Fish Energy Investment in Growth Rate and Reproduction

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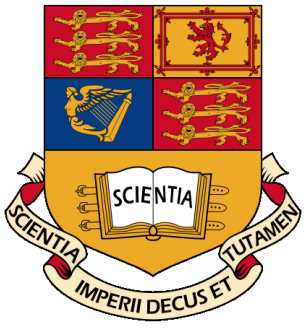

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Keywords

allometry; fish; life history; metabolism; productivity; reproduction

Introduction

Recent results from Barneche et al. (2018) have shown that larger fish produce disproportionately more offspring than smaller fish, that is to say reproductive output is hyper-allometric. In other words, a single 2kg fish will produce more offspring than two 1kg fish. This project aims to use and build upon established models from the literature to try and understand how, from a metabolic standpoint, this phenomenon occurs.

Methods

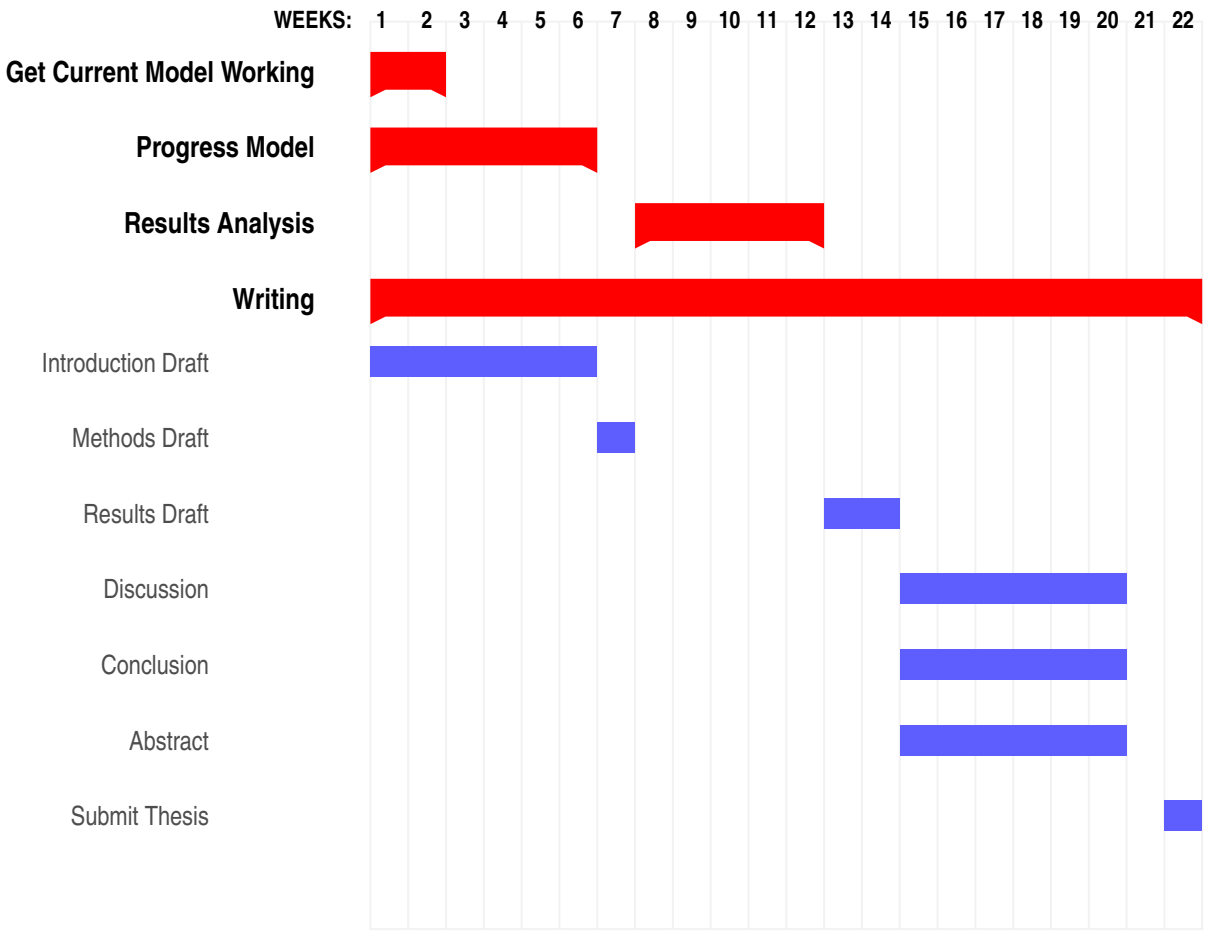
The project will use a lifetime reproductive output model (Charnov et al., 2001) to infer how energy allocation to reproduction and growth changes throughout development (West et al., 2001). These models will be implemented with some modification so as to make them more specific to fish. First, parameters will be optimised so as to maximise reproductive output, then the model will be fitted to real data in order to compare how "real world" growth compares to the purely theoretical case and what inferences can be made based on the results.

Anticipated Outcomes

To quantify the energy allocation of fish throughout ontogeny, specifically with regard to growth and reproduction.

Timeline

April 3rd	Implement currently existing models
May 15th	Finish progressing the model / model ready to apply to data
May 15th	Introduction rough draft
May 22nd	Methods rough draft
June 26th	Finish results analysis
July 10th	Results rough draft
August 14th	Hand in full draft to Supervisor
August 27th	Submit thesis



Budget

Category	Item	Cost	Justification
Data Backup and storage			Backup and storage of project data to ensure no lose of time or progress due to data loss
	1TB external Hard drive	£62	
Travel			Travel to the UK once travel restrictions are lifted
	Flight	£100	

References

Barneche, D. R., Robertson, D. R., White, C. R. and Marshall, D. J. (2018), 'Fish reproductive-energy output increases disproportionately with body size', *Science* **360**(6389), 642–645.
URL: *https://www.sciencemag.org/lookup/doi/10.1126/science.aao6868*

Charnov, E. L., Turner, T. F. and Winemiller, K. O. (2001), 'Reproductive constraints and the evolution of life histories with indeterminate growth', *Proceedings of the National Academy of Sciences of the United States of America* **98**(16), 9460–9464.

West, G. B., Brown, J. H. and Enquist, B. J. (2001), 'A general model for ontogenetic growth', *Nature* **413**(6856), 628–631.