Production of South-American prawns based on replacement of fish meal with discarded brewer's yeast meal: effects on growth, survival, proximal composition and fecundity.

Paula S. Reyes [1], Natalia S. Calvo [2], Cristian De Bonis [2], Maria Celeste Mora [2], Débora A. Carvalho [2].
[1] Universidad Nacional del Litoral-FHUC, Ruta Nac. 168, km 0, Paraje El Pozo, Santa Fe.
[2] Instituto Nacional de Limnología, Ruta Nac. 168, km 0, Paraje El Pozo, Santa Fe.
paulareyes1990@hotmail.com - dazevedo@inali.unl.edu.ar

1. INTRODUCTION

The replacement of fish meal with sustainable protein resources is a challenge to aquaculture feed. The quantity and quality of feed protein affect the growth, survival and fecundity of crustaceans. *Macrobrachium borellii* is an exclusively freshwater prawn, native to South America, with important features to aquaculture due to its easy management, omnivorous and generalist feeding habits, and abbreviated larval development.

The aim of this study was to evaluate growth, survival, proximal composition and fecundity of *M. borellii* cultivated with feeding that partly replaces fish meal (FM) with discarded brewer's yeast meal (YM).

2. MATERIALS AND METHODS

Juveniles of *M. borellii* were captured from the wild and placed in 9 tanks (Fig. 1) with PVC shelters (density: 178 individual/m^2). Prawns were fed twice a day (7% biomass) with one of the diets formulated with different levels of fishmeal inclusion and liquid yeast discarding (Table 1) during 75 days. Every 15 days, prawns were weighed and counted. At the end of the experiment ovigerous females were counted and placed in individual containers, fed with the same feed, and daily checked until the eggs hatched. The rest of the prawns were weighed and sacrificed to determine the proximal composition.

Table 1: Formulation and ingredients used in the elaboration of feeds for *M. borellii*.

Ingredients (%)	D1	D2	D3
Fish meal	45	38	31
Brewer´s yeast	18	25	32
Starch	24	24	24
Fish oil	1.5	1.5	1.5
Unflavored gelatin	3	3	3
Mixture of vitamins and minerals	2	2	2
Bicalcium phosphate	3.5	3.5	3.5
Lecithin	1.5	1.5	1.5

Growth increment (GI), total biomass (B), survival (S), proximal composition (PC) were compared using ANOVA and Kruskal-Wallis tests to evaluate effect of the diet. Then, to study the effect on fecundity, the females that attached to different development stages (% ovigerous females, % ovigerous with advanced-stage eggs and % ovigerous that successfully hatched) fed with diets that differs on fish meal replacement (18, 25, and 32%) were compared using ANCOVA.

