

ROO, J.; HERNÁNDEZ-CRUZ, C.M; SOCORRO, J.; FERNANDEZ-PALACIOS, H. AND IZQUIERDO, M.S  
Grupo de Investigación en Acuicultura (Instituto Canario de Ciencias Marinas - Universidad de Las Palmas de Gran Canaria).  
P.O. Box 56, 35200 Telde - Las Palmas, Canary Islands, Spain • e-mail: jroo@iccm.rcanaria.es

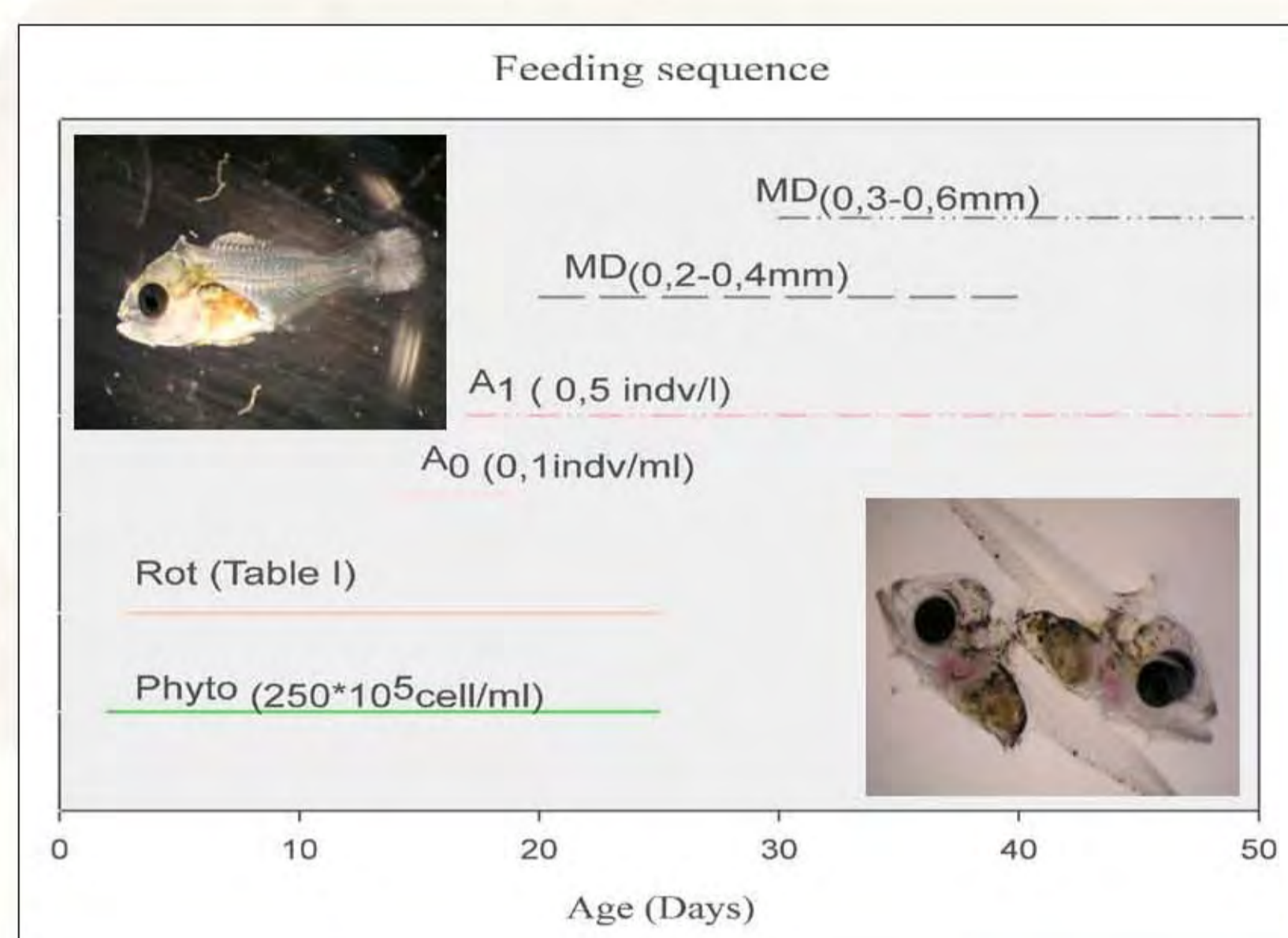
## Abstract

Red porgy is a candidate species for marine aquaculture diversification. The objective of the present study was to describe the osteological development and the occurrence of skeletal deformities in *Pagrus pagrus* larvae in relation to the intensification of the rearing system. Fish samples were periodically collected along the development from hatching to juveniles (95 days after hatching). Osteological development and the presence of skeleton abnormalities were evaluated. X-ray studies