Robert CZERNIAWSKI • Łukasz SŁUGOCKI •
Katarzyna DZIEWULSKA • Józef DOMAGAŁA

CANOEING AND ANGLING IN DRAWA RIVER DRAINAGE AS IMPORTANT ISSUES IN SPATIAL PLANNING: AN ECOSYSTEM SERVICES APPROACH

Robert **Czerniawski**, PhD • Łukasz **Sługocki**, MSc • Katarzyna **Dziewulska**, PhD •
Józef **Domagała**, Prof. PhD – *University of Szczecin*

Correspondence address:
University of Szczecin
Department of General Zoology
Felczaka 3c, 71–412 Szczecin, Poland
e-mail: czerniawski@univ.szczecin.pl

ABSTRACT: The analysis of ecosystem services in the Drawa River drainage with regard to canoeing and angling indicated that anglers found lake areas most attractive whereas canoeists preferred river sections. The use of the Drawa River only by the two branches (only the basic range) of economy and region development generates profit of at least 1.5 million PLN within one year. The aforementioned analysis excludes indirect costs which may be equal to or exceed the value obtained directly from the sale of angling licenses and canoe rentals.

KEY WORDS: canoeing, angling, cultural services, provisioning services

Introduction

Currently, angling belongs to one the most popular recreational activities internationally (Holmlund, Hammer 1999; Wrona, Guziur 2007; Rechulicz et al. 2014). Despite the fact that angling is classified as a cultural ecosystem services (CICES) (Haines-Young, Potschin, 2012) it can also be defined in terms of provisioning ecosystem services (angling as a method to obtain food). The significance of this activity is increasing with the economic development of the society because in developed countries people catching fish in this way have no need to obtain food to provide for families or for sale (Kapusta, 2015). It should be expected that the significance of angling will become greater with greater economic development of the society(Arlinghaus, 2006). Similarly, all forms of ecotourism enjoy great popularity, for example canoeing (cultural ecosystem services) which currently experiences progress in the whole of Poland (Czerniawski et al., 2013).

The Drawa River drainage belongs to the areas willingly visited by anglers and canoeists. In the past, it resulted in the establishment of two forms of nature conservation, namely the Drawienski National Park (DPN) and the Drawski Landscape Park. Despite effective restrictions, these areas are much desired by anglers and canoeists for amateur angling and canoeing. It might be assumed that, with a possible simultaneous increase in the number of anglers and canoeists and with the use of nature conservation measures taken in the areas encompassed by nature conservation laws, there might occur certain conflicts between the two groups of interest. A significant increase in the number of anglers and canoeists leads to decision-making in economy and nature conservation. In the case of the Drawa River drainage, the knowledge of angling and canoeing is particularly useful in economic undertakings and in spatial planning. Therefore, there is a need for estimation of ecosystem services value with regard to the two most popular leisure activities which are crucial branches of economy in the region. This also results from the demand from the local authorities and entrepreneurs for a thorough analysis of ecosystem services which may indicate the right direction in the development of cultural ecosystem services and, further, in the economy of the region. Therefore, conducting a survey to even partially demonstrate tentative differences in the evaluation of the two regional branches of economy in this valuable natural area was justified.

Methods

The estimation of ecosystem services value with regard to angling was performed in 2013 on the basis of the survey results from anglers belonging to the Polish Angling Association: Gorzów District, Koszalin District and Netze District. The survey was conducted on 390 anglers from thirteen groups of the Polish Angling Association (Czerniawski et al., 2015). Evaluation of the ecosystem services value with regard to canoeing was performed in 2012 on the basis of the results of 29 surveys on entrepreneurs who offered canoeing services in the whole Drawa River drainage (Czerniawski et al., 2013). Thus, the results of the present work are partially based on the result of the two aforementioned publications (Czerniawski et al., 2013; Czerniawski et al., 2015). However, they concern a completely different issue – evaluation of the ecosystem value with regard to angling and canoeing as opposed to the quoted publications which determined the degree of human pressure on the Drawa River ecosystems. The present work concerns the whole Drawa River drainage with division into sections: upper, middle and lower (figure 1). Studied region is classified as Lakelands according to landscape-ecological units (Mizgajski, Stępniewska, 2012).

