

<http://dx.doi.org/10.14798/72.3.741>

CODEN RIBAEG ISSN 1330-061X

SOCIAL, ECONOMIC, FISHERY AND CONSERVATIONAL ISSUES FEATURING FLY FISHING COMMUNITY IN SERBIA

Predrag Simonović^{1*}, Radmilo Pešić², Dubravka Škraba¹, Goran Grubić², Ana Tošić¹, Vera Nikolić¹

¹ University of Belgrade, Faculty of Biology, Studentski trg 16, 11000 Belgrade, Serbia

² University of Belgrade, Faculty of Agriculture, Nemanjina 6, 11080 Belgrade, Serbia

* Corresponding Author, E-mail: pedja@bio.bg.ac.rs

ARTICLE INFO

Received: 4 March 2014

Received in revised form: 20 May 2014

Accepted: 20 May 2014

Available online: 22 May 2014

Keywords:

Fly fishermen

Education

Wealth

Residence

Skillfulness

ABSTRACT

Modern fly fishing, mainly for brown trout and grayling, has been done on a local scale and in low extensity in Serbia for over 50 years. Data obtained from 117 fly fishermen filling out an online questionnaire, with 30 questions processed using multivariate analysis, revealed that most fishermen who had started fly fishing since 2000 were under 40. Only few who were under 20 started to fish initially with the fly fishing equipment. They turned up committed to and skilled in fly fishing. Most of them live in large municipalities with much better economic opportunities. Their level of education is above average in Serbia. Economic power, place of residence and level of education outline their fishing capabilities, frequency of fishing outings, distance they travel to fly fish, as well as their attitudes towards fishery policy, conservation of native brown trout and grayling stocks, management of streams and communication with other fly fishermen.

INTRODUCTION

Though mentioned only as a transitional location which was swiftly passed in the trout fishing odyssey of Prosek (2003), Serbia has, in its mountain territory, both headwater streams and large tailwaters, homing brown trout *Samo* cf. *trutta* of two indigenous lineages *sensu* Bernatchez (2001): Danubian (*Da*) and Adriatic (*Ad*) in three drainages: Black Sea, Aegean Sea (Southern Serbia) and Adriatic Sea (South-western Serbia), as well as the Atlantic (*At*) brown trout introduced into the *Da* and *Ad* stocks. Serbia also homes a limited stock of European grayling *Thymallus thymallus* that belongs to the distinct Balkan lineage in the southernmost part of its dispersal area with only one isolated stock hitherto introduced there so far (Marić et al., 2011). In addition to the widespread brown trout mtDNA strains in both indigenous lineages, there are few narrowly distributed (Marić et al., 2006; Tošić et al., 2014). That uniqueness of Serbia in brown trout diversity was confirmed by the morphological investigations (Simonović et al., 2007) that assigned its south-eastern part as an area of the likely center of divergence of the *Ad* lineage from the ancestral *Da* lineage. Both non-indigenous strains of *At* and *Ad* lineages introduced and translocated respectively by stocking revealed strong invasive character (Simonović and Nikolić, 2009; Simonović et al., 2014). In contrast to its conservational value, the importance of

Serbia for its brown trout stocks in a fishery sense is much smaller. Fortunately, almost all headwater sections holding unique indigenous stocks of brown trout are not attractive for fly fishing, being only under small-to-moderate fishing pressure by local natives as traditional fishermen (i.e., poachers) who fish regardless of the limitations or even ban issued on brown trout fishing. A traditional brown trout fishing technique of natives which is using hairs from horse tail as line, a hazel tree rod and simple wet flies made of sewing thread and cock's neck feather tied on crude wire, resembles greatly contemporary fly fishing. However, there are no indicators that could reliably link the traditional fly fishing in Serbia to the contemporary one. Other traditional trout fishing techniques (e.g., hand-catching, netting, poisoning with mulleins *Verbascum* sp. and hemp *Cannabis* sp., stream bed drying by building weirs, etc.) testify to a long-term fishery utilization of brown trout stocks on the local scale.

Contemporary fly fishing in Serbia, a constituent part of the former Yugoslavia, was practiced to a small extent in the 20th century. In addition to a few brief reviews on fly fishing in publications introducing the recreational fishing in general, e.g., Klašterka (1976), Ripić (1977) and Ristić (1977), only few more authors in the recreational fishing journals (e.g., Božidar Voljč, Andrija Urban, Goran Grubić, Aleksandar Panić, etc.), and in fly tying publications, e.g.,

Hafner (1953), Petrović (1971, 1990), Merkaš (1990), covered fly fishing. Since 2000, the interest for fly fishing has increased, leading to the formation of small but recognizable fly fishermen's community and establishment of novel, exclusive fly fishing stretches at streams and rivers (e.g., Gradac and Djetinja streams in Western Serbia, Crni Timok, Mlava, Moravica and Jerma in Eastern and South-eastern Serbia, etc.). Recently, two major publications of Grubić and Panić (2002, 2010) addressed the entomology of fly fishing, fly tying techniques and presentation of various types of flies. Mainly the knowledge on fishing techniques and fly casting styles was adopted from various foreign sources.

The Environmental Agency of Serbia supplied the data on the number of angling licenses sold annually in Serbia in the last decade which varied from 58657 in 2001 to 104000 in 2002, and to 66722 in 2010 (Simonović et al., 2011). There are no data on the participation of fly fishermen in these figures, nor published estimation of their expenditure so far. Knuth (2010) reported that fly fishermen focused on trout species in the USA spent annually over USD 40 thousand million both on fishing (44%) and other, non-fishing-related expenses (56%). Considering that, it seems that an impact of fly fishermen in Serbia might also be remarkable. Following the USA 2006 National Survey (Anonymous, 2007), 27% of almost 30 million U.S. freshwater anglers (which is about 8.1 million) fished for trout. It is certain that the number of fly fishermen in Serbia is not even close to the proportion in the USA. They do not travel that much and that far to fly fish either. Considering the fact that they traditionally fly fish for mainly brown trout and European grayling, it seems that the majority is also very mobile. Therefore, traveling and lodging are obligatory additional expenses and proportionally greater than the expenses that other anglers usually have (e.g., licenses, baits, fishing equipment, etc.), rising thus the expenditures of fly fishermen. Fly fishermen hence might be a group of anglers with a disproportionately greater impact on economy than one might expect.

Since there was hitherto no report about fly fishing in Serbia, this paper aims to analyze certain general and specific social characters of fly fishermen, their economic capabilities and activities, as well as their judgments related to conservational and certain ethic issues. The analysis was accomplished exclusively on the basis of their own statements. This approach was considered the only one possible in a total lack of official data for such specific group of anglers.

MATERIALS AND METHODS

Assessment of fly fishermen characteristics in Serbia was accomplished using answers from the questionnaire in Serbian language which was available online to fly fishermen (Anonymous, 2012a) from 10 February to 10 March 2012. It was voluntarily filled out by 117 male fly fishermen

residing in the Republic of Serbia. In total, 30 questions (as translated in Table 1 and abbreviated as q in the text) were used for this research.

