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FACTORS AFFECTING SETTLEMENT AND POSTLARVAL GROWTH OF THE BLACK SCALLOP, *CHLAMYS VARIA (L.)*

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ABSTRACT: Metamorphosis is a demanding energy process. After losing the velum, the larvae can not feed until gills are developed. Postmetamorphic growth and survival will rely on endogenous reserves stored during larval development. It is not clear when the gills are functional and suspension feeding starts. Furthermore, some bivalves pass through a transitional pedal feeding, filling the nutritional gap until suspension feeding starts. In the case of *Chlamys varia* it is not known at what size suspension feeding starts, or how the shell growth depends on endogenous reserves and the existence and extent of pedal feeding.

***KEY WORDS*:** scallop, *Chlamys varia*, settlement, *Isocrhysis galbana*, *Pavlova lutheri*, *Thalassiosira pseudonana*, *Chaetoceros graciliis*, *Rhodomonas salina*

INTRODUCTION

Difficulties in the culture of bivalve molluscs are often associated with settlement and metamorphosis. Settlement is a reversible, exploratory, behavioral response of mature larvae when searching for an appropriate substratum. The pediveliger is the last larval stage before settlement and metamorphosis of the bivalve larvae. It typically shows a mixed behavior, alternating between periods of swimming/feeding with the velum, and crawling on the bottom by means of the foot, to select a suitable substratum for settlement. The primary stimuli that initiate settlement of many marine invertebrate larvae are believed to be chemical cues associated with substrata (Morse & Morse 1984). Larvae of many species settle and metamorphose selectively on different substrata with particular physical, chemical or biological characteristics. The effect of several environmental factors on settlement and metamorphosis of bivalve larvae has been studied in detail (Eyster & Pechenik 1987, Doroudi & Southgate 2002, Fitt et al. 1990, Rico-Villa et al. 2006, Satuito et al. 2005, Tritar et al. 1992). Competent molluscan larvae can be induced to settle and begin metamorphosis by functional analogues of these natural inducers.

Chlamys varia (L.) is a small sized scallop, currently in consideration for aquaculture in Spain. Successful culture of the black scallop, *C. varia*, has already been achieved in France, Ireland and Spain (Le Pennec 1978, Burnell 1983, Roman 1991, Louro et al. 2003). In black scallops, as in other bivalves, the larvae are competent to settle and metamorphose a few days after the development of a dark-pigmented eyespot. The settlement of *C. varia* larvae is determined by factors such as light intensity, as well as the orientation, type, and availability of substrates. The best settlement rates are obtained by providing large areas of substrate in conditions of low light, and by use of collectors with a concave inner surface, made from PVC or polythene and placed in a horizontal position (De la Roche et al. 2005). Although chemical cues have been reported to improve yields of bivalve spat under hatchery conditions, their use with black scallop larvae has not been reported.

In this study we described, the effects of the growth and the settlement under diets different from phytoplankton, as well as the best settlement conditions in substrates of the larvae of the scallop *Chlamys varia*.

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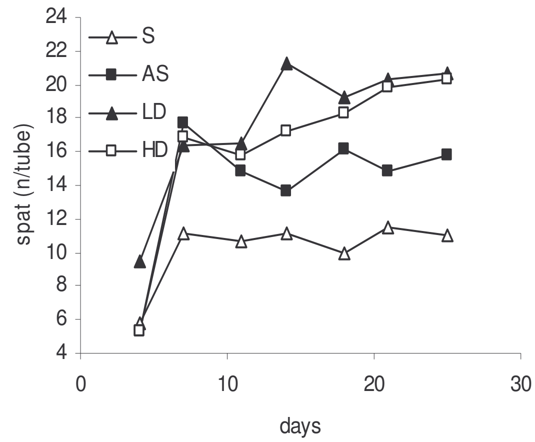
MATERIALS AND METHODS