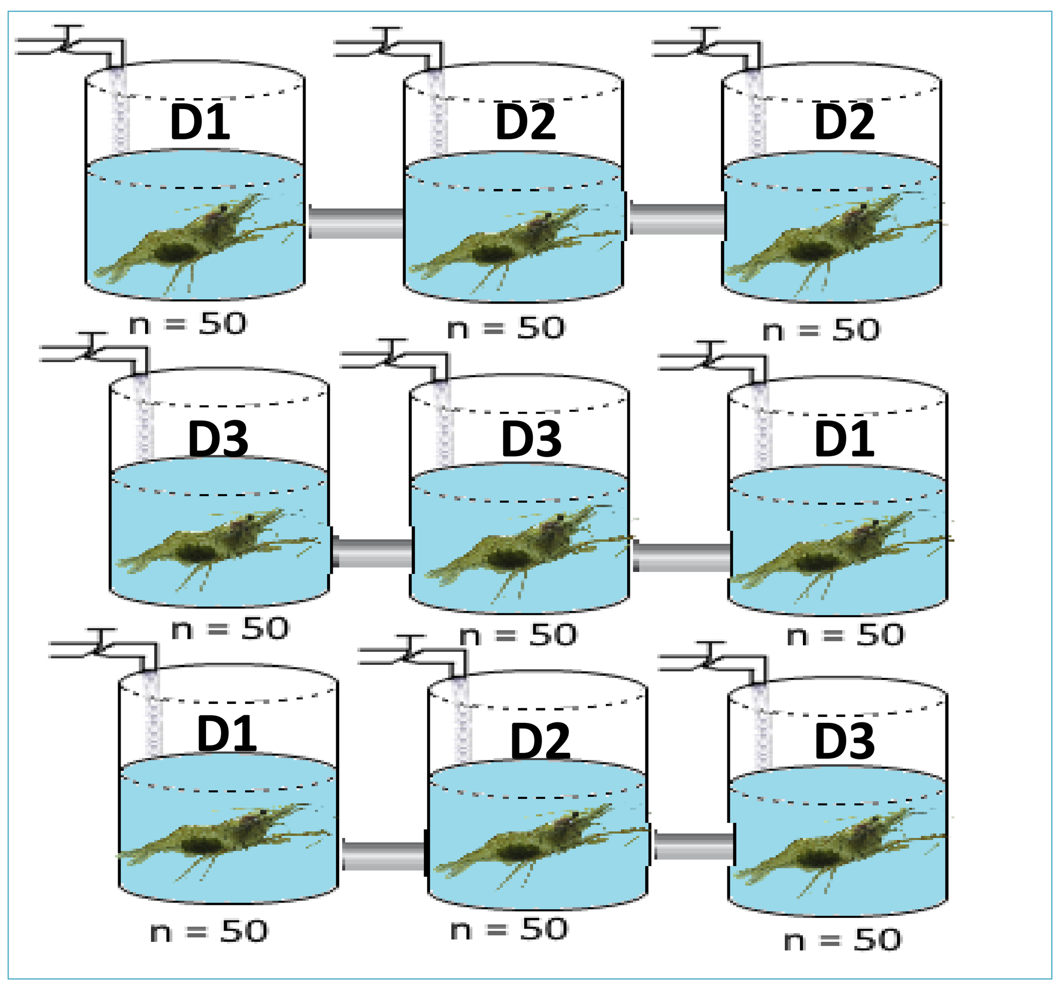

Figure 1: Experimental design used to compare the three diets.

3. RESULTS

Juveniles fed with D1 showed GI significantly higher than those fed with D2 or D3 (Fig. 2). B, S and PC were similar among treatments. A positive relationship between YM replacement and H was found.

The females with eggs attached to different development stages were affected by the percentage of fish meal replacement (significant interaction between factors, $F(2,21) = 3.56$, $p = 0.04$). The graphical observation shows that the percentage of ovigerous that successfully hatched increased when the replacement increased (Fig. 3).

Table 2: Survival, growth parameters, proximal composition and fecundity of *M. borellii* fed with artificial diets.

	Growth and survival			Proximal composition (g/100g dry weight)				
	S (%)	GI (%)	B (g)	Protein	Carbohydrate	Lipid	Ash	Fiber
D1	72.7±2.3	97.7±7.2	9.6±0.5	60.8±0.6	1.12±0.3	10.36±2.2	16.5±0.4	11.8±3.5
D2	80.7±1.2	50.8±2.3	8.4±0.1	61.5±1.2	0.83±0.1	9.32±1.0	15.9±1.2	12.2±1.9
D3	80.7±3.1	54.2±7.2	8.3±1.1	63.2±0.8	0.92±0.1	10.40±0.6	15.1±0.2	10.3±1.2
p-value	0.5	**$2.7e^{-05}$**	0.7	0.05	0.66	0.58	0.15	0.63

