AN AGE AND GROWTH COMPARISON

BETWEEN JUVENILE ATLANTIC SALMON (Salmo salar)

'MOVERS' AND 'STAYERS'

IN THE PONOI RIVER SYSTEM, NORTHERN RUSSIA

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EXTENDED ABSTRACT ONLY – DO NOT CITE

Movements of juvenile Atlantic salmon (*Salmo salar*) between mainstem spawning sites and small tributaries, where salmon do not spawn, were monitored in the Ponoi River (67^{o} N, 40^{o} E), Russia from June - September 1998. Atlantic salmon parr have traditionally been viewed as sedentary territory holders (Gerking, 1959), however, it has been well established that a small fraction of a population may become mobile (the 'movers') prior to smolting. Movers have been found to leave their natal sites (the 'stayers') to take up residence in lakes, estuaries and small streams; they also tend to be the older members from parr populations and contribute significantly to annual smolt production (see Bardonnet and Baglinière, 2000). Movers, therefore, leave the natal area, not as a result of intraspecific competition, but because needs are not met, or they are undertaking an ontogenetic niche shift.

In contrast to many rivers where Atlantic salmon are native, the Ponoi is not experiencing the global decline in adult returns. In fact, adult returns have been

increasing due in part to a conservation effort initiated in 1994. As a result, juvenile salmon densities within natal sites have increased dramatically over a short period of time. The current study was conducted to determine if the ontogenetic niche shift model, as an explanation for juvenile salmon release of holding behaviour, also holds for a river system where parr densities increase rapidly.

Trap-fences were used to monitor parr movements between the mainstem and three small, non-spawning tributaries (< 3 m wide), where no adult salmon spawn, that feed directly to the mainstem. Brown trout (*Salmo trutta*) were the primary residents of these streams and are a known predator of salmon parr. Fences were checked daily and captured salmon parr were measured, movement direction was noted and scale samples were collected. Scale samples from the stayers were obtained during autumn electrofishing surveys. Age and growth information for individual parr was obtained by measuring distance from the scale focus to the first annulus and employing the scale-proportional method of back-calculation to estimate fork-length of movers and stayers at the end of first year growth (Francis, 1990).

Streamward migration occurred sporadically from June through September, but intensified during the last two weeks of July when water temperatures exceeded 10 ^{o}C. Upstream movers were predominantly 1+. After leaving the mainstem, movers remained upstream in Falls and Clough Creek and no return to the mainstem occurred, indicating this movement was not random. Parr that moved upstream prior to the 1998 season did leave these two streams. Movers also remained upstream after moving into the Little Ryabaga, but a mass return to the mainstem occurred during the first week of September. 62% of the returnees were 1+ parr that had moved upstream earlier in July. Few older parr and no smolts were among Clough Creek and Little Ryabaga emigrants, while parr leaving Falls Creek were older than those entering. Clough Creek was found to be a spawning site for adult salmon, as young-of-the-year salmon were among its emigrants. When back-calculated end of first year fork-lengths were compared, movers were larger than the stayers, for all hatch years, although both groups spent their first year in the mainstem (Fig. 1). Mean fork-length of 1+ movers at the end of the 1998 growing season was not different from the stayers ($p>0.05$) and movers older than 1+ were smaller compared to mainstem parr ($p>0.05$, Fig. 2), although they were initially larger at the end of their 1st year.

Although parr leaving the mainstem were the largest of their cohort, they were also the youngest from the mainstem population (>80% of Ponoi parr smolt at

3+ and 4+) and their growth decreased once in the tributaries, indicating movement is a result of intraspecific competition within natal sites. Decreased growth of the movers was not expected because the tributaries had suitable substrate, fewer predator species and greater insect drift than the mainstem. Tributary temperatures were cooler than the mainstem, yet remained within the range required for growth. Although Cunjak and Gibson (1986) found little evidence for interspecific competition between salmon parr and brown trout, small stream size may prevent sufficient habitat segregation based the two species' preferences and cause high competition for resources. The ontogenetic niche shift model, therefore, does not universally apply to salmon parr release of holding behaviour; the cause for this behaviour must be determined at a riverine scale.

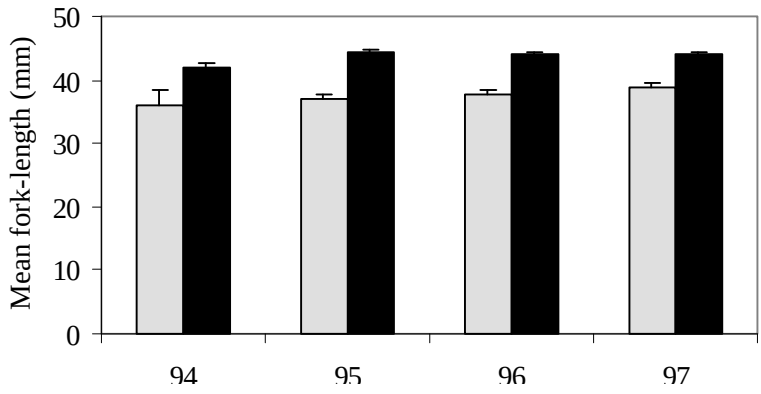

Figure 1. Mean back-calculated fork-length of movers (black bars) and stayers (hatched bars) at the end of first year growth, grouped by hatch year.

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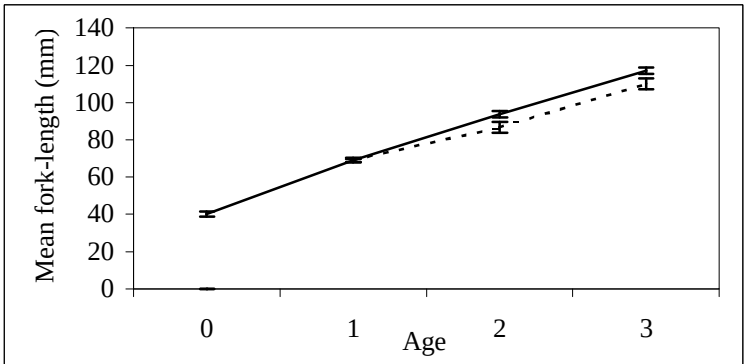

Figure 2. Mean fork-length of 'movers' (dashed line) and 'stayers' (solid line) at the end of the 1998 growing season.