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Trout Exam-Invest

The resettlement of the Danubian clade of brown trout in the region of the National Park Hohe Tauern

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Abstract

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Most Austrian waters belong to the Danube drainage system. Autochthonous trout is therefore expected to be of Danubian mitochondrial haplotype. During an extensive search for autochthonous brown trout six populations of homogenous Danubian haplotype could be found.

Successful reproduction of the population from the Anraser See (2538 m) was the basis for stocking experiments. Twenty seven months after stocking a high mountain brook as well as a lowland brook the recapture rate was much higher in the high mountain brook. In addition, growth rate of fish in the high mountain brook by far exceeded the growth rate of brown trout in the lowland brook. This indicates that fish reproduced from relic population like that in Anraser See are well adapted to high Alpine areas and ideal for restocking of remote waters like that in the National Park Hohe Tauern.

Keywords

brown trout, autochthonous, genetic analyses, reproduction, stocking, monitoring

The project started in 2002 and will last until 2008. Aim of this project is to trace relic populations of brown trout, to secure their survival, and to create brood for stocking.

Introduction

During the last ice-age the European river systems have been formed. After glacier retreat the emerging rivers have been colonised by brown trout, *Salmo trutta*. Nowadays at least five genetically distinct lineages of brown trout are found (BERNATCHEZ 2001). The major part of Austrian water bodies belong to the Danubian drainage system and it may be assumed that most autochthonous populations of brown trout in Austria belong to the Danubian clade (WEISS et al., 2001). In the Middle Ages man started to stock brown trout from the rivers in fishless lakes and brooks.

Beginning in the late 19th century trout populations began to decline due to the destruction of natural habitats by human activities. As a consequence intensive stocking activities were initiated. However, most of the stocked brown trout belonged to the Atlantic lineage. Furthermore, American species, namely the rainbow trout, *Oncorhynchus mykiss*, and brook trout, *Salvelinus fontinalis*, have been introduced. This introduction of allochthonous material led to altered population structures in most Austrian waters (LARGIADÈR & SCHOLL, 1996; OSIMOV & BERNATCHEZ, 1996; HANSEN et al., 2000; WEISS, 2000, 2001; DUFTNER et al., 2003).

Only in a few remote lakes and rivers descendants of the ancient populations survived until now. The InterregIIIA-project 'Trout Exam-Invest' aims to locate these indigenous populations of brown trout, to reproduce them and to build up autochthonous brood stocks.

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Searching for autochthonous trout populations

Promising waters where selected by the following criteria: being remote, being separated from larger rivers by a barrier preventing the entrance of possibly stocked trout, and the absence of a stocking record during the last decades. 20 to 30 brown trout from each of these lakes or brooks where caught and a small piece of the anal fin was preserved in ethanol for genetic analyses. The fish were marked individually with visible implant tags and released. So far, genetic analyses of the samples revealed seven populations with haplotypes belonging to the Danubian lineage in Tyrol and Salzburg (based on the complete sequence of the mitochondrial control region). Within the area of the National Park Hohe Tauern sixteen brooks and three high mountain lakes were surveyed for autochthonous brown trout populations

Stocking experiments

The criteria adopted to identify brooks to search for autochthonous populations were also used to identify brooks for stocking, expanded by the requirements for enough food, high structural diversity and habitats for all developmental stages.

The fish from the lake Anraser See where among the first being identified as an autochthonous brown trout population (DUFTNER et al. 2003). Successful breeding of these fish at the Institute of Zoology and Limnology (Innsbruck University) provided the opportunity for first stocking experiments. Two different brooks where stocked with one year old fingerlings, the Kristeinbach (a high mountain brook at about 1,620 m a.s.l.) and the Fohlenhof Laue (a low land brook at 620 m a.s.l with slowly flowing water). The field-experiment lasted for 27 months.

