The common octopus culture - 15 years of research in the Aquaculture Research Group (Las Palmas, Canary Islands, Spain)

Grupo de Investigación en Acuicultura

UNIVERSIDAD DE LAS PALMAS DE GRAN CANARIA

Juan Estefanell , Javier Roo, Marisol Izquierdo, Juan Socorro.

1st scientific meeting of CephsInAction, Barcelona (Spain), March 14th-15th 2014

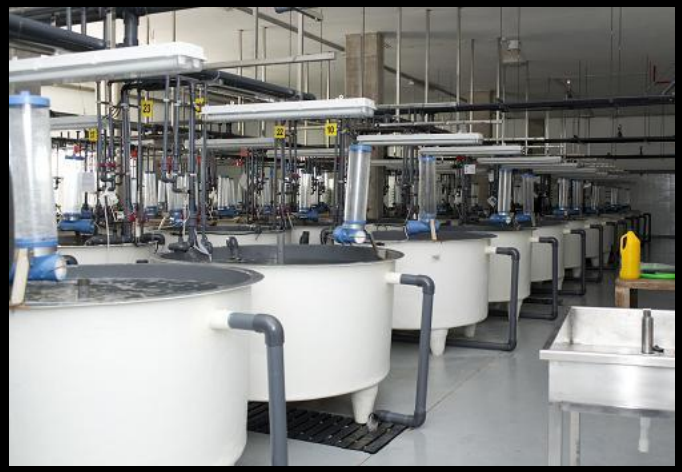





Grupo de Investigación en Acuicultura

UNIVERSIDAD DE LAS PALMAS DE GRAN CANARIA






www.giaqua.org

CURRENT RESEARCH LINES

Grupo de Investigación en Acuicultura

1. Optimization of on-growing conditions
2. Development of artificial feeds
3. Development of specific enrichments & microdiets
4. Improvement of paralarvae quality
5. Broodstock & paralarvae ecology

1. Optimization of on-growing conditions

- Nutrition - fresh diets:
  - ➢ Crab: “natural diet”
  - ➢ Low price fish
    - Discarded by fisheries
    - Discarded by aquaculture





Aquaculture Research, 2011, 1–13 doi: 10.1111/j.1365-2109.2011.03014.x

Efficient utilization of dietary lipids in *Octopus vulgaris* (Cuvier 1797) fed fresh and by-p

Juan Es
Palacio

Aquaculture 322-323 (2011) 91–98

Contents lists available at SciVerse ScienceDirect

Aquaculture

journal homepage: www.elsevier.com/locate/aqua-online

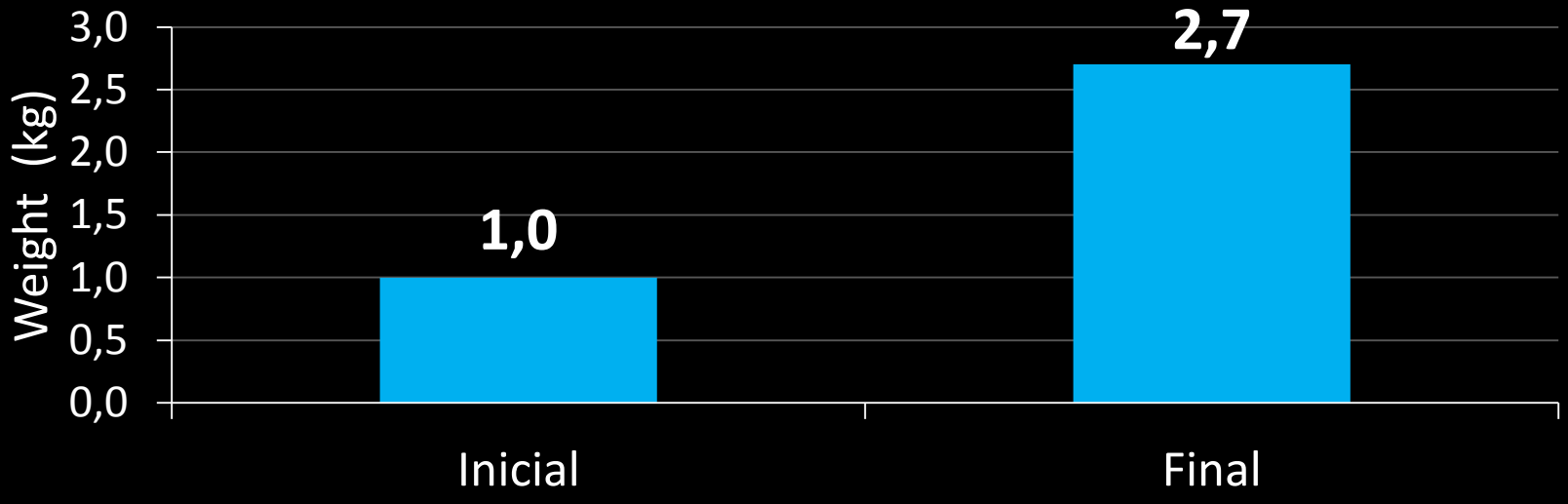
Growth, protein retention and biochemical composition in *Octopus vulgaris* fed on different diets based on crustaceans and aquaculture by-products