revealed a high number of fish (Semi-intensive: 38.8%; Intensive: 46.5 %) with skeletal deformities. No significant interaction was found on the incidence of lordosis and fused vertebrae with the rearing technique. However, cranial abnormalities and kyphosis incidences were significantly higher in intensive system cultured red porgy. Also, the position of fused vertebrae in this fish was located mainly in the caudal area instead of pre-hemal area for semi-intensive system reared red porgy. Present results, suggest a relationship among feeding sequence, osteological development and deformity incidence and location in red porgy larvae.

## Material and methods

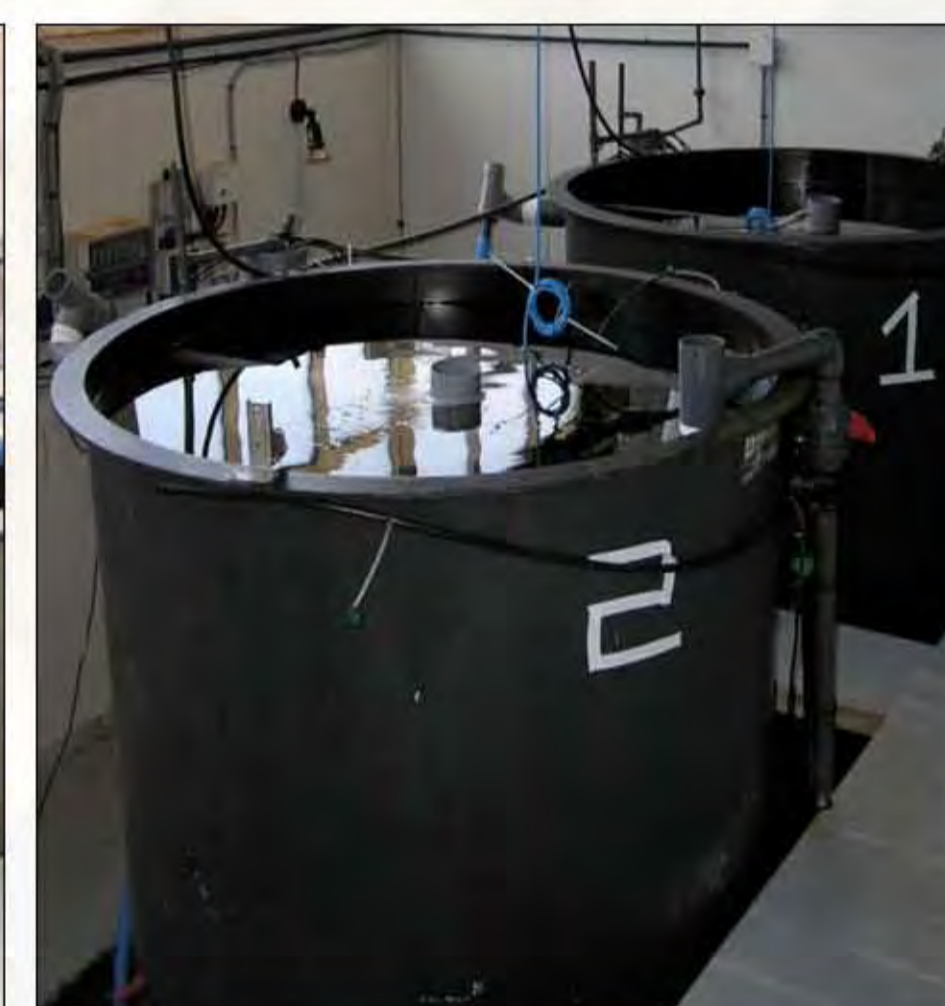
### Rearing techniques

- Intensive System (100 eggs/l) in 2m<sup>3</sup> tanks.
- Semi-intensive System (5 eggs/l) in 40m<sup>3</sup> tanks.



