

EFFECTS OF DIETS OF DECREASED PROTEIN TO ENERGY RATIOS SUPPLEMENTED WITH STAR ANISE OIL (*Illicium verum*) ON GROWTH OF SMOOTH MARRON (*Cherax cainii* AUSTIN & RYAN 2002) IN COMMERCIAL MARRON PONDS

Authors

Anthony J. Cole¹
Professor Ravi Fotedar¹

Affiliations

¹Curtin Aquatic Research Laboratory, Molecular and Life Science, Curtin University, 1 Turner Avenue, Technology Park, Bentley, Perth, Western Australia 6102, Australia.
anthony.j.cole@postgrad.curtin.edu.au



01

INTRODUCTION

Aquaculture of the freshwater crayfish, marron (*Cherax cainii*, Austin & Ryan 2002), has been well established in Western Australia for over twenty years, however production is still below 100 tonnes per annum.

There has been no development of a species-specific nutritionally balanced formulated diet.

Growth and feeding slows in winter, where a diet with an attractant and high energy content may improve feeding rates and growth rates in this season. Star anise oil (*Illicium verum*) may be a useful attractant because it commonly attracts freshwater fishes.

02

AIM

Investigate the effects of chemoattractants and protein to energy (P:E) ratio on the growth rate and survival rate of marron in commercial semi-intensive aquaculture ponds.

03

METHODOLOGY

- Marron were stocked in 13x 600m² broodstock ponds for 1 year.
- 3 Diets: -D₁ - Basal Diet
 - D₂ - Basal + Attractant
 - D₃ - Attractant + High Energy
- P:E ratios of 19.7, 19.0, 18.4 g/MJ.
- Crude protein content of 28%.
- Marron were fed tested diets from April (autumn) to July (winter).
- Pond water quality measured including colorimetric analysis.
- Marron numbers and weights measured at stocking and harvest.

04

RESULTS

Fig 1. Average weekly ambient water temperature (°C) from July 2021 to August 2022 using data loggers.

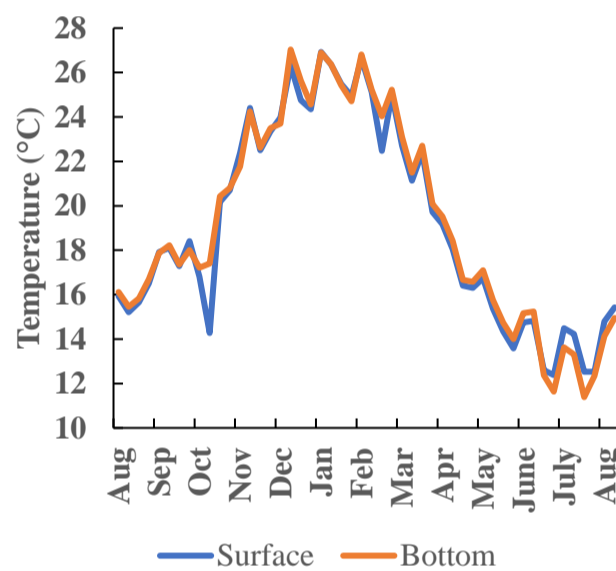
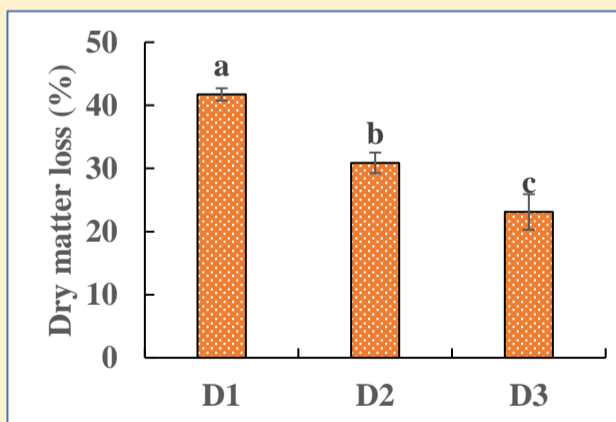


