Wild Zooplankton for *Octopus vulgaris* larval rearing

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INTRODUCTION

Octopus vulgaris is considered an important species for aquaculture in Spain. Ongrowing is carried out in cages specially designed for the species with 750 g subadult octopus separated according to sex and cultivated during a 4 month period until they reach 2.5 – 3 Kg. However, life cycle has been rarely completed due to the high larval mortality mostly due to the absence of an appropriate live prey. Ongrown *Artemia* (1 to 4 mm size) alone or complemented with spider crab (*Maja brachydactyla*) zoeae have been used as prey being the survival of the paralarvae extremely low (Carrasco et al., 2006; Iglesias et al, 2004). Several attempts to rear the larvae by means of micro- or encapsulated diets have resulted in no survivors (Villanueva et al, 2002).

We present here the results obtained in octopus paralarval rearing using wild zooplankton (copepods and shrimp zoeae) captured by a light trap from a lagoon that collect the water coming from the fish ongrowing area at IRTA facilities.

MATERIALS AND METHODS

Paralarvae were obtained from a matured female donated by IEO Vigo. The larvae were reared in four 500 l black, cylindric-conical tanks connected to a recirculation unit at 20 larvae/l, 20ºC, 35 ppt salinity and 16hL:8hD photoperiod. *Artemia* metanauplii grown for 5 days using *Tetraselmis suecica* and *Isochrysis galbana* (1-3 nauplii/ml) alone (tanks 1 and 2) or mixed with zooplankton (0.05-1 *Palaemon* sp. zoeae and copepods/ml, tanks 3 and 4) were used as food and administered 4 times per day. Larvae were measured (total length and mantle length, resutls not shown) and weighed (dry weight) every 10 days. Zooplankton was captured from the lagoon by means of a light trap (Fig. 1) in which a mesh basket with an air-lift was immersed. Plankton was collected at night during July and August 2008 and separated the next morning according to the size of the prey. Only the less than 0.4 mm fraction was used to feed the larvae. Lipid analysis (total lipids, lipid class and fatty acid composition was carried out on 1 and 10 day old paralarvae .

RESULTS AND DISCUSSION

Temperature, oxygen and salinity in the lagoon where the plankton was produced were kept at 26.4 ºC, 6.0 mg/l and 32.8 ppt respectively. Quantities of zooplankton collected varied between 370-100000 zoeae and 1400-27500 copepods per day (Fig. 2). Larvae fed *Artemia* metanauplii alone survived until day 37 whereas those fed a mixture *Artemia* + zooplankton survived until day 48. Growth in wet and dry weight is shown in Fig. 3. Taken together all the growth data, a final growth curve (wet weight= $1.563e^{0.0443age}$, R^2= 0.966) was obtained, lower than previously published results (Table I)

Fig 1.- Light trap for zooplankton collection

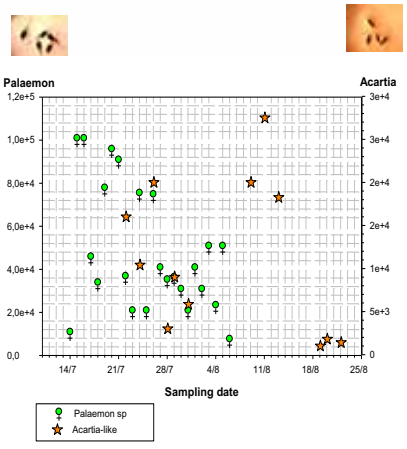

Fig. 2.- Type and quantities of zooplankton collected with the light trap

	DW vs age	WW vs age
Carrasco et al (2006)	$y= 0.322\ e^{0.0725x}$	
Moxica et al (2002)	$y= 0,441e^{0.0568x}$	
Iglesias et al (2004)	$y=0.356e^{0.0745x}$	
Villanueva (1995)		$y=1.247e^{0.081x}$
This work	$y= 0.286e^{0.0051x}$	$y= 1.563e^{0.0443x}$

Table I.- Growth in dry (DW) and wet weight (WW) obtained during octopus paralarvae rearing in this and previously published works

Lipid composition of the paralarvae is presented in Table II. A reduction in total phospholipid content and n-3 PUFA levels (especially in DHA cotnent) was observed in 10 day-old paralarvae when compared to newly hatched ones. On the contrary levels of monounsaturated fatty acids (MUFA) and oleic acid (18:1n-9) were higher in 10 day-old larvae.