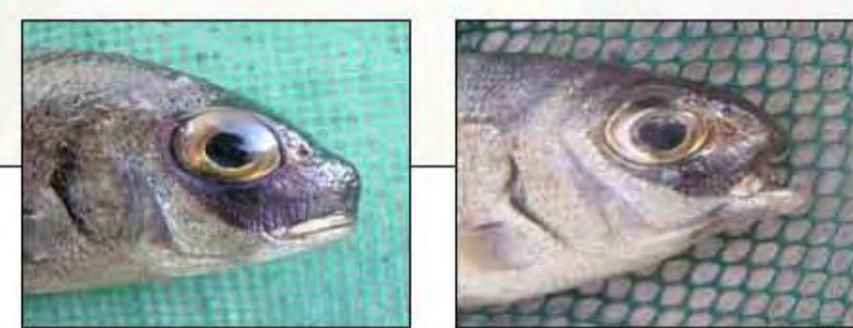
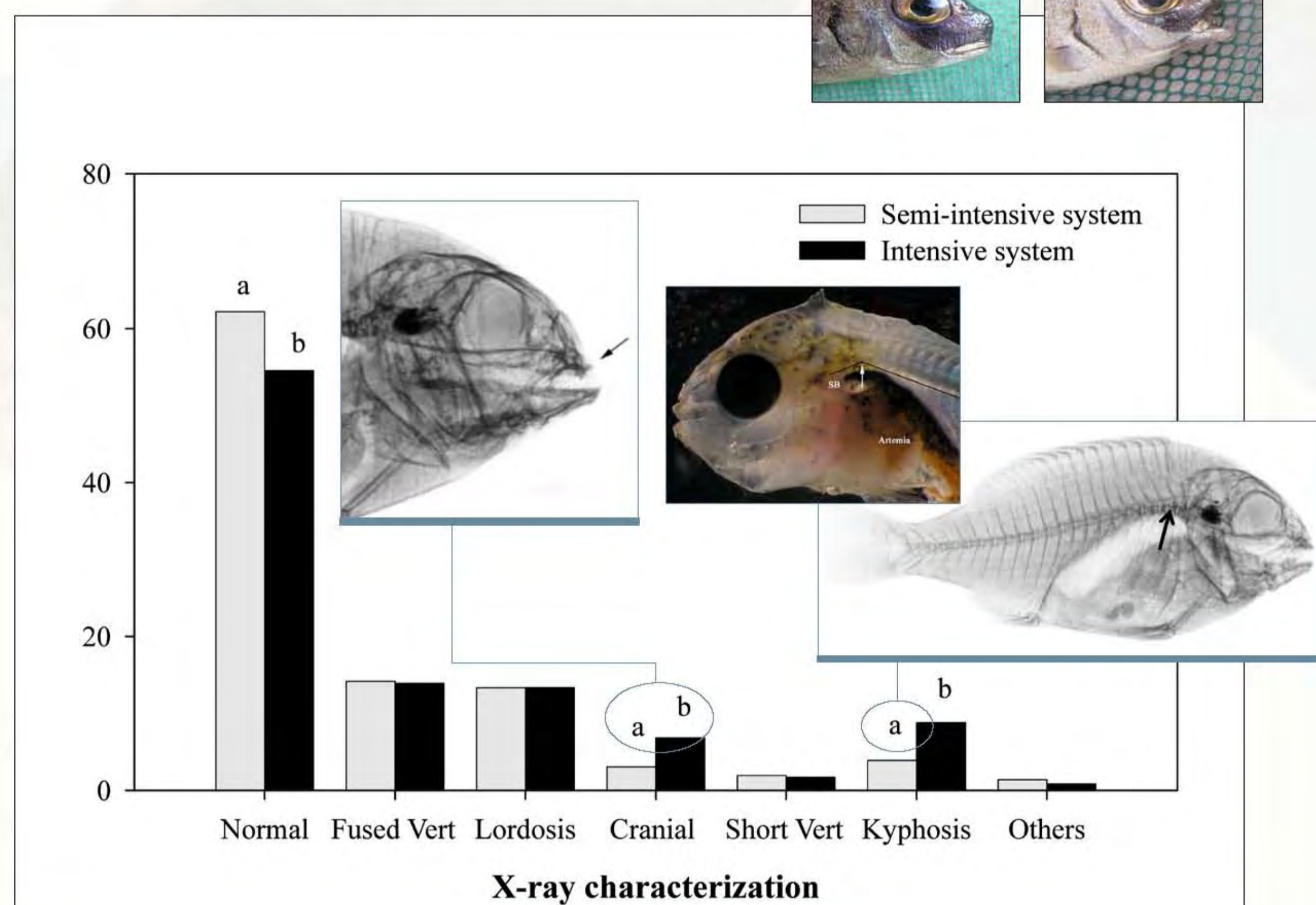
### Determinations

- Total length (n=25; 5-7days).
- Deformities (n= 500; 95dpe); Boglione *et al.* (2001) and Matsuoka (2003).
- Osteological development (0-45dpe; 5days); (Taylor and Van dyke (1985)-Dikeirkus and Uhler (1977)).