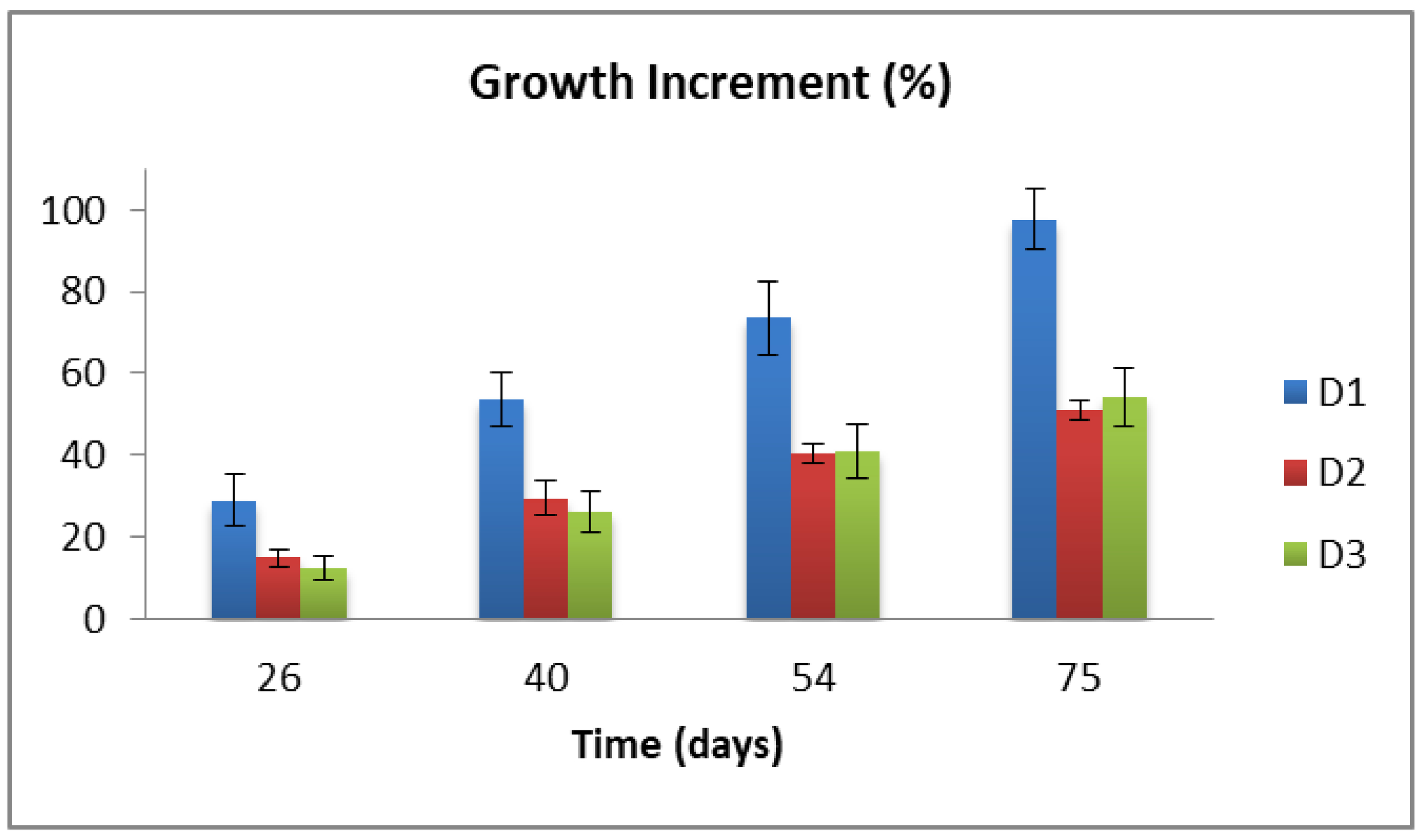

Figure 2: Growth increment (%) of prawns fed with different diets.

