FEEDING AND NUTRITION IN EUROPEAN PERCID FISHES – A REVIEW

Patrick Kestemont1, Xueliang Xu1, Gersande Blanchard1, Charles Mélard2, Murielle Gielen2, Jean Brun-Bellut1 and Pascal Fontaine3. 1. The University of Namur, Belgium. 2. University of Liège, Belgium. 3. Université H. Poincaré, Nancy, France, patrick.kestemont@fundp.ac.be.

Introduction. In Europe, two species belonging to the Percidae family are currently under investigation in aquaculture: the Eurasian perch Perca fluviatilis and the pikeperch Stizostedion (or Sander) lucioperca. Despite the fact that both species are highly prized food fish, feeding and nutrition of Eurasian perch and pikeperch are still in their infancy. Indeed, few publications deal with the nutritional requirements of European percid fishes, and most of them focus on Eurasian perch. Short reviews of percid feeding and nutrition have been published by Barrows and LeLliss (1996), Brown et al. (1996), Kestemont et al. (1996), Kestemont and Mélard (2000) and Brown and Barrows (2002). The present paper summarises the main nutrition issues related to broodstock management, larval rearing and juvenile rearing in European percid fishes since the PERCIS II conference held in Vaasa in 1995.

Broodstock nutrition. Reproductive performances of Eurasian perch are largely affected by the origin of breeders, wild or captive. Survival of captive females prior to ovulation or after spawning are low, and egg and larval quality poor, often ranging between 0 and 5%, regardless of spawning period (normal or out-of-season) (Migaud et al., 2003). It has been suggested that gamete nutrition of Eurasian perch could be improved by improving broodstock nutrition. Performances of breeders held during their entire vitellogenesis period in recirculating aquaculture system under natural profiles of day length and temperature, and fed different formulated diets enriched with vitamin E, vitamin C or HUFAs were compared to performances of breeders fed natural food (NF), chironomid larvae and prey fish) or reared in ponds (C). Survival rate of breeders fed NF was significantly higher than in the other groups. Both diet and culture conditions significantly affect performances of Eurasian perch breeders, since fertilisation and hatching rates were maximal in fish reared in ponds, but differences between NF and formulated diets were also significant. The better egg quality of fish fed NF can be related to an improvement in their biochemical composition, namely the level of thyroid hormone (T3) as well as the K+/Mg2+ and K+/Na+ ratios. Total lipid content and fatty acid composition of eggs were, however, not significantly different between treatments. More research is still needed in order to improve broodstock nutrition and management in captive Eurasian perch breeders to secure high quality eggs and larvae. To our knowledge, there is no data available regarding the influence of dietary treatment on reproductive performances and the nutritional requirements of pikeperch breeders.

Larval nutrition. No specific larval nutrition investigations have been performed recently in Eurasian perch and most research efforts have been paid to improve survival and growth rates, and minimise cannibalism (Fiogbé and Kestemont, 2003, Kestemont et al., 2003). Up to date, Eurasian perch larvae are still fed Artemia naupii until they reach 50 mg b.w., and then can be trained to dry feed usually formulated for marine fish larvae. However, the main pancreatic and intestinal enzymes are efficient from early developmental stages, suggesting that a compound diet could be provided very early to perch larvae (Cuvier-Péres and Kestemont, 2002). Dynamics of total lipids and fatty acids during embryogenesis and early larval development suggest that docosahexaenoic acid (DHA), and to a lesser extent, eicosapentaenoic acid (EPA), play a major role during early life stages of Eurasian perch and must be present at a sufficient level in larval diets to support growth performances (Abi-Ayad et al., 2003). In pikeperch, recent investigations have compared different diets as initial food and determined the optimal weaning time to dry diet. Enrichment of Artemia nauplii with vitamin C and HUFAs is recommended since it reduces significantly morphological deformities (compared to standard Artemia or dry feed) and support high growth rate (Xu et al., this book). It has been also suggested that a formulated feed should be introduced at the day 19 post-hatch in order to avoid some essential nutrients deficiency leading to morphological deformity (Kestemont et al., 2002).

Nutrition of juveniles and adults. While requirements of some indispensable amino acids have been determined recently for yellow perch (for review, Brown and Barrows, 2002), there are few published nutritional requirements for European percids. Fiogbé et al. (1996) estimated the protein requirements of Eurasian perch as 36-56 % of the diet, depending on mathematical model chosen, and recommended 40-49% in practical diets. Lipid nutrition is another major concern in Eurasian perch, since high lipid diets usually formulated for salmonids can support rapid growth but are susceptible to impair liver function by excess storage of fat into the hepatocytes. Kestemont et al. (2001)
compared semi-purified diets containing different levels of lipids (6, 12, 18%), with or without added ethoxyquin as antioxidant, and concluded that Eurasian perch juveniles are highly sensitive to oxidised lipid. No significant differences in feed intake and growth were observed between fish fed 12 and 18% dietary lipid, but storage of large lipid droplets, and associated signs of impaired liver function (significant reduction of rough endoplasmic reticulum and mitochondria), was much more severe in fish fed 18% lipid. However, using practical diets containing from 11.7 to 19.3% lipid, Xu et al. (2001) indicated that 19.3% of dietary fat supported the highest growth, feed efficiency and protein efficiency ratio. These authors also suggested that Eurasian perch possess a high capability to elongate and desaturate DHA from their dietary precursors. The effects of different lipid sources on lipid metabolism and fatty acid composition of Eurasian perch were investigated recently. The results showed that Δ6 and Δ5 desaturases are highly active in this species. Desaturation enzymes are not specifically favouring n-3 over n-6 acids in perch lipid metabolism, and they are greatly influenced by n-3 and n-6 fatty acid content in the diet (Xu and Kestenmont, 2002). There are few results related the influence of feeding and nutrition on quality of perch flesh. Mathis et al. (2003) reported that filleting rate can vary with dietary protein/energy ratio, high energy diet decreasing filleting rate, while sensorial analysis did not reveal any difference between dietary treatments. Feeding and nutrition ofpikeperch are poorly documented, but recent studies have investigated the effects of protein, fat and carbohydrate ratio on growth, feed efficiency and nutrient retention in pikeperch fingerlings. Results suggested that the cost-effective P/E ratio is 43/10/15. It has been also demonstrated that optimal rearing temperature and feeding frequency for pikeperch fingerling are 28°C with feeding 3 times a day.