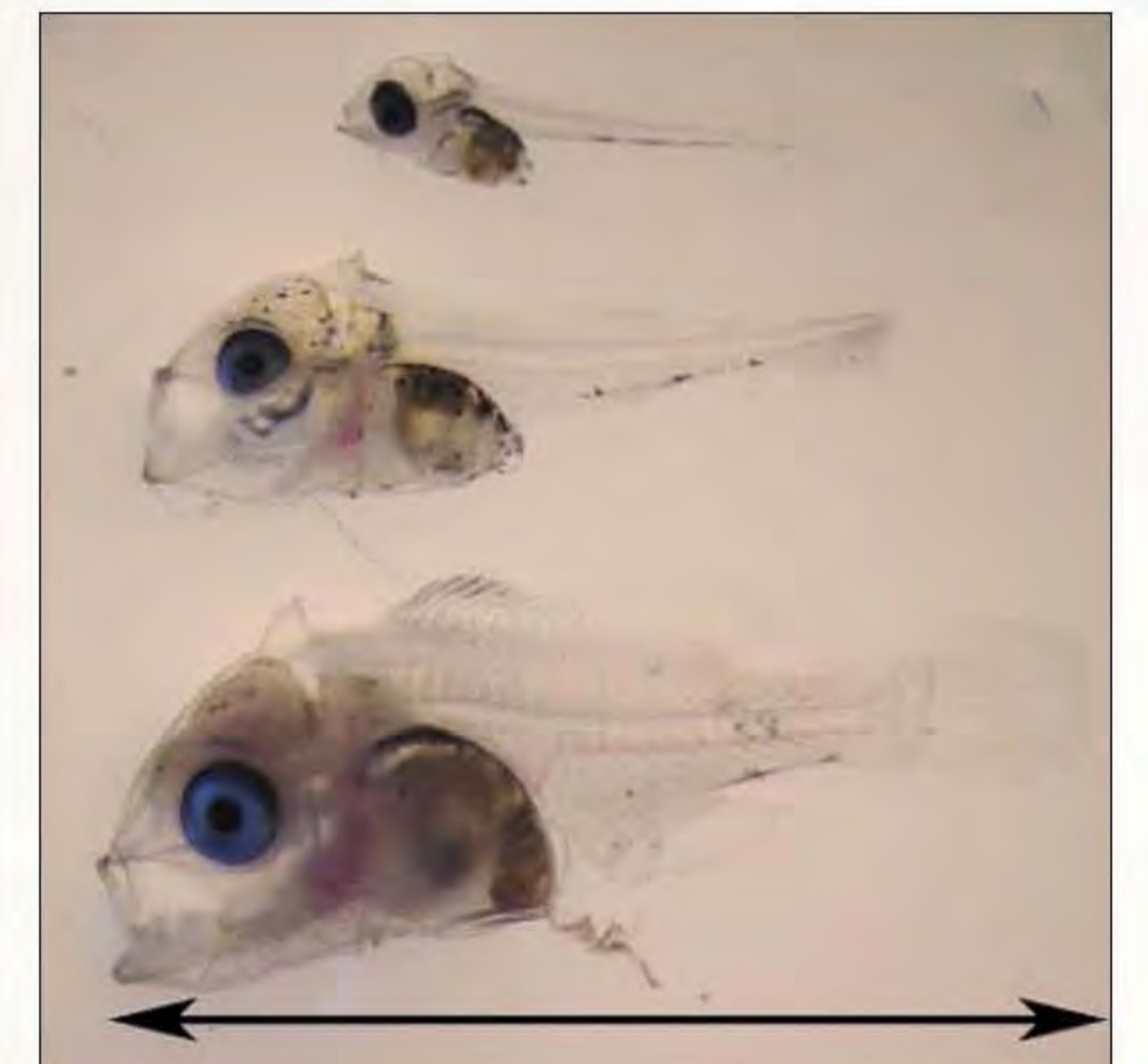