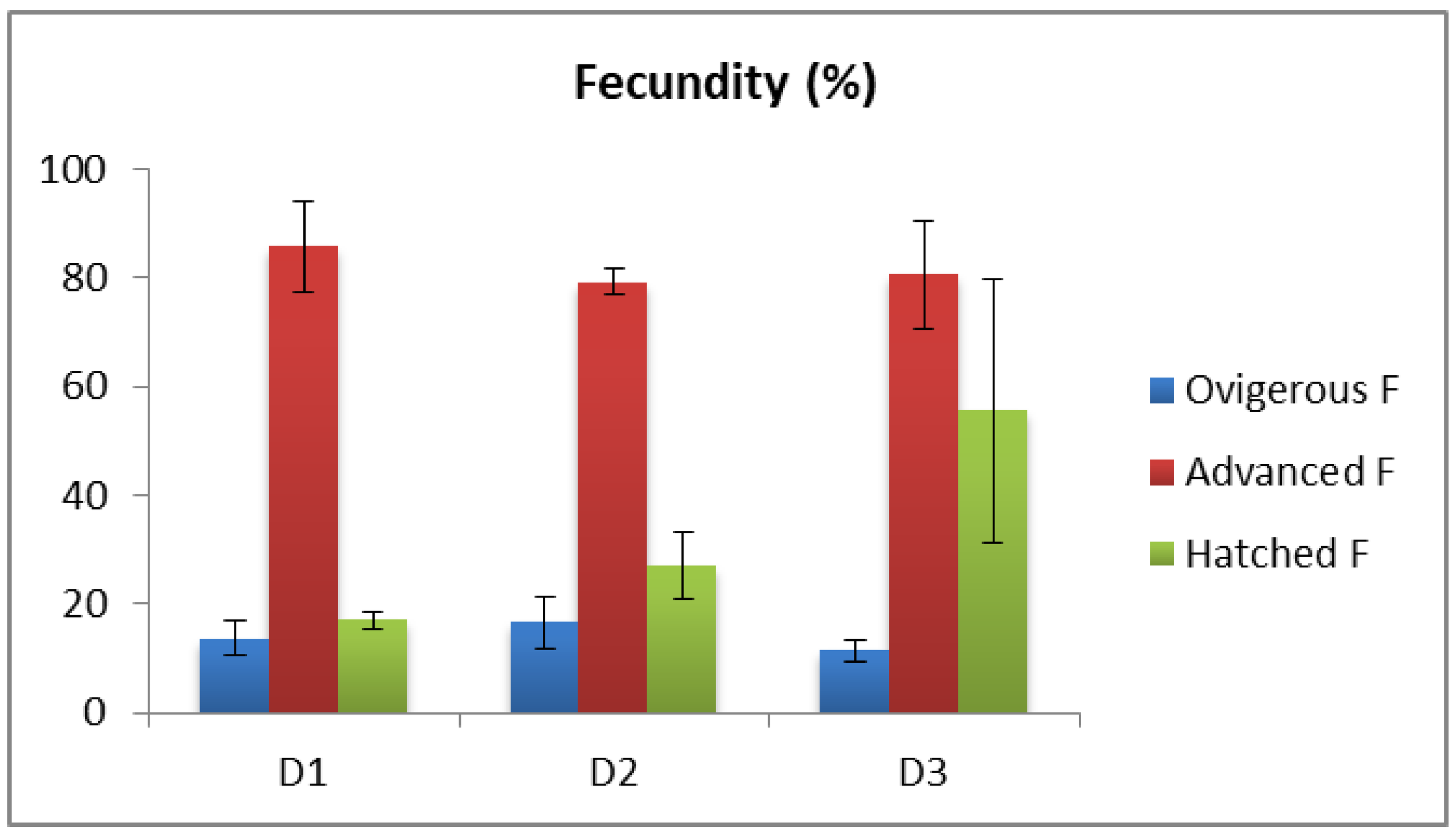

Figure 3: Fecundity (%) of ovigerous females fed with different diets.

4. DISCUSSION

Prawns cultivated with D1 grew faster, while diets with more YM tend to have a more successful reproductive stock. This indicates that YM might have other qualities for the reproductive stage. Proximal composition of prawns appears to be constant despite changes in protein quality. Prawns had high protein content and represent a nutritional high quality product. Results are useful to formulate diets with sustainable protein resources, reduce the carbon footprint of prawn farming and lower production costs.