Results

Evaluation and analysis of ecosystem services with regard to angling

In 2013 one statistical angler caught on average 80 kg and 307 fish in the Drawa River drainage. The biggest average weight and number of fish was caught by a statistical angler from the commune of Czaplinek – 172 kg and 974 fish whereas the smallest ones in the communes of Drawsko Pomorskie and Krzyż Kolejarz (table 1).

The anglers caught 22 fish species on the whole (table 2). The biggest number of fish species (20) was caught by anglers from the "Kolejarz" Group affiliated with the Polish Angling Association in Krzyż whereas the smallest number was caught by anglers from Kalisz Pomorski – 8 species. The species caught in every commune were bream, roach, perch, pike and tench. Bream and roach were caught in the biggest number by anglers from Czaplinek, perch by anglers from Złocieniec and pike and tench by anglers from Drawno.

Most frequently, the preferred species by an angler was the one which was caught as a record fish although there were some exceptions to the rule. The most preferred species were pike, bream and carp (Table 3). The species, as preferred ones, were selected by anglers from each commune.

Table 1. Mean and range of fish mass and number of fish caught by anglers from various areas of Drawa drainage

Area	Fish mass [kg]			Fish number [ind.]		
	Mean	Range		Średnia	Range	
		Min.	Max.		Min.	Max.
Połczyn Zdrój	52	6	99	140	25	392
Czaplinek	172	19	483	974	21	2220
Złocieniec	116	6	382	318	2	1220
Drawsko Pomorskie	32	14	51	103	39	181
Mirosławiec	73	14	246	302	21	940
Kalisz Pomorski	35	12	53	105	4	256
Drawno	100	24	330	194	61	754
Tuczno	93	20	303	425	30	1924
Człopa	86	26	184	360	45	1060
Bierzwnik	71	1	225	196	1	1031
Dobiegniew	123	24	253	646	54	1988
Krzyż Gmina	52	0	140	152	0	560
Krzyż Kolejarz	38	5	148	82	1	294

Source: (Czerniawski et al., 2015).

The analysis of the record fish indicates that more than 70% of anglers caught fish in waters located closest to their place of residence, within their communes where their fishing groups are based and it has to be presumed that anglers spend most of their time fishing close to their place of residence. The most attractive areas for anglers are areas with the biggest coverage of lakes, mainly in upper section of the Drawa River drainage. The most preferred species are pike, carp, like in other parts of Poland, that is species which require relatively great financial means due to the special equipment, fishing spot rental and purchase of baits (Wołos et al., 2001). However, the preferences were slightly different in two communes. The analysis of the value of the fish caught by anglers in the Drawa River drainage for one year is as follows. The survey indicates that one angler from one group of the Polish Angling Association catches 80 kg of fish on average. With prices ranging from 4 PLN for 1 kg of roach to 17 PLN for 1 kg of perch, the mean value for 1 kg of fish is 10.50 PLN. Thus, one statistical angler catches fish valued at 840 PLN. Assuming that one group of the Polish Angling Association has on average 100 members, in our group they catch fish valued at 84,000 PLN.

Table 2. Mean total mass of fish species [kg] caught by anglers from various areas of Drawa drainage

Fish species	Połczyn Zdrój	Czaplinek	Złocieniec	Drawsko Pomorskie	Mirosławiec	Kalisz Pomorski	Drawno	Tuczno	Człopa	Bierzwnik	Dobiegniew	Krzyż Gmina	Krzyż Kolejarz
Amur	7					9		1	1		12	2	2
Boleń												4	4
Brzana												4	5
Certa	5											4	2
Jaź		10										2	4
Karaś pospolity	5	8	4		5	3		5	4	10	3	4	3
Karp	8			1	1	7	5	2	2	10	3	9	4
Kleń					4		3	7	2			3	2
Krąp	2	37	9	3	5		8	17	6	25	49	12	8
Leszcz	10	69	47	12	24	8	20	38	35	13	22	12	5
Lin	2	4	2	2	7	2	26	7	5	7	6	3	3
Łosoś atlantycki	1												
Okoń	8	28	58	8	17	4	29	14	18	13	19	10	9
Płoć	17	73	38	7	23	15	19	20	23	31	24	16	15
Pstrąg potokowy	2				9		2		3		10		3
Sandacz	10		5	4	1		6	2	2		10	1	8
Sum europejski	4			3			12		1				7
Szczupak	6	18	23	6	7	8	31	12	9	13	15	10	6
Troć wędrowna			1										
Ukleja				2	3			1	1				1
Węgorz	1	1		1			3	1	1	4	3	3	3
Wzdręga	3	51	6	3	4		8	10	3	13	5	10	2

Source: (Czerniawski et al., 2015).