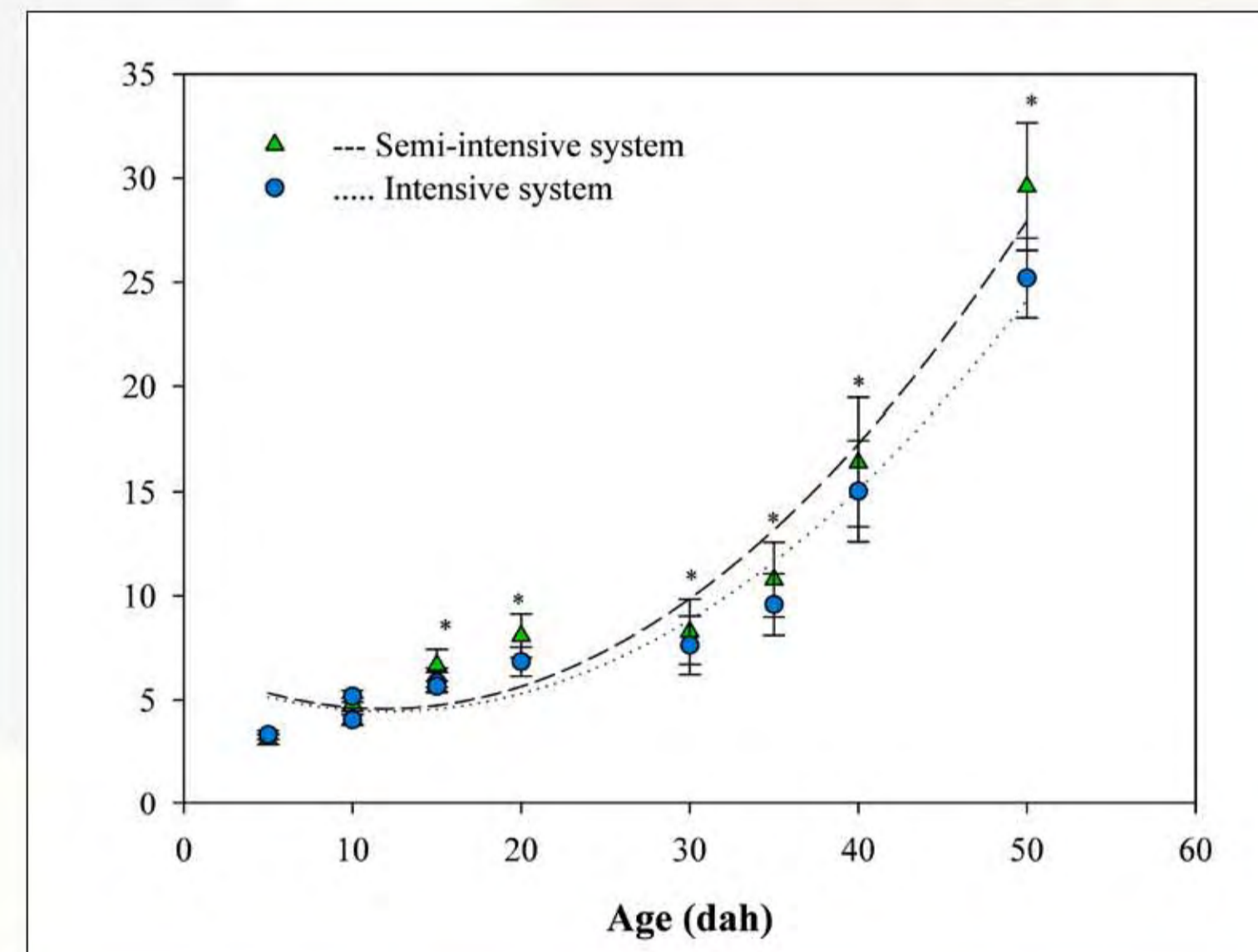