J. Estefanell [a,*], J. Socorro [a], F. Tuya [b], M. Izquierdo [a], J. Roo [a]

- Best growth: mixed diets
- Bogue *Boops boops* discarded aquaculture: acceptable growth

Summary of rearing trials (19)

Initial weight	1 kg
Initial density	10 kg/m^3
Rearing time	60 days



Weight increase of 850 g/month and 90% survival rate

1. Optimization of on-growing conditions

- Specific rearing systems:
  - Individual
  - Floating & benthic cages

JOURNAL OF THE WORLD AQUACULTURE SOCIETY

Vol. 43, No. 1
February, 2012

Comparison Between Individual and Group Rearing Systems in *Octopus vulgaris* (Cuvier, 1797)

J. ESTEFANELL[1], J. ROO, H. FERNÁNDEZ-PALACIOS, M. IZQUIERDO AND J. SOCORRO

Aquacultural Engineering 49 (2012) 46–52

Contents lists available at SciVerse ScienceDirect

Aquacultural Engineering

journal homepage: www.elsevier.com/locate/aqua-online

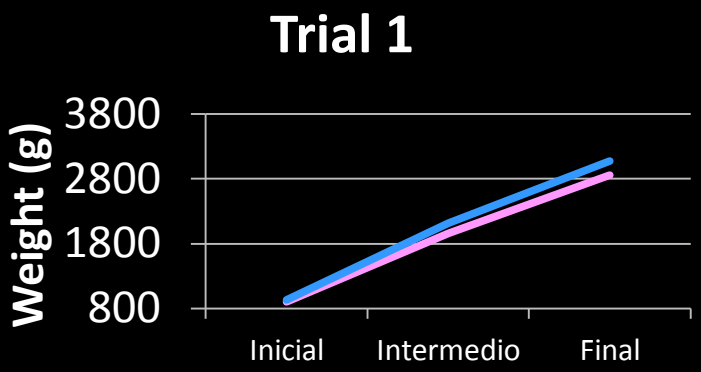
ELSEVIER

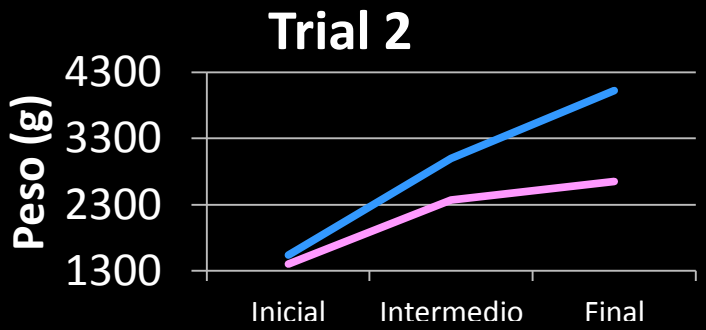
Benthic cages *versus* floating cages in *Octopus vulgaris*: Biological performance and biochemical composition feeding on *Boops boops* discarded from fish farms

J. Estefanell[a,*], J. Roo[a], R. Guirao[b], M. Izquierdo[a], J. Socorro[a]

1. Optimization of on-growing conditions

- Sexual maturity – probably age related; associated mortality; sex ratio





Gonad maturation in *Octopus vulgaris* during ongrowing, under different conditions of sex ratio

Juan Estefanell, Juan Socorro, Francisco J. Roo, Rafael Guirao, Hipólito Fernández-Palacios, and Marisol Izquierdo

Received 19 October 2009; accepted 8 June 2010.

Estefanell, J., Socorro, J., Roo, F. J., Fernández-Palacios, H., and Izquierdo, M. 2010. Gonad maturation in *Octopus vulgaris* during ongrowing, under different conditions of sex ratio. – ICES Journal of Marine Science, 67: 1487–1493.

