Use of different commercial *Artemia* sp. Enrichemts in *Octopus vulgaris*, paralarval rearing at initial planctonic phase :effects on growth, survival and fatty acid composition of the paralarvae

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Introduction

Octopus 'paralarvae', are planktonic, swim actively and have high metabolic rates, requiring large quantities of live prey of adequate motility and nutritional quality (Iglesias *et al*., 2000; Navarro and Villanueva, 2000, 2003). During the planktonic phase, they undergo strong morphological changes, after which the octopuses start settling to the bottom. The potential of *Octopus vulgaris* as candiadate for diversification of marine aquacultures are mainly due to its high food conversion rate and fast growth.(Iglesias *et al* 2006). Despite the research effort taken until now, paralarval rearing of *O. vulgaris* still suffers high mortalities which limited the industrial culture of this species. The main problems in the paralarval rearing stages are the high mortality rates and poor growth. These are attributed to the lack of standardized culture techniques and nutritional deficiencies in the diet of paralarvae, especially in n-3 highly unsaturated fatty acids (n-3 HUFA). The objective if this experience was to test different commercial live prey enrichment to improve nutritional quality of the artemia.

Materials and methods

Paralarval rearing was performed in 18 cylinder-conical fiberglass tanks 125 liters volume. Clear water conditions were applied in a flow through sitems with temperture and oxigen varies around 22.1-23.3°C and 6.0-6.9 ppm respectively and paralarval density was 15 indv.l-1. Diets tested consisted in enriched *Artemia* sp. (EG, INVE, Belgium) with three different commercial enrichment products: Easy DHA Selco™ (INVE, Belgium), Ori-Green™ (Skretting, France) and Ori-Prot™ (Skretting, France). Artemia were added to the rearing tanks twice a day (9:00-15:00) at 0,5 ind.ml-1. From hatching to 10 days after hatching (dah), the diet was based on 48 hours enriched Instar II *Artemia* sp. (size range: 0,91 ± 0,07 to 1,00 ± 0,12mm), while from 10 to 20dah, 96h enriched Instar II *Artemia* sp. (from 1,19 ± 0,07 to 1,22 ± 0,08mm). Each treatment was tested in sextuplicate.

Table I EFA levels (% TFA) in 96h enriched Instar II *Artemia* sp. Different superscripts for the same row between column from each trial, reflects significant differences (P<0.05).

Treatments			
FA	**Ori-G Art**	**Ori-Prot Art**	**Selco-Art**
Saturates	23.90	21.80	20.46
Monoenes	26.91[a]	26.40[a]	37.17[b]
Total n-3	26.51	23.91	27.67
Total n-6	21.44[a]	27.08[b]	12.42[c]
Total n-9	18.15[a]	18.64[a]	26.22[b]
n-3 HUFA	16.73[a]	14.10[a]	19.01[b]
ARA	1.69[a]	1.43[a]	2.06[b]
EPA	6.25[a]	5.84[a]	9.36[b]
DHA	9.59[a]	7.41[a]	8.10[a]
DHA/EPA	1.53[a]	1.27[a]	0.86[b]
EPA/ARA	3.70[a]	4.08[ab]	4.54[b]
n-3/n-6	1.24[a]	0.88[b]	2.23[c]
Lipids (dw)	22.31[a]	21.76[a]	23.08[b]

Discussion

At 20dah no significant differences were observed among the three groups, the survival rate varies from 22.9 ± 6,0% to 31,5 ± 28,1%, however, these result are significantly lower than obtained when Octopus paralarvae are co-fed with Artemia and crab zoea (Villanueva *et al*.,2002; Carrasco *et al*.,2003; Iglesias *et al*., 2004).

Growth in total lenght and dry weight in Selco-PL were lower than reported by Moxica *et al* (2002) when enriched artemia was cofed with Crab zoeas.

EFA levels were similar among different Artemia tested, nevertheless these data are under the values reported for natural paralarvae preys such as crab zoeas and zooplancton (Jacumar 2005).

Despite no significant differences in EFA composition of the paralarvae at 20dah, a significant drop in Lipid content was observed for all the treatments. These results could be related to a low EFA content of the Artemia for this especie.