Answers were analyzed using the Multiple Correspondence Analysis in the Statistica Version 7 data analysis software system (StatSoft Inc., 2004) in order to investigate the link between various features of fly fishermen's questions addressed. Frequencies for particular answers in each group of questions served for interpretation of association patterns that were observed.

RESULTS

According to their answers to the questions considered one-by-one (Table 1), the largest proportion of fly fishermen in Serbia is between the age of 21 and 40 ($q1$: Age), with a great variety in general fishing experience ($q2$: Gen) but with a rather short fly fishing experience ($q3$: Ffexp). In spite of the latter, the majority considers themselves as very skilled ($q8$: Skl) in a fishing technique in majority considered more sophisticated and challenging than other fishing techniques ($q30$: Exc). Fly fishermen in Serbia fish dominantly for trout and/or grayling ($q14$: Dts), mostly more than twenty times a year ($q9$: Ann). Most fly fishermen use a variety of fly fishing techniques ($q13$: Fft) and tie their flies by themselves ($q18$: Of). The distribution of fly fishermen in Serbia seems correlated with the overall distribution of inhabitants, since Belgrade and Niš municipalities comprise a quarter of the total number, with the smallest numbers living in the Kosovo and Metochia Province ($q4$: Serb). The majority of fly fishermen are married or single, predominantly with a high school (i.e., medium) and university level of education ($q6$: Edu), their families being both supportive of their fly fishing and remarkably participating in it ($q23$: Sup). In comparison to the general population of Serbia (Anonymous, 2012b), the educational structure of fly fishermen is significantly higher ($\chi^2_{(5,2)} = 6.035.88$; $G_{(5,2)} = 4165.11$; $df = 4$; $p < 0.001$). Over 90% of fly fishermen consider their income either as average or less than average ($q7$: W), and two thirds travel either regularly or occasionally over 100 km to fly fish ($q10$: Trv), which is the proportion close to the frequency of trout and/or grayling stream distance from them ($q11$: Tgv). Almost two-thirds of fly fishermen feel greatly limited by their income in choosing their fly fishing equipment and destinations ($q21$: Inc), taking a good control of fly fishing expenses ($q22$: Bal). They are equally divided on the matter of fishing abroad ($q24$: Abr), being quite opposed in considering management and in evaluating attractiveness of trout streams in Serbia ($q12$: Aff). Although they are declaratively committed to conservation of trout streams from alien strains and species of trout fish ($q16$: Cons), this is not entirely accompanied by their readiness to involve actively and personally in supporting this ($q25$: Pi). Over two-thirds of fly fishermen advocate the unconditional Catch-and-Release ($q17$: C&R), considering in large proportion that barbed hooks

harm fish (*q19*: Mort), not necessarily adding remarkably to the success of their landing (*q20*: Land). They communicate rather well (*q26*: Com) and are aware of the fly fishing organizations in Serbia (*q27*: Org), predominantly through electronic communications, e.g. fly fishing web sites (*q28*: Vrt), and consider this adds to the improvement of their relationship to various issues included in the term “fishing culture” (*q29*: Cul).

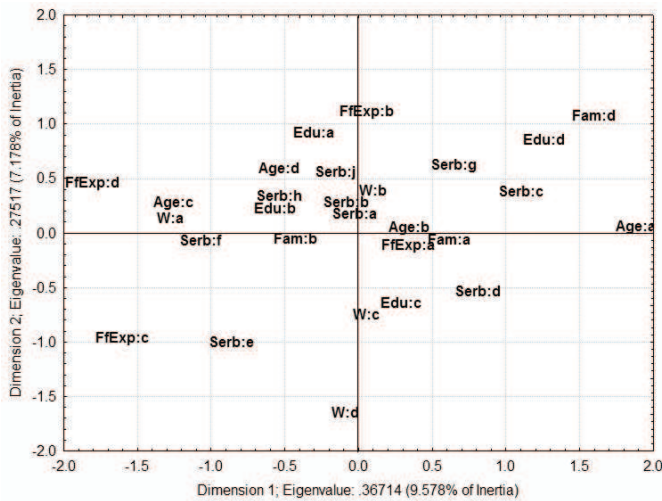


Fig 1. Association of general features (Age; Edu, level of education ; Fam, family status; Ffexp, fly fishing experience; Serb, region of Serbia; W, wealth) of fly fishermen in Serbia, as revealed using the Correspondence Analysis (states of each feature are available in Table 1)

The association of general features (e.g., wealth, education, family status, fly fishing experience and place of residence) of fly fishermen in Serbia (Figure 1) revealed that the majority under the age of 40 (Age:b) and over 60 (Age:d) has a university degree (Edu:a), consider themselves moderately wealthy (W:b), fly fish for either up to 20 years (Ffexp:b) or up to ten years (Ffexp:a), and are either single (Fam:a) or married and with children (Fam:b). They are most closely associated with the Vojvodina Province (Serb:a) and the Belgrade municipality (Serb:b), as well as with the Niš municipality (Serb:i) and Southern Serbia (h) as places of residence. A distinct group close to this majority comprise fly fishermen between the age of 41 and 60 (Age:c) from South-western Serbia (Serb:f) who have a higher level of education (Edu:b) and consider themselves wealthy (W:a). They fly fish for either over 20 (Ffexp:c) or over 30 years (Ffexp:d). Fly fishermen with a high-school (i.e., medium level) level of education (Edu:c) consider themselves to be of either below average wealth (W:c) or on the brink of poverty (W:d) but have fly fishing experience of over twenty or less than thirty years (Ffexp:c). They are closely associated to the Central (Serb:d) and Eastern (Serb:e). The youngest fly fishermen (Age:a) with the shortest fly fishing experience (Ffexp:a) are mainly situated in Western and Central Serbia, as well as in the Kosovo and Metochia Province. Their level

of education is elementary school (Edu:d) and they did not specify their family status (Fam:d).

In considering the features of fly fishing itself among fly fishermen in Serbia (Figure 2), the most prominent association occurs between warm-water fly fishermen who fish mainly for pike *Esox lucius* (Dts:d), zander *Sander lucioperca* and asp *Aspius aspius* (Dts:e) and use streamers (Fft:e) as a predominant type of fly (Figure 2, small insert, the left lower quadrant). Among the rest of the fly fishermen, (1) the most experienced fly fishermen (Ffexp:c and Ffexp:d) consider that streams and rivers in Serbia are not managed appropriately, being rather inconvenient for fly fishing (AFF:d) and do not intend to start fishing for a new fish species (Ios:b); (2) the beginners and those declaring an average skillfulness (Skl:c and Skl:b) who declare the shortest fly fishing experience (Ffexp:a), both buy (Of:c) and buy-and-tie (Of:b) flies for fishing and consider streams and rivers in Serbia, in which they fish, well-managed and convenient for fly fishing (AFF:a); (3) fly fishermen fishing predominantly for grayling (Dts:b) fish mainly using nymphs, wet flies and emergers (Fft:b); (4) the largest group of fly fishermen is the one with a fly fishing experience of less than 20 years (Ffexp:b) who tie their flies themselves (Of:a), only sometimes fly fish 100 km and more far away from home (AFF:b) at the fishing locations that are not close to all of them (Tgw:a and Tgw:b) for fishing trout (Dts:a), as well as trout and grayling (Dts:c), being sharply opposed to considering streams and rivers in Serbia either mainly appropriate enough for fly fishing (AFF:b) or mainly inappropriate (AFF:c) due to bad fishery management.

