

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

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ABSTRACT

Modern fly fishing mainly for brown trout and grayling occurs on a local scale and in low extensity for more than 50 years in Serbia. Data from 117 fly fishermen obtained using the on-line set questionnaire with the 30 questions processed using multivariate analysis revealed that majority of them who started with fly fishing since 2000 are in age under 40. Only few of them under the age of 20 started to fish initially with the fly fishing equipment. They turn up committed to and skilled in fly fishing. The great proportion of them resides in large municipalities with the better economic opportunities. Their educational level is above the average in Serbia. Economic power, place of residence and education level 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 and swiftly passed location in the trout fishing odyssey of Prosek (2003), Serbia has in its mountain territory both headwater streams and large tailwaters, homing brown trout *Salmo* 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 so far isolated stock hitherto introduced there (Marić et al., 2011). In addition to the widespread brown trout mtDNA strains in both indigenous lineages, there are few of them narrowly distributed (Marić et al., 2006; Tošić et al., 2014). That uniqueness of Serbia in brown trout diversity was confirmed with 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, importance of Serbia for its brown trout stocks in a fishery sense is much lesser. Fortunately, almost all headwater sections holding unique indigenous stocks of brown trout are not attractive for fly fishing, being only under the small-to-moderate fishing pressure by local natives as traditional fishermen (i.e., poachers), who fish regardless the limitations, or even ban issued on brown trout fishing there. Traditional brown trout fishing technique of natives that use hairs from horse tail as line, a hazel tree rod and simple wet flies made of sewing thread and cock neck's feather tied on crude wire resembles greatly to modern fly fishing. Though, there are no indicators that could reliably tie traditional fly fishing in Serbia with the modern one. Certain 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 about the long-term fishery utilization of brown trout stocks on the local scale.

Contemporary fly fishing in Serbia, a constituent part of the former Yugoslavia until its crack, occurred in a small extent throughout the 20th century. In addition to few brief reviews of fly fishing in publications introducing to 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., Bozidar 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 increased, leading to the formation of still small, but recognizable fly fishermen community and of the 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.

Environmental Agency of Serbia supplied the record that number of angling licenses sold annually in Serbia in the last decade varied from 58657 in 2001 to 104000 in 2002 and to 66722 in 2010 (Simonović et al., 2011). There is no either any record about the participation of fly fishermen in those figures, or published estimation of their expenditure, so far. Knuth (2010) reported that fly fishing anglers focused on trout species in USA spend annually over 40 thousand million US\$ both through fishing- (44%) and other, non-fishing-related expenses (56%). Considering that, it seems that an impact of fly fishermen in Serbian range 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 very certain that the number of fly fishermen in Serbia is neither even close to the proportion occurring in the USA, nor they travel that much and far to fly fish. Considering that they traditionally fly fish mainly on brown trout and European grayling, it seems that majority of them are also very mobile. Therefore, traveling and lodging expenses are obligatory additional ones 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 the disproportionately greater impact on economy than one would expect.

Since there was hitherto no report about fly fishing in Serbia, this paper aims to analyze certain general and specific social character of fly fishermen, their economic capabilities and acting, as well as their judgments related to conservational and certain ethic issues. Analysis was accomplished exclusively after their own statements. That approach was considered the only one possible in a total lack of formal records for such specific group of anglers.

MATERIALS AND METHODS

Assessment of fly fishermen characteristics in Serbia was accomplished using answers from the questionnaire set in Serbian language that was available to fly fishermen on-line (Anonymous, 2012a) from 10 February to 10 March 2012. It was voluntarily filled by 117 male fly fishermen residing throughout of the Republic of Serbia. In total, 30 questions (as given 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 association between various features of fly fishermen questions addressed. Frequencies for particular answers in each of group of questions served for interpretation of association patterns that were observed.

