Morphological shifts, body length and developmental stages during the ontogeny of the grayling (*Thymallus thymallus*): a between-river comparison

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With 3 figures and 2 tables in the text

**Abstract:** The five morphological groups which have previously been described for 0+ grayling from one river (SAGNES et al. 1997) have now been demonstrated for two other rivers differing in abiotic characteristics. These morphological groups were determined by variables which are known to be relevant for the hydrodynamic potential (i.e. drag coefficient) and are therefore related to the habitat use of the fishes (SAGNES et al. 1997). Thus, this study confirms the importance of considering the physical habitat of young stages of fish in management studies. The comparison of the morphological groups from the different rivers revealed that the parameters which are conventionally used for the characterization of 0+ graylings (body length, developmental stages sensu Peñáz 1975) do not coincide with the morphological groups. Genetic and environmental aspects should be examined in future studies.

**Introduction**

In the past decades, several studies have emphasized the importance of the first stages of fish for the recruitment of the entire population (HUMPESCH 1985; SCHLOSSER 1985; HOUDE 1997). Therefore detailed information on the needs and risks of each ontogenetic stage of fish is necessary to provide an efficient management of aquatic ecosystems. Periods of sometimes radical changes in physiology, morphology, behaviour and/or resource use (food, habitat) are considered to represent especially delicate phases in the ontogeny of fish (BALON 1975, 1984, 1990). For many fish species such shifts have been described mainly in the first months after emergence, when the development and growth have reached their maximum speed (BALON 1984; MARK et al. 1989; KOVÁČ & COTT 1996). Addi-

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