JOURNAL OF THE WORLD AQUACULTURE SOCIETY

Vol. 44, No. 1
February, 2013

Growth, Mortality, and Biochemical Composition in *Octopus vulgaris* Reared Under Different Conditions of Sex Ratio

JUAN ESTEFANELL[1], JAVIER ROO, MARISOL IZQUIERDO, AND JUAN SOCORRO

Aquaculture Research, 2012, 1–11

doi:10.1111/are.12094

Biological performance of *Octopus vulgaris* in 'integrated aquaculture' models: effect of two potential fresh diets, sex and sexual maturation during the grow-out phase

Juan Estefanell [1], Javier Roo[1], Rafael Guirao[2], Marisol Izquierdo[1] & Juan Socorro[1]

2. Development of artificial feeds

- Dry / wet raw materials
- Growth rates: 500 g/month

FORMULATED DIETS FOR *Octopus vulgaris*: EFFECT OF TWO PROTEIN/LIPID RATIOS

Juan Estefanell*, Juan Socorro, Javier Roo, Marisol Izquierdo
Grupo de Investigación en Acuicultura, Instituto Canario de Ciencias Marinas & Universidad de Las Palmas de Gran Canaria, PO Box 56, E-35200 Telde, Las Palmas, Canary Islands, Spain. Email: juan.estefanell@giaqua.org

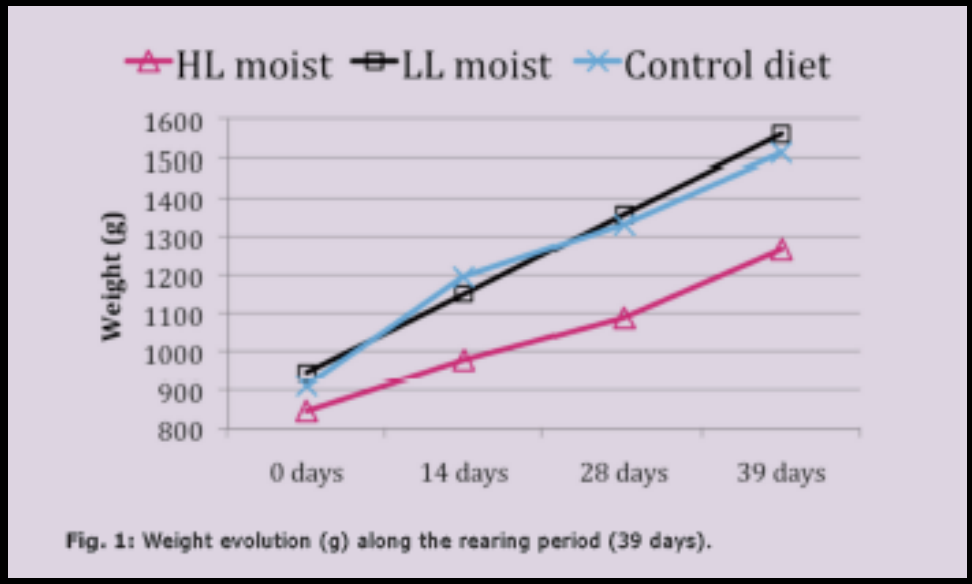


Fig. 1: Weight evolution (g) along the rearing period (39 days).

Aquaculture Research, 2011, 1–13 doi: 10.1111/j.1365-2109.2011.03014.x

Efficient utilization of dietary lipids in *Octopus vulgaris* (Cuvier 1797) fed fresh and agglutinated moist diets based on aquaculture by-products and low price trash species

Juan Estefanell[1], Javier Roo[1], Rafa
Palacios[1], Marisol Izquierdo[1] & Ju

Aquaculture Research, 2012, 1–14 doi: 10.1111/j.1365-2109.2012.03204.x

Growth, food intake, protein retention and fatty acid profile in *Octopus vulgaris* (Cuvier, 1797) fed agglutinated moist diets containing fresh and dry raw materials based on aquaculture by-products

Juan Estefanell, Juan Socorro, Marisol Izquierdo & Javier Roo

3. Development of specific enrichments & microdiets

- Best results: crab zoeas as live prey
- Enriched Artemia on commercial and experimental products

Growth, survival and histology of the digestive gland in paralarvae of *Octopus vulgaris* fed on Artemia enriched on EPA, DHA and 5 levels of ARA