RESULTS

According to answers on the questions considered one-by-one (Table 1), the largest proportion of fly fishermen in Serbia is of age 21 – 40 (*q1*: Age), with the great variety in general fishing experience (*q2*: Gen), but with the rather short fly fishing experience (*q3*: Ffexp). In spite of the latter, the majority of them consider themselves very skilled (*q8*: Skl) in a fishing technique they in majority consider more sophisticated and demanding in knowledge than other fishing techniques (*q30*: Exc). Fly fishermen in Serbia dominantly use to fish trout and/or grayling (*q14*: Dts), doing that in majority more than twenty times in a year (*q9*: Ann). Most of 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 them, with the smallest number occurring in the Kosovo and Metochia Province (*q4*: Serb). Majority of fly fishermen are married, or single, predominantly with the high school (i.e., medium) and university education levels (*q6*: Edu), their families being both supportive for 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 better ($\chi^2_{(5,2)} = 6.035.88$; $G_{(5,2)} = 4165.11$; $df = 4$; $p < 0.001$). Over 90% of fly fishermen consider themselves either averagely, or less than that wealthy (*q7*: W) and two thirds of them use to travel either regularly, or occasionally over 100 km away to fly fish (*q10*: Trv), which is the proportion close to the frequency of trout and/or grayling stream distance to them (*q11*: Tgv). Almost two-thirds of fly fishermen feel greatly limited by their incomes in choosing their fly fishing equipment and destinations (*q21*: Inc), holding the good control on fly fishing expenditures they make (*q22*: Bal). They are about equally divided on the matter of fishing abroad (*q24*: Abr), being pretty 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 followed by their readiness to involve actively and personally in supporting that (*q25*: Pi). Over two-thirds of fly fishermen advocate the unconditional Catch-and-Release (*q 17*: 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 among each other (*q26*: Com), being aware of the fly fishing organizations that occur in Serbia (*q27*: Org) predominantly from the electronic means, e.g., fly fishing web portals (*q28*: Vrt) and consider that adds to an improvement of their relationship to various issues contained in term of “fishing culture” (*q29*: Cul).

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

No.	Abb.	Question	Answers	n	%
1	Age	Please give your age.	a. Up to 20	5	4.39
			b. Up to 40	79	67.54
			c. Up to 60	32	27.19
			d. Over 60	1	0.88
2	Gen	How long do you fish?	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 do you fly fish?	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	In what region of Serbia do you reside?	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 sign 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 give your educational level.	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 esteem 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	SkI	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 do you fly fish in a year?		
		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 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 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 predominantly?		
		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 you used to fly fish predominantly, 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
15	Ios	Do you intend to fly fish other fish species in time?	a. Yes	106	90.35
			b. No	11	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 maintenance of fish stocks attractive for fishing by their size and abundance?	a. Yes	105	89.53
			b. No	12	10.47
17	C&R	Do you consider that Catch & Release must be unconditional and obligatory on trout and grayling streams?	a. Yes	81	69.38
			b. No	36	30.62
18	Of	Do you tie flies for fly fishing, or buy them:	a. I tie own flies	93	78.94
			b. I both tie own and buy flies	12	10.53
			c. I buy flies	12	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)	48	41.23
			b. No, for sure (29.82)	35	29.82
			c. I don't know and can't state (28.95)	34	28.95
20	Land	Do you consider that barbed hooks add remarkably to the likeliness of landing fish?	a. Yes, for sure (31.68)	37	31.62
			b. Not necessarily (54.45)	64	54.70
			c. I don't know (14.03)	16	13.67
21	Inc	Please denote the relationship between your personal wealth and fly fishing?	a. Incomes limit me somewhat in choosing fly fishing equipment and destinations	12	10.53
			b. Incomes greatly limit me in choosing fly fishing equipment and destinations	72	61.40
			c. Incomes provide me full freedom in choosing fly fishing equipment and destinations	33	28.07
22	Bal	Are your expenditures for fly fishing equipment in correspondence with your incomes?	a. Completely yes	32	27.22
			b. Mainly yes, I buy over my possibilities only exceptionally	61	51.75
			c. Mainly no, I comply with cheaper equipment only if and when I have to	20	17.54
			d. Never, since only the best equipment provides the complete fly fishing pleasure	4	3.51

23	Sup	Do you have the support for fly fishing and companionship in the family?	a. I have both support and companionship	26	21.93
			b. I have support only	75	64.03
			c. I have no support at all, though I persist	16	14.03
24	Abr	Do you go abroad to fly fish?	a. Yes, often	14	11.97
			b. Only sometimes	39	33.33
			c. Mainly not	27	23.08
			d. Never	37	31.62
25	Pi	Would you involve personally to support the ban of alien fish strain and species introduction, regardless they are attractive for fly fishing?	a. Yes, for sure	48	41.23
			b. No, for sure	38	32.45
			c. Don't know for sure	31	26.31
26	Com	Do you have an opportunity to meet and communicate with other fly fishermen in the place of residence?	a. Yes, in fly fishing associations of various kinds	35	29.82
			b. Yes, on informal meetings and private contacts	61	51.75
			c. No, only on fly fishing streams and rivers	21	18.42
27	Org	Do you know about any organized fly fishing meetings in Serbia?	a. Yes	91	78.07
			b. No	26	21.93
28	Vrt	Do you participate on fly fishing web portals, or similar virtual groups related to fly fishing?	a. Yes, on several, frequently	64	54.70
			b. Yes, on several, though seldom	25	21.37
			c. Yes, on few and seldom	25	21.37
			d. No	3	2.56
29	Cul	Do you find that electronic communication between fly fishermen and their meetings add to their fishing culture?	a. Yes, both electronic and real communication add to their fishing culture	108	92.31
			b. Only the real communication adds to their fishing culture	3	2.56
			c. None of them is essential for upgrading the fishing culture in fly fishermen	6	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 demanding in knowledge than other kinds of fishing		63.25
			b. No, that is the fishing technique with advantages and disadvantages in regard to fishing of particular fish species		36.75

