making a broad synthesis, your conclusion may be based on many published papers, and you’ll pay less attention to individual ones.

This assignment asks you to look closely at some data analyses, decide whether you accept them, and whether your examination leads you to a different conclusion about the results. It is designed to get you thinking about how to review Results and Methods sections of papers. We have provided several examples, from different research areas. You should choose one of the examples and dissect that example. We have provided a guide to the kinds of questions you should ask about the treatment of the data.

We have asked a series of questions as a guide to your dissection of the paper, and they are provided at the back of this document. Things to pay particular attention to:

* Is the biological question clear, and stated in a way that links to a statistical model?
* The statistical model. The authors should give you enough information for you to be satisfied, but it’s often useful for you to write out your own model based on their description. Is everything that *should* be in the model there? If not, why not?
* What are the experimental (or observational) units, and have they been used appropriately?
* If it’s a complex model, be on the lookout for mixed models, i.e. the presence of random and fixed effects. Remember that the correct hypothesis tests in mixed models are not the same as when all factors are fixed. You can often see mismatches by looking closely at the degrees of freedom for particular tests.
* Does the analysis support the authors’ conclusions? Yes? No? Can’t tell?

You ‘ll be asked to complete the Table at the end of this document, and then upload your assignment through the Canvas.

You ***must*** work on your own to complete the document and you should not discuss it with any other student.

***You are not expected to read any other literature*** – this exercise is about scrutinising one paper only, so we don’t expect you to go off and read related papers or cite other literature. The only exception might be if you need to refer to a statistical source.

The examples are below. **Choose only one!** Once you’ve chosen, you need to sign up for that paper on Canvas (People -> Assignment 2 papers).

## Influence of salinity on the bioaccumulation of trace elements in fish (Pouil et al. 2020)?

This laboratory experiment tested the effects of three salinity levels on the assimilation efficiency (AE) of two trace elements (Mn and Zn) in an euryhaline fish species (tolerant to wide range of salinities).

## Tolerance of pollutants by marine invertebrates (Piola and Johnston 2006)

### The aim of the experiment was to determine whether populations of animals from locations with high levels of contaminants are more tolerant than those from relatively clean areas.

## Effects of nutrition on laying behaviour in seagulls (Bolton et al. 1992)

This paper reports on feeding experiments examining reproductive life history in gulls, particularly the limiting role of nutrient supply.

1. **Interactive effects of nutrient enrichment and predation on invertebrate communities in intertidal mudflats (Posey et al. 1995)**

This study was a field experiment that manipulated nutrient levels and predation using cages to test the effects on invertebrate abundance and biomass.

1. **Does chronic alcohol consumption increase risks associated with surgical anaesthesia? (Gvozdenovic et al. 1993)**

The aim of this experiment was to study possible interactions between 3 nonbarbiturate anaesthetics and ethanol “In view of the fact that in some cases ... a patient, either temporarily or chronically intoxicated with ethanol, has to undergo surgical treatment...”

1. **Enzymatic responses of coral symbioses to increased temperatures (Krueger et al 2015)**

This experiment addresses a component of climate change by examining enzyme upregulation in two corals with different thermal thresholds: “Here, we compared the response of symbiont and host enzymatic antioxidants in the coral species *Acropora millepora* and *Montipora digitata* at 28 °C and 33 °C”

**Note:** In the analysis section, you will see reference to a Welch-corrected analysis of variance. Please don’t worry about chasing up this correction (it’s adjusting for some variance heterogeneity) and make your assessment as if it’s a standard ANOVA as covered in lectures.

### References

All references are available electronically through the UoM library catalogue (<https://library.unimelb.edu.au/>).

Bolton M, Houston D, Monaghan P (1992) Nutritional constraints on egg formation in the Lesser Black-backed Gull - an experimental-study. **Journal of Animal Ecology** 61:521-532.

Pouil et al 2020.  Trophic transfer of trace elements in a euryhaline fish, the turbot Scophthalmus maximum” Contrasting effects of salinity on two essential elements. **Marine Pollution Bulletin**154: 111065.

Piola RF, Johnston EL (2006) Differential tolerance to metals among populations of the introduced bryozoan *Bugula neritina*. **Marine Biology** 148:997-1010.

Posey et al (1995) Top down versus bottom up control of benthic community composition on an intertidal tideflat. **Journal of Experimental Marine Biology and Ecology** 185:19-31.

Gvozdenovic, L V,Popovic, M R, Jakovljevic, V S, Lukic, V (1993) Effect of Fentanyl, Ketamine and Thalamonal on some Biochemical Parameters in Ethanol-Treated and Untreated Dogs. **Hum Exp Toxicol** 12(4): 279

Krueger, T. *et al.* (2015). Differential coral bleaching – contrasting the activity and response of enzymatic antioxidants in symbiotic partners under thermal stress. **Comp Biochem Physiol Part A** 190: 15-25

## Word limit: 1000 words

## Due date: 20 August

In the table below, the marking scheme shows the relative importance of each component.

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| --- |
| What (biological) question(s) were the data designed to answer? (2 marks) |
| What kind of statistical model(s) were fitted to the data? (2 marks) |
| Describe your preliminary conclusion, based on what the authors said about their results (2 marks) |
| Outline the assumptions associated with the statistical model(s) used (2 marks) |
| Did the authors provide you with enough information to determine whether the data analysis is appropriate? If not, what additional information would you like to see presented? (4 marks) |
| What changes would you make to the data analysis? (4 marks) |
| What would you conclude after your assessment of the data analysis? (4 marks) |