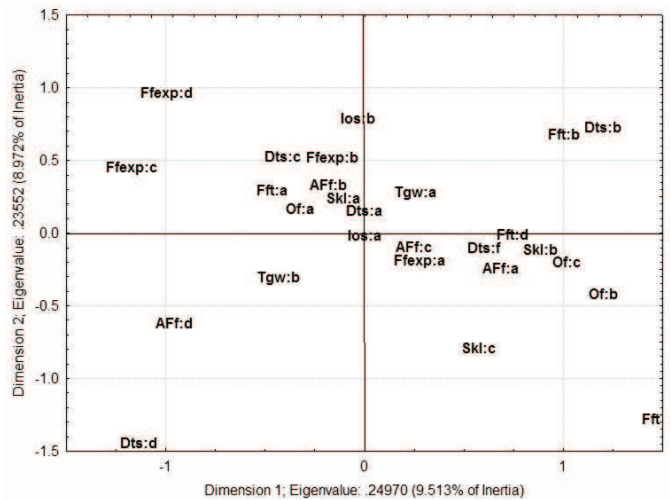


Fig 2. Association of fly fishing features (AFF, management and convenience of trout streams for fly fishing; Dts, predominant target fly fishing species; Ffexp, fly fishing experience; Fft, predominant fly fishing technique used; Ios, intention to fly fish for other species; Of, tying or buying flies; Skl, fly fishing skills; Tgw, closeness of trout or grayling stream) of fly fishermen in Serbia, as revealed using the Correspondence Analysis (states of each feature are available in Table 1)

Table 1. Questionnaire filled out online by 117 fly fishermen in Serbia between February and March 2012 (Abbr, abbreviations of the questions that were used in text and figures) and answers that the fly fishermen gave (n, number next to each answer denotes the frequency of fly fishermen choosing it; %, same as previous given in %)

No.	Abb.	Question	Answers	n	%
1	Age	Please choose your age group.	a. Under 20	5	4.39
			b. Under 40	79	67.54
			c. Under 60	32	27.19
			d. Over 60	1	0.88
2	Gen	How long have you been fishing?	a. Up to 10 years	19	16.24
			b. Up to 20 years	31	24.49
			c. Up to 30 years	39	33.33
			d. Over 30 years	28	23.93
3	Ffexp	How long have you been fly fishing?	a. Less than 10 years	78	66.67
			b. Less than 20 years	23	19.66
			c. Less than 30 years	10	8.54
			d. Over 30 years	6	5.13
4	Serb	What is your place of residence?	a. Vojvodina Province	8	6.83
			b. Belgrade Municipality	28	23.93
			c. Western Serbia	13	11.11
			d. Central Serbia	17	14.53
			e. Eastern Serbia	10	8.54
			f. South-western Serbia	12	10.26
			g. Kosovo & Metochia	5	4.27
			h. Southern Serbia	9	7.69
			i. Niš Municipality	15	12.82
5	Fam	Please choose your family status.	a. Single, no children (31.68)	37	31.62
			b. Married, without or with children (60.52)	71	60.68
			c. Divorced, with children (2.63)	3	2.56
			d. No record (5.33)	6	5.13
6	Edu	Please choose your highest level of education.	a. High (VII & VIII degree)	39	33.33
			b. Higher (V & VI degree)	19	16.24
			c. Medium (III & IV degree)	54	46.15
			d. Basic (I & II degree)	5	4.27
			e. No formal education	0	0.00
7	W	Please determine your own wealth.	a. Large	7	5.98
			b. Average	82	70.08
			c. Below average	25	21.37
			d. Barely surviving	3	2.56
8	Skl	Please assign your fly fishing skills.	a. Capable of matching fly fishing circumstances (i.e., skilled)	91	77.78
			b. Largely dependent on fly fishing circumstances (i.e., trainee)	13	11.11
			c. Complete beginner	13	11.11
9	Ann	How many times a year do you fly fish?	a. Up to five times	3	2.56
			b. Up to ten times	12	10.25
			c. Up to twenty times	17	14.53
			d. Over twenty times	85	72.65
10	Trv	Do you travel far (over 100 km) from your place of residence to fly fish?	a. Mainly yes	48	41.03
			b. Only sometimes	41	35.04
			c. Mainly no	28	23.93
11	Tgw	Is there any trout (or grayling) stream convenient for fly fishing close to your place of residence?	a. Yes	73	62.39
			b. No	44	37.61
12	Aff	Do you consider trout streams appropriately managed and convenient for fly fishing?	a. Yes, always	13	11.11
			b. Mainly yes	61	52.14
			c. Mainly no	36	30.77
			d. Not at all	7	5.98
13	Fft	Which fly fishing technique do you use most?	a. Various, depending on fishing circumstances	66	56.41
			b. Nymphs, wet flies and emergers	7	5.98
			c. Wet flies and emergers	1	0.85
			d. Dry flies and emergers	39	33.33
			e. Streamers	4	3.42
14	Dts	Which fish species have you used most to fly fish so far?	a. Trout	47	40.35
			b. Grayling	4	3.51
			c. Trout and grayling	33	28.10
			d. Pike	3	2.63
			e. Asp and zander	2	1.75
			f. Chub	28	23.73

