BUILDING A GROWTH MODEL FOR *Hediste diversicolor* AQUACULTURE

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Introduction

The "ragworm" *Hediste diversicolor* is a euryhaline and eurytherm polychaete with a great feeding plasticity. Its demand for baitfish and as food for fishes and crustaceans makes him a good candidate for the aquaculture industry (Batista et al., 2003). Modelling growth is basic for aquaculture purposes from a husbandry point of view, in order to establish a correct planning and optimization of production performance. In this work we show the results obtained to date of an experience in progress whose main objective is to build a growth model of *H. diversicolor* with the body weight and water temperature as descriptive variables.

Material and methods

Ragworms of nine different size classes (< 25 mg; 25-50 mg; 50-75 mg; 75-100 mg; 100-150 mg; 150-200 mg; 200-250 mg; 250-300 mg; 300-400 mg) coming from a captive population stock were placed in experimental units (EU) which consisted of a cylindrical PVC structure (height: 20 cm; internal Ø: 11.3 cm) whose wall and base were 335 µm mesh. EUs were filled with sifted sand (0.25-1 mm grain size) to a height of 12 cm. The substrate was always submerged. Ragworm density was about 1,000 ind m^{-2} (10 ind. per EU). Each size class was in triplicate. Groups of 6 EUs were placed inside polycarbonate trays (width: 35 cm; height: 30 cm; length: 54 cm) which were part of a Recirculating Aquaculture System (RAS) with a daily water renewal rate of around 10 %. The RAS had biological and mechanical filtration, UV sterilization and temperature control. Salinity was around 36 ‰ and photoperiod was 16L:8D.

Ragworms were weighed (wet body weight: *BW*) to the nearest mg at the beginning (BW_i) and at the end (BW_f) of the experimental period of 15 days during which they were fed to apparent satiety with sole (*Solea senegalensis*) weaning feed pellets (0.35-0.50 mm in size) once a day. Dissolved oxygen was always close to 100 % saturation, and ammonium level below 0.1 ppm.

The assay was conducted at three different temperatures (*T*): 10-11 °C, 15-16 °C, and 19-20 °C. Absolute growth rate was calculated for each EU as follows:

$$AGR = \frac{BW_f - BW_i}{t}$$

A natural-log relationship between BW and growth has been clearly established for most animals (Aguado-Giménez & García-García, 2002). In order to explain variations in growth according to BW and T, data were empirically fitted by mean of multiple regression analysis (MRA) to equations such as the following:

$$LnAGR = Ln\,a + b \times LnBW + c \times LnT \qquad \text{(Eq. 1)}$$

$$LnAGR = Ln\,a + b \times LnBW + c \times T \times LnBW \qquad \text{(Eq. 2)}$$

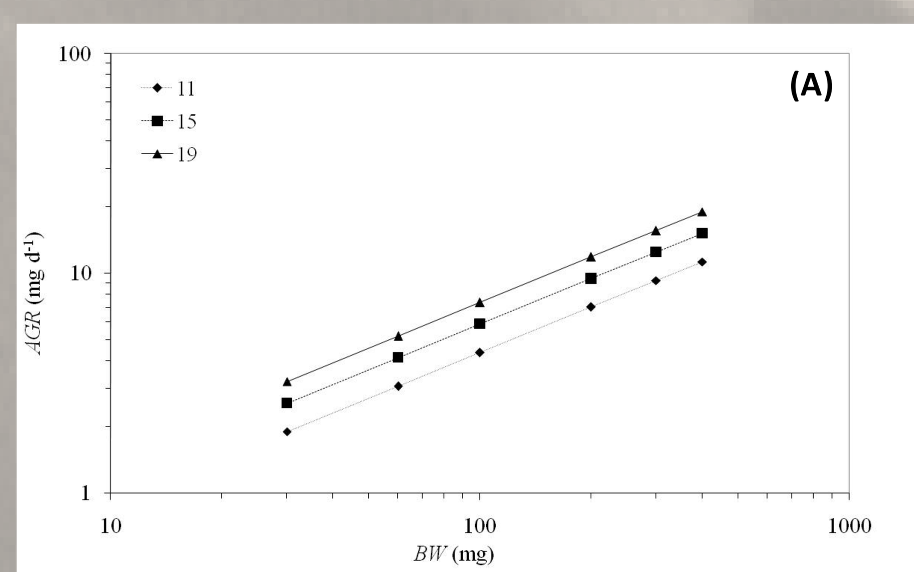
Eq. 1 predicts that maximum AGR will occur around an optimum T and it is independent of BW, while Eq. 2 predicts that the optimum T for AGR changes with BW. Estimations of AGR were carried out with both models. Residual analysis was performed by linear regression to compare the goodness of fit of both models.

