

The Effects of Nutrition on Reproduction in the Eastern Rainbowfish,  
*Melanotaenia splendida splendida*

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March 2004

for the degree of Master of Science by Research  
in the school of Marine Biology and Aquaculture  
James Cook University

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## Acknowledgments

Firstly, I would like to thank my supervisor, Dr Trevor Anderson, for all the guidance and encouragement that he has given me throughout my studies. I appreciate his willingness to help with any problems and to listen any time I needed to talk. I would also like to thank my other supervisor, Dr Chaoshu Zeng, for all the help he has given to me during the writing of the thesis.

Secondly, I would like to thank all of those people who have helped me collect fish over the duration of this study: Terry Valence, Dr Trevor Anderson, Dr Dean Jerry, Andrew Scardino and my many friends that gave up their nights to capture fish.

I would like to acknowledge Adella Edwards for her help in making the three maps included in this thesis. Also, thanks go to Roger Laws for all of his invaluable help with the statistical parts of data analyses.

I would like to thank everyone in the aquaculture department and in MARFU (Marine and Aquaculture Research Facility Unit) for their ongoing help, technical support, and aid in maintaining my systems for fish holding. I also need to extend much gratitude to Saman Athauda for watching my fish on the occasions that I had to be away from Townsville.

Finally I need to thank all my family and friends both here in Australia and at home in the United States. Without their encouragement and support I would not have made it this far.

## Abstract

Fish broodstock raised in an aquaculture setting must be provided with a diet not only adequate to meet the demands of their basic metabolic functions, but also to support reproduction. The frequency, ration, and types of nutrients provided within a diet are all very important to the performance of broodstock.

The eastern rainbowfish, *Melanotaenia splendida splendida*, can be easily reared and readily spawn in captivity. This species has many characteristics that make it a good model species for reproductive experiments and is also commercially important to the aquarium trade. Studies were carried out to investigate the effects of nutrition on reproductive performance of this species.

Firstly, experiments were carried out to establish the basic reproductive parameters of *M. splendida splendida*. Periods of starvation were then carried out to gauge which parameters would be the more effective indicators for reproductive performance of the fish broodstock. It was determined that egg number, survival to eyed embryo, hatching rate, and unfed larval life were the parameters that would indicate reproductive success of this fish.

The next two studies were carried out to evaluate feeding frequency and feeding ration on reproductive performance in this species. Different feeding regimes were designed with feeding frequencies at every one, two, three, four and five days and feeding rations of 100%, 50%, 25%, and 12.5% satiation. The results showed that the reproductive parameters significantly declined when fish were fed less than every day, and less than 100% satiation.

The effects of energy, protein and lipid content on reproduction were then assessed. Diets containing 17 MJ Kg<sup>-1</sup>, 14 MJ Kg<sup>-1</sup> and 11MJ Kg<sup>-1</sup> were made and tested. The 17 MJ KG<sup>-1</sup> energy diet resulted in the highest egg number as well as the

longest unfed larval life. The protein experiment examined the effects of three protein levels, 35%, 43% and 50%, on reproductive parameters. The results showed that the 35% protein level gave reduced reproductive success ( $p < 0.05$ ). The 43% and 50% level diets gave better reproductive success but between the treatments had no significant differences in reproductive parameters ( $p > 0.05$ ). The 43% protein diet was recommended for subsequent experiments as it resulted in the longest unfed larval life and it would theoretically cost less to provide and would likely reduce water quality problems. Three diets containing 20%, 12% and 9% lipid were evaluated. The 20% lipid diet caused deformities in larvae, and led to reduced fertilisation and hatching rates. The 12% lipid diet gave the best overall results ( $p < 0.05$ ).

Three essential fatty acids, arachidonic acid (AA), eicosapentaenoic acid (EPA), and docosahexaenoic acid (DHA), were respectively supplemented into three diets, a fourth diet was supplemented with all three fatty acids and a fifth had no fatty acid supplementation and was used as a control. Egg number, survival to eyed embryo and hatching rate were not significantly different in any of the four diets containing no or only one fatty acid ( $p > 0.05$ ), however, supplementation of the diet with all three fatty acids resulted in significantly longer unfed larval life ( $p < 0.05$ ).

In summary, the results of the current study showed that a diet containing 17 MJ KG<sup>-1</sup> energy, 43% protein, 12% lipid and supplemented with all three fatty acids at the levels tested would maximise the level of reproduction in *M. splendida splendida*.

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