
ICHTHYOLOGICAL SURVEY OF MORAVICE RIVER ABOVE THE SLEZSKÁ HARTA DAM

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ABSTRACT

In 2013 there was ichthyological survey of up-river Moravice above the Slezská Harta dam, the trout fishing district Moravice 7 and trout fishing district Moravice 8 carried out. The main topic of interest was cryophilic economically important fish species, mainly the brown trout (*Salmo trutta m. fario*) and grayling (*Thymallus thymallus*). In total, 6 localities were chosen for topographic data establishing and for carrying out the inventory ichthyological survey. Fish were caught by electrofishing generator – every locality were caught twice. Fish were determined, measured, weighed and released back into the stream. In total, 6 fish species and 1 lamprey species were caught. 397 brown trouts were caught, most of them (56%) reached the total length from 65 mm to 144 mm. 24 graynigs were caught, total length from 101 mm to 295 mm. Only 2 rainbow trout individuals were caught. Also presence of bullhead (20 individuals, total length of 43 - 117 mm) and alpine bullhead (75 individuals, total length of 54 - 122 mm) was detected. Abundance of fish community in particular localities has ranged from 1011 to 3859 individuals per hectare and biomass from 13 to 132 kg per hectare. Values of diversity index (H') ranged from 0.456 to 1.144, equitability (E) from 0.33 to 0.96. A_T coefficient varied due to locality from 0 % to 32.33 %.

Key words: Moravice river, population, *Salmo trutta m. fario*, *Thymallus thymallus*

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INTRODUCTION

Moravice river is the fourth largest stream in river Odra basin. It rises in Hrubý Jeseník at the altitude of 1134 m n. m. in Velký Kotel. From here it is flowing away southward and after 99.1 km it empties into Opava river at the altitude of 240 m n. m., right above the Opava city (<http://www.pod.cz/>). Detailed ichthyological surveys on Moravice river were organized under the management of Silesian study institute in Opava during 1946 – 1952 (HOCHMAN, 1957). Results of the surveys are published by KEMPŇY (1950), DYK (1950 – 1952), DOBŠÍK *et* VEJMOLA (1953). Mostly professor Dyk dedicated himself to river survey in years 1950 – 1955 in fisheries and ichthyological respects. DOBŠÍK *et* LIBOSVÁRSKÝ (1953) summarized the results from the ichthyological survey on Moravice river carried out in 1953. Further surveys were carried out in 1954. Results were published by HOCHMAN (1957), BILÍK (1955), HOLAS (1955), JIRÁSEK (1956), TUČEK (1954), VEJMOLA (1954), ZYKMUND (1955). Next detailed ichthyological survey of Moravice river was carried out as late as under the auspices of Mendel University in Brno. The last survey was carried out in 2012 by Czech Fishing Union.

MATERIAL AND METHODS

At September 18th and 19th, 2013 there was detailed ichthyological survey of up-river Moravice above the Slezká Harta dam to the spring carried out. According to fishing districts classification, up-river Moravice fits the trout zone. It is divided in two zones – Moravice 7 (registration number 473 056) and Moravice 8 (473 057). Localities for ichthyological survey were the same as in the survey in 2004 and 2012. In total, 6 localities were chosen: 3 localities in trout zone Moravice 7 and 3 localities in trout zone Moravice 8. Coordinates of localities are presented in Tab.1. Ichthyological survey was realised by electrofishing generator Honda EX 1000 (230 V, 0,75 – 0,90 kW). Method of electrofishing was quantitative, by the repeated passing through the catching electrode in the whole wide of river bed in sections of 64 – 117 m length. Caught fish were determined. Total body length (TL), standard length (SL), body height and wide and weight was individually measured with economically important fish species as *Salmo trutta* m. *fario*, *Thymallus thymallus*, *Oncorhynchus mykiss*. Total number of caught individuals, total weight and total body length of the smallest and largest individual was recorded with *Cottus gobio*, *Cottus poecilopus* and *Rutilus rutilus*. Only presence was recorded with *Lampetra planeri*. From the plastic characteristics, only fitness was assessed at economically important species and abundance (individuals per hectare) and biomass (kg per hectare) of fish population was calculated for each locality. Quantity dominance, weight dominance, diversity index (H'), equitability (E) and A_T coefficient were calculated from species presence of caught individuals. Results were compared to ichthyological surveys in 2004 and 2012.

