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CONTRIBUTIONS TO THE INTENSIVE CULTIVATION OF *HEDISTE DIVERSICOLOR*

I. Rasines-Pérez*[1], I. Martín[1] and F. Aguado-Jiménez[1]

[1]Spanish National Research Council. National Centre Spanish Institute of Oceanography. Oceanographic Centre of Santander.

“El Bocal” Marine Aquaculture Station. Monte-Corbanera, 39012, Santander, Spain. E-mail: inma.rasines@ieo.es

Introduction

The “ragworm” *Hediste diversicolor* is a suitable species for industrial aquaculture because of its adaptability to wide environmental conditions, feeding flexibility and high growth rates. Its use can be the traditional one, as fishing bait or the more recently as feed supplements for farmed fish and crustaceans (Batista *et al*. 2003).

The relationship between growth rate and density is well known and no more than 1000 individuals/m2 is recommended for the cultivation of this species (Nesto *et al*. 2012). Nevertheless, production with this low density is scarce an intensification of the cultivation is needed to achieve industrial profitability. Depending on the final commercial use, production objectives can be larger individuals or higher biomass/m^2.

This species lives buried in the substrate and burrow depth increases with size (Esselink and Zwarts, 1989), so an increase in depth culture bed could result in increased space for growing worm. The relationship between density and substrate height has not been studied in this species and we hypothesise that there will be interactions between these factors.

Material and methods

Two substrate heights (60 and 120 mm) and two densities (1000 and 4000 ind. m^{-2}) were evaluated in the culture of *H. diversicolor*. Replicates (three for high density and six for low density) were considered for each of the substrate height x density combinations. Juveniles of wet body weight (BW) 48 ± 3 mg, obtained from a captive population stock, were used. Each replicate consisted of 10 or 40 worms stocked in cylindrical containers (0.01 m2 and 0.2 m high) made with PVC frame closed at the base and sides by 335 µm mesh. Substrate was quarry sand (0.25 - 1.0 mm grain size). These cylindrical containers were immersed in 3 polycarbonate trays (width: 0.35 m; height: 0.30 m; length: 0.54 m) provided with aeration, top water inlet (2.5 renewals/hour) and bottom drainage connected to a Recirculating Aquaculture System (RAS).The RAS had biological and mechanical filtration, UV sterilization, and temperature control.

Temperature, salinity and photoperiod were fixed at 20 °C, 36 and 16/8 h light/dark, respectively. Dissolved oxygen (DO), pH, temperature and salinity were monitored daily and ammonia and phosphates once a week.

Polychaetes were fed with sole (*Solea senegalensis*) feed (0.35-0.50 mm in size) in a total amount equivalent to 4% of the daily wet biomass, distributed three times a week. Fortnightly, wet BW and survival was estimated and the diet adjusted to account for increases in mean polychaete weight throughout time.

Mean wet BW, survival and specific growth rate (SGR= (ln BWf- ln BWi)*100/ Tf-Ti) at day 57 were calculated as growth performance, and number of individuals greater than 0.6 g and total biomass production (g/m^2) as a proxy of productivity. The factors height and density were analysed by two-factorial ANOVA. The Mann-Whitney test was used for non-parametric data. Values with $p < 0.050$ were considered significant.