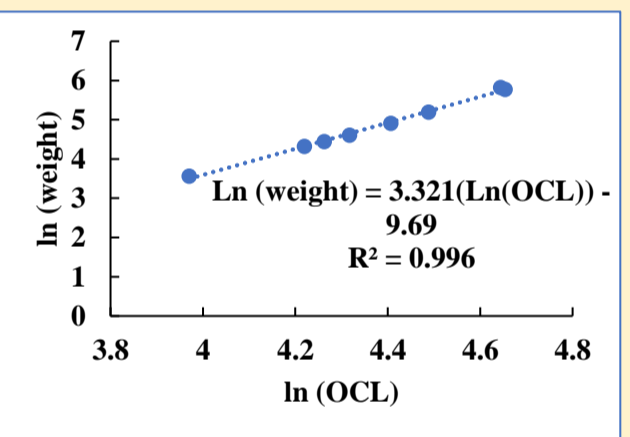
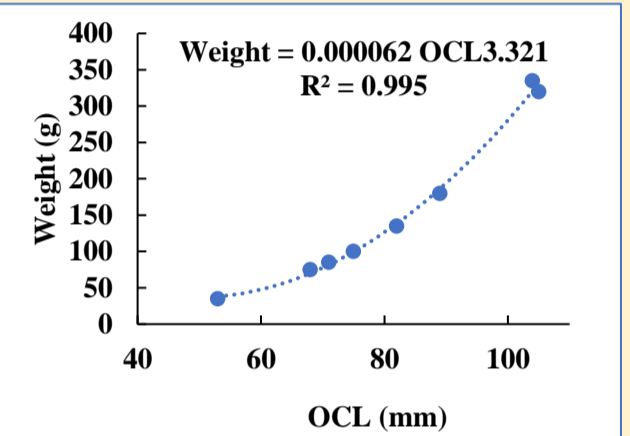
Fig 2. Dry matter loss after 75 mins of immersion. Pellet stability was higher with the customised high energy diet (D3), which included starch, soy lecithin and higher fish oil content.



There was no effect of attractant (star anise oil) or high dietary energy on marron survival rate or yield. Yield may have been affected by many factors, including natural productivity in ponds. There was high variability between individual ponds.

	D1	D2	D3
SGR (g% day⁻¹)			
	0.10 ± 0.02	0.09 ± 0.02	0.07 ± 0.02
Yield (kg ha⁻¹)			
	1462 ± 109	1273 ± 119	1476 ± 172
Survival Rate (%)			
	93.2 ± 1.3	79.4 ± 9.8	85.4 ± 7.2

Fig 3. Marron length - weight relationship, OCL = Orbital Carapace Length.



05

CONCLUSION

- Pellet stability of commercial marron diets can be improved with addition of starch, soy lecithin, oil.
- Cost-benefit analysis suggests addition of cholesterol in diets in marron ponds is not cost-effective, adding high cost with minimal benefit. The basal diet (D1) was cost-effective due to high carbohydrate and low lipid content.
- Star anise oil can be added without negatively affecting growth or survival of marron.
- The P:E ratio can be decreased from 19.7 to 18.4 without significantly affecting growth rates or survival of marron in commercial ponds.
- Further laboratory trials are recommended to determine the effects of attractants and P:E ratios on marron nutrition.

Related Literature

Cole, A. J., Tulsankar, S. S., Saunders, B. J., & Fotedar, R. (2019). Effects of pond age and a commercial substrate (the water cleanser™) on natural productivity, bacterial abundance, nutrient concentrations, and growth and survival of marron (*Cherax cainii* Austin, 2002) in semi-intensive pond culture. *Aquaculture*, 502, 242-249.

Tulsankar, S. S., Cole, A. J., Gagnon, M. M., & Fotedar, R. (2020). Effects of seasonal variations and pond age on trace elements and their correlations with plankton productivity in commercial freshwater crayfish (*Cherax cainii* Austin, 2002) earthen ponds. *Aquaculture Research*, 51(5), 1913-1922.