Acknowledgements

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Results

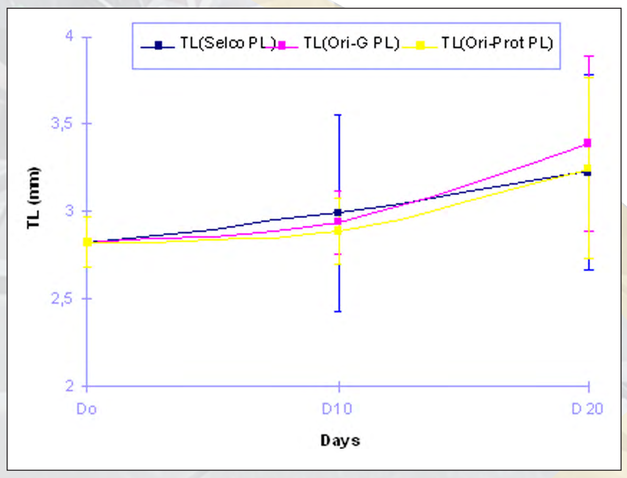


Fig. 1 Length growth for *Octopus vulgaris* paralarvae (Selco, Ori-Green y Ori-Prot).

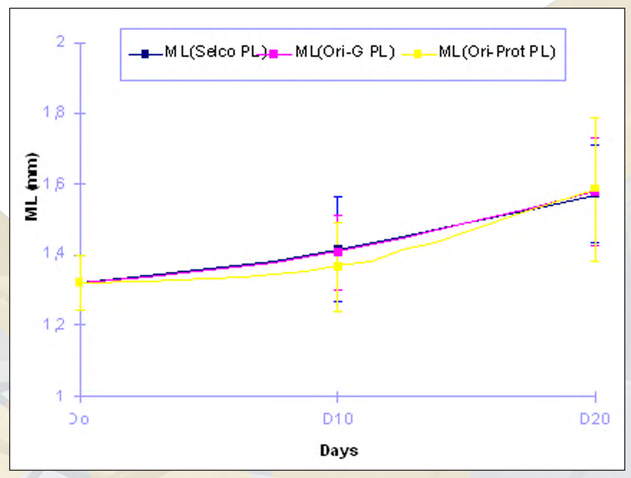
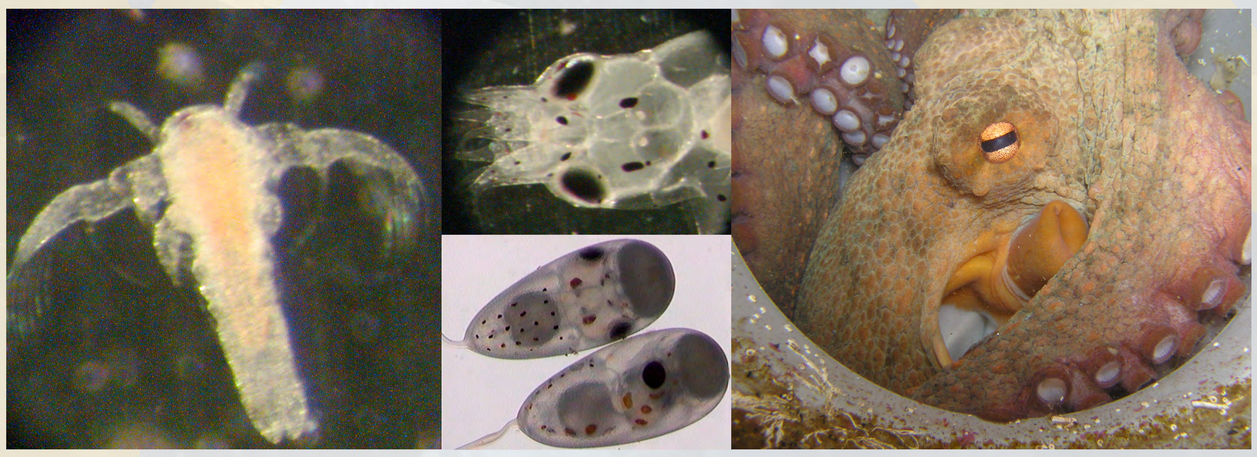


Fig. 2 Growth in mantle length for *Octopus vulgaris* paralarvae (Selco, Ori-Green y Ori-Prot).

Table II Growth equations for *O. vulgaris* paralarvae from different treatments. (d: age in days).