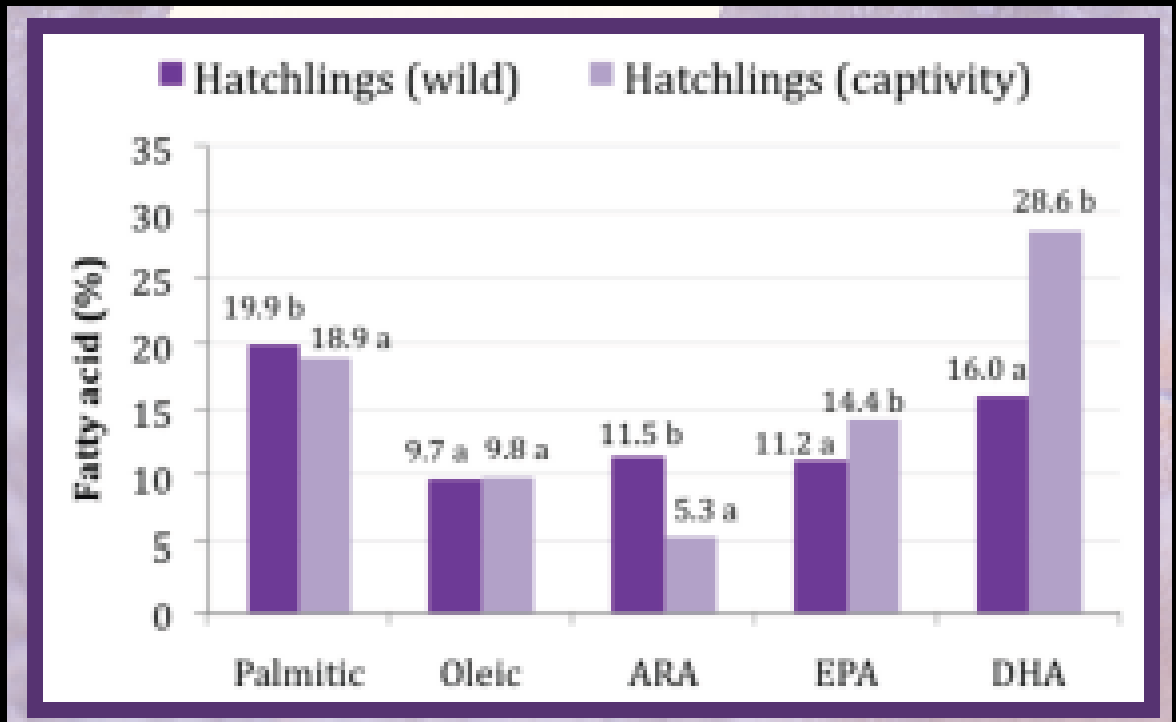
Juan Estefanell, Burcu Biçer, Juan Socorro, Marisol Izquierdo, Javier Roo
Grupo de Investigación en Acuicultura, Universidad de Las Palmas de Gran Canaria & Instituto Universitario de Sanidad Animal y Seguridad Alimentaria, Trasmontaña s/n, 35416, Arucas, Las Palmas, Canary Islands, Spain

4. Improvement of paralarvae quality

- Wild / reared paralarvae: very different fatty acid profile

Fatty acid profile in eggs and newly hatched paralarvae of *Octopus vulgaris* collected from the wild, and after 1-5 days starvation

J. Estefanell*, J. Socorro, B. Ramírez, M. Izquierdo, and J. Roo



5. Broodstock & paralarvae ecology

- The answer is out there!!!!
- Trials in progress…

EU Directive 2010/63/EU on animal welfare

Anaesthetic agents

- Clove oil: 20, 40, 100 mg/L
- Ethanol (96%): 1, 1.5, 2%

Aquaculture Research, 2010, 1–8 doi: 10.1111/j.1365-2109.2010.02634.x

Evaluation of two anaesthetic agents and the passive integrated transponder tagging system in *Octopus vulgaris* (Cuvier 1797)

J Estefanell[1], J Socorro[1,2], J M Afonso[1], J Roo[1], H Fernández-Palacios[1] & M S Izquierdo[1]

Table 1. Description of anaesthesia and recovery stages observed in *Octopus vulgaris*

Stages	Anaesthesia	Recovery
I	Hyperventilation	Resurgence of sucking activity
II	Muscle tone disappears. Flaccid arms	Recovery of chromatophore activity
III	Weak breathing and loss of sucking intensity	Recuperation of breathing movements
IV	Chromatophores relax (the skin becomes white)	Recovery of activity, regular breathing