

Private Owned Trout Fishery in the Raba River – Six Years after Opening

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ABSTRACT

In 1996 a 15 km long stretch of the Raba river have been leased out to the Author to be run as an anglers' trout fishery. The objectives were to maintain a good level of fly fishing for trout and to support local populations of brown trout and grayling. These objectives were fulfilled partially on “put & take” basis mainly with rainbow trout and using local spawners to proliferate brown trout. Most affected was grayling population, due to extremely high Summer water temperature, but leaving it without any manipulation proved to be a best solution to recreate local strain used to local conditions.

Fishery data collection and reporting was the part of a program: the results are presented here together with some comments coming from independent reports made mainly by aquaculture students in their diploma thesis.

The River

From June 1996 the part of the Raba river in Pcim, Stróża and Myślenice, about 40 km from Kraków, has been designated as a trout fishery. Fly fishing by the public was allowed after the purchase of an appropriate fishing permit which included a returnable catch record. All tributaries of this part of the Raba river are a nature reserve, in which trout fry are being reared, and in which all fishing is prohibited. The number of sizeable fish in the Raba river is maintained at the level which allows catches at all times. In 1997 biggest brown trout caught on fly was 62 cm long, weighing 2,40 kg, and the rainbow trout 67 cm, 2,80 kg. Daily tickets are obtainable in Myślenice and Kraków, seasonal permits are also available. Fishing is allowed from dawn till dusk with two single hook flies tied on barbless hooks or on hooks with the barb fully pressed to the hook bend. Groundbaiting and weighing the leader are prohibited. Limit sizes and closed seasons are the same as those in the National Fishing Rule and the Nature Preservation Act.

Average width of the Raba river in the fishery region is 20 meters, the length of the stretch 15 kilometers, average slope 0,3 %. The river flows parallel to the road, it has both thick bush vegetation on high banks and wide, flat, stony beaches. Banks are reinforced with rip-rap made with big rock fragments, which has the channelling effect on the river. It has a current/pool pattern, the characteristic feature of the Carpathian rivers, with gravely-stony bottom, and occasional rock. It is a spring and rain fed river, thus the amount of water is dependent on amount of recent rainfall. Water level rises and falls quickly. At the highest water level mark the water is murky, periods of turbid water are short lived. The water is highly alkaline, the channel is rich with nutrients, although with a limited number of water weeds. This actually is a most visible result of downcutting of the Raba channel (Wyżga, 1991). Other drawbacks are shallow water, moveable bottom gravel and high Summer water temperatures, usually couple of days above 26°C in June – July – August, maximum ever recorded: 28,8°C on 27th July, 2003 16.30 hours. High Summer temperature is correlated with the extent of channel regulating works (Jeleński, 1984).

Fish species

Number of species recorded in 1966-1971 on the same part of the Raba river was 20 (22 with salmon and seatrout) and was highest ever recorded (Kołder, 1974). This number declined to 9 in 1994, (Żurek, 1994, unpublished report) and started to grow to reach 12 in 2000 (Mikołajczyk, 2003) and 17 in the end of 2003. Pike and eel are not present because the old river-beds were cut from the main channel, lamprey, barbel and sculpin are extinct since 1986. Otherwise, the set of species is characteristic for boundary of grayling/barbel regions, sorry to say without barbel and with limited number of grayling.

Rainbow trout was present in sixties, and has been always present in anglers or electrofishing catch. At present, it can be estimated, that from one year old cohort 0,1 % are grayling, 0,3 % rainbow trout, 3 to 5 % salmon and the rest consists of brown trout. It is very hard to estimate if or how many wild rainbow trout are present in the river, because of using rainbow trout as main “put & take” fish, and because of many pond fish-cultures of rainbow trout at most Raba tributaries. However, it seems, that all salmonids can spawn successfully in the Raba river, although survival rate is very poor for rainbow trout and grayling.

Fish diseases

Many warmwater fish species had been affected by *erythrodermatitis*, bacterial disease caused mainly by acute environmental exposure. Visible ulcers were observed on as much as 15 to 20 % of chub, bleak, barbling, nasecarp and roach in 1998. Only extensive electrofishing for chub, barbling and roach have reduced substantially the amount of these fish present in the river, which reduced also a number of fish affected to less than 1 % of specimens caught. Salmonids were never seen affected by *erythrodermatitis*, or any other kind of disease.