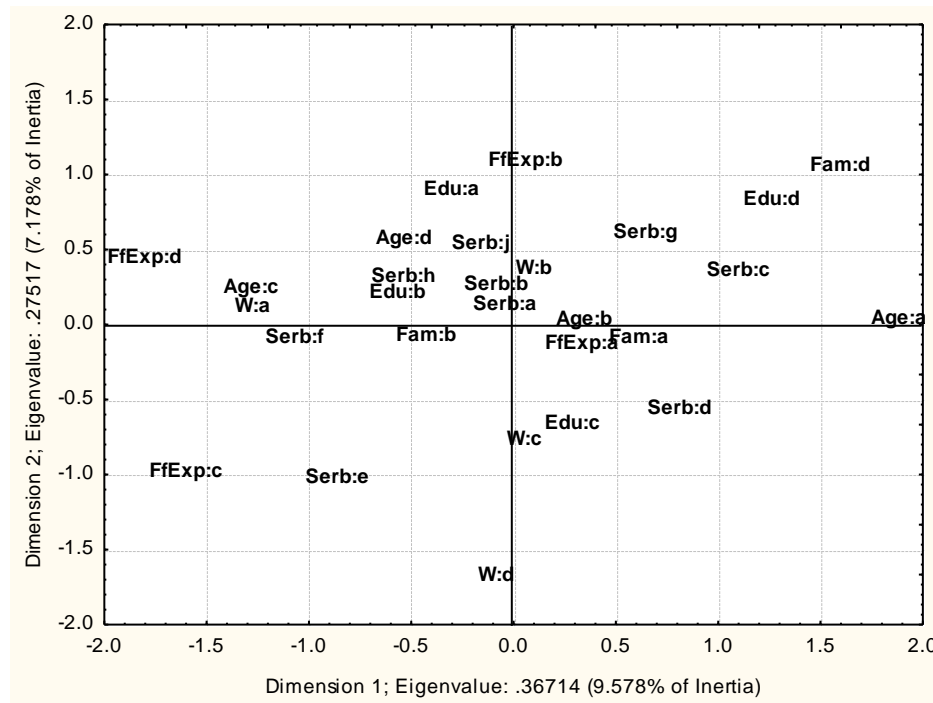


Fig 1. Association of general features (Age; Edu, education level; Fam, family status; Ffexp, fly fishing experience; Serb, region of Serbia; W, wealth) of fly fishermen in Serbia, as revealed using the Correspondence Analysis (states of each feature are available in Table 1)

The association of general features (e.g., wealth, education, family status, fly fishing experience and place of residing) of fly fishermen in Serbia (Figure 1) revealed that majority of them of age up to 40 (Age:b) and over 60 (Age:d) have university education (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 the most closely associated with the Vojvodina Province (Serb:a) and the Belgrade municipality (Serb:b), as well as with the Niš municipality (Serb:j) and Southern Serbia (h) as places of residing. The pretty distinct group close to this majority comprise fly fishermen of the age of 41 – 60 (Age:c) from the South-western Serbia (Serb:f) who have the higher education (Edu:b) and consider themselves wealthy (W:a). They fly fish pretty long, either over 20 (Ffexp:c), or over 30 years (Ffexp:d). Fly fishermen with the high school (i.e., medium level) education (Edu:c) consider themselves of the wealth that is either below average (W:c), or at the limit of poverty (W:d), but have the fly fishing experience over twenty and 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 smallest fly fishing experience (Ffexp:a) are mainly situated in Western and Central Serbia, as well as in the Kosovo and Metochia Province. Their educational level is elementary school (Edu:d), and they did not declare specifically their family status (Fam:d).

In considering features of fly fishing itself in fly fishermen in Serbia (Figure 2), the most prominent association occurs between warm-water fly fishermen who fish mainly 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 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 at 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 greatest group of fly fishermen is that with the 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 away from home (AFf:b) to 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 in 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 on them.