Table 1. Continued

No.	Abb.	Question	Answers	n	%
15	Ios	Do you intend to fly fish for other fish species in time?	a. Yes b. No	106 11	90.35 9.65
16	Cons	Do you consider that conservation of indigenous strains and populations of trout, grayling and other fish species is at least equally important as the maintenance of fish stock size and abundance?	a. Yes b. No	105 12	89.53 10.47
17	C&R	Do you consider that Catch & Release must be unconditional and obligatory on trout and grayling streams?	a. Yes b. No	81 36	69.38 30.62
18	Of	Do you tie flies for fly fishing or buy them?	a. I tie my own flies b. I both tie my own and buy flies c. I buy flies	93 12 12	78.94 10.53 10.53
19	Mort	Do you consider that barbed hooks add remarkably to the mortality of caught and released fish?	a. Yes, for sure (41.23) b. No, for sure (29.82) c. I don't know and can't say (28.95)	48 35 34	41.23 29.82 28.95
20	Land	Do you consider that barbed hooks add remarkably to the likeliness of fish landing?	a. Yes, for sure (31.68) b. Not necessarily (54.45) c. I don't know (14.03)	37 64 16	31.62 54.70 13.67
21	Inc	Please choose which of the following describes best the relationship between your personal wealth and fly fishing?	a. My income limits me somewhat in choosing fly fishing equipment and destinations b. My income limits me greatly in choosing fly fishing equipment and destinations c. My income provides me full freedom in choosing fly fishing equipment and destinations	12 72 33	10.53 61.40 28.07
22	Bal	Are your expenditures for fly fishing equipment in correspondence with your income?	a. Completely yes b. Mainly yes, I buy more than I can afford only exceptionally c. Mainly no, I comply with cheaper equipment only if and when I have to d. Never, since only the best equipment provides the complete fly fishing pleasure	32 61 20 4	27.22 51.75 17.54 3.51
23	Sup	Do you have the support for fly fishing and companionship in the family?	a. I have both support and companionship b. I have support only c. I have no support at all, though I persist	26 75 16	21.93 64.03 14.03
24	Abr	Do you go abroad to fly fish?	a. Yes, often b. Only sometimes c. Mainly not d. Never	14 39 27 37	11.97 33.33 23.08 31.62
25	Pi	Would you personally get involved to support the ban of alien fish strain and species introduction, regardless whether they are attractive for fly fishing?	a. Yes, for sure b. No, for sure c. Don't know	48 38 31	41.23 32.45 26.31
26	Com	Do you have the opportunity to meet and communicate with other fly fishermen in your place of residence?	a. Yes, in fly fishing associations of various kinds b. Yes, at informal meetings and via private contacts c. No, only at fly fishing streams and rivers	35 61 21	29.82 51.75 18.42
27	Org	Do you know about any fly fishing meetings being organized in Serbia?	a. Yes b. No	91 26	78.07 21.93
28	Vrt	Do you participate in fly fishing web sites or similar online communities related to fly fishing?	a. Yes, in several, frequently b. Yes, in several, though seldom c. Yes, in few and seldom d. No	64 25 25 3	54.70 21.37 21.37 2.56
29	Cul	Do you find that electronic communications between fly fishermen and their meetings in person add to the fishing culture?	a. Yes, both electronic and face-to-face communication add to the fishing culture b. Only the face-to-face communication adds to the fishing culture c. None of the above is essential for upgrading the fishing culture of fly fishermen	108 3 6	92.31 2.56 5.13
30	Exc	Do you think that fly fishing is considered different from other kinds of fishing?	a. Yes, it is more sophisticated and more challenging than other kinds of fishing b. No, it is a fishing technique with both advantages and disadvantages in regard to fishing of particular fish species		63.25 36.75

The analysis of fly fishermen's features that include items related to economics revealed that they are evenly polarized for the majority of them (Figure 3). However, the majority of fly fishermen, regardless of the wealth they declare, state that they only exceptionally spend on fly fishing more than they can afford (Bal:b), fly fish annually over twenty times (Ann:d), consider streams and rivers they fish either mainly appropriate (i.e., well managed) for fly fishing (Aff:b) or mainly inappropriate (Aff:c), and have their family's consent for their way of recreation (Sup:b). Fly fishermen who declared themselves as wealthy (W:a) and of average wealth (W:b), have a university (Edu:a) or higher (Edu:b) level of education, are mainly married (Fam:b) or divorced (Fam:c), and have both their family's support and companionship in fly fishing (Sup:a). They have extensive fishing experience (Gen:c,d), though the majority has fly fishing experience of 11 to 20 years (Ffexp:b), whereas a smaller percentage is more experienced in fly fishing (Ffexp:c,d). They mainly consider the distant (Trv:a), often abroad (Abr:a,b) trout and grayling streams and rivers, they fish up to five (Ann:a) or up to ten times (Ann:b) a year in lack of sites close to their place of residence (Tgw:b) properly managed and convenient for fly fishing (Aff:a). The majority considers that their income either somewhat (Inc:a) or greatly (Inc:b) limits them in covering fly fishing expenses, but they either completely (Bal:a) or mainly (Bal:b) manage to balance between their income and expenses, though a smaller percentage does not manage it well (Bal:d). Fly fishermen who declared to be of below average (W:c) or of very low (W:d) wealth are of mainly high-school (i.e., medium level) level of education (Edu:c), mainly single (Fam:a), without family support for fly fishing (Sup:c). They have up to 10 (Gen:a) or up to 20 years (Gen:b) of fishing experience and a short fly fishing experience (Ffexp:a). The majority travels only exceptionally (Trv:b) or does not travel far from their place of residence (Trv:c), only exceptionally (Abr:c) or never abroad (Abr:d). They fly fish up to twenty (Ann:c) times a year in trout and grayling streams situated nearby their homes (Tgv:a). They do not consider them appropriate for fly fishing at all (Aff:d). Their income provides them full freedom in exercising fly fishing (Inc:c), declaring that they used to spend for fly fishing more than they can afford (Bal:c). The most specific group of fly fishermen appears to be that of the elementary school level of education (Edu:d) who refused to declare their family status (Fam:d) with a greater percentage spending their income to fly fish with the best equipment for hedonistic reasons (Bal:d), almost exclusively not fly fishing abroad (Abr:c) and in majority evaluating Serbian waters, where they fish close (Tgv:a) to their homes, as inappropriate (Aff:d).

It seems that conservational and management policy-related issues for the majority of fly fishermen (Figure 4) are associated with their age, fly fishing experience and level of education. Thus, the largest proportion of fly fishermen who are between the age of 21 and 40 (Age:a), having less than 10 years of fly fishing experience (Ffexp:a) and of a

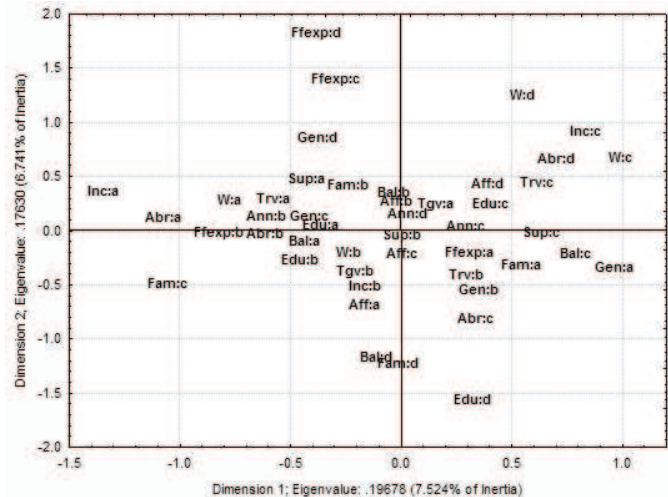


Fig 3. Association of social- and economics-related features (Abr, fly fishing abroad; Aff, management and convenience of trout streams for fly fishing; Ann, how many times fly fish a year; Bal, are fly fishing expenditures balanced to incomes; Edu, level of education; Fam, family status; Ffexp, fly fishing experience; Gen, fishing experience; Inc, relationships between incomes and fly fishing expenditures; Sup, family support for fly fishing; Trv, far travelling to fly fish; W, personal wealth) of fly fishermen in Serbia, as revealed using the Correspondence Analysis (states of each feature are available in Table 1)

