FIRST FEEDING OF THE EUROPEAN HAKE *MERLUCCIUS MERLUCCIUS*: SELECTIVE PREYS AND PREY DENSITY

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Introduction

The European hake is a top predator which first feeding preferences are largely unknown, despite being suspected that certain prey species and sizes are preferred. This knowledge is relevant for exogenous hatchery food supply during early life stages of hake, but remains elusive due to the difficulty of maintaining, spawning and harvesting hakes (Iglesias et al. 2010) to properly test its natural diets. Post-hatching early stages of hake are believed to feed at low light intensities associated to the deep water column, so testing parallel experimental designs of light-intensity vs. preys are key to undertake this species' domestication. We examined in vitro prey preference, prey density and mortality of starved 7-8 DPH hake larvae under 12 zooplankton-based diets.

Material and Methods

The larvae used were derived from eggs issued from the hake broodstock of IEO-Vigo. Catching conditions, acclimatization, embryonic development, incubation and feeding of newly hatched larvae are described in the works by Iglesias et al. (2010), Sánchez et al. (2011) and Bjelland & Skiftesvick (2006).

Experiment 1. Type of zooplankton species used

Zooplankton from Ría de Vigo was collected with a bongo sleeve of 500 µm mesh. Zooplankton was kept in 500 L tanks with gentle aeration and fed phytoplankton (*Tetraselmis spp.*, *Isochrysis spp.*, *Rhodomonas lens*). Four buckets 5 L each were used to feed 7 DPH starving larvae with three mixed zooplankton diets at 0.1 individuals/ml until 12 DPH. Larvae were collected at 1h 3h 5h and 24 h and their stomach content examined under a Leica binocular. Increased larval survival was observed in diet-mix III where zooplankton appeared in stomachs 3 hours after coming in contact to each other. Cladocerans (e.g. *P. intermedius*, averaging 0.898x0.435 µm LxW) and copepods (e.g. *T. longicornis*, averaging 1.657x0.588 µm LxW) were present in 20% of 9 DPH larvae.

Experiment 2. Role of prey density

Tanks witch 1liter of filtered (0.5 µm) seawater, UV disinfected, 36 ‰, salinity and temperature 14±0.5 °C, soft aeration, constant light (24h, cool-daylight) and 75 lux on the surface of the tank were prepared 30 larvae witch 8 DPH in starvation. Three different densities of nauplii (A0) of *Artemia* sp. (AF INVE): 0.1, 1 and 2 A0/ml quintuplicate (15 tanks and 450 larvae). Stomach contents of larvae and survival were examined under binocular Nikon SMZ1500 at 20h. Survival and differences in the percentage of feeding larvae between treatments were explored with an ANOVA test post-hoc Tukey test (SPSS Statistics 19.0). The three densities differed significantly from each other ($p<0.05$) being 2AF the most performant and suggesting increase density in future assays. Mortality at density 2 AF/ML was significantly lower ($p<0.05$) than the two lower prey concentrations.

Experiment 3. Prey selection.
18 tanks were prepared as described previously. Six types of prey diets were prepared upon their size. Stomach contents of larvae were examined under binocular Nikon SMZ1500 at 4h, 18h and 26h for a total of 540 larvae.

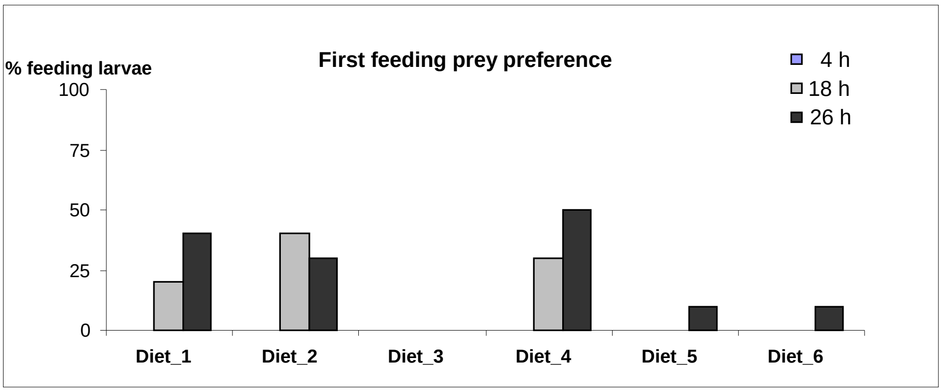

Fig. 1. Percentage of feeding larvae (4, 18, 26 hours) for six different diets: Diet_1 (A0 nauplii and small copepodites *Acartia* sp., density 5/mL), Diet_2 (copepodites-*Acartia* sp., density 2/mL), Diet_3 (adult copepods *Acartia*, density 1/mL), Diet_4 (A0 nauplii AF *Artemia* sp. (AF INVE), density 2/mL), Diet_5 (A1 *Artemia* 24h, density (2/mL), Diet:6 (*Rotifers*, density 5/mL).

Larvae improve capture capacity over time and show a higher preference for prey of similar size range (Figure1). Hake larvae grown at 14 °C preferred Artemia AF (50%, 438.83 µm), copepodites of Acartia sp. (40%, 451.75 µm) and rotifers (10%, 219.43 ± 60.13 µm) what is consistent with Iglesias et al. (2011). All assays made avoided rotifers, and larvae selected for low-sized (0.4-0.5 mm) Artemia prey, suggesting that they were more available than copepods to these larvae.

Conclusion

Both prey taxa and size affected prey preference during the larval period. Hake larvae prefer small Artemia's nauplii with more densities to those commonly used in the initial larval rearing, what also reduces their mortality. Prey taxa and prey size interacted with predator size to influence selectivity and its effect on growth and survival (Mayer and Wahl, 1997). This result advocates for eliminating rotifer and increase fresh made Artemia. Consequently, those factors must be considered in combination when examining the importance of first feeding decisions in hake larvae.

References

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