Brown trout

Supporting of brown trout population have been executed as proliferating local strain by catching and rearing wild spawners, using their spawn in hatchery and incubators for couple of years, then releasing them back to the river. Each year trout fry were distributed over the whole length of many tributaries in Spring, then some of tributaries were electrofished for fingerlings and yearlings in Autumn, to release them into the main channel of the Raba river. Over 600 thousand of brown trout fry were released into system between 1997 and 2003, and number of trout shifted “manually” to the river was between 2000 to 4000 yearly.

In the beginning, there was almost impossible to observe sure spawning nests of brown trout in river or in its tributaries. Only in 2000 first successful count has been done, in coincidence with the first generation of wild trout fry released being four years old (3⁺). Despite this, almost each year places of possible spawning were cleaned by pressure washing machine to make gravel devoid of fines, which makes natural survival rate higher.

Position of brown trout has been found visibly improving in whole system in (Mikołajczyk, 2003). At present, the number of trout is between 50 to 3750 per one longitudinal kilometer of tributary or river.

Table 1. Brown trout fry release, spawning nests count and spawning grounds cleaning in Raba 3

Year:	1997	1998	1999	2000	2001	2002
Trout fry released:	35575	102052	73900	56866	79907	55895
Trout eggs buried in gravel or used in temporary incubators:	0	77050	32650	33440	0	0
Nests count (estimated fry produced):	0	0	0	12 (6000)	112 (56000)	57* (28500)
Area of cleaned gravel, m ²	-	41	20	100	97	-

* – due to turbidity of water and sediment released by river regulating works most nests in the river could not be distinguished and counted in 2002

Salmon and seatrout

It is very hard to recognise if there is any production of seatrout smolt in the river, however, some small, silvery fish were always caught in Spring or Summer either by fishing rod or by electrofishing. Vicinity of reservoir makes some older trout to look like seatrout, and anglers declare seatrout catches. Extremely big spawners (over 3 kg) caught by electrofishing were recognised as brown trout.

Salmon fry was released in 2002 and 2003 in 10000 pcs portions. Its survival rate and growth are assumed to be satisfactory. Some salmon spawners were released in 2002 as well.

Grayling

Grayling was not present in Raba in 1994 and 1995 (Żurek, unpublished report 1994). Grayling fingerlings releases in 1996 and 1997 failed completely, and there were no attempts to stock the Raba river with extraneous fish. This resulted in gradual built up of grayling population, which in some locations (for example below Myślenice weir enriching the water with oxygen by about 1 ppm) reached 20 % of total grown (2⁺ and older) salmonid specimens. It is believed, that the local strain of grayling is either the original local strain or at least consists of specimens which are used to high Summer water temperature.

However, it has been noticed, that trout and grayling adopt themselves to high water temperatures not by organism adaptations but rather in behavioural way, by finding and knowing the places of lower water temperature or higher oxygen content, as for example tributary mouths, bottom springs, waterfalls. This kind of survival depends on the number of such places, thus become a limiting factor to grayling population in the same way as number of oasis limits survival of humans in the desert. Resultant population density will never be higher without changing the environment itself.

Table 2. Grayling fingerlings release, spawning pair count and anglers' declared catch of grayling in Raba 3 as compared with the number of days with water temperature above 26 °C

Year:	1996 & 97	1998	1999	2000	2001	2002
Grayling fingerlings released:	2000 & 2000	0	0	0	0	0
Spawning pair count:	0	0	0	0	10	0
Anglers' yearly declared catch	0	3	5	10	78	39
Number of days with water temperature above 26 °C	?	?	?	4 max 27,8°C	0 max 23,8°C	4 max 26,9°C

Warmwater species

Chub, roach and barbling (spotted barbel) are three species rewarding from high water temperature in Summer, while other characteristic barbel region species as sculpin and barbel are gone or as nose carp rare. Extremely good feeding and spawning conditions make Summer populations numerous and widespread, while low water temperature and high density of fish in Winter refuges spread diseases. Less advantageous fish, as dace, bleak, gudgeon or spirling are exposed to the disease spread without possibility to compensate it by greater number of survivors. Incidentally, electrofishing by which control over *erythrodermatitis* was undertaken maintained the equilibrium in species and specimen number. More and more nose carp of all age is visible in the river, and the room is made to receive offspring of any coming back sculpin or barbel. Dace and gudgeon are once again prolific and occupy first fast latter slow reaches of the river. Reducing of warmwater species has not reduced the anglers' catch of chub and nose carp.