lower level of education of high school (Edu:c) and elementary school (Edu:d), advocate unconditional Catch-and-Release (C&R:a). They mainly consider that barbed hooks add remarkably to the mortality of fish (Mort:a), as well as that barbed hooks influence the fish landing success (Land:a). They support the conservation of indigenous fish stocks (Cons:a), though they are in majority not sure whether they would involve personally in conservational activities that might adversely impact the fishing (Pi:c). The group of fly fishermen who are of the university level of education (Edu:a) are not associated with any particular age but with the fly fishing experience of 11 to 20 years (Ffexp:b). They in majority declare supportive of the conservational issues (Cons:a) and would involve personally in the support of a ban of alien fish strain and species introduction (Pi:a). While the majority was not determined whether barbed hooks add to the landing success (Land:c), a certain percentage considered that barbed hooks do not necessarily add to it (Land:b). They were in majority closer to the statement that Catch-and-Release does not need to be the obligatory mode of management on trout and grayling streams (C&R:b). The group of fly fishermen of the higher level of education (Edu:b) is mainly between the age of 41 and 60 (Age:c), and as for fly fishing experience, both between 21 and 30 years (Ffexp:c), with only a small proportion being of fly fishing experience over 30 years (Ffexp:d). The majority does not support unconditional Catch-and-Release in fish stock man-

agement (C&R:b) and does not give priority to the preservation of indigenous fish strains and species (Cons:b). They think barbed hooks add to the landing success (Land:a), as well as that they do not add remarkably to the mortality of hooked and released fish (Mort:b). The group of fly fishermen over 60 (Age:d) were not obviously associated with any of features related to the conservational issues at all, whereas those of the longest fly fishing experience (Ffexp:d) were sharply divided on this.

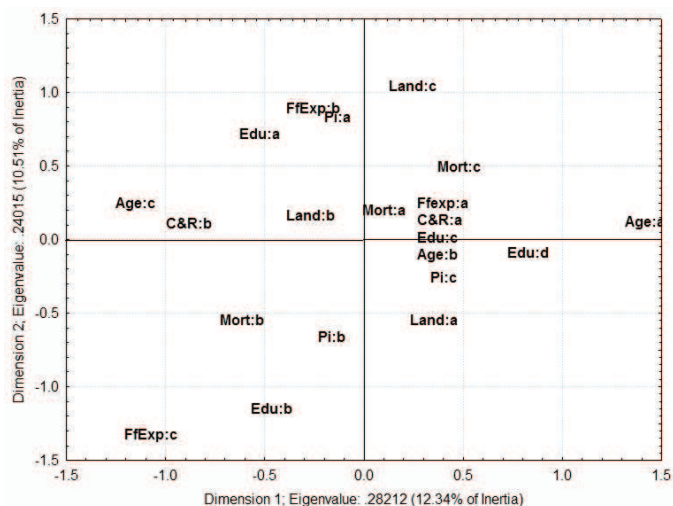


Fig 4. Association of conservation- and management-related features (Age; Cons, support for conservation of indigenous trout and grayling stocks; C&R, Catch-and-Release; Edu, level of education; Ffexp, fly fishing experience; Land, barbed hooks add to landing success; Mort, barbed hooks add to fish mortality; Pi, personal involvement in conservational activities regardless of impact on fly fishing) of fly fishermen in Serbia, as revealed using the Correspondence Analysis (states of each feature are available in Table 1)

Communication and organization in fly fishing community in Serbia (Figure 5) revealed that fly fishermen between the age of 41 and 60 (Age:c) of the university (Edu:a) and higher(Edu:b) level of education, who reside mainly in the Vojvodina Province (Serb:a), Belgrade (Serb:b) and Niš (Serb:j) municipalities, use the opportunity to communicate among each other in their places of residence (Com:a) and know about the existence of fly fishing organizations in Serbia (Org:a). They communicate using web pages either regularly (Vrt:a) or occasionally (Vrt:b), which they think adds to the fishing culture of fly fishermen, together with the face-to-face communication(Cul:a). They are polarized in considering fly fishing as an exclusive fishing technique (Exc:a; Exc:b). Fly fishermen between the age of 21 and 40 (Age:b), who have mainly a high-school (i.e, medium) level of education (Edu:c), consider fly fishing an exclusive fishing technique (Exc:a). Although they are familiar with fly fishing organizations in Serbia (Org:a), they do not have the opportunity to

communicate with other fly fishermen (Com:b) in their places of residence in South-western (Serb:f), Southern (Serb:h) and Central Serbia (Serb:d). The youngest fly fishermen under 20 (Age:a), who dominate in Eastern (Serb:e) and Western (Serb:c) Serbia, are not informed about fly fishing organizations in Serbia (Org:a) and communicate with other fly fishermen only on streams while fishing (Com:c), seldom participate in fly fishing web sites (Vrt:c) and consider that neither electronic nor face-to-face communication between fly fishermen add to their fishing culture (Cul:c). The oldest fly fishermen (Age:d), as well as those who have elementary school level of education (Edu:d), consider that only face-to-face communication between fly fishermen adds to their fishing culture (Cul:b) and do not use electronic means of communication (Vrt:d).

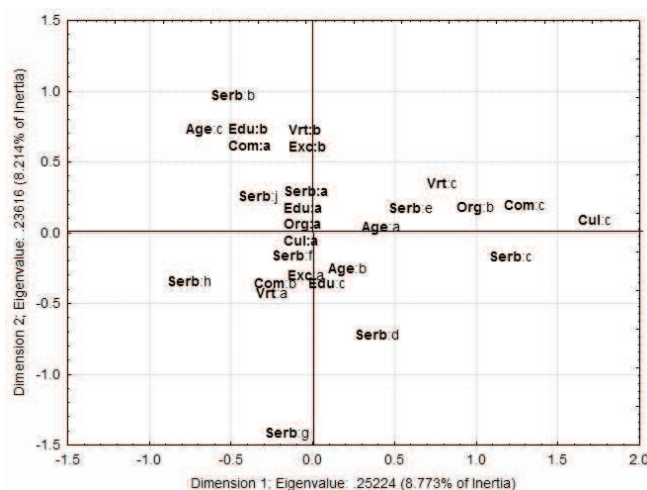


Fig 5. Association of features related to communication and organization (Age; Com, opportunity to meet with fly fishermen in the place of residence; Cul, fishing culture; Exc, fly fishing as exclusive fishing technique; Edu, level of education; Org, knowledge about organized fly fishermen's meetings; Serb, region of Serbia; Vrt, virtual communication) of fly fishermen in Serbia, as revealed using the Correspondence Analysis (states of each feature are available in Table 1)