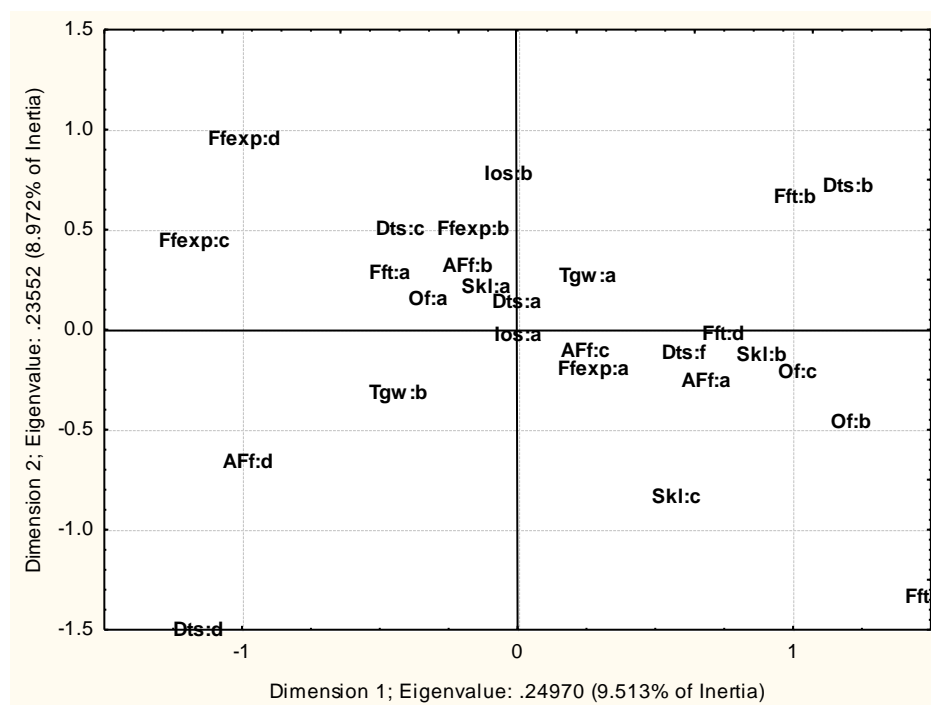


Fig 2. Association of fly fishing features (AFf, management and convenience of trout streams for fly fishing; Dts, predominant target fly fishing species; Ffexp, fly fishing experience; Fft, predominant fly fishing technique used; Ios, intention to fly fish other species; Of, tying or buying flies; Skl, 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)

The analysis of fly fishermen's features that include items related to economics revealed that they are evenly polarized for majority of them (Figure 3). However, majority of fly fishermen, regardless of the wealth they declare, state that they only exceptionally spend for fly fishing over their possibilities (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 (Axf:b), or mainly inappropriate (Aff:c) and have family consent for their way of recreation (Sup:b). Fly fishermen that declared wealthy (W:a) and of average wealth (W:b) have university (Edu:a) and one level below (Edu:b) education levels, are mainly married (Fam:b), or divorced (Fam:c) and have both family support and companionship in fly fishing (Sup:a). They have a long fishing experience (Gen:c,d), though majority of them have fly fishing experience between 11 and 20 years (Ffexp:b), whereas smaller proportion 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) in a year in a lack of those close to their reside (Tgw:b) properly managed and convenient for fly fishing (Aff:a). Majority of them consider that their incomes either somewhat (Inc:a) or greatly (Inc:b) limit them in covering costs of fly fishing, but they either completely (Bal:a), or mainly (Bal:b) keep the control to balance between their incomes and costs, though one smaller proportion of them does not manage that well (Bal:d). Fly fishermen that declared of below average (W:c), or very low (W:d).wealth are of mainly high school (i.e., medium level) education (Edu:c), mainly single (Fam:a), without family support for fly fishing (Sup:c). They have up to ten (Gen:a) or up to 20 years (Gen:b) of fishing experience and short fly fishing experience (Ffexp:a). Majority of them travel only exceptionally (Trv:b), or do not travel far from their residing places (Trv:c), only exceptionally (Abr:c), or never abroad (Abr:d). They fly fish up to twenty (Ann:c) times in a year on trout and grayling streams situated nearby to their homes (Tgv:a). They consider them inappropriate for fly fishing at all (Aff:d). Their incomes provide them full freedom in accomplishing fly fishing (Inc:c), declaring that they use to spend for fly fishing over their capabilities (Bal:c). The most specific group of fly fishermen appears that of the elementary school education (Edu:d), who denied to declare family status (Fam:d), with the greater proportion of them spending incomes to fly fish with the best equipment for hedonistic reasons (Bal:d), almost exclusively not fly fishing abroad (Abr:c) and evaluating the in-country water they fish close (Tgv:a) to their homes in majority inappropriate (Aff:d).