Tab. 1 Description of the location on the river Moravice

locality	GPS (WGS84)		length (m)	area (m ²)	altitude
	start	finish			
1. vzdutí	N 49 55,356 E 17 27,087	N 49 55,321 E 17 27,097	64	789,2	508
2. Břidličná - lesy	N 49 55,115 E 17 24,157	N 49 55,141 E 17 24,071	117	1147,1	525
3. Břidličná - most	N 49 54,745 E 17 22,217	N 49 54,745 E 17 22,217	61,78	409,5	531
4. Malá Šáhle	N 49 56,243 E 17 20,765	N 49 56,298 E 17 20,733	107,5	633	556
5. Dolní Moravice	N 49 59,508 E 17 19,114	N 49 59,537 E 17 19,067	82,2	537	617
6. Karlov	N 50 01,013 E 17 18,660	N 50 01,033 E 17 18,608	71,3	353	654

RESULT AND DISCUSSION

During the ichthyological survey of Moravice river 2013 totally 6 fish species (in 3 families) and 1 lamprey species were detected. List of the species and localities is in Tab. 2. During ichthyological survey carried out in fifties of twentieth century totally 10 fish species (*Salmo trutta m. fario*, *Thymallus thymallus*, *Oncorhynchus mykiss*, *Barbatula barbatula*, *Gobio gobio*, *Cottus gobio*, *Cottus poecilopus*, *Leuciscus cephalus*, *Chondrostoma nasus*, *Phoxinus phoxinus*) and 1 lamprey species (*Lampetra planeri*) in up-river Moravice (above Nová Pláň) were detected (HOCHMAN, 1957). Ichthyological surveys carried out in 2004, 2012 (non-published data) and 2013 had not confirmed the presence of *Barbatula barbatula*, *Gobio gobio*, *Leuciscus cephalus*, *Chondrostoma nasus* and *Phoxinus phoxinus* (SPURNÝ *et al.*, 2006). On the contrary, presence of *Rutilus rutilus* was confirmed in 2004 and 2013. In 2012 and 2013 presence of *Lampetra planeri* was recorded.

Tab. 2 The occurrence of fish species in the years 2004, 2012 and 2013

species	Locality 1			Locality 2			Locality 3			Locality 4			Locality 5			Locality 6			
	2004	2012	2013	2004	2012	2013	2004	2012	2013	2004	2012	2013	2004	2012	2013	2004	2012	2013	
<i>Salmo trutta m. fario</i>	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
<i>Thymallus thymallus</i>	X	—	—	X	—	—	X	X	—	X	—	—	—	—	—	—	—	—	—
<i>Oncorhynchus mykiss</i>	X	—	—	—	—	—	X	—	—	—	—	—	—	X	—	—	—	—	—
<i>Salvelinus fontinalis</i>	—	—	—	—	—	—	—	X	—	—	—	—	—	—	—	—	—	—	—
<i>Cottus gobio</i>	X	X	X	X	X	X	—	X	X	—	—	—	—	—	—	—	—	—	—
<i>Cottus poecilopus</i>	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
<i>Barbatula barbatula</i>	X	—	—	X	—	—	X	—	—	—	—	—	—	—	—	—	—	—	—
<i>Rutilus rutilus</i>	—	—	X	—	—	—	—	X	—	—	—	—	—	—	—	—	—	—	—
<i>Perca fluviatilis</i>	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
<i>Lampetra planeri</i>	—	X	X	—	X	—	—	—	—	—	—	—	—	—	—	X	—	—	—