DISCUSSION

It is likely that a drop of more than 35% in the number of angling licenses sold annually in the last decade in Serbia (Simonović et al., 2011) is a consequence of both adverse economic circumstances in that period and enforcement of management and control activities by fishery managers and state administration. That drop is not real in the sense of fishing pressure but only in the number of angling licenses sold, implicating a great proportion of illegal fishing. The proportion of anglers that varies between 1.05 and 1.46% of residents in Serbia is incomparably lesser than in the USA. Similarly, the number of fly fishermen in Serbia should not be approximated from the ratio (27% of freshwater anglers) Knuth (2010) reported to occur in the USA in 2006. A rough

estimate for Serbia could not exceed a figure of 1000 fly fishermen, which is at most 1% of all anglers. The decline in number of licensed fishermen in Serbia from 2000 to 2010 corresponds to the same trend occurring in the USA between 2006 and 2011, though it was much greater (i.e. of up to 40%) than in the USA, where that drop amounted to 15%. Since there is not even a rough estimate of fishing expenditures (either directly related or additional, non-fishing related), it is realistic that decline in expenditures in Serbia exceeds the drop in number of recorded licensed fishermen, considering that living standard measured by GDP per capita in Serbia (USD 11883) is much smaller than in the USA (USD 48112) (The World Bank Database).

The statements from the questionnaire that fly fishermen chose reveal a predominantly affirmative attitude for the topics the questionnaire addressed. Generally short fly fishing experience in the greatest group of fly fishermen between the age of 21 and 40 supports the statement that fly fishing has grown in popularity since 2000. In contrast to characteristics implying the fashionable attitude of fly fishermen (e.g., majority consider themselves skilled, more sophisticated and superior in knowledge than other anglers), certain features reveal their true commitment to and versatility in fly fishing (e.g., fly tying by themselves, use of various fly fishing techniques accordingly). The predominance in distribution of fly fishermen in large municipalities of Belgrade and Niš, as well as in Western and South-western Serbia, is coupled with the availability of fly fishing streams and traveling for fly fishing. The almost twice-as-many fly fishermen in Belgrade, the capital of Serbia distant from mountain regions, confirm that fly fishermen are a mobile kind of anglers who travel to fly fishing destinations. In the same time, all next three regions (Niš municipality, Central Serbia, Western Serbia), homing a lot of fly fishermen, are in a close vicinity of streams and rivers where they fly fish for trout and grayling but also for chub. The majority of fly fishermen are married and their families are supportive of their fishing. Records from questions, considered one-by-one, do not allow easy inferring the relationship between education, wealth and expenditures of fly fishermen, though it implies fly fishermen are in all those categories slightly above the average of the residents in Serbia, as well as they sustain and remain realistic in covering the demanding costs of their recreation. Fly fishermen are mainly both committed to and decisive in protection (e.g., in practicing Catch-and-Release (C&R) and advocating use of barbless hooks) and conservation of indigenous trout and grayling stocks of Serbia. They are well informed about the fly fishing community in Serbia, communicate among each other and look forward to the advancement of fishing culture among them.

Analysis of association between general social features and fly fishing revealed that the level of education has influence on the wealth of fly fishermen, as well as on the issues concerning the fly fishing itself. Fly fishermen who are either actively working or close to retirement and retired, who are well educated, married or bachelors, have the fishing ex-

perience of up to 10 or up to 20 years and consider themselves moderately wealthy (which implies they belong to the "middle class"). They reside in large municipalities of Belgrade and Niš and in the Vojvodina Province, which are the regions of Serbia with the highest level of economic activity. In 2009, according to Mijačić and Paunović (2011), regional disparities in Serbia were among the largest in Europe. If the national average was considered to be 100, regional GDP per capita in Belgrade was 179.4, in Vojvodina 95.2, in Central and Western Serbia 71.4, and in Southern and Eastern Serbia 63.3 (records for Kosovo and Metochia are not available). The prominent small group of older fly fishermen residing in South-western Serbia, who declared themselves as wealthy, were of higher level of education with very extensive fly fishing experience. They are mostly married, and a few divorced. The most numerous fly fishermen that are of a medium level of education, who are not wealthy and have an extensive fly fishing experience, are both married or bachelors, without the family support for fly fishing. They live mainly in Central and Eastern Serbia where the economic activity is much lower and they fish close to their places of residence up to 20 times a year. The youngest group of the shortest fly fishing experience resides in economically less developed regions of Western and Central Serbia, as well as in the Kosovo and Metochia Province. They are of the lowest level of education and they fish waters close to their places of residence, which they consider badly managed and inappropriate for fly fishing.

It is implied by the realism in the issues concerning the fly fishing that the majority of fly fishermen are strongly related to the fly fishing experience. They adapt to circumstance on the stream, being versatile in use of various types of flies which they tie on their own. Only few of those with the shortest fly fishing experience buy flies.

The relationship between age, general fishing and fly fishing experience of fly fishermen corroborated that majority of them started fly fishing after 2000. The most mobile group of fly fishermen is of the moderate fly fishing experience. Those who only occasionally travel far are sharply opposed in a matter of appropriateness of fly fishing streams of Serbia, whereas those with the shortest fly fishing experience not travelling far are affirmative about the management of trout and grayling streams of Serbia. Whereas the most experienced fly fishermen consider streams in Serbia badly managed and inconvenient for fly fishing. Those who fish abroad for trout and grayling up to five or ten times a year are strongly opposed in a matter of quality of streams for the fly fishing in Serbia to those who use to fish only in Serbia, close to their places of residence more than twenty times a year. There is a strong segregation between the two groups of specialists in fly fishing: ones who fish mainly for grayling using the subsurface flies (nymphs, wets and emergers) and those who fish for warm-water pike, asp and zander using streamers.

Despite the fact that they suffer because of limits their incomes impose, the vast majority of fly fishermen control

their expenditures, being awarded with their family's support for it. It is incongruent that fly fishermen with the lowest level of education, who declared themselves poor, buy the best available equipment for their complete joy in fly fishing, being not concerned about other (*inter alia*, family-related) implications of this attitude.