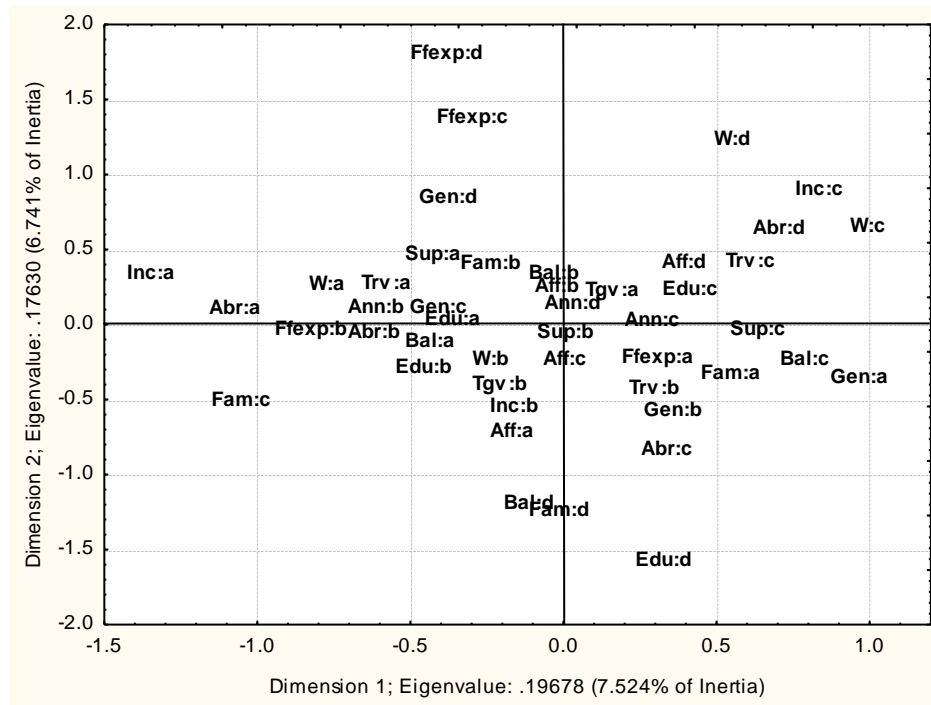


Fig 3. Association of social- and economics-related features (Abr, fly fishing abroad; Aff, management and convenience of trout streams for fly fishing; Ann, how many times fly fish in a year; Bal, are fly fishing expenditures balanced to incomes; Edu, education level; Fam, family status; Ffexp, fly fishing experience; Gen, fishing experience; Inc, relationships between incomes and fly fishing expenditures; Sup, family support for fly fishing; Trw, 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)

It seems that conservational and management policy-related issues in majority of fly fishermen (Figure 4) are associated with their age, fly fishing experience and education level. Thus, the largest proportion of fly fishermen who are of age between 21 and 40 (Age:a), of the fly fishing experience less than 10 years (Ffexp:a) and of the lower education levels 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 education level (Edu:a) are not associated with any particular age, but with the fly fishing experience between 11 and 20 years (Ffexp:b). They in majority declare supportive to the conservational issues (Cons:a) and would involve personally in support of ban of alien fish strain and species introduction (Pi:a). While majority of them were not determined whether barbed hooks add to the landing success (Land:c), some proportion considered that barbed hooks do not necessarily add to it (Land:b). They were in majority closer to the statement that Catch-and-

Rerelease 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 education level (Edu:b) is mainly of the age between 41 and 60 (Age:c) and of the fly fishing experience both between 21 and 30 years (Ffexp:c), with only a small proportion being of the fly fishing experience over 30 years (Ffexp:d). Majority of them do not support unconditional Catch-and-Release in fish stock management (C&R:b) and do not give advance 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 they do not add remarkably to the mortality of hooked and released fish (Mort:b). The group of fly fishermen with the age over 60 (Age:d) were not obviously associated with any of features related to the conservational issues at all, whereas those of the greatest fly fishing experience (Ffexp:d) were sharply divided on that.

