Water quality, feed intake and growth in European seabass (*Dicentrarchus labrax* L.) in relation to water renewal rate

**Lemarié, Gilles & Toften, Hilde**

**Introduction**

Off late, the use of oxygenation of the production water in intensive fish culture has increased. This enables the farmers to increase the production capacity and to economise with the water consumption. However, when the water flow is reduced, the accumulation of excretion products from the fish as ammonia, urea, carbon dioxide, suspended solids and induced low pH may lead to reduced performance or health problems in fish. There are few studies on the effects of the combination of these parameters when water renewal is decreasing. Thus, we have conducted an experiment with groups of seabass which were exposed to five different flow rates.

**Materials and methods**

The experiment was conducted at the Aquaculture station of Ifremer in Palavas-les-Flots (France) from December 2001 to April 2002. 15 circular tanks (1 m³) were used, each of them stocked with a biomass of 38 kg seabass (100-150 g). Five different flow rates (1520, 660, 380, 190, 125 l·h⁻¹) in triplicates were chosen in order to obtain the different treatments of sea water renewal rates: 40 (control), 20, 10, 5 and 3.3 l·h⁻¹·kg⁻¹ of fish biomass. Oxygen concentration was maintained at 100 % saturation and the temperature was 22 °C. Commercial feed (45% protein, 12% lipids, 10% ash and 10% water) was supplied ad libitum twice a day and feed intake was measured by using a particle trap. The experiment lasted for 84 days and the stocking density was maintained in a narrow range (38-44 kg m⁻³) by removing fish regularly. Water quality parameters, feed intake, growth rate and some other selected physiological parameters were measured. ANOVA was used to statistically test between treatments (a probability level of p<0.05 was considered significant).

**Results and discussion**

Feeding and growth: The weight of the fish increased in all treatment groups during the course of the experiment, but fish subjected to the lowest renewal rates showed reduced growth, especially in the first period of the experiment (Fig. 2a).

The feed intake and growth of fish were significantly lower in treatment groups 10, 5 and 3.3 compared to the treatment groups 40 and 20, indicating that the reduction in water quality impaired the performances of seabass (Fig. 2b, c).

**Conclusions**

- The accumulation of excretion products, when the water flow is reduced, leads to decreased performance in seabass when water renewal is below 20 l·h⁻¹·kg⁻¹ or when the feed intake is above 27 g·m⁻³ of renewal seawater. A 10% breakdown in feed intake and growth from control fish is observed when water renewal rate is 8.35 l·h⁻¹·kg⁻¹ or when the feed intake is 59 g·m⁻³ of renewal seawater.
- Carbon dioxide is mainly responsible of the reduced performances in fish.

---

1. First Research Institute for Exploitation of the Sea, 34250 Palavas-les-Flots, France
2. Fiskeriforskning (Norwegian Institute of Fisheries and Aquaculture Research), 9931 Tromsø, Norway