## Results

### Deformities characterization



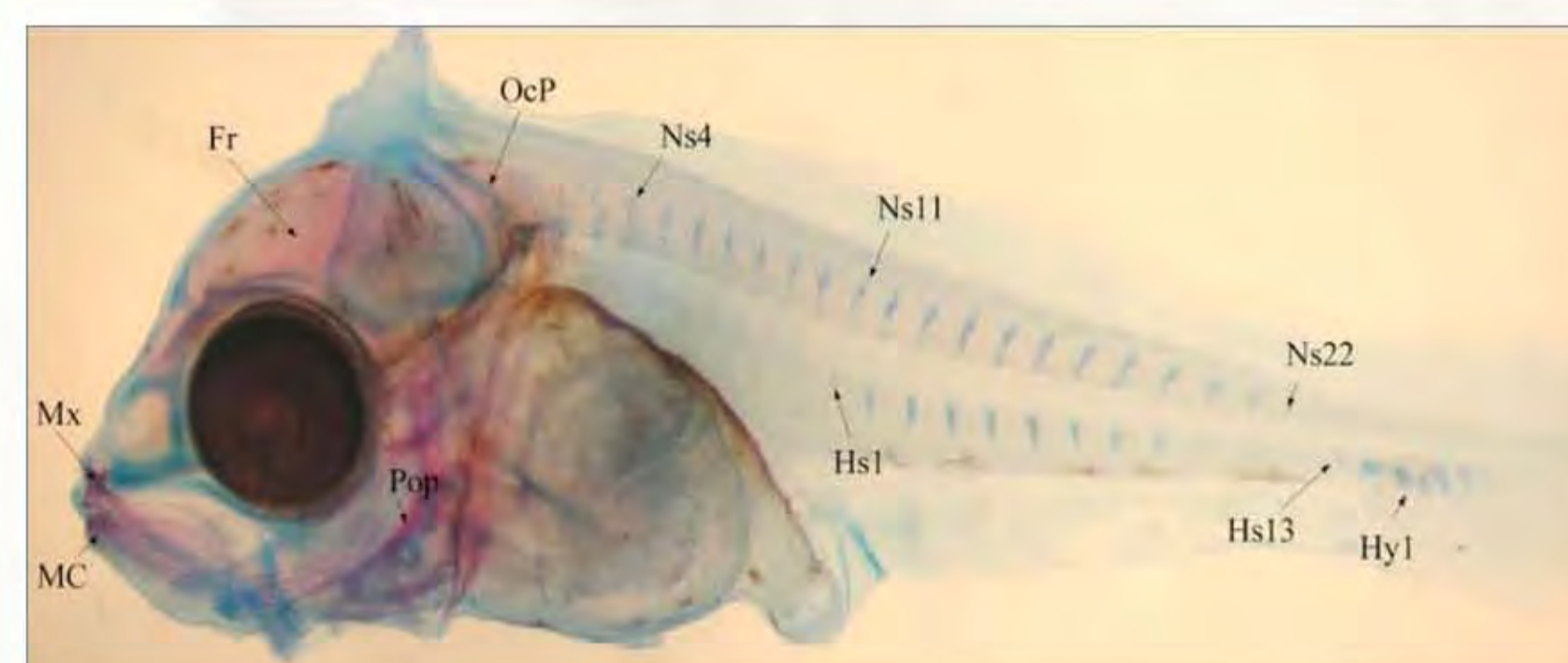
### Growth



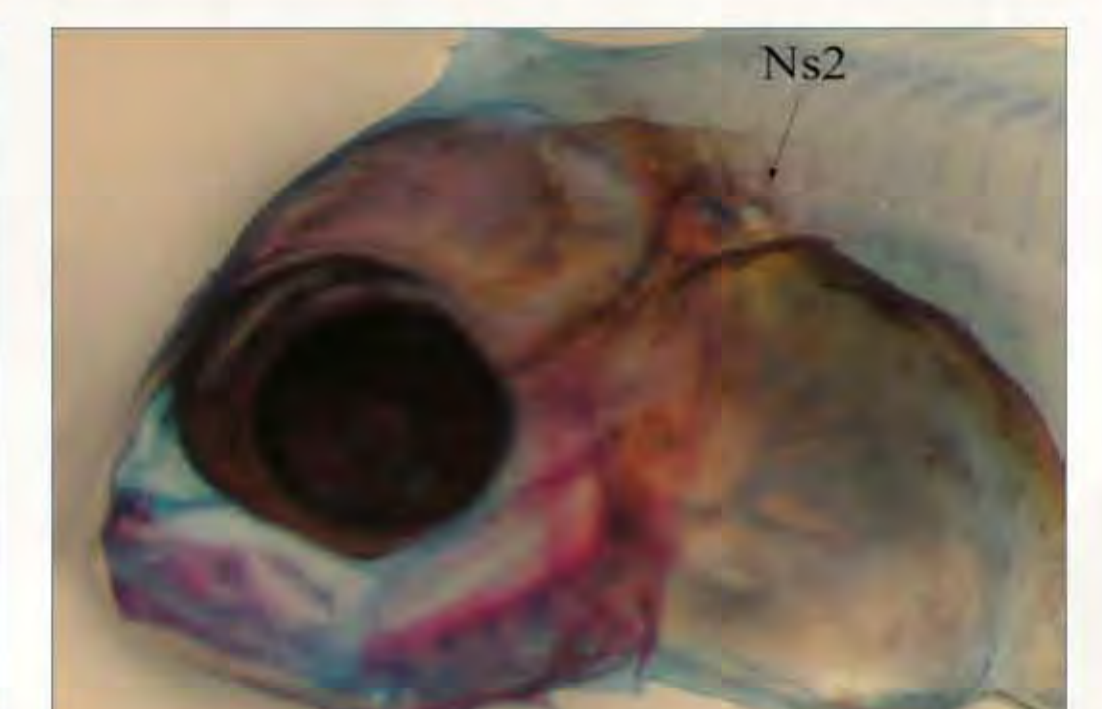
### Discussion

- Intensification reduce growth from early stages (Papandroulakis *et al.*, 2004, Roo *et al.*, 2005).