	0 dph	10 dph	
		Art	Art+Zoo
Lipids (% DW)	8.36	12.02	10.02
Total Neutral (% lipids)	52.6 2.2	**68.8 0.7**	**67.4 0.1**
CHO	37.1 1.4	31.3 0.7	36.9 0.5
TAG	5.3 0.3		
Total Polar (% lipids)	47.4 0.6	**31.3 0.7**	**32.6 0.1**
PC	2.6 1.5	13.2 1.1	13.1 0.3
PE	15.0 0.2	15.5 0.2	15.3 0.2
PS+PI	7.7 0.4	2.5 0.7	4.13 0.2
Fatty acids (% TFA)			
16:0	11.9	16.0	12.9
18:0	7.7	10.3	10.4
SAT	20.7	28.6	24.7
18:1n-9	5.0	**16.7**	**10.2**
20:1n-9	4.2	3.1	3.4
MUFA	9.8	**29.4**	**18.9**
18:2n-6	1.0	5.4	2.8
20:4n-6	5.7	2.8	3.5
Total n-6	8.1	9.0	7.5
18:3n-3	0.5	10.5	5.5
20:5n-3	21.6	**11.3**	21.0
22:6n-3	37.0	**9.0**	**18.8**
Total n-3	61.4	**33.0**	**48.9**

Table II.-Total lipid content (in % of dry weight-DW-), lipid class composition (CHO:cholesterol,TAG:triglycerides,PC:phosphatidylcholine;PE:phosphatidylethanolamine, PS+PI:Phosphatidylserine+inositol) and fatty acid composition (TFA: total fatty acids) of newly hatched and 10 day-old paralarvae fed Artemia alone or Artemia+ wild zooplankton

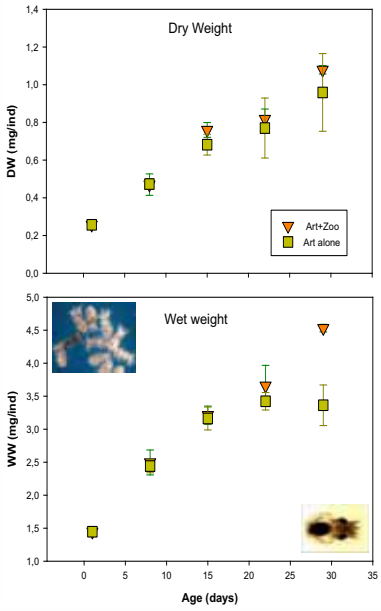

Fig. 3.- Growth in wet and dry weight (average of two tanks) of octopus paralarvae fed either *Artemia* metanauplii alone or mixed with wild zooplankton

Although growth obtained in this work is lower than the recorded in the literature, the fatty acid composition of paralarvae is very similar to previous results, especially in the larvae fed *Artemia* enriched with phytoplankton (Jacumar, 2005). Thus, lower DHA and higher EPA and 18:3n-3 levels were recorded in the paralarvae fed this live prey in contrast to those reared with a mixed *Artemia*+ zooplankton diet which could have resulted in the lower growth and survival obtained in this experimental group.

CONCLUSIONS

Octopus paralarvae can be reared with a mixture of ongrown Artemia metanauplii and wild zooplankton, mainly formed by *Palaemon* sp. zoeae and *Acartia*-like copepods, for 48 days with good results in growth but low survival. Lipid composition of paralarvae was similar to previously published results. Atlhough zooplankton can be a good alternative to *Artemia* metanauplii more research is needed to find the appropriate live prey/diet for these larvae at least during the first, more sensitive, 40 days.

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REFERENCES Carrasco et al. 2006. Aquaculture Research 37: 1601-1605, Iglesias et al. 2004. Aquacult. Internat. 12: 481-487, Jacumar. 2005. Informe final Plan Nacional Cultivo de pulpo, 2001-2004, 170 pp (http://www.mapa.es/app/jacumar/planes_nacionales/Documentos/77_IF_PULPO_I.PDF), Moxica et al. 2002. Bol. Inst. Esp. Oceanogr. 18: 31-36, Villanueva, 1995. Can. J. Fish. Aquat. Sci. 25: 2639-2650, Villanueva et al. 2002. aquaculture 208: 169-184