FRESHWATER RESIDENCE OR MIGRATION

IN BROOK CHARR, *SALVELINUS FONTINALIS* :

INFLUENCE ON GROWTH AND ASSOCIATED AGE AT MATURITY

AND AGE-SPECIFIC FECUNDITY

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Introduction

Differences in growth rate may be associated with differences in some reproductive traits influencing fitness, such as age at maturity and fecundity (Roff, 1984). Partially migratory fish species, which can present high variations in growth rate within the same population, provide an opportunity to study interactions between growth and life history (Dodson, 1997). In numerous rivers opening into estuaries, brook charr (*Salvelinus fontinalis*) can be found as freshwater residents that mature sexually without any seaward migration and migrants that move between freshwater and saltwater before maturing. As with most charrs, anadromous and freshwater resident forms of *S. fontinalis* are thought to belong to the same gene pool, with different life-history patterns reflecting adaptive phenotypic plasticity in the face of prevailing environmental conditions (Jonsson et Jonnson, 1993). Anadromous brook charr exhibit enhanced growth rates, causing residents to be significantly smaller than their migratory counterparts (Power, 1980).

The objectives of this study were to compare juvenile growth of resident and anadromous charr originating from the same river, as well as to examine associated age at maturity and age-specific fecundity.

Methods

We studied resident and anadromous brook charr from the Sainte-Marguerite River (48°20'N, 70°00'W), in Saguenay, Québec, Canada. In 1998, 2757 anadromous charr were caught in spring during their migration downstream (Alaskan trap) or during their first summer of growth in the Saguenay Fjord (seine). Fish were measured to the nearest mm. 299 charr were sacrificed for laboratory analyses, including sex, reproductive stage and age determination (the latter was determined using sagital otoliths). 500 fish were individually tagged with T-bar tags (Floy) and released. 4810 more anadromous charr were caught during the spring and summer of 1999. 300 were sacrificed during their downstream migration and 4510 were tagged with T-bar tags. 11% of tagged fish were recaptured by anglers, mostly in September and October 1999. Those recaptures were measured again. Sex, reproductive stage and age were determined. Moreover, 500 fish caught by anglers during 1998 and 1999 were sampled, in order to evaluate size and age at first reproduction. Eggs from ripe females were counted to estimate the relationship between size and fecundity.

Juvenile growth rate, size and age at sexual maturity of freshwater residents were evaluated by collecting 30 fish in two different streams of the Sainte-Marguerite River system in September 1998 and 1999. Six ripe females were collected in one of these streams and were used to estimate a preliminary relationship between size and fecundity in resident charr.

Results

Anadromous charr leave the Sainte-Marguerite River at age 1 or 2 and grow at an accelerated rate, reaching about twice the size of freshwater residents of the same age at the end of their first summer in salt water. At the end of their third summer, migrants that left the river at age 1 still exhibit a greater body size than migrants that left the river at age 2 (in September 1999, respective mean fork lengths ± SD were 29.9 ± 2.5 cm and 23.0 ± 3.1 cm).

We found a strong relationship between body size and fecundity in anadromous and resident charr (Figure 1) and this relationship did not differ significantly between the two forms (ANCOVA, slope : p=0.95 and elevation : p=0,09). Thus, anadromous charr, which grow bigger, exhibit a higher age-specific fecundity than resident charr. Variation in age at sexual maturity between the three groups (residents, migrants that left at age 1 and migrants that left at age 2) will be discussed during the oral presentation.

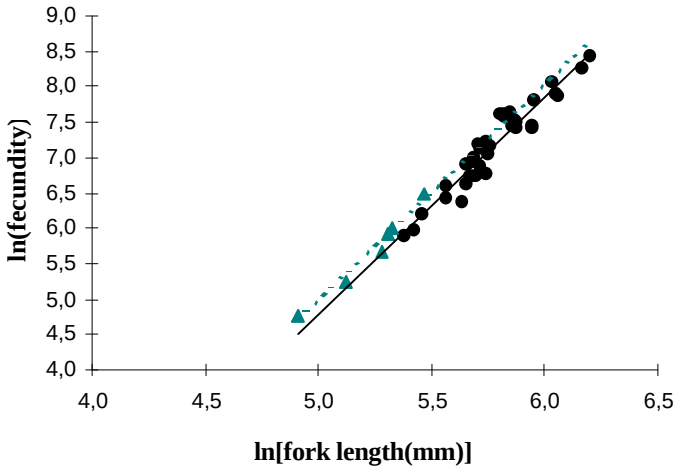

Figure 1. Relationships between fork length and fecundity in anadromous and resident (Morin creek) brook charr collected in 1998 and 1999 (filled triangles : resident brook charr from Morin creek; filled circles : anadromous brook charr). Regression lines in anadromous (solid line) : ln(fecundity)=3.0884 ln(fork length)-10.672, r=0.92, n= 36); residents (broken line) : ln(fecundity)=3.0952 ln(fork length)-10.528, r=0.98, n=6).

References

Dodson J. J., 1997. Fish migration : an evolutionary perspective. *In* : Godin J.-G. (ed.), Behavioral ecology of teleost fishes. Oxford University Press, 10-36.

Jonsson B. et Jonsson N., 1993. Partial migration : niche shift versus sexual maturation in fishes. *Reviews in Fish Biology and Fisheries*, **3** : 348-365.

Power G., 1980. The brook charr, *Salvelinus fontinalis*. *In* : Bakon E. F. (ed.), Charrs : salmonids fishes of the genus *Salvelinus*, a review. Junk., The Hague, 141-203.

Roff D. A., 1984. The evolution of life history parameters in teleosts. *Can. J. Fish. Aquat. Sci.*, 41 : 989-1000.

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