Fish from the Fohlenhof Laue were of week condition during the entire period and the total number of recaptured fish declined steadily. In contrast, the fish in the colder Kristeinbach showed excellent growth. Despite two flood waters, at the end of the experiment 22% of the stocked animals could be recaptured in the same section of the brook where they have been released (Fig. 1).

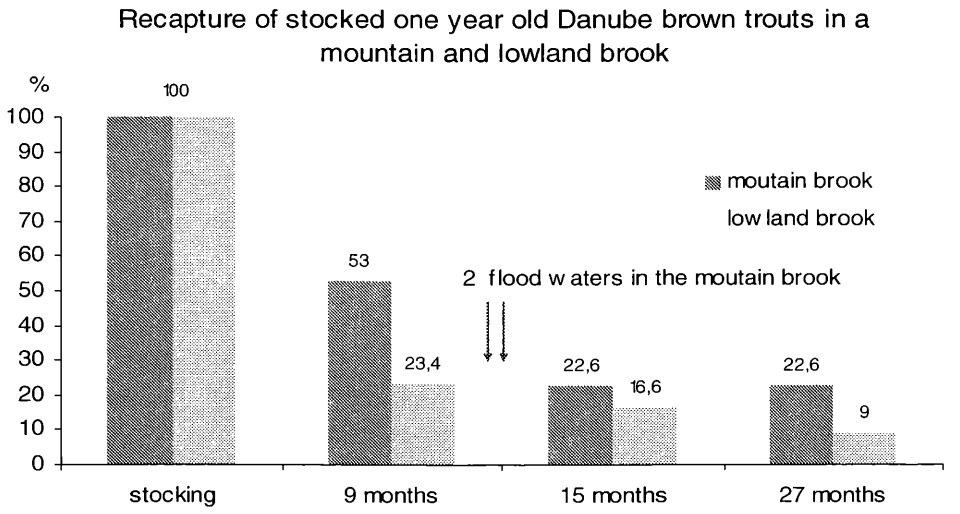

Fig. 1: Percentage of fish recaptured after 9, 15 and 27 month after stocking in a mountain and lowland brook.

The high proportion of recapture and good growth rate of the Danube brown trout in a mountain brook shows that these fish are well adapted to rough environmental conditions while those released in a lowland river appear to be less competitive compared to brook and rainbow trout and brown trout of Atlantic origin (Tab. 1).

Discussion

Brown trout embodies the history of a typical European fish. Therefore, the continuous disappearance of local populations and the efforts to stop this trend lead to a high interest not only by fishermen but also by the general public. This was demonstrated by several contributions in professional journals, local newspapers, as well as in national and international TV programmes. Autochthonous brood stocks are required to counteract the import of foreign material. The growing interest even in very specific approaches assures and increases the socio economic value of natural sanctuaries.

Growth of stocked yearlings

Mountain brook

	stocking			after 9 months			after 15 months			after 27 months		
	Lt cm	Wt g	Kf	Lt cm	Wt g	Kf	Lt cm	Wt g	Kf	Lt cm	Wt g	Kf
mean	17,3	52,6	1,0	19,4	70,9	0,9	20,9	85,9	0,9	23,5	136,8	1,0
max	19,7	80,0	1,2	22,8	118	1,2	23,9	138	1,0	26,8	226	1,2
min	14,3	29,0	0,8	17,2	44	0,8	18,5	53	0,8	21,4	98	0,9
growth				2,1	18,3		3,6	33,2		6,2	84,2	

Lowland brook

mean	15,6	38,6	1,0	16,1	33	0,8	17,4	41,4	0,8	18,9	62,0	0,9
max	20,9	96,0	1,2	18,8	48	1,0	19,3	60	0,9	21,4	94	1,0
min	10,2	10,3	0,8	12,8	15	0,5	14,0	21	0,6	15,4	33	0,8
growth				0,5	-5,5		1,8	2,8		3,3	23,4	

Lt = total length, Wt = weight, Kf = condition coefficient

Tab 1: Allometric data and growth of the stocked fish in the Fohlenhof Laue and Kristeinbach.

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