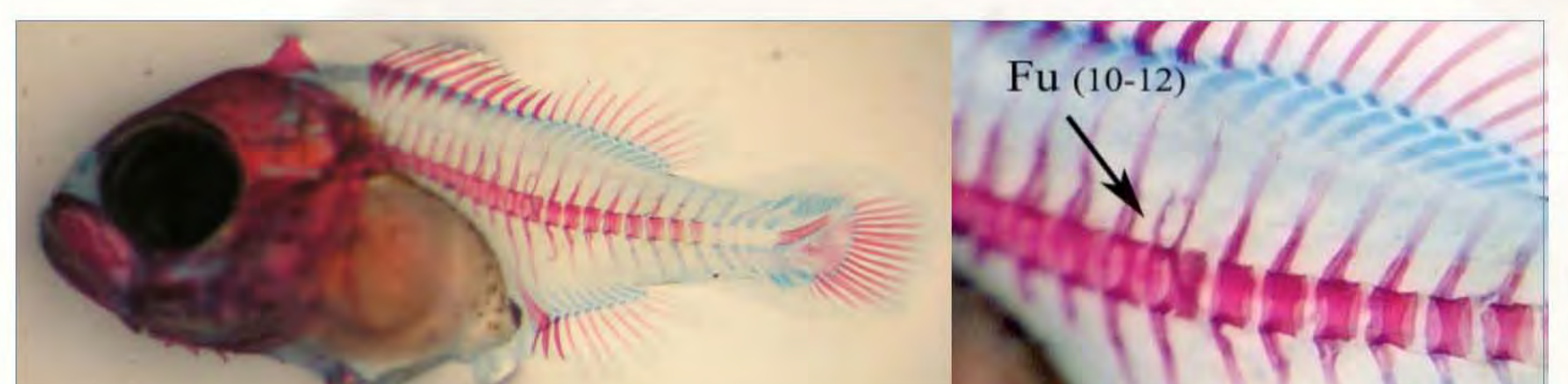
### Osteological development



Notocord flexion (6.0±0.5mm, 15dah), aparition of neural and hemal spines.



Onset vertebral ossification (20dah).



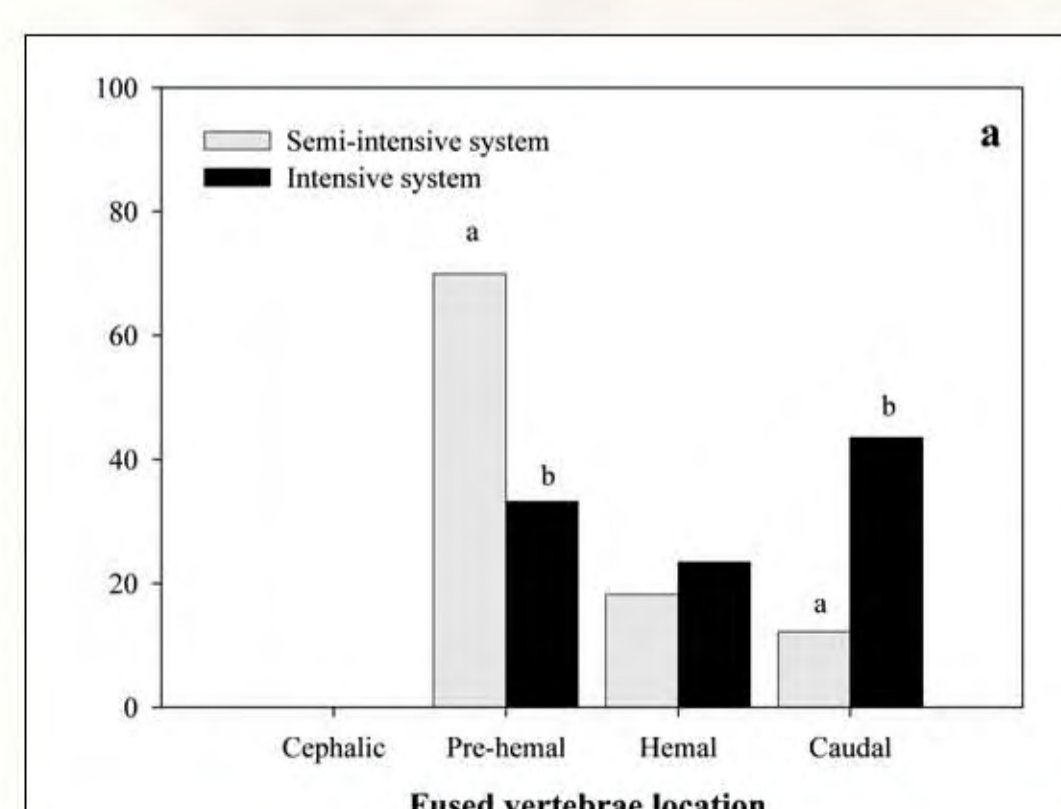
30dah incomplete vertebral ossification first record of vertebral fusión.