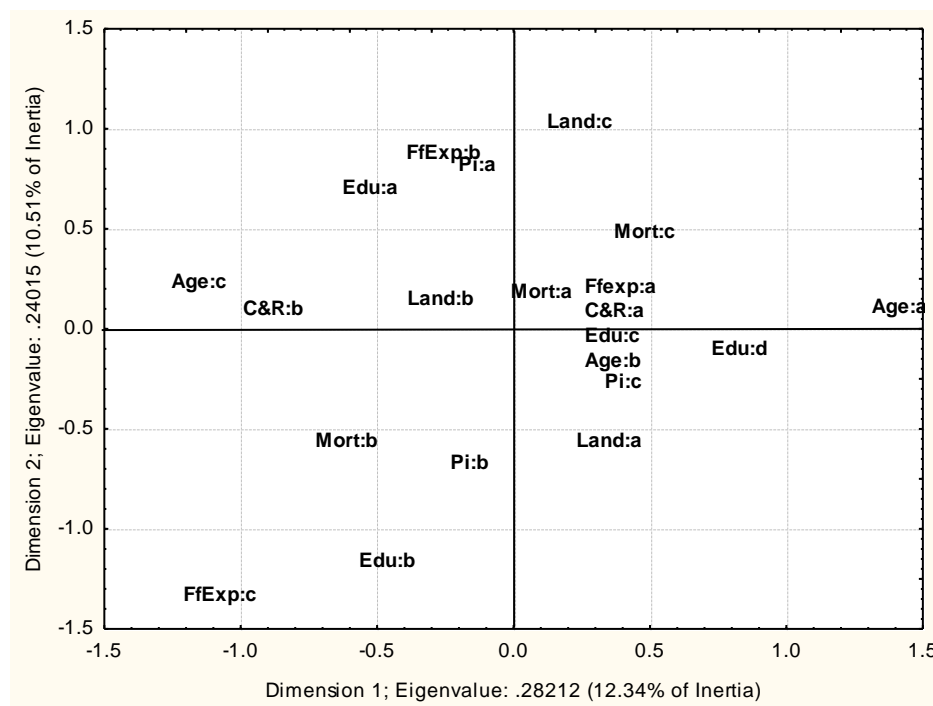


Fig 4. Association of conservation- and management-related features (Age; Cons, support for conservation of indigenous trout and grayling stocks; C&R, Catch-and-Release; Edu, education level; Ffexp, fly fishing experience; Land, barbed hooks add to landing success; Mort, barbed hooks add to fish mortality; 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 of age 41 – 60 (Age:c) of the university (Edu:a) and one below (Edu:b) education levels that 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 residing (Com:a) and know about an occurrence of fly fishing

organizations in Serbia (Org:a). They communicate using web portals either regularly (Vrt:a), or occasionally (Vrt:b), which they think adds to the fishing culture in fly fishermen, together with the real meeting of them (Cul:a). They are polarized in considering fly fishing an exclusive fishing technique (Exc:a; Exc:b). Fly fishermen of age 21 – 40 (Age:b), being mainly with the high school (i.e, medium) education level (Edu:c) consider fly fishing an exclusive fishing technique (Exc:a). Although they know about fly fishing organizations in Serbia (Org:a), they do not have an opportunity to communicate with other fly fishermen (Com:b) in their residing places in South-western (Serb:f), Southern (Serb:h) and Central Serbia (Serb:d). The youngest fly fishermen of age up to 20 (Age:a) that dominate in Eastern (Serb:e) and Western (Serb:c) Serbia are not informed about fly fishing organizations in Serbia (Org:a), communicate with other fly fishermen only on streams when fishing (Com:c), seldom participate on fly fishing web portals (Vrt:c) and consider that neither electronic, nor real communication between fly fishermen add to their fishing culture (Cul:c). The oldest fly fishermen (Age:d), as well as those with the elementary school education (Edu:d) consider that only real communication between fly fishermen adds to their fishing culture (Cul:b) and do not use electronic means of communication (Vrt:d).