Salmo trutta m. fario is an eudominant species in all of 6 localities of up-river Moravice. Total body length ranged due to locality from 65 mm (locality 2) to 330 mm (locality 1). Totally 397 *Salmo trutta m. fario* individuals were captured in all localities. The highest number was recorded on locality 3 (141 individuals) and the lowest on locality 6 (15 individuals). According to law no. 99/2004 code and implementing regulation no. 197/2004 code the smallest legal catch size of *Salmo trutta m. fario* is 25 cm. On each of 6 localities legal catch size is reached by 5% of individuals *Salmo trutta m. fario*. There was no *Salmo trutta m. fario* detected on localities 4 and 6 reaching the lowest legal catch size. On locality 2 there was the highest number of *Salmo trutta m. fario* individuals (16) reaching the lowest legal catch size detected. Population of *Salmo trutta m. fario* in Moravice river is created by juvenile individuals from 56%. These individuals reach maximal size of 14 cm. Second largest group of *Salmo trutta m. fario* is created in 39 % by individuals with size ranged from 15 cm to 24 cm. Distribution of *Salmo trutta m. fario* in the whole up-river Moravice is confirmed by DYK (1951). Based on the ichthyological survey in fifties of twentieth century, HOCHMAN (1957) confirms that *Salmo trutta m. fario* creates the sole population from spring to weir in Velká Štáhle. *Thymallus thymallus* is an eudominant species at locality no. 2 and subdominant species at locality no. 3. At the rest of localities there was no presence of this species detected. Total body length ranged due to locality from 101 mm (locality 2) to 295 mm (locality 2). At both localities 24 *Thymallus thymallus* individuals were caught. At locality 2 there were 18 *Thymallus thymallus* individuals caught. At locality 3 there were 6 *Thymallus thymallus* individuals caught. At both localities the individuals do not reach the lowest legal catch size of 30 cm. According to ichthyological surveys carried out in 2004, 2012 and 2013 the presence of *Thymallus thymallus* was detected at 3 localities. According to DYK (1952), original presence of *Thymallus thymallus* in Moravice river was to Karlov village (locality 6). According to HOLAS (1955) the presence of *Thymallus thymallus* was divided into two smaller sections due to building weirs on Moravice river. HOLAS (1955) and HOCHMAN (1957) describe remaining of *Thymallus thymallus* population only in the area from Velká Štáhle. The authors state the most abundant presence of *Thymallus thymallus* in Břidličná stream (responds with localities 2

and 3) and by the Valšov (responds to locality 1). HOLAS (1955) states that population of *Thymallus thymallus* had created 52% of fish stock. During the ichthyological survey in 2004 the population of *Thymallus thymallus* created 3,8 % (locality 2) and 1,68 % (locality 3) of fish community (SPURNÝ *et al.*, 2006). There was no presence of *Thymallus thymallus* recorded in 2012. In 2013, population of *Thymallus thymallus* created 18,8 % (locality 2) and 3,8 % (locality 3) of fish community (non-published data). During the ichthyological survey in 2013, there was also *Oncorhynchus mykiss* detected. This species was found only at locality 2 (size of individual 309 mm) and at locality 4 (size of individual 279 mm). Both individuals reached the lowest legal catch size of 25 cm. *Cottus gobio* is an eudominant species at locality 1 and, subdominant species at localities 2 and 3. Total body length ranges due to locality from 43 mm (locality 2) to 117 mm (locality 3). At three localities 20 individuals of *Cottus gobio* were captured (locality 1: 6 individuals; locality 2: 7 individuals; locality 3: 7 individuals). Population of *Cottus poecilopus* occurred at each of 6 localities of Moravice river. At localities 1, 4, 5 and 6 there is *Cottus poecilopus* an eudominant species. As subdominant the species is presented at localities 2 and 3. Total body length ranged due to locality from 54 mm (locality 3) to 122 mm (locality 5). At all localities there were totally 75 individuals of *Cottus poecilopus* caught. The highest number of *Cottus poecilopus* individuals was recorded at locality 6 (24 individuals) and the lowest at locality 3 (4 individuals). Ichthyological surveys in fifties of twentieth century established the presence of *Cottus gobio* and *Cottus poecilopus* (HOCHMAN, 1957). DYK (1951) confirmed that abundant presence of *Cottus gobio* begins from Velká Štáhle (responds with locality 3). During ichthyological survey in 2013 *Rutilus rutilus* was presented at locality 1 (2 individuals). At locality 1 there was also recorded 1 lamprey species *Lampetra planeri* in number of 3 individuals (1 adult and 2 ammocoete). DYK (1951) and DOBŠÍK *et VEJMOLA* (1953) confirmed the presence of *Lampetra planeri* also in the spring part of Moravice river. Based on the results of ichthyological surveys (2004, 2012 a 2013) the abundance (individuals per hectare) and biomass (kg per hectare) was calculated for each species (Tab. 3). Opposite to 2004, population of *Salmo trutta* m. *fario* shows increase in abundance and biomass (except locality 1) at localities 1, 2, 3 and 5 in 2013. Abundance and biomass of *Thymallus thymallus* have also increased at localities 2 and 3 towards 2013 opposite to 2004. The presence of *Oncorhynchus mykiss* is completely dependent on stocking. During ichthyological surveys 2012 and 2013 the presence of *Cottus gobio* at locality 3 was newly detected. At localities 1 and 2 there was decrease of biomass of *Cottus gobio* in 2013 detected comparing to 2004. Abundance and biomass of population of *Cottus poecilopus* have decreased at localities 2, 3, 5 and 6 towards 2013 comparing to 2004.