### Discussion

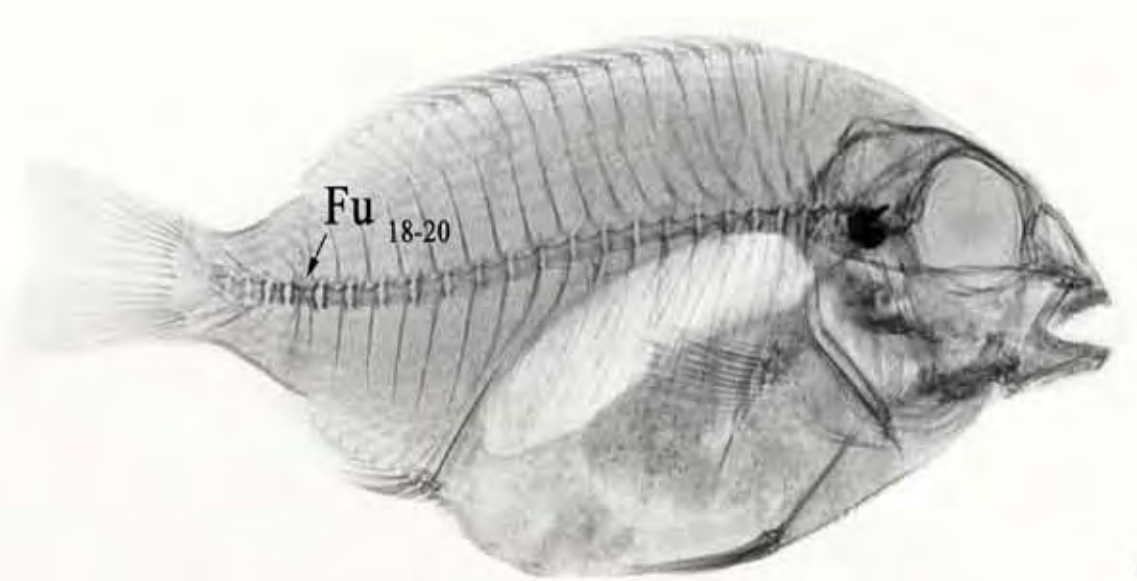
- Similar to *P. major*, *S. aurata* (Matsuoka, 1987; Faustino & Power, 2001).
- Rearing technique effect: aparition of diferent degree of osteological development at the same larval age.
- Skeleton ontogeny *P. pagrus* more related to size rather than age as in *S. senegalensis* (Gavaia *et al.*, 2002) and *S. aurata* (Faustino, 2002).

### Discussion

- Intensification increased deformities; (Divanach *et al.*, (1996), Boglione *et al.*, (2001), (Sfakianakis *et al.*, 2004).
- Cranial deformities related to nutrition and mechanical factors (Kanazawa *et al.*, 1983; Cobcroft *et al.*, 2009; Roo *et al.*, 2009).
- Kyphosis related to nutrition (Koumoundouros *et al.*, 2002) and swim bladder over inflation (Grotmol *et al.*, 2005) in sea bass and cod and digestive tract overfilling with large quantities of Artemia.



### Fusion location according to the rearing technique



### Discussion

- Lordosis related to tank hydrodynamic (Chatain, 1994; Andrades *et al.*, 1996; Divanach *et al.*, 1997) for both rearing techniques.
- Fusions related to nutritional factors such as Vitamina A : (Dedi *et al.*, 1995; Takeuchi *et al.*, 1998), AGE (Cahu *et al.*, 2003; Lall and Lewis-McCrea, 2007; Roo *et al.*, 2009) and feeding sequence according to the rearing technique.

## Acknowledgement

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