

SENEGALESE SOLE POST-LARVAE EXHIBIT DAILY RHYTHMICITY OF FEED INTAKE AND PROTEIN METABOLISM

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Introduction

To attain higher growth, and consequently, greater profitability in hatcheries it is essential to understand species feeding behavior and nutritional requirements. It has been reported that larvae do not display constant food ingestion under natural or laboratory conditions but have daily feeding rhythms (Kotani & Fushimi, 2011).

Sole is a species with a complex metamorphosis, which implies important changes in food habits and in digestive physiology. In juveniles and adults it was suggested the existence of circadian feeding rhythms (Navarro *et al.*, 2009), nevertheless, the larval daily feeding rhythm and the potential effect on digestive and absorptive efficiency remain unknown.

The aim of this study was to understand the daily feeding behavior and digestive metabolism of Senegalese sole post-larvae (35 days post hatching-dph) under a 12h light:12h dark photoperiod in order to improve feeding protocols and promote growth.

Material and Methods

In this experiment feed intake, *Artemia* protein digestibility, protein retention and protein catabolism were estimated at different experimental times within a day in sole at 35 dph, using ¹⁴C-labelled *Artemia* protein and posterior incubation in metabolic chambers.

Photoperiod in the nutrient flux laboratory was the same as in the rearing room: 12h light: 12h dark, with lights turned on and off at 9:00 and 21:00 respectively. Trials were conducted at five different hours: 10:00, 14:00, 18:00, 23:00 and 04:00 (UTC+1).

To carry out the trials, radiolabeled *Artemia metanauplii* were added to the corresponding tray and larvae were allowed to eat for 30 min. After this period, larvae were individually incubated for 18h in a sealed system (Rønnestad *et al.*, 2001).

Results

Feed intake results were significantly different depending on the time. The times of the day in which larvae showed the highest feed intake were at 10:00, 14:00 and 04:00h. The feeding activity decreased significantly at 18:00 and 23:00h.

Larvae showed significantly different *Artemia* protein digestibility values depending on the feeding hour. Larvae fed at 10:00, 14:00, 18:00 and 04:00h had higher digestibility than those fed at 23:00h. Protein digestibility was always above the 69%.

Sole larvae fed at 18:00 and 23:00h presented significantly higher protein retention efficiency (% of label absorbed; 91.88 ± 2.83 and 94.08 ± 2.57 , respectively). Protein retention was always higher than 80% (Fig. 1).

Conclusions

The results of the present study show that sole larvae have different ingestion rhythms during the whole day, therefore, these results suggest that sole post-larvae suffer variations in appetite control and digestive metabolism along the day, with a marked influence of day/night cycles in the feeding rhythmicity.

The low *Artemia* intake and the high evacuation rate achieved at 23:00h suggest the existence of a shift in appetite regulation at that time, it might be expected that the digestive capacity at this time will not be as effective as in hours that larvae are more responsive to food.

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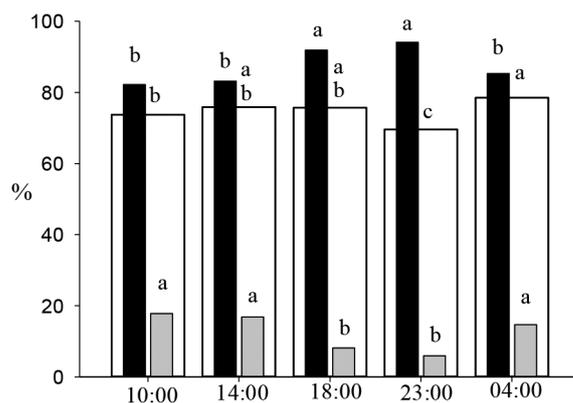


Fig. 1. Percentage of label absorption (white bars, % of total fed), retention (black bars, % of absorption) and catabolism (grey bars, % of absorption) in 35 dph Senegalese sole post-larvae. Results are represented as means \pm SD (n=12). Letters mean significant differences between hours in the percentage of absorption, retention and catabolism.

In conclusion, this study helps to understand sole post-larvae feeding behavior, focused on the digestive metabolism and prey consumption, under a 12h light:12h dark photoperiod. Post-larvae showed a high *Artemia* intake at 10:00, 14:00 and 04:00h and a significantly lower *Artemia* intake at 18:00 and 23:00h, accompanied by low digestive capacity at 23:00h, suggesting the existence of a feeding rhythmicity in Senegalese sole post-larvae with a broad feeding peak after light turns on and another during the dark phase.

References

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