Table 3. Electrofishing for warmwater species, anglers' declared catch of chub and nose carp

Year:	1997	1998	1999	2000	2001	2002
Warmwater species electrofishing	-	210 pcs 85 kg	1890 pcs 333 kg	9671 pcs 1275 kg	6314 pcs 574 kg	5423 pcs 469 kg
Bait anglers' yearly declared catch, chub	No bait angling allowed				127 pcs 37 kg	234 pcs 125 kg
Flyfishers' yearly declared catch, chub	35 pcs 14 kg	22 pcs 9 kg	81 pcs 35 kg	194 pcs 87 kg	331 pcs 122 kg	448 pcs 220 kg
Flyfishers' yearly declared catch, nose carp	-	1 pc 1 kg	2 pcs 2 kg	11 pcs 8 kg	39 pcs 21 kg	11 pcs 6 kg

Anglers' declared catch

To recover a refundable deposit an angler must return filled record, from which the number, species and length (tl) in cm of an angler's catch can be taken. This is entered into fishery register, which summarises number and mass of fish taken by species. Mass of fish of given species is calculated assuming average condition factor k to multiply third power of a fish length. This allows to report the number of anglers' outings, number and mass of fish caught for each reported species and period, and to make any other statistic.

For brown trout the assumed average growth within the season, that is between Winters, could be derived from data taken from scale samples collected from fishermen, because samples were gathered over the whole fishing season (Błachuta, Jeleński, 1981, Raba trout growth, unpublished). This allows to estimate most probable trout age by its length, which consequently can be used to evaluate the stocking success. The following table is used in Raba 3 to assume trout age.

Table 4. Most probable age of Raba trout assumed by its total length in cm (based on scale readings)

Raba brown trout age:	0 ⁺	1 ⁺	2 ⁺	3 ⁺	4 ⁺	5 ⁺	6 ⁺	7 ⁺	8 ⁺	9 ⁺	10 ⁺
Until the end of April:	3-4	5-15	16-21	22-26	27-31	32-36	37-41	42-46	47-51	52-56	57-61
May:	3-6	7-16	17-22	23-27	28-32	33-37	38-42	43-47	48-52	53-57	58-62
June:	3-8	9-17	18-23	24-28	29-33	34-38	39-43	44-48	49-53	54-58	59-63
July:	3-11	12-18	19-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64
August:	4-14	15-20	21-25	26-30	31-35	36-40	41-45	46-50	51-55	56-60	61-65
Till the end of year:	5-15	16-21	22-26	27-31	32-36	37-41	42-46	47-51	52-56	57-61	62-66

Using table 4 it was possible for example to establish the distribution and the dominant age of brown trout caught by fishermen in Raba. From 1997 to 2001 it was 4+, in 2002 it happened to be equally 3+ and 4+, whatever it meant.

Table 5. Fragment of a fishery report 2002: assumed age of brown trout according to the data from the anglers' declared catch

Brown Trout	2001		2002		1998		1999		2000	
Anglers' catch, by the age of the trout										
Born 1989									11+	1
Born 1990	11+	2								
Born 1991	10+	4			7+	2				
Born 1992	9+	7			6+	17	7+	3		
Born 1993	8+	4	9+	3	5+	56	6+	5	7+	2
Born 1994	7+	5	8+	1	4+	70	5+	44	6+	13
Born 1995	6+	22	7+	4	3+	26	4+	136	5+	33
Born 1996	5+	87	6+	11	2+	1	3+	37	4+	84
Born 1997	4+	219	5+	62					3+	33
Born 1998	3+	55	4+	159						
Born 1999	2+	1	3+	161						
Born 2000			2+	6						
Altogether:	406 pcs 154,9 kg		407 pcs 172,8 kg		172 pcs 61,8 kg		225 pcs 67,6 kg		166 pcs 57,4 kg	

4+ | **70** | - means the age and the number of generation dominant in anglers' catch

Evaluation of stocking success for sizeable fish (rainbow trout, salmon) given to anglers on "put & take" basis does not require the age of the fish to be estimated. Number or mass of fish stocked in the given year is simply compared with anglers' declared catch. Usually, the mass return rate is higher by few points.

