

Growth and biochemical composition of octopus fattened with different natural and artificial diets.

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Introduction

The common octopus (*Octopus vulgaris*, Cuvier, 1797) is a species with great potential in marine aquaculture, however, its industrial development is limited by the difficulty of larval rearing and nutritional deficiencies of artificial feed.

Materials and methods

All the experiments were carried out with male octopus in a pool of 24 000 liters divided into 6 compartments, at a density of 1.5-2 octopuses·m⁻³. The feeding regimen was 6 days a week, until satiety.

The values of temperature and salinity were 17.5 C 3.5 and 32.0‰ 2.8. Always oxygen levels above 80%, (Lopez et al., 2009).

•**The first experiment** was conducted over 52 days, with 56 octopuses, divided into two groups, one group fed with mussel (*Mytilus edulis*) monodiet (MM) and the other group with blue whiting (*Micromesistius poutassou*) (BWM). In both cases the experience lasted another 30 days with a mixed diet of blue whiting, mussels and crab (MMD) and (BWMD), respectively.

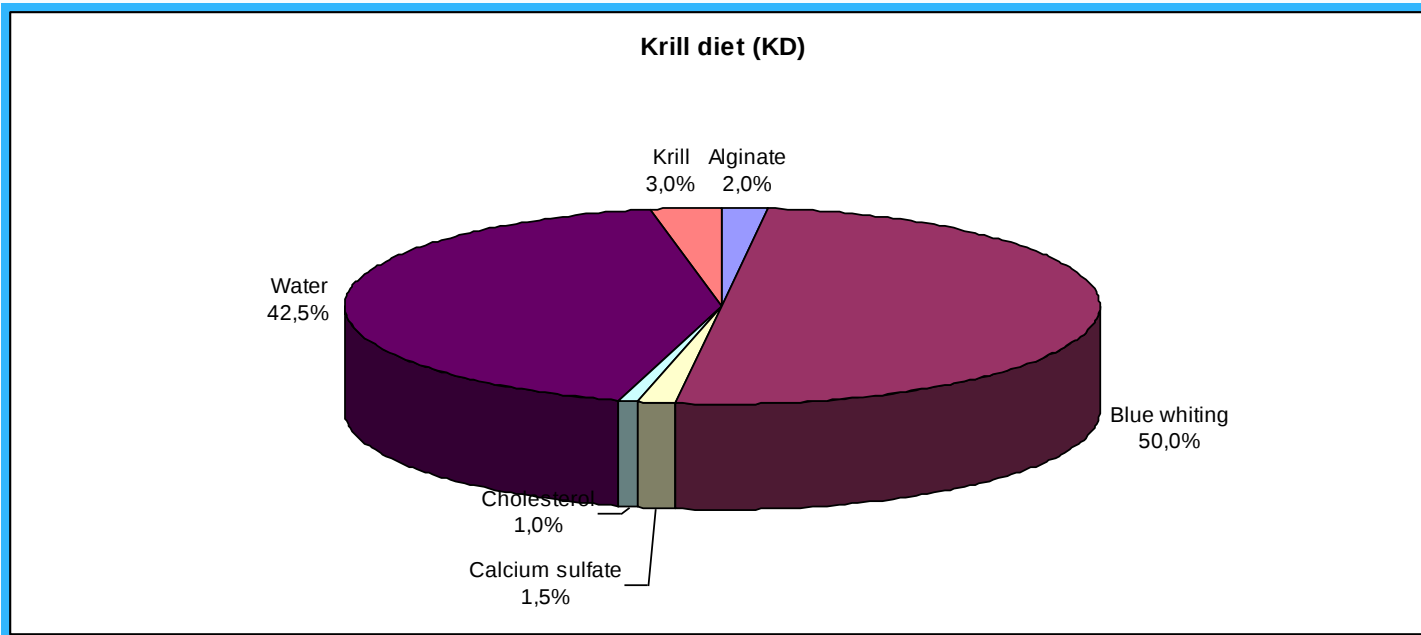
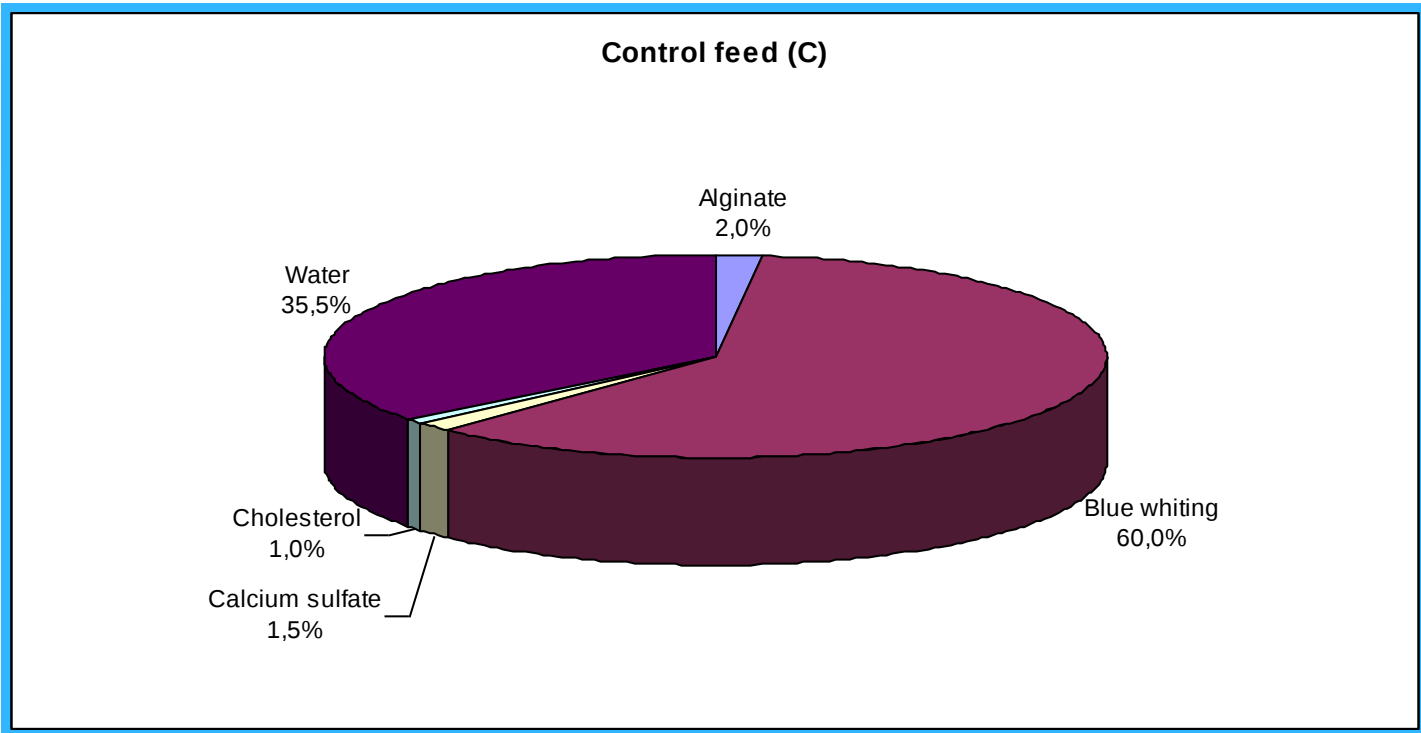
•**The second experiment** was carried out for 43 days with 36 octopuses, divided again in two were fed with 2 types of semi-moist feed designed by IMIDA with these components: alginate (2%), blue whiting (60%), calcium sulfate (1.5%), cholesterol (1%) and water (35.5%). Control feed (C) (C: 82.9% moisture, 12.4% protein, 2.0% fat, 3,6% minerals). Krill diet (KD) (KD: 81.9% moisture, 12.3% protein, 1.6% fat, 3.5% minerals), 10% blue whiting was replaced by 3% krill meal and 7% of water.

To determine the biochemical (protein and total fat), 5 octopus at the beginning of each experiment and 5 octopuses fed with each diet type were analyzed. Digestive glands from the body were separated, crushed and homogenized. A sample of 100g of each group was analyzed by IMIDA.

