Effect of rearing technique over skeletal deformities incidence and osteological development in red porgy 
Pagrus pagrus (Linnaeus, 1758) larvae

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 skeletal 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 deformities in relation to nutrition and mechanical factors (Kanazawa, 1995; Papandroulakis et al., 2004) and swim bladder over inflation (Grotmol et al., 1995) in sea bass and cod and digestive tract overfilling with large quantities of Artemia. Disease-related deformities 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 2m3 tanks.
- Semi-intensive System (5 eggs/l) in 40m3 tanks.

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

Results

Deformities characterization

Discussion
- Intensification increased deformities; (Divanach et al., 1996), Boglione et al., (2001), (Efakianakis et al., 2004).
- Craniotabular 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., 1973) and swim bladder over inflation (Grotmol et al., 2005) in sea bass and cod and digestive tract overfilling with large quantities of Artemia.

Growth

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

Osteological development

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

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