Voluntary C&R angling became widely accepted in managing recreational fisheries in 1970s (Barnhart and Roelofs, 1977; 1987), whereas the regulatory C&R was the legal protective measure providing the sustainability of fishery. Being introduced as a management tool for decrease of the real fishing pressure on fragile fish stocks, it was coupled with barbless hooks as a supportive means that adds to a decrease in mortality after the hooking, and encouraged as a sort of sportsmanship. The voluntary C&R has soon led to the confrontation with anglers who like to fish for food, as well as with those addressing various ethic aspects (Arlinghaus et al., 2007). Until 2000, trout fishermen in Serbia used to fish almost exclusively for fish as a food source, with pleasure being commonly accepted as an additional legitimate reason for angling, with the legal obligation of the regulatory release of undersized hooked fish only. Total C&R was introduced after 2000 as a regulatory measure for trout fisheries with a strong fishing pressure. The voluntary C&R was also adopted by fly fishermen as a sort of sportsmanship and awareness about the need for securing the sustainability of trout and grayling fishery. In contrast to the smallest group of the most experienced fly fishermen in Serbia who are sharply opposed in those matters and the small group of the oldest fly fishermen over 60 who are very diverse regarding voluntary C&R, barbless hooks and conservational activism, the largest group of fly fishermen with high school and elementary school levels of education, having the shortest fly fishing experience, is positive and uncompromising in statements related to the conservational issues, as well as voluntary C&R and utility of barbless hooks, in contrast to their uncertainty in supporting the conservational activities personally, if these would compromise fishing. Fly fishermen with a university degree are supportive, though much more compliant and ready to admit when they have no knowledge about certain issues, advocating and, in majority, readily supporting the conservation of indigenous stocks regardless of the impact on fishing, but being more reasonable and moderate concerning total C&R the use of barbless hooks in trout and grayling fishery. Fly fishermen of a higher level of education clearly stated they do not support unconditional (i.e., total) C&R and do not consider barbed hooks as adverse but useful for a more certain landing of hooked fish. The attitude towards the voluntary C&R in many societies in the world differs greatly, as reported by Policansky (2007). In Norway, it is generally not widely adopted, in Germany it is forbidden, Alaskan Inuits consider it as "playing with food", some people even see it as torturing landed fish, etc. In addition, when the voluntary C&R becomes the total and permanent C&R, in certain circumstances it can lead in time to adverse effects, e.g. overcrowding, decrease in growth,

drop of production, increase and selectivity in mortality. This might lead to a change in population structure due to the increase in abundance of older age classes, which might have a consequence in the shift of gender ratio toward females, loss of hierarchy and loss of reproductive fitness (Arlinghaus et al., 2007). Considering this, the difference between fly fishermen of different age and fishing experience in Serbia concerning voluntary C&R and barbless hooks is understandable, imposing a need for the tolerance of all fishery stakeholders towards that variety. The awareness of fly fishermen about the conservation of indigenous fish stocks seems a more general pattern, although only a minority with a university degree is ready to persist in it despite the compromising of fishing. The same group that strongly opposes the C&R and barbless hooks are reluctant in having a good fly fishing regardless of conservation of indigenous brown trout and grayling stocks.

The communication issues that characterize the fly fishing community in Serbia again revealed its dependence on age, level of education and the place of residence. Since 2006, several fly fishing web sites have been set up in Serbia. Each of web sites in Serbia hosts a lot (e.g., from 471 members sending 29308 posts at the <http://musicarenje.forum3.biz>, via 1028 members sending 62105 posts at the <http://www.musicarenje.com>, to 1531 members with the 100487 posts at the <http://www.musicarenje.org>) of fly fishermen. In addition to those web sites, the common language in the majority of Western Balkan countries gives great opportunities for communication with other fly fishermen in the region. Apart from electronic communications, there are only three fly fishing sections in the angling associations or clubs. Fly fishermen meet voluntarily there to consider various fly fishing topics and carry out other kinds of activities, e.g., dissipate fly tying materials originating from hunters, jointly purchase fly tying consumables, organize dinners with traditional dishes made by themselves, etc. Considering that frame, it is expected that a few oldest (over 60), as well as those in the group of the least educated fly fishermen, avoid communication on web sites. However, it is surprising that the youngest fly fishermen under 20 rarely communicate electronically, acknowledging only live communication with other fly fishermen on the fly fishing streams, though not considering that any kind of communication adds remarkably to the fishing culture. Fly fishermen under 40 and of high school level of education are resolute, like in issues related to C&R and barbless hooks, in advocating the exclusivity and advance of fly fishing in relation to other fishing techniques. Almost all fly fishermen know about fly fishing organizations but those who live in areas out of large municipalities, with proportionally small number of fly fishermen, have neither an organization close to them, nor opportunity to visit any. In contrast to them, the middle-age fly fishermen of between 41 and 60 communicate virtually but also by meeting each other, accepting both ways of communication. They are mainly of the high (university and higher) levels of education, residing in large municipalities. They are fairly divergent

in opinion about the exclusivity of fly fishing. It might seem as if this investigation encompassed many divergent topics that feature fly fishermen in Serbia. Moreover, the reliability of results might seem low from the proportion of variability (i.e., of the inertia from the Correspondent Axes) explained by this method. Replies that were obtained from the low number of fishermen who voluntarily accepted to fill out the online questionnaire should be considered preliminary until a more comprehensive study is done. At the moment, the design of investigation we applied targeting the fly fishermen community was the only possible one. Despite failures, we considered the research worth accomplishing since it brings to light the first survey of features that fly fishing community of Serbia is affected by. Each of the issues (economy, education, residence, general social features, conservation, management and communication) from this research remarkably segregates fly fishermen. As their dispersal by place of residence in Serbia roughly corresponds to the general dispersal pattern of citizens, it seems that attitude in the majority of fly fishermen corresponds to the level of economic activity in the region where they live. Judgments and attitudes reflecting the value system are also strongly associated with the level of education, age and fly fishing experience. This characterization should be kept in mind when addressing fly fishermen as stakeholders in the fishery policy of Serbia.

ACKNOWLEDGEMENTS

The research was supported by Grant 173025 of the Ministry of Education and Science of Serbia.

Sažetak

SOCIJALNE, EKONOMSKE, RIBARSTVENE I KONZERVACIJSKE ODLIKE MUŠIČARENJA U SRBIJI

Suvremeno mušičarenje, prije svega potočne pastve i lipljena, postoji više od 50 godina u Srbiji na lokalnom nivou i slabog je intenziteta. Podaci od 117 mušičara dobiveni anketiranjem upitnikom sastavljenim od 30 pitanja putem Interneta, analizirani multivarijatno, pokazali su da je većina onih koji su počeli mušičariti od 2000. godine starosti ispod 40 godina. Samo mali broj onih mlađih od 20 godina mušičari su od početka bavljena ribolovom. Svi anketirani pojedinci vrlo su posvećeni mušičarenju i posjeduju potrebne mušičarske vještine. Veliki dio njih živi u velikim gradovima gdje postoje bolje ekonomske mogućnosti. Njihov obrazovni nivo je iznad prosječnog u Srbiji. Ekonomska moć, mjesto stanovanja i obrazovni nivo određuju njihove mogućnosti za ribolov, učestalost odlaska na ribolov, daljinu na koju putuju radi ribolova, kao i njihove stavove prema ribarstvenoj politici, očuvanju autohtonih fondova

potočne pastve i lipljena, ribarstvenom upravljanju pastvskim i lipljenskim vodama i komunikaciji s drugim mušičarima.

