LIFE HISTORY TRAITS OF THE PIKEPERCH *Sander lucioperca* (L.) IN THE SOUTHERN OUTSKIRTS OF ITS DISTRIBUTION AREA

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**Introduction.** In 1948 the pikeperch colonised the sandy Vaccarès lagoon, in the Mediterranean delta of the Rhône River (Goubier 1972). Very few data are available about the life history traits of pikeperch in the southern part of its distribution area. Yet, such information is crucial for the species management. We investigated growth, maturity, fecundity and the diet of one of the Rhône delta population.

**Methods.** The study area was located in the Rhône delta (Fig. 1), southern France (43°34' N, 4°34' E). The Fumemorte canal collects water from a complex canal network spreading over 68 km². It was shallow (1 m), around 14 m wide and flowed into the brackish Vaccarès lagoon. The salinity in the canal varied from 0.1 g l⁻¹ in summer to 5 g l⁻¹ in winter depending mainly on the agricultural activities. The water remained highly turbid all over the year.

![Map of the Rhône delta](image)

**Figure 1.** The Rhône delta (the Camargue). The rectangle delimits the Fumemorte basin.

Age readings were performed on scales and otoliths of 30 males and 46 females captured from 2000 to 2002. The growth curve was fitted using the Schnute (1981) model which includes numerous historical models as special cases and the fitting was processed by non-linear regression based on the least squared errors. Sexual cycle was determined by monitoring the Gonadosomatic Index (i.e. weight of ovaries*100/total weight). Length at first maturity was considered as the length at which 50% of the individuals were mature using a logistic regression. Both sexual cycle and maturity were studied using pikeperch collected since 1982 (more than 300 fish). The fecundity was measured on 17 females captured between January and March 2000 and was estimated by weighting 500 eggs to the nearest 1/10 mg in a tarred water volume. As the weight of the eggs changed among month, its relation with the fork length was tested using a covariance analyse where the length was the covariable and the month the fixed factor. Diet analysis was performed on 194 pikeperch caught between 1982 and 2002. The occurrence of each prey was registered.

**Results.** No growth difference between sexes was observed (ANCOVA, F₁=1.28, p=0.26). Richards growth model was the best to fit pikeperch growth in the Fumemorte canal, both sexes pooled (Fig. 2; n=76, r²=0.94; p<0.001). The estimated fork length at 1 year was 258 mm, 2: 404 mm, 3: 568 mm, 4: 689 mm and 5 years: 747 mm. The estimated L₅₀ was 779 mm.

The spawning occurred from mid-March to late April, at a temperature of 12°C-15°C (Fig. 3). A sexual rest occurred in summer and the ovaries maturation took place from September to March.

![Graph of fish length vs. age](image)

**Figure 2.** Growth of the pikeperch fitted according to the Richard growth model.

![Graph of gonadosomatic index vs. temperature](image)

**Figure 3.** Monthly mean (± S.E.) Gonadosomatic Index development (bars) and monthly mean (± S.E.) temperature between 1988 and 2000 (solid line).
Fifty percent of the males reached their sexual maturity at 246mm (11 months) and 50% of the female at 322mm (18 months) (Fig. 4). The smallest mature male and female were 215mm and 242mm long respectively.

![Graph showing percentage of mature individuals](image)

**Figure 4.** Length at first maturity of the male (solid line) and the female pikeperch (broken line).

The mean relative fecundity was 255412 (± 16710) eggs/kg. The absolute fecundity increased significantly with the fork length according to a power function (n=17, r=0.77, p<0.001), while the relative fecundity decreased significantly according to a linear function (n=17, r=0.46, p=0.002) (Fig. 5). The egg weight (n=17, mean=0.53mg ± 0.06) increased significantly with the fork length (ANOVA, F=9.8, p=0.008).

![Graph showing absolute and relative fecundity](image)

**Figure 5.** Regression of absolute (solid line) and relative fecundity (broken line) on the fork length.

On 194 stomachs investigated, 107 were full and 89.7%, 11.2% and 2.8% contained fish, crustacean and other preys, respectively. Among the 64 stomachs displaying identifiable species 58% contained Atherina boyeri, 19% shrimp and 14% Mugil spp. Other species as Lepomis gibbosus, Carassius gibelio, Alburnus alburnus, Abramis spp. and Pseudorasbora parva were also found. No cannibalism was observed.

**Discussion.** The growth of the pikeperch in the Fumemorte canal was one of the fastest observed for this species. This might be due to the geographical location: summer water temperatures at this latitude are close to the pikeperch physiological optimum (i.e. 27°C, Hokanson 1977). Thus 0+ become piscivorous early which speeds up their growth. The age at first maturity was also among the earliest reported but the usual difference between males and females was still observed. As for growth, the acquisition of the sexual maturity probably depended on the latitude: earlier maturity is related to fastest growth rate at lower latitudes (Lappalainen et al. 2003). The power function fitting the absolute fecundity and length was congruent with an early sexual maturity (Zivkovic & Petrova 1993). Smaller females had a greater relative fecundity which was seldom observed for this species (Lappalainen et al. 2003). This may be due to the short lifespan of the pikeperch in the Fumemorte canal bringing the females to express their full fecundity potential at their youngest age. However, older females displayed heaviest eggs: this is commonly observed for teleost fish. Further data on fecundity and egg size would be necessary to confirm these results. In the Fumemorte canal, adult pikeperch fed on fish but also on shrimp. Sandsmelt and mullet were only abundant in winter. Nevertheless, other species abundant all over the year also provide suitable preys. This fact associated with the low density of pikeperch could explain why no cannibalism occurred. Environmental conditions in the Rhône delta bring the pikeperch to adapt its life history traits thereby proving its plasticity.

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