	Total length	Mantle length	Dry weight
Selco PL	TL =0,2048d+2,6059 (r^2 =0,99)	ML =0,1265d+1,1817 (r^2 =0,98)	DW = 0,1832 * $e^{0.1116d}$ (r^2 = 0.88)
Ori-G PL	TL =0,2831d+2,4841 (r^2 =0,89)	ML =0,1286d+1,177 (r^2 =0,97)	DW = 0,1587 * $e^{0.1858d}$ (r^2 = 0.85)
Ori-Prot PL	TL =0,2108d+2,5633 (r^2 =0,86)	ML =0,1325d+1,1579 (r^2 =0,88)	DW = 0,1664 * $e^{0.1501d}$ (r^2 = 0.87)



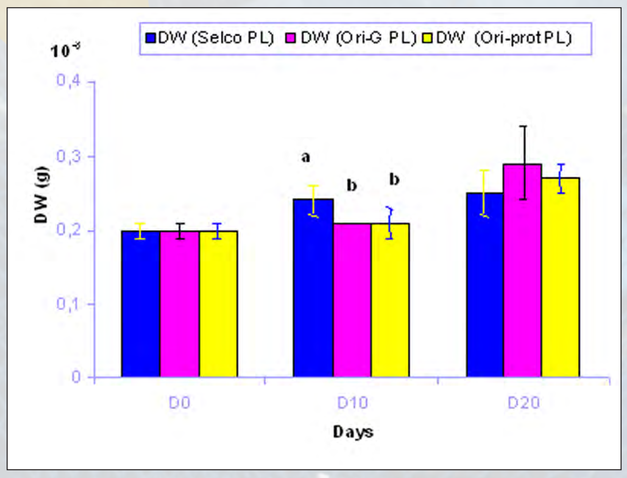


Fig. 3 Dry weight growth for octopus paralarvae from different treatments.

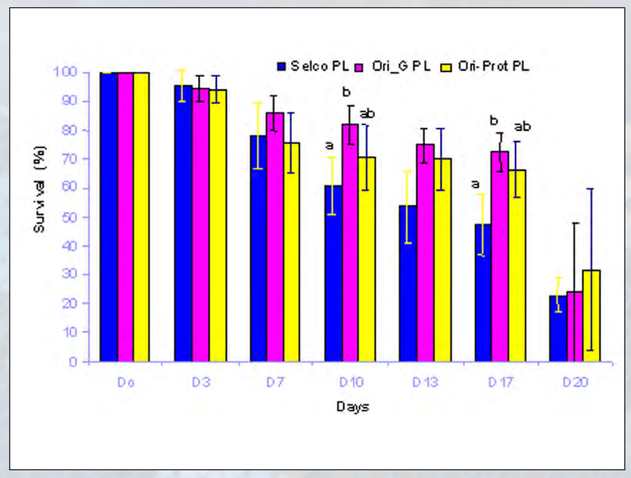


Fig. 4 Survival of octopus paralarvae from different treatments. (Selco, Ori-Green y Ori-Prot).

Table III EFA levels (% TFA) just after hatching and 20day old paralarvae fed different enriched artemia. Different superscripts for the same row at 20dah , reflects significant differences (P<0.05).

Treatments	Paralarvae	20dah		
FA	**Hatching**	**Ori-G PL**	**Ori-Prot PL**	**Selco-PL**
Saturates	33.61±0.28	32.48±2.32	28.95±1.86	34.59±5.29
Monoenes	17.86±0.86	22.44±0.83	22.06±0.97	22.09±0.25
n-3	36.73±0.25	34.41±0.33	35.59±2.54	31.33±3.98
n-6	11.16±0.79	11.63±0.81[a]	13.72±0.76[b]	10.80±1.21[a]
n-9	15.50±0.48	17.99±1.24[a]	17.38±1.48[ab]	15.41±0.50[b]
n-3 HUFA	32.33±0.09	29.11±0.27	29.77±2.62	26.23±3.43
ARA	7.7±1.00	6.77±0.65	6.10±0.66	5.56±0.62
EPA	10.88±0.23	11.28±0.24	12.11±0.84	10.00±1.62
DHA	18.20±0.60	15.39±0.18	15.21±1.83	14.12±1.69
DHA/EPA	1.67±0.09	1.36±0.01	1.25±0.11	1.42±0.06
EPA/ARA	1.42±0.15	1.68±0.20	2.00±0.24	1.79±0.09
n-3/n-6	3.30±0.26	2.97±0.18	2.60±0.27	2.90±0.04
Lipids (dw)	22.44±0.76	14.83±0.34[a]	13.17±0.26[b]	15.36±0.29[a]