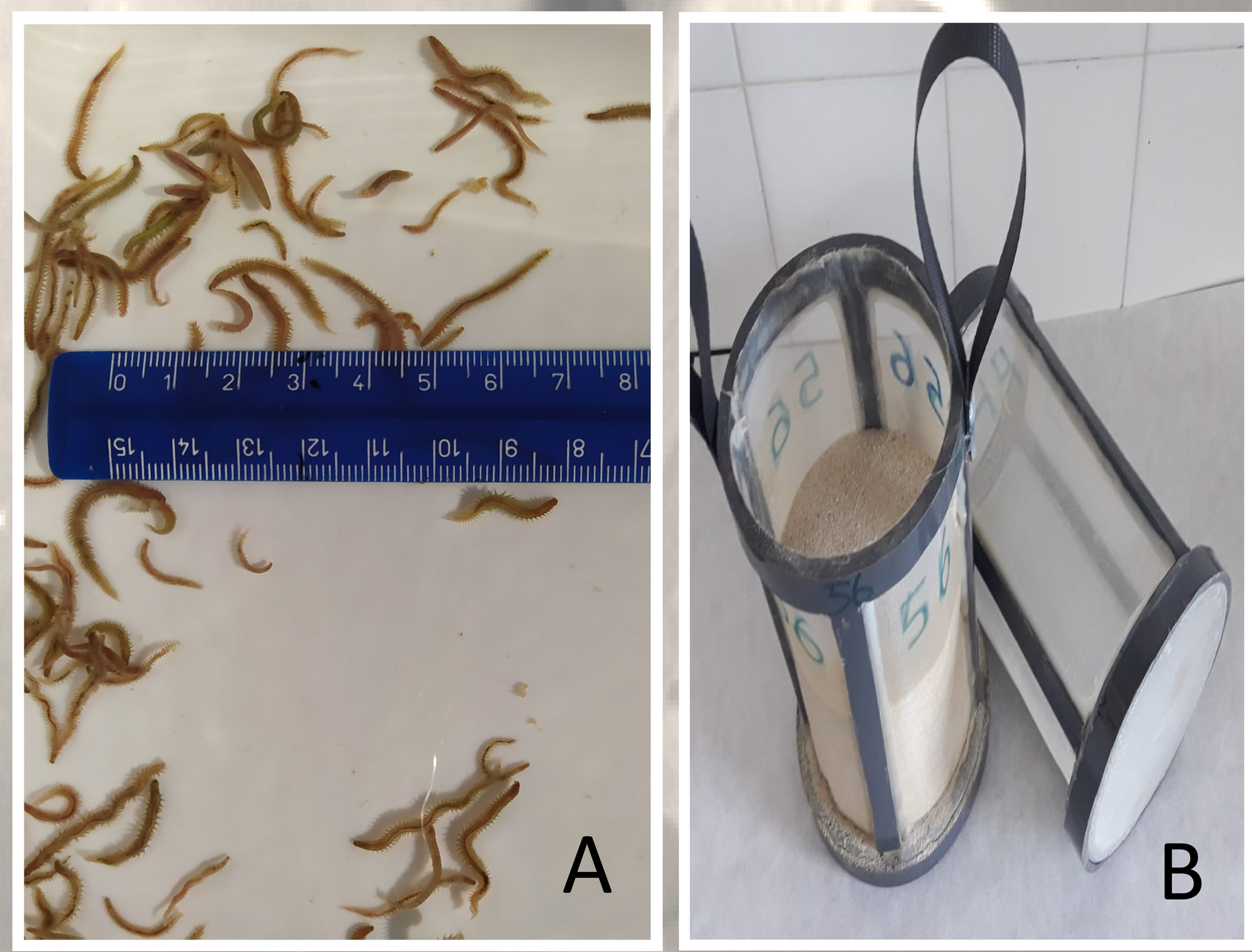

Figure 1. A-Juveniles of wet body weight (BW) 48 ± 3 mg, obtained from a captive population stock. B-cylindrical containers of PVC frame closed at the base and sides by 335 µm mesh.

Results and Discussion

At day 57, the two-factor ANOVA showed no significant interactions between density and substrate height (p=0.392), no significant substrate height effects (p=0.207) but a significant effect of density on BW (p=0.021). Similar results were obtained for SGR: interaction p=0.435, height p=0.179 and density p=0.010. See figure 2. No significant differences were found in survival (Mann-Whitney test, density p=0.615, height p=0.920).

Nevertheless, the total final biomass was 415±16 and 1378±46 g/m^2 for low and high densities respectively, i.e. about 3 times higher when an initial stocking density 4 times higher was used. Nesto *et al*. 2012 found a higher SGR and similar final biomass when the stocking density was 1000 or 3000 ind /m^2. In our case, the similar survival rate between the two densities tested could have counterbalanced the lower growth. Additionally, in 8 weeks, the number of individuals that can be sold as bait (greater than 0.6 g) is 2.75 times higher with the high density (550±43 ind>0.6g)/m2) than whit the low (200±30 ind>0.6g)/m^2). The high survival rates obtained in this work could be due to the culture system used that allows a very good water quality. We conclude that *Hediste diversicolor* can be reared at a high stocking density in order to obtain a major profitability, especially if low-cost feed, e.g. waste of fish aquaculture, will be used.

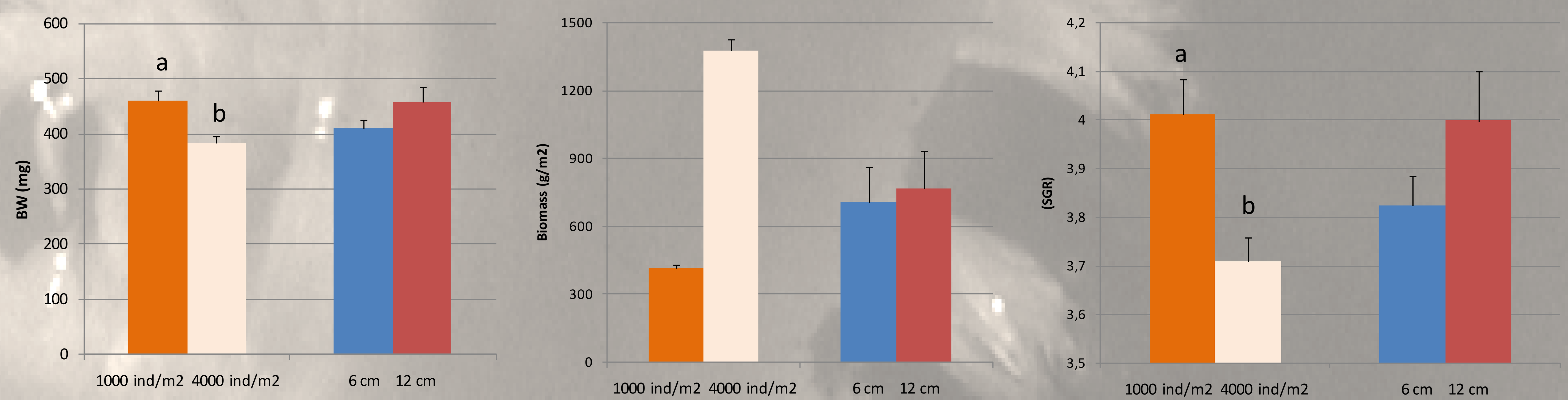

Figure 2. Growth performance and productions parameters calculated in *H. diversicolor* reared at different densities and substrate height. Data are expressed as mean ± SEM. Mean values with different superscript letters were significantly different ($p < 0.050$).

References

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