aquaculture 2015 – Cutting Edge Science in Aquaculture
23-26 August 2015
Montpellier, France

Shape differences between organic gilthead seabream (*Sparus aurata*, L.) juveniles reared at different stocking densities

Fabrizio Capoccioni[1], Riccardo Aleandri[2], Sergio Rabai[3], Valerio Vitalini[4], Marco Martinoli[5], Domitilla Pulcini[1]

[1]Consiglio per la Ricerca in Agricoltura e l'Analisi dell'Economia Agraria (CREA) – Centro per la Produzione delle carni ed il Miglioramento Genetico (PCM) – Via Salaria 31, 00016, Monterotondo (Italy)
[2]Consiglio per la Ricerca in Agricoltura e l'Analisi dell'Economia Agraria (CREA) – Dipartimento Produzioni Animali – Via del Caravita 7A, 00100, Roma
[3]NSAqua s.r.l. Ornamental Fish Farm – Via Provinciale Vejanese s.n.c., 01012, Capranica (VT, Italy)
[4]Piscicoltura del Golfo di Gaeta, Società Cooperativa Agricola – Lungomare Giovanni Caboto 55, 04024, Gaeta (Italy)
[5]Università degli Studi di Roma "Tor Vergata" – Laboratorio di Ecologia Sperimentale e Acquacoltura – Via Cracovia 1, 00133, Roma (Italy)

Introduction

Human population is projected to reach 9.3 B in 2050, thus in order to ensure animal food proteins availability, we must increase yield and production outputs. Today, there is a strong concern about the state of the world's oceans, and global forecasts indicate that aquaculture will compensate for the stagnating supply of sea food from fisheries, contributing in feeding the boosting human population. On the other hand, fish farming ought to focus on sustainable production models, aimed at maintaining ecosystem performance by reducing the overall impact on resource use and pollution of the marine ecosystem. Organic aquaculture (EC No 834/2007 and EC No 710/2009) would be an answer. However, organic aquaculture is a relatively new field of organic production, and planned research is expected to result in new knowledge on specific gaps.

The SANPEI II project was properly aimed at contributing to the definition of good rearing practices for the production of high quality organic juveniles of gilthead seabream (*Sparus aurata*, L.). Efforts were focused on the effects of stocking densities on fish quality.

Materials and Methods

Fish (3.67±1.06 g), sampled from the P2G hatchery (Gaeta, Italy) were stocked at NSAqua s.r.l. (Viterbo, Italy) in a closed-recirculating system of four PVC rectangular tanks (350 l) for 10 months (June-March). Temperature and salinity were kept constant at 20°C and 31‰, respectively. The natural photoperiod was not altered. Fish were fed with organic complete extruded feed for marine species, ratio was calibrated according to the production company's indications. Two tanks were kept at constant high density (T1: 9.21±2.02 kg·m^{-3}; T2: 9.08±1.61 kg·m^{-3}) and two at constant low density (T3: 4.72±0.79 kg·m^{-3}; T4: 4.67±0.72 kg·m^{-3}). Fish were sampled once a month with a fine net, euthanized with a lethal dose of MS222, measured, weighted and photographed in lateral aspect.

On each specimen (n = 194), 16 landmarks and three semi-landmarks were recorded. Landmarks were converted to shape coordinates using Procrustes superimposition, which removes information about location and orientation from the raw coordinates and standardizes each specimen to a unit centroid size (CS). Residuals from the registration were analysed using the thin-plate spline (TPS) interpolating function, producing principal warps.

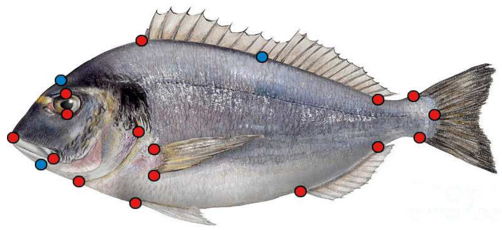

Figure 1. Landmarks (red) and semi-landmarks (blue) collected on specimens of gilthead seabream

Results and Discussion

As no significant difference were detected between replicas of each batch, data were pooled (high and low density). Specimens harvested at the end of the experiment (n = 90) were completely overlapped in Principal Component Analysis ordination plot (Fig. 2).

Discriminant Analysis (cross-validation scores, with 10,000 runs, reported in Fig. 3), performed on the same sample, detected significant differences between specimens reared at different densities (T^2 = 98.87, p < 0.05). However, misclassification rates were very high (33.3% for high density and 41% for low density), and shape profiles were substantially indistinguishable (Fig. 3).

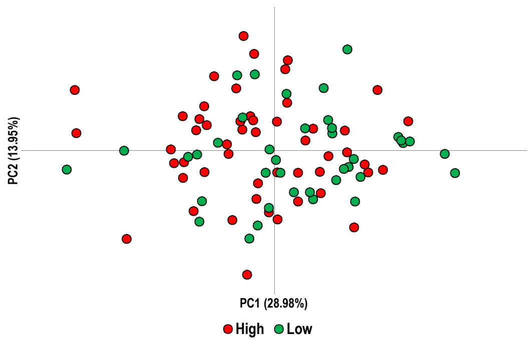

Figure 2. Principal Component Analysis ordination plot for *S. aurata* juveniles reared at high and low density

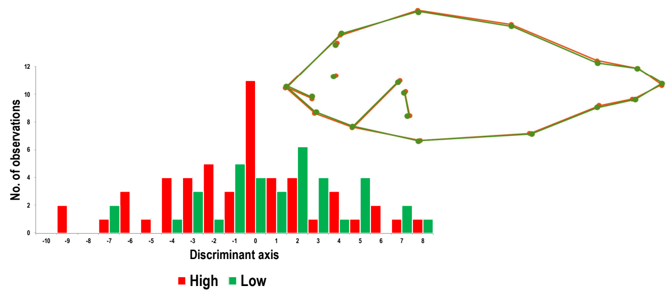

Figure 3. Discriminant Analysis scores and shape variation along the axis

Shape variation during growth (n = 194) was compared by means of Analysis of covariance computed between shape data (as regression scores from the regression between shape and age) and age. No significant differences were detected between the two shape ontogenetic trajectories (F = 0.40, p = 0.53) (Fig. 4).

These preliminary results evidenced that no substantial differences could be detected in shape of gilthead seabream juveniles reared under organic rules at different stocking densities.

Further trials at higher densities and comparison with wild juveniles are planned in order to have clearer results.

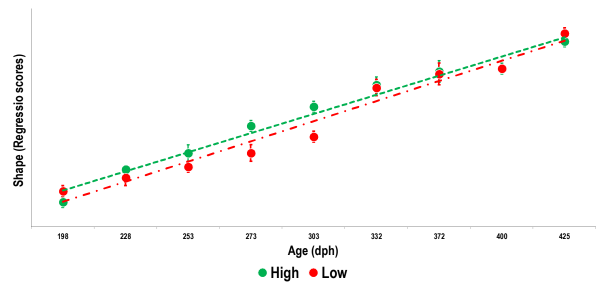

Figure 4. Analysis of covariance for shape ontogenetic trajectory comparison

Acknowledgments

This study was carried out within the research project SANPEI II, financed by the Italian Ministero per le Politiche Agricole Alimentari e Forestali (MIPAAF), Direzione Generale per la Promozione della Qualità, Agroalimentare, Ippico e della Pesca.