

Growth and reproductive performances of juveniles and sexually mature pollack (*Pollachius pollachius*) in different conditions, Seafarming Today and Tomorrow, Proceedings of Aquaculture Europe 2002, Trieste, Italy, October 16–19, 2002, Spec. Publ. vol. 32, EAS, Oostende (2002), pp. 394–395.

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Growth and reproductive performances of juveniles and sexually mature pollack *Pollachius pollachius* in different conditions

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Introduction

The pollack *Pollachius pollachius* is a commercially important fish, considered as a candidate for aquaculture in France. Rearing attempts are promising (Suquet *et al.*, 1996), and more information is required about its reproduction, to contribute to a better management of breeders for this species. This study was designed to examine the first maturity in pollack and the effects of conditions such as origin and delayed reproduction season, on gonad maturation, reproductive and growth performances of adults.

Materials and Methods

Immature pollacks (born in wild) were reared in captivity fed a 56/12% (protein/lipid) artificial food. Growth was checked monthly towards the age of two years, on (1) a seven months duration including the period of fish gamete maturation to assess the first maturity, then (2) seven months later at the foreseen spawning time.

On adult pollacks, individual growth and gametogenesis were monitored throughout an annual cycle. Fish were divided in three groups. Two groups (initial mean body weight (bw) 1.6±(sd)0.3kg - 1.2±0.3kg) were acclimated to captivity for one year; one of them (A) was maintained under natural conditions of photoperiod (8L/16D-16L/8D) and temperature (9,7-17 °C) while the second (B) was kept under a two months delayed spawning season. A third group (C) newly wild-caught (initial mean bw 2.4±0.8kg) was kept under natural conditions. Fish were fed fresh or frozen food twice a week. Gonad and blood were sampled monthly. Oocyte size was measured and their development was described by light microscopy. Osmolarity, plasma content of ions, T₃ and steroid hormones (quantified using RIA) were analysed.

Results

The weight gain of young pollacks was variable between individuals, with an average: in period (1) of 85.7±(sd) 21% for females, different ($p<0.05$) of males with 61.5±35.6%; in period (2) of 67.9±20% for both sexes. First maturity of males was observed as early as 0.7kg average weight (about 2 years) in 30% of the fishes. Towards 1.6kg average weight (about 3 years),

44% of the individuals were vitellogenic females, 44% were spermiating males whereas 12% fishes had no sign of maturation.

On adult pollacks, lower survival was observed in the wild origin group (C: 66% versus A: 81% and B: 90%). Weight gain showed variability between individuals; it was superior in the shifted group than in the others, where females grew faster than males ($p < 0.05$). The best specific growth rate of the acclimated to captivity adult pollacks was around 0.2% at 14°C. Broodstock pollacks yielded 4 to 7 batches of eggs per female. They spawned in captivity from February to May under natural conditions (from 9 to 11.5 °C, 10:30 to 14 DL) (Table 1).

Table 1. Main reproductive performances of adult pollacks according to the groups.

| | One year Captivity | | Wild origin |
|------------------------|--------------------|--------------------|-------------|
| | A Natural season | B 2 months delayed | C |
| Spawning period 2001 | 26Feb 23Apr | 25Apr 10Jul | 10Mar 26Apr |
| Duration (days) | 57 | 77 | 48 |
| Mean viab. rate±SD (%) | 53.4±24.2 | 26.0±22.1 | 72.5±23.2 |
| Mean eggs/kg Female | 296 300 | 686 000 | 522 600 |

Plasma levels of calcium and T_3 slightly increased during spawning period. T_3 levels ranged between 10 to 35ng.ml⁻¹ and showed two peaks: before the beginning of spawns and the second in summer (i.e. sexual rest). Vitellogenesis in pollack was short since it took place within three months, and, it was immediately followed by spawns (Fig.1).

Mean plasma levels of E_2 in females increased close to oocyte growth (vitellogenesis) and peaked just before spawns (A: 12.9±4.0 (beginning of February); B: 9.9±5.0 (beginning of April); C: 13.7±7.8ng.ml⁻¹ (March; ns). 11KT plasma levels in males showed an annual cycle with a mean maximum value of 2.7±0.7ng.ml⁻¹ (in January (A), (C), and April (B)).

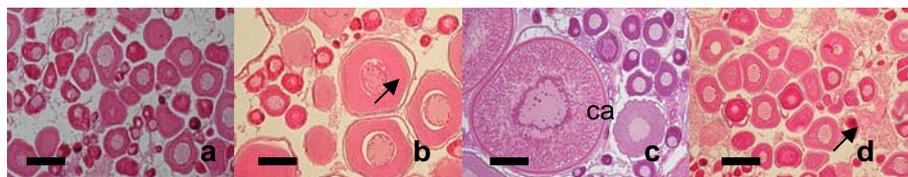


Fig. 1. Oocyte section: (natural conditions; bar=200µm). (a) primary oocytes; (b) early cortical alveoli stage (arrowhead); (c) secondary oocyte showing vitellin globules; (d) post-ovulatory follicles (arrowhead) and primary oocytes.

Discussion

Wild-caught group (although stressed by handling), showed the highest viability of eggs than the others, while high fecundity in the delayed spawning season group was associated with a poor quality of eggs. Because shifted spawning season is usual to provide eggs and fry all-year-round, this aspect will need more investigation.

References

Suquet, M., Petton, B., Normant, Y., Dosdat, A., Gaignon, J.L., 1996. First rearing attempts of pollack, *Pollachius pollachius*. Aquat. Living Resour. 9, 103-106.

Acknowledgments: To AFSSA - Brest, for using materials for histology and light microphotographs.