Specific Growth Rate (G%) was calculated: $G\ (%) = [(Ln\ Final\ Weight - Ln\ Initial\ Weight) \cdot days\ of\ culture^{-1}] \cdot 100$

The average daily weight increase (ΔW): $\Delta W\ (g.day^{-1}) = (Final\ Weight - Initial\ Weight) \cdot days\ of\ culture^{-1}$

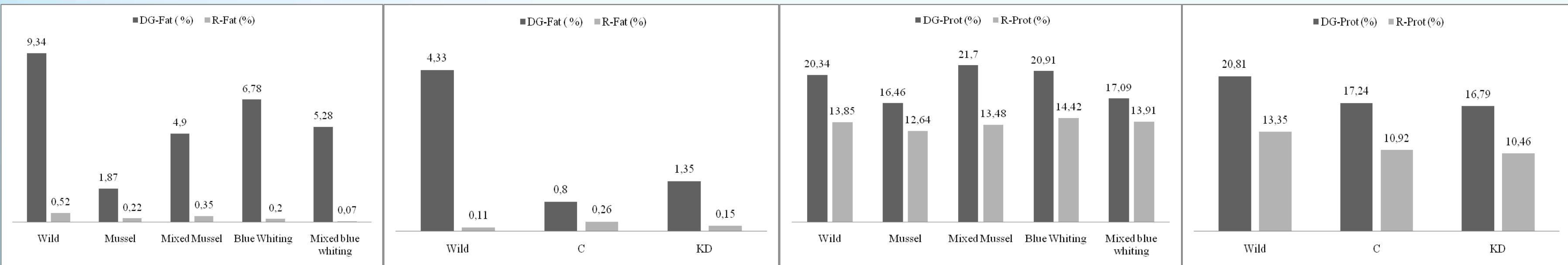
Digestive gland index (DGI) $DGI = (digestive\ gland\ weight \cdot animal\ weight^{-1} \cdot 100)$



Results

	MM	MMD	BWM	BWMD	C	KD
Initial Weigth (g)	1 040.0	1 194.5	1 089.6	2 142	934.50	906.3
Final Weigth (g)	1 186.6	1.677.2	2 126.6	2 823.5	1 053.78	861.0
Weigth increase (g/day)	2.61	16.09	19.94	22.71	2.77	-1.05
Specific Growth (%)	0.26	1.13	1.41	0.93	0.23	-
Digestive gland index (%)	1.95	4.26	4.30	3.13	1.71	1.82
Mortality (%)	25.92	18.2	27.58	16.6	11.11	27.77

Initial weigth, final weigth, weigth increase, specific growth, digestive gland index and mortality versus food supplied.



Average percentage wet weight of fat (Fat) and protein (Prot) in digestive gland (DG) and rest of the body (R) in wild octopuses and octopuses fed with different natural and artificial diets.



Remains of food with bite marks

Discussion and conclusion

- Octopuses fed with blue whiting show similar growth to other experiences made with mixed diet, (Rodríguez et al., 2006) and much higher than that obtained with mussel, with an average specific growth of 1.41 vs. 0.26, respectively.
- Providing a mixed diet to the survivors of both groups, resulted in a recovery in growth in those fed with mussels and an increase in the weight of the digestive gland.
- Growth with prepared feed was lower than that obtained with the natural monodiet. Acceptance of artificial diet differed according to its composition, the inclusion of krill meal caused rejection, decreased intake and no growth, (López et al., 2009).
- During fattening with different diets, except with blue whiting monodiet, digestive gland suffered a significant reduction compared to wild octopus analyzed at the beginning of the experience, where percentages of 4.28% ± 1.72 and 0.56 ± 5.16% were found respect to the body.
- These results suggest that nutritional deficiencies are compensated by the energy reserves stored in the digestive gland.
- The highest percentages of fat and protein fluctuations occur in the digestive gland, apart from the rest of the body. The digestives glands of octopuses fed with mussels and with the prepared feed do not only suffer a significant reduction in volume, but also significantly decreased the percentages of fat and protein, relative to wild octopus analyzed at the beginning of the different experiences.

References

- López, M. C. Rodríguez, J.F Carrasco, 2009. Engorde de juveniles de pulpo (*Octopus vulgaris* Cuvier, 1797) con distintas dietas naturales y artificiales. XII CNA Madrid 2009.
Rodríguez, C., J.F. Carrasco, J.C Arronte, M. Rodríguez, 2006. Common octopus (*Octopus vulgaris* Cuvier, 1797) juvenile ongrowing in floating cages. Aquaculture, 254: 293-300.