COMPARATIVE STUDY OF AGE ESTIMATION IN WILD AND CULTURED Octopus vulgaris PARALARVAE. Effect of Temperature and Diet

Catalina Perales-Rayá1, Manuel Nande2, Aurora Bartolomé3, Camino Gestal3, Juan José Otero2, Pablo García-Fernández1 and Eduardo Almansa1

1Instituto Español de Oceanografía: C.D. de Canarias, Vía Española, Dársena Pesquera P.C.I, 8, 38100, Santa Cruz de Tenerife, Spain.  
2Instituto Español de Oceanografía: C.D. de Vigo, Subida a Radio Faro 50, 36300, Vigo, Spain  
3Consejo Superior de Investigaciones Científicas, Instituto de Investigaciones Marinas. Rúa de Eduardo Caballo, 6, 36208, Vigo (Spain). e-mail: catalina.perales@csic.es

Abstract

We estimated the age in 100 wild paralarvae collected during spawning season in NW Spain, where temperature was about 14.5°C. We also analyzed 50 paralarvae (0 to 22 days old) reared at 14°C and 33 paralarvae reared at 21°C (0 to 30 days old) which is the optimal temperature under culture conditions. Age estimation using anterior region of paralarvae beaks was improved. Results at 21°C matched with true age supporting daily deposition, whereas less than one increment/day was recorded at 14°C. General Linear Model (GLM) analysis showed that temperature significantly (p < 0.05) influenced the increment deposition in captivity, but not the diet (p > 0.05). In the natural environment, ages ranged between 0 and 8 days presuming daily deposition. Nevertheless, considering the possible influence of temperature, we used the mean value at capture to correct with GLM equation the age estimations of wild paralarvae.

Introduction

Wild and cultured populations of common octopus (Octopus vulgaris Cuvier, 1797 and multiple O. vulgaris-like species since Amor et al. 2016) have a high economic value worldwide. However the survival of the species during its planktonic early life is critical for the population success. Difficulties in collecting wild paralarvae and the complexity to estimate their age has prevented the accurate study of the ecology and feeding of planktonic stages in the natural environment and the comparative analysis of wild and cultured paralarvae of similar ages. This comparative approach could serve as a guide to establish the requirements of these early developmental stages and improve their low survival under captivity.

Aims. The present study aims to address the effect of temperature and diet under culture conditions. It was used to interpret the age estimated in wild paralarvae collected during its planktonic early stage.

Paralarvae

- 33 paralarvae cultured at 21°C and 50 paralarvae cultured at 14°C in 2015 (Nande and Otero, 2015) with two different crustacean preys (Artemia and Maja brachydactyla soaeae). Paralarva photo: 40X
- 100 wild paralarvae from NW Atlantic during spawning season of 2015 and 2016. Oceanographic vessel "José María Navaz" (IED). Sampling: Multinet 200 µm, 2m diameter. Hauls at 10-20m depth, 15 min, 2 knots speed

Age estimations

- Counting the parallel thin increments (rings) observed in the anterior region of upper jaws, as described in Perales-Rayá et al. (2014). Maximum width of reading area (WRA) was measured in all individuals
- Transmitted light with Nomarski Differential Interference Contrast. 400X magnification. Two readings, precision estimated by Coefficient of Variation (CV) (Campana, 2001)

Results and Discussion

Paralarvae

Fig. 1. Increments in the beaks
Optimal thermal conditions (21°C) → 1 increment/day with any diet
Cold temperature (14°C) → <1 increment/day with any diet

Fig. 2. Beak growth in captivity
Lowest WRA at 14°C (both diets). Wild specimens showed intermediate values and similar growth trend to individuals cultured at 21°C

Age improvements

First increment: in the base of oral denticles
Reading area: Rosinum (R) surface, fused to the anterior Hood and Lateral Walls

Mean rings in captivity

- 1.6 ± 0.5 rings at 14°C
- 2.3 ± 0.5 rings at 21°C

Paralarvae groups

- Cultured 21°C (N=33) 2.07 ± 2.05
- Cultured 14°C (N=50) 3.53 ± 4.52
- Wild (N=130) 2.04 ± 5.56

Age estimation

The relationship between age and the number of increments was modelled as

\[ \text{AGE} = NI - 4.604 + T \times 0.176 \]

Where T is temperature

Fig. 4. Age of wild paralarvae
Numbers by age (A). Model (GLM) for age adjustment considering the effect of temperature in the increment deposition, and table with mean ages obtained (B)

Fig. 3. Capture location of wild paralarvae and oceanographic data

Table: Parameters

<table>
<thead>
<tr>
<th>Temperature (°C)</th>
<th>Salinity (%)</th>
<th>pH</th>
<th>Oxygen (ml/l)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>30 ± 1.0</td>
<td>8.2 ± 0.3</td>
<td>210</td>
</tr>
<tr>
<td>21</td>
<td>30 ± 1.0</td>
<td>8.2 ± 0.3</td>
<td>210</td>
</tr>
<tr>
<td>25</td>
<td>30 ± 1.0</td>
<td>8.2 ± 0.3</td>
<td>210</td>
</tr>
</tbody>
</table>

Conclusion

Beak increments in octopus paralarvae reared at optimal thermal conditions (21°C) have a daily deposition, however cold temperature conditions (14°C) decrease the number of increments. Culture results were considered for age estimation in paralarvae from the natural environment.

References

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