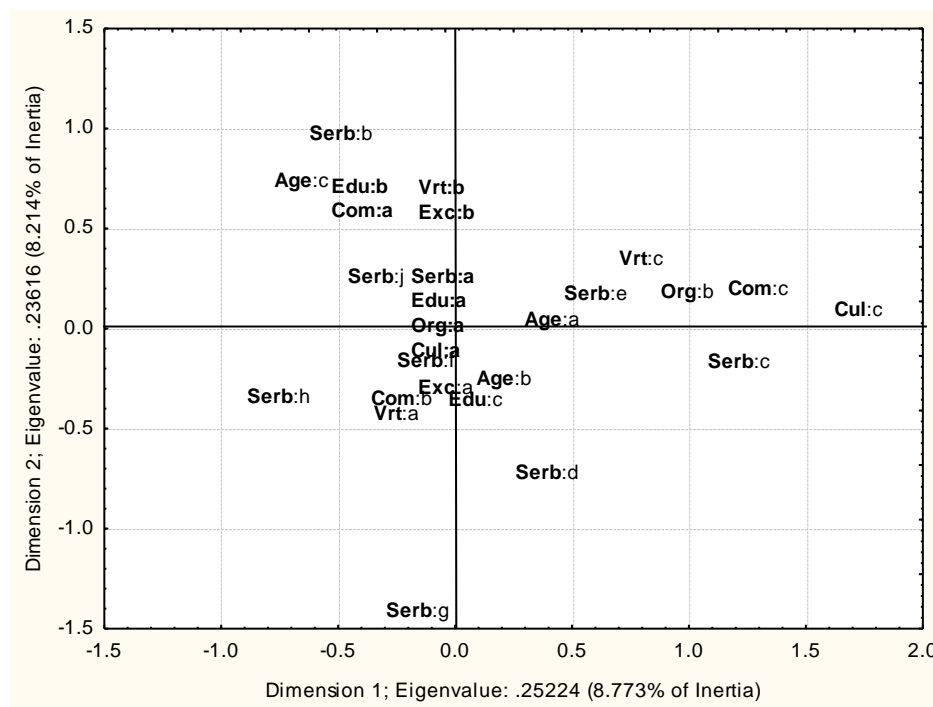


Fig 5. Association of features related to communication between and organization (Age; Com, opportunity to meet with fly fishermen in the residing place; Cul, fishing culture; Exc, fly fishing as exclusive fishing technique; Edu, education level; Org, knowledge about organized fly fishermen meetings; Serb, region of Serbia; Vrt, web 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 drop of more than 35% in 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 a sense of fishing pressure, but only in the number of angling licenses sold, implicating the great proportion of illegal fishing. The proportion of anglers that varies between 1.05 and 1.46% of residents in Serbia is incomparably less 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. The freest estimation 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 in the 2006 - 2011 period, though it was much greater (i.e. of up to 40%) than in the USA, where that drop amounted 15%. Since there is even no rough estimation 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 fishermen with license, considering that living standard measured by the per capita GDP in Serbia, 11883 USD, is much less than in the USA, 48112 USD (The World Bank Database).

Statements from the questionnaire that fly fishermen settled reveal a predominantly affirmative attitude for the topics questionnaire addressed. Generally short fly fishing experience in the greatest group of fly fishermen of the age of 21 – 40 supports the statement that fly fishing grew in popularity since 2000. In contrast to characteristics implying the fashionable attitude of fly fishermen (e.g., majority consider themselves skilled, as well 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-much fly fishermen in the Belgrade, a capital of Serbia distant from mountain regions confirms 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 the close vicinity of streams and rivers where they fly fish for trout and grayling, but also for chub. Majority of fly fishermen are married and their families are supportive for their fishing. Records from questions considered one-by-one do not allow easy inferring on 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 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 others and look forward to the advance in fishing culture among them.

Analysis of association between general social features and fly fishing revealed that educational level has an influence to the wealth of fly fishermen, as well as to 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 and bachelors, have the fishing experience up to ten, 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. According to Mijačić and Paunović (2011), in 2009 regional disparities in Serbia were among the largest in Europe. If the national average was considered to be 100, regional per capita GDP 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 the South-western Serbia who declared wealthy was of the higher education, very long fly fishing experience. They are mainly married with a few divorced among them. The most numerous fly fishermen that are of the medium-level education, who are not wealthy and have a long fly fishing experience are both married and bachelors, without the family support for fly fishing. They live mainly in Central and Eastern Serbia, where the economic activity is much lower, and fish close to their residing places up to 20 times in a year. The youngest group of the least 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 education level and they fish waters close to their residing places, which they consider badly managed and inappropriate for fly fishing.

It implies from the realism in issues concerning the fly fishing that 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 smallest fly fishing experience buy flies.

The relationship between age, general fishing and fly fishing experience in fly fishermen corroborated that majority of them started fly fishing after 2000. The group of the most mobile of them 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 smallest fly fishing experience not travelling far are affirmative about the management with 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 in 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-country, close to their residing places more than twenty times in a year. There is a strong segregation between two groups of specialists in fly fishing: ones who fish mainly grayling

using the subsurface flies (nymphs, wets and emergers), and those that fish warm-water pike, asp and zander using streamers.

Despite they suffer of limits that their incomes impose, the vast majority of fly fishermen keep the control over their expenditures, being awarded with the family support for that. It is incongruent that fly fishermen with the lowest education level who declared themselves poor buy the best available equipment for their complete joy in fly fishing, being not concerned about other (*inter alia*, the 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 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). Since 2000, trout fishermen in Serbia used to fish almost exclusively for fish as a food, with the pleasure they 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 on trout fisheries with the strong fishing pressure. The voluntary C&R was also adopted by fly fishermen as a sort of sportsmanship and of 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 oldest fly fishermen of age over 60 who are very diverse regarding voluntary C&R, barbless hooks and conservational activism, the greatest group of high school and elementary school educated fly fishermen with the shortest fly fishing experience is positive and uncompromising in statements related to the conservational issues, as well as in voluntary C&R and utility of barbless hooks, in contrast to their uncertainty in supporting the conservational activities personally if that would compromise fishing. University educated fly fishermen are supportive, though much more compliant and ready to admit when they have no knowledge about certain items, advocating and in majority readily supporting the conservation of indigenous stocks regardless of impact on fishing, but being more reasonable and moderate concerning total C&R and use of barbless hooks in trout and grayling fishery. Fly fishermen of the higher education level clearly state they do not support unconditional (i.e., total) C&R and do not consider barbed hooks adverse, but useful for the more certain landing of hooked fish. The attitude towards the voluntary C&R in many societies throughout the world differs greatly, as reported by Policansky (2007). E.g., in Norway, it is generally not widely adopted, in Germany is forbidden, in Alaskan Inuits is opposed as “playing with the 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 in time lead to adverse effects, e.g. overcrowding, decrease in growth, drop of production,