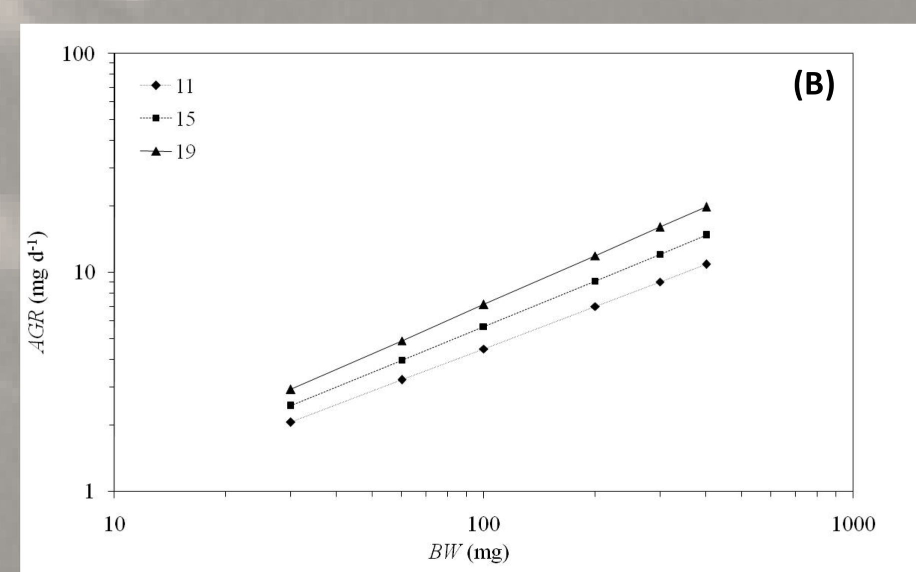
Results and Discussion

Variability explained by both models was very high, and the estimation error was low for both models (Table 1). As it was expected, MRA showed that BW and T have a strong influence on H. diversicolor growth: the larger the ragworm and the higher the temperature, the higher the growth. The coefficient of determination R2adj and the goodness of fit were slightly better for Eq. 1 (Table 1; Figure 1C), but the differences in estimating AGR were minimal (Figure 1 A-C). We go on conducting trials with worms of the same size classes and higher, and at temperatures above and below those set out in this communication. It would be expected that expanding the range of BW and T, the combined effect of weight and temperature on growth may be highlighted, being able to define the optimum T for growth depending on the worms size.

Table 1: Results of the Multiple Regression Analyses for AGR (a-b-c: coefficients; s.e. standard error; RSE: residual standard error). *** P < 0.001

	a s.e. *P*-value	b s.e. *P*-value	c s.e. *P*-value	R R^2_{adj} RSE	ANOVA *F* *P*-value
Eq. 1	-3.9927 0.1763 ***	0.6873 0.0193 ***	0.9585 0.0591 ***	0.9584 95.72 % 0.1312	 851.7 ***
Eq. 2	-1.4574 0.1094 ***	0.5034 0.0263 ***	0.0125 0.0008 ***	0.9492 94.78 % 0.1450	 691.2 ***





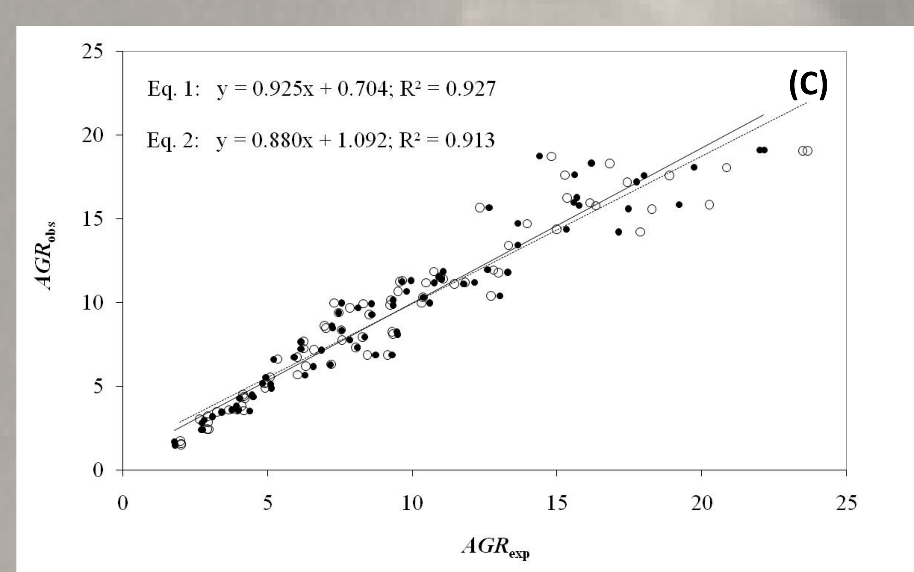


Figure 1: Simulations of AGR with Eq. 1 (A) and Eq. 2 (B), and observed vs- expected residual analysis (C).

References

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