It is not easy to find the statistic describing the angler's success (or fishery success) for "catch & release" anglers. It is even hard to explain to fishermen, why for example one is asking them to report number of outings. Presence of C&R anglers disturb the statistics, so despite the fact that they are welcome to the fishery, their reluctance to report anything unable them to be included in the report.

The following table shows some of fishery statistics. It is worth to notice, that the cold and rainy year 2001 was very good for wild fish (both brown trout and grayling), and that whole anglers increased visiting frequency has been filled with rainbow trout stocked for them in 2002. Stocking with rainbow trout seems not to be disturbing the gradual increase in brown trout catch. However, it is possible, that the river with its present limitations has a limited volume for wild fish living there for 4 to 5 years to be caught by anglers, thus the number of wild fish possible to be caught in that stretch might be limited to about 500 yearly. This again, asks for alternative solution: either number of fishing effort shall be decreased or "put & take" proportion shall be increased in fishery, to comply with anglers demand.

Table 6. Some angling and fishery statistics.

Year:	1997	1998	1999	2000	2001	2002
Number of flyfishers outings	688	887	1124	814	1547	2108
Average daily catch (salmonids only)	0,81	1,15	1,07	0,78	1,11	1,15
Brown trout number/average mass in kg	59 0,48 kg	172 0,36 kg	225 0,30 kg	166 0,35 kg	406 0,38 kg	407 0,42 kg
Brown trout as percent of all trout caught:	11,7 %	16,9 %	18,8 %	26,6 %	24,9 %	17,2 %
Rainbow trout number/average mass in kg	501 0,40 kg	844 0,43 kg	973 0,55 kg	456 0,57 kg	1226 0,51 kg	1969 0,52 kg
Rainbow trout return rate, number/mass %	19/19 %	33/36 %	29/34 %	19/22 %	30/35 %	40/42 %
Brook trout* number/average mass in kg	-	-	-	3 0,30 kg	1 0,30 kg	-
Grayling number/average mass in kg	-	3 0,44 kg	5 0,36 kg	10 0,33 kg	78 0,34 kg	39 0,42 kg
Sea trout & salmon** number/average mass in kg	-	-	-	-	-	3 & 1 1,65 kg

* - never stocked

** - 9 spawners stocked

Anglers' opinion

According to Jackowski, 2001, (unpublished diploma thesis) who questioned anglers visiting the fishery, most anglers were satisfied with stocking level, but they were complaining on poachers, low water, and garbage on the river banks. In 1983 and 1984 fly fishers were satisfied, when the average trout number caught was 0,5 per outing, while its average mass was 0,3 kg then (Jeleński, 1994). By this standards, fishery success is visible, but return rate for rainbow trout compared with that known from abroad (60 to 90 %) seems to be rather low.

Poachers keepers

The economy dictated, that the number of keepers was reduced in 2000 to one half-time person, who acts parallel as a guide and a fly tier. When they were working in a group, they were never able to prosecute successfully any of poachers met at the river, and the recovery rate for rainbows became gradually smaller. Money saved on their salaries financed many sets of simple fly fishing equipment (fishing rod, reel and line, plus chest-high rubber boots), which have been distributed among those locals, who decided legally fish in a fishery. They were obliged to have state fishing permission, and they have had to promise as well, that the value of the tackle should be given back in form of work for fishery. In this way more than twenty persons have had a chance to join legal fishermen, and they were the best source of workmanship to remove garbage from the river, to plant water weeds, to perform fish stocking or to clean gravel for spawning nests. Since 2000 recovery rate for rainbows jumped dramatically twice up, and it is now at the highest ever level.

Local people poaching seem to be pacified somehow, although this usually means, that some kind of promotion in tackle purchase or reduction in fishing permit price must be maintained longer than one year. Now, the poachers are coming from farther distances, but they must compete with local and regular fishermen.

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