Cljučne riječi: mušičari, obrazovanje, bogatstvo, mjesto stanovanja, mušičarska vještina

REFERENCES

- Anonymous (2007): 2006 National survey of fishing, hunting and wildlife-associated recreation. National Overview. U.S. Department of the Interior, U.S. Fish, Wildlife Service, Washington, D.C. 20 p.
- Anonymous (2012a): On-line set questionnaire for an assessment of fly fishermen characteristics. Available from: <https://docs.google.com/spreadsheet/viewform?formkey=dGUyam9LTnVaZG0xaHZTaHo0OGIUbm66MO>.
- Anonymous (2012b): Statistical yearbook of Serbia. Population aged 15 and over, by educational attainment, by census 2002. Statistical Office of the Republic of Serbia, Belgrade (in Serbian).
- Arlinghaus, R., Cooke, S. J., Lyman, J., Policansky, D., Schwab, A., Suski, C., Sutton, S. G., Thorstad, E. B. (2007): Understanding the complexity of catch-and-release in recreational fishing: an integrative synthesis of global knowledge from historical, ethical, social, and biological perspectives. *Reviews in Fisheries Science*, 15, 75-167.
- Barnhart, R., Roelofs, T. (1977): Catch-and-Release Fishing as a Management Tool. A National Sport Fishing Symposium. California Cooperative Fishery Research Unit, Humboldt State University, Arcata.
- Barnhart, R., Roelofs, T. (1987): Catch-and-Release Fishing: a decade of experience. A National Sport Fishing Symposium. California Cooperative Fishery Research Unit. Humboldt State University, Arcata.
- Bernatchez, L. (2001): The evolutionary history of brown trout (*Salmo trutta* L.) inferred from phylogeographic, nested clade, and mismatch analyses of mitochondrial DNA variation. *Evolution*, 55, 351-379.
- Grubić, G., Panić, A. (2002): Signs on the water [Znakovi na vodi]. Private Publication, Belgrade (in Serbian). 120 pp.
- Grubić, G., Panić, A. (2010): Tales about flies [Priče o mušicama]. Private Publication, Belgrade. 244 p. (in Serbian).
- Hafner, R. (1953): Sport fishing on freshwaters [Sportski ribolov na slatkim vodama]. Glas Slavonije, Osijek. 285 p. (In Serbo-Croatian).
- Klašterka, V. (1976): Sport fishing on rivers and lakes [Sportski ribolov na rekama i jezerima]. Nakladni zavod Znanje, Zagreb. 310 p. (In Serbo-Croatian).
- Knuth, B. (2010): People and trout: implications of social and economic trend for wild trout and associated habitats. In: Carline, R. F., LoSapio, C. (2010), *Conserving Wild Trout*. Proceedings of the Wild Trout X Symposium, Bozeman, MT, pp. 13 - 14.
- Marić, S., Sušnik, S., Simonović, P., Snoj, A. (2006): Phylo-

- geographic study of brown trout from Serbia, based on mitochondrial DNA control region analysis. *Genetique, Selection, Evolution*, 38, 411-430.
- Marić, S., Razpet, A., Nikolić, V., Simonović, P. (2011): Genetic differentiation of European grayling (*Thymallus thymallus*) populations in Serbia based on mitochondrial and nuclear DNA analyses. *Genetics Selection Evolution*, 43, 2.
- Merkaš, M. G. (1990): Lexicon of flies for fishing [Leksikon ribolovnih mušica]. ZOV, Beograd. 118 p. (In Serbo-Croatian).
- Mijačić, D., Paunović, B. (2011): Regional disparities in Serbia. *Ekonomika preduzeća*, 58, 379-389.
- Petrović, J. M. (1971): Fishing for trout and grayling [Ribolov pastrmke i lipljena]. Sportska knjiga, Beograd. 87 p. (In Serbo-Croatian).
- Petrović, J. M. (1990): Secrets of fly fishing [Tajne mušičarenja]. Svjetlost, Sarajevo. 176 p. (In Serbo-Croatian).
- Policansky, D. (2007): The good, bad and truly ugly of Catch and Release. In: Carline, R. F., LoSapio, C., Sustaining Wild Trout in a Changing World: What have we learned? Proceedings of the Wild Trout Symposium IX, West Yellowstone, MT, pp. 194-201.
- Prosek, J. (2003): Fly-fishing the 41st from Connecticut to Mongolia and home again: a fisherman odyssey. Harper Collins, New York. 336 p.
- Ripić, A. (1977): Practical book on sport fishing [Praktična knjiga o sportskom ribolovu]. BIGZ, Beograd. 177. p. (in Serbo-Croatian).
- Ristić, M. (1977): Fish and fishing in freshwaters [Ribe i ribolov u slatkim vodama]. Nolit, Beograd. 330. p. (in Serbo-Croatian).
- Simonović, P., Marić, S., Nikolić, V. (2007): Trout *Salmo* spp. complex in Serbia and adjacent regions of western Balkans: reconstruction of evolutionary history from external morphology. *Journal of Fish Biology*, 70 (Supplement C), 359-380.
- Simonović, P., Nikolić, V. (2009): Fisheries management for the sustainable utilization and conservation of aboriginal *Salmo cf. trutta* stocks in Serbia. COMBAFF – 1st Conference on Conservation and Management of Balkan Freshwater Fishes, Ohrid – Macedonia. Abstract Book, pp. 31 – 32.
- Simonović, P. D., Tošić, A., Škraba, D., Nikolić, V. (2011): Role of recreational trout fishing in development of rural mountain areas of Serbia [Uloga rekreativnog pastrmskog ribolova u razvoju planinskih područja Srbije]. In: Mihajlov, A. (2011), Environment for Europe EnE7: Sustainable Rural Development of Mountains. Proceedings of the Symposium, Belgrade, pp. 111-116 (in Serbian, with the summary in English).
- Simonović, P., Mrdak, D., Tošić, A., Škraba, D., Grujić, S., Nikolić, V. (2014): Adverse effects of stocking with brood fish to management with resident stream dwelling brown trout *Salmo cf. trutta* stock. *Journal of Fisheries Sciences*, 8, 139-152.
- StatSoft, Inc. (2004): STATISTICA (data analysis software system), version 7. www.statsoft.com.
- Tošić, A., Škraba, D., Nikolić, V., Mrdak, D., Simonović, P. (2014): New mitochondrial DNA haplotype of brown trout *Salmo trutta* L. from Crni Timok drainage area in Serbia. *Turkish Journal of Fisheries and Aquatic Sciences*, 14, 37-42.
- World Development Indicators database, World Bank (2012): From http://databank.worldbank.org/data/views/variableselection/selectvariables.aspx?source=world-development-indicators#c_s. Accessed: 30 December 2012.