Tab. 3 Fish abundance and biomass in the years 2004, 2012 and 2013

species/locality	locality 1						locality 2						locality 3						locality 4						locality 5						locality 6						
	2004		2012		2013		2004		2012		2013		2004		2012		2013		2004		2012		2013		2004		2012		2013		2004		2012		2013		
abundance/biomass	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B			
<i>Salmo trutta</i> m. <i>fario</i>	200	16,6	311	?	355	12,2	565	50,7	1648	?	1064	66,3	476	74,4	3361	?	3443	107,7	841	44,0	5192	?	648	24,0	821	31,5	3796	?	931	39,6	2363	134,2	2505	?	425	12,3	
<i>Thymallus thymallus</i>	13	0,0				36,5	9,0				157	14,3	19	5,6			147	21,1																			
<i>Oncorhynchus mykiss</i>	6,5	1,4									9	3,2											16	4,0													
<i>Salvelinus fontinalis</i>												9,5	2,2																								
<i>Cottus gobio</i>	61	0,8	110	?	76	0,4	289	2,8	179	?	61	0,4		121	?	171	2,0																				
<i>Cottus poecilopus</i>	123	2,4	169	?	557	0,6	217	3,2	220	?	52	0,7	198	3,8	93	?	98	1,5	298	2,4	559	?	347	3,0	566	7,2	535	?	242	2,7	1704	17,2	1143	?	680	6,0	
<i>Barbus barbatula</i>	10	0,1					43	0,5					122	2,8																							
<i>Rutilus rutilus</i>					25	0,4																															
<i>Percu fluviatilis</i>																																			23,5	0,1	
Total	414	21,2	590	0	1013	13	1150	66	2047	0	1343	85	1253	105	3575	0	3859	132	1139	46	5751	0	1011	31	1387	39	4331	0	1173	42	4090	152	3648	0	1105	18,3	

Diversity index (the richness of species in community) was calculated according to Shanon and Weaver formula (1963). The diversity index was at locality 1: 1,144; locality 2: 0,733; locality 3: 0,457; locality 4: 0,717; locality 5: 0,509; locality 6: 0,666. The highest community diversity was on locality 1 (4 fish species and 1 lamprey species). The lowest community diversity was at locality 3 (4 fish species). The equitability (balance in community) was at locality 1: 0,71; locality 2: 0,45; locality 3: 0,33; locality 4: 0,65; locality 5: 0,73; locality 6: 0,96. According to equitability values

the mostly balanced fish community is at locality 6 and the least balanced community at locality 3. Also coefficient A_T was established. This coefficient expresses the weight percentage representation of fish reaching catch size in ichthyocenosis. Among these species in river Moravice belong only *Salmo trutta m. fario*, *Thymallus thymallus* and *Oncorhynchus mykiss*.

CONCLUSIONS

The presence of 6 fish species and 2 lamprey species in Moravice river was confirmed by ichthyological survey in 2013. Population of *Salmo trutta m. fario* should reach in the stream with this carrying capacity abundance of 700 – 1500 individuals per hectare (BARUŠ *et al.*, 1995). By this survey it was detected that this abundance is reached at localities 2, 3 and 5. Opposite to 2004, there was improvement of population of *Salmo trutta m. fario* (in 2004 required abundance was at localities 4 and 6.). An improvement of population condition also occurred with *Thymallus thymallus*. SPURNÝ (1998) states that average fish abundance in trout zones in Czech Republic reaches ca. 3300 individuals per hectare and biomass ca. 167 kg per hectare. During ichthyological survey in 2013 there was only 1 locality with this average values. There was increase of total abundance and biomass in 2013 comparing to 2004 at three localities. At three high-lying localities the total abundance and biomass of fish have decreased. According to A_T coefficient, strong improvement of populations occurred in 2013 compared to 2004. In 2004, A_T coefficient values ranged from 4,85 to 18,50 %, at locality 5 reached a zero value. In 2013 A_T coefficient values ranged from 8,48 to 32,33 %, at localities 5 and 6 reached zero value.

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