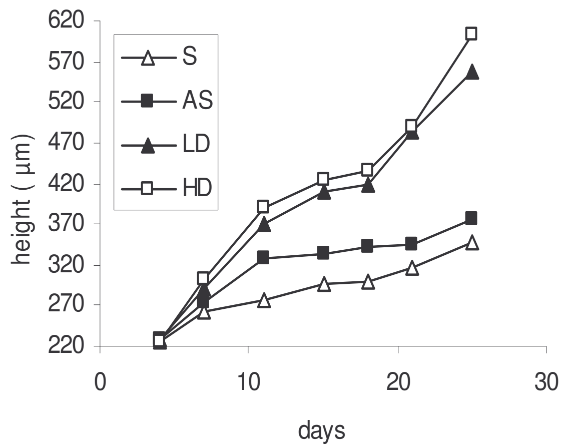
Larvae of *C. varia* were grown until competence, when they were sieved on 140µm and placed in 8 x 50 L tanks. 7 lines of collectors were added to each tank (nylon threads each of them bearing 3 PVC tubes 3 cm length and 1.5 cm diameter). 4 days later the larvae were sieved and the swimming larvae were discarded. 2 of the 8 tanks were employed for one of four different treatments : (S) starved , (AS), starved but the collectors were aged in unfiltered seawater for 7 days to allow growth of bacteria and microalgae, (LD) feed at low diet (2.5 cells µL of a mixture of *Isocrhysis galbanaI, Pavlova lutheri*, *Thalassiosira pseudonana* and *Chaetoceros graciliis* more 2.5 cells µL de *Rhodomonas salina*), and (HD), feed at high diet, total 50 cells µL in the same proportion as the DB. Sampling was performed the days 4, 7, 11, 15, 18, 21 and 25. At sampling dates a line with 3 collectors was removed from each tank and all the spat detached, counted and measured. The experiments started in December 23th 2005 and finished 25 days later.

RESULTS

Number of settled larvae.

A multifactor ANOVA was employed for comparison of the number of settled larvae, factors being treatment (S, AS, LD, HD) and sampling date (days 4, 7, 11, 15, 18, 21 and 25). There are significant differences in number of settled spat according sampling date and treatment. Post-hoc comparisons employing SNK test showed that the number of settled larvae were significantly lower the first sampling day (D4), and there were not significant differences after. D4< D7 = D11 = (...) = D25. Regarding to treatment, significantly lower number of spat were recorded in starved tanks (S) than in the ones with aged collectors (AS), which showed a significantly lower number than in fed tanks, so: S < AS < LD = HD. The postlarvae growth was recorded in all the treatments. Growth values at each sampling day were analysed with a one way ANOVA. There were not significant differences in size between treatments the days 4 and 7. From days 11 to 21, there were significant differences in size in treatments S<AS<LD=HD. The day 25, S<AS<LD<HD.





Figures 1 and 2. Number of spat per collector tube (left) and spat growth (right) according the different treatments.

DISCUSSION:

The significant differences in number of settled spat between day four and subsequent days could be a result of high motility of recently settled spat looking for adequate places. In fact, the fourth day all the swimming larvae were removed from the experimental tanks, remaining only the settled spat, who apparently moved from tank walls to the collectors.

According to Rupp et al, (2004), a higher settlement was expected in aged collectors (AS). Than in (S), but lower than in tanks with food (LD, HD), perhaps the added food forms a biofilm on the collectors promoting higher settlement than the produced by ageing the collectors.

Regarding to the growth of the postlarvae, differences were recorded from the 11th day. The starved larvae grow employing the endogenous reserves, able them to live and grow at least until day 25; the larvae placed in tanks with aged collectors grow faster, showing a significantly higher size from day 11 to the end of the experiment, suggesting a slight pedal feeding. However, from the day 11 the fed larvae grow significantly faster, suggesting that the capability for suspension feeding is developed when postlarvae reach 289.9 μm, which is the mean size of postlarvae the day 7; have the same growth independently of the amount of food provided, until day 21, only from this date the postlarvae fed at HD show a higher size.

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