increase and selectivity in mortality. That might lead to the change in population structure by increase in abundance of older age classes that 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 that, 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 about the conservation of indigenous fish stocks in fly fishermen seems a more general pattern, although only a smaller part of them with the university education is ready to persist in that despite the compromising of fishing. The same group that strongly opposes to the C&R and barbless hooks are reluctant in having the 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, education level and on the area of residing. Since 2006, several fly fishing web portals were set up in Serbia. Each of portals 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 portals, the common language in majority of Western Balkans countries gives great opportunities for communication with other fly fishermen in the region. Apart of electronic communication, there are recently only three fly fishing sections in the angling associations or clubs. Fly fishermen in them meet voluntarily 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 realistic that few oldest (of age over 60), as well as those in the group of the least educated fly fishermen void communication by web portals. However, it is surprising that the youngest fly fishermen of age up to 20 rarely communicate electronically, acknowledging only the 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 of age up to 40 and of high school 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 great municipalities with proportionally small number of fly fishermen have no either organization close to them, or opportunity to visit any. In contrast to them, the middle-age fly fishermen between 41 and 60 communicate virtually, but likewise in a real way, by meeting each other, being positive for both ways of communication. They are mainly of the high (university and one below) education levels, residing in great municipalities. They are fairly divergent in opinion about the exclusivity of fly fishing.

It might look that this investigation encompassed many divergent topics that feature fly fishermen of Serbia. Moreover, the reliability of results might seem low form the

proportion of variability (i.e., of the inertia from the Correspondent Axes) explained by this method. Replies that were obtained from the pretty low number of fishermen who voluntarily accepted to fill the web-set questionnaire should be considered preliminary until the more comprehensive investigation. In this moment, that design of investigation we applied targeting the fly fishermen community was the only possible one. Despite of failures, we considered the research worth of accomplishment, since it brings at sight the first survey of features that fly fishing community of Serbia is affected of. 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 residing place in Serbia roughly corresponds to the general dispersal pattern of citizens, it seems that attitude in majority of fly fishermen correspond 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 education level, age and fly fishing experience. That characterization should be kept in mind on addressing fly fishermen as stakeholders in the fishery policy of Serbia.

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Sažetak

SOCIJALNE, EKONOMSKE, RIBARSTVENE I KONZERVACIJSKE ODLIKE MUŠIČARENJA U SRBIJI

Suvremeno mušičarenje, prije svega potočne pastrve 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 bavljenja 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 pastrve i lipljena, ribarstvenom upravljanju pastrvskim i lipljenskim vodama i komunikaciji s drugim mušičarima.

Ključne 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 pp.
- Anonymous (2012a): On-line set questionnaire for an assessment of fly fishermen characteristics. Available from: <https://docs.google.com/spreadsheets/viewform?formkey=dGUyam9LTnVaZG0xaHZTaHo0OGIUbm66MQ>.
- 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 (in Serbian). 244 pp.
- Hafner, R. (1953): Sport fishing on freshwaters [Sportski ribolov na slatkim vodama]. Glas Slavonije, Osijek. (In Serbo-Croatian). 285 pp.
- Klašterka, V. (1976): Sport fishing on rivers and lakes [Sportski ribolov na rekama i jezerima]. Nakladni zavod Znanje, Zagreb. (In Serbo-Croatian). 310 pp.
- 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): Phylogeographic 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 (In Serbo-Croatian). 118 pp.
- 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. (In Serbo-Croatian). 87 pp.
- Petrović, J. M. (1990): Secrets of fly fishing [Tajne mušičarenja]. Svjetlost, Sarajevo. (In Serbo-Croatian). 176 pp.
- 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 pp.
- Ripić, A. (1977): Practical book on sport fishing [Praktična knjiga o sportskom ribolovu]. BIGZ, Beograd (in Serbo-Croatian). 177 pp.
- Ristić, M. (1977): Fish and fishing in freshwaters [Ribe i ribolov u slatkim vodama]. Nolit, Beograd (in Serbo-Croatian). 330 pp.
- 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):
http://databank.worldbank.org/data/views/variableselection/selectvariables.aspx?source=world-development-indicators#c_s. Accessed: 30 December 2012.