Table 3. The percentage points [%], which were received by fish species according to the anglers preferences

Fish species	Połczyn Zdrój	Czaplinek	Złocieniec	Drawsko Pomorskie	Mirosławiec	Kalisz Pomorski	Drawno	Tuczno	Człopa	Bierzwnik	Dobieg-niew	Krzyż Gmina	Krzyż Kolejarz	Total/ Łącznie
Amur						10					3		1	14
Brzana												3		3
Certa													4	4
Jaź	3											3	2	8
Karaś pospolity	1											3	1	5
Karp	14		3	3	1	22		2	1	5	8	10	6	75
Kleń	1	1										4	1	7
Krąp									4			1	2	7
Leszcz	18	15	6	16	12	9	13	20	24	29	6	32	32	232
Lin	18	3	6	3	12	17	12	2	4	20	3	4	8	112
Okoń	22	12	27	3	6	6	15	5	7	17	6	12	14	152
Płoć	7	3	1	1	2	2	1		2	1		17	16	53
Pstrąg potokowy	2				3	5			3		3	1	6	23
Sandacz	12	5	21	8	3	4	31	3	3	6	5	8	7	116
Sum europejski	5		10	3	1	3	10		2			4		38
Szczupak	32	16	28	16	23	8	34	25	27	33	6	16	25	289
Świnka	9													9
Węgorz	6	3		1	3	4	10	9		9	8	7	7	67

Source: (Czerniawski et al., 2015).

Multiplying this value by the number of groups of the Polish Angling Association which were surveyed in the Drawa River drainage, we receive the value of 1,176,000 PLN. However, the analysis excludes anglers outside the Drawa River drainage as well as ignores the costs associated with the service of anglers (angling licenses, accommodation, equipment, etc.). Thus, the value might be bigger. It has to be added that no special fishery functions on the Drawa River and probably in any natural stagnant waters, which would boost angling attractiveness of the region and relieve areas which are legally protected.

Evaluation and analysis of ecosystem services with regard to canoeing

The section that is most frequently selected for canoeing trips, regardless of the headquarters of a given company, is a section of the Drawa River located in the area of the Drawienski National Park (Table 4). This indicates great popularity of this section among tourists who choose this section regardless of the location of the company they use the services. In each part of the drainage, the companies also pointed to a section or a river which were most willingly selected only in their area. They did not repeat in other parts of the Drawa River drainage.

Table 4. Stretches of rivers in Drawa drainage which were most frequently chosen by tourists for canoeing

Stretch	Upper Drawa/ Górna Drawa	Middle Drawa/ Środkowa Drawa	Lower Drawa/ Dolna Drawa
Drawa: j. Drawsko-j.Wlk. Dębno	x	-	-
Drawa: j.Prostynia-j.Adamowo	-	x	-
Drawa: DPN	x	x	x
Korytnica: St.Korytnica-Bogdanka	-	x	x
Drawa: St.Osieczno-Krzyż	-	x	x
Mierzęcka Struga	-	-	x

Source: (Czerniawski et al., 2013).

In the whole Drawa River drainage, 83% of the interviewees noted that the section of the Drawa River located in the DPN was most willingly selected by tourists in July and August (table 5). In September, this section was selected by a smaller number of tourists, which is probably connected with the ban on trips down the Drawa River in the DPN section until the end of June. Another section which was indicated by the biggest number of the interviewees was the Korytnica River.

Table 5. Stretches of rivers in Drawa drainage which were most frequently chosen by tourists for canoeing regard to months [percentage of respondents]

Stretch	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
Total drainage/Zlewnia Drawy												
Drawa: j. Drawsko – j. Wlk. Dębno	-	0,7	2,8	11,4	35,0	35,0	35,0	35,0	35,0	11,4	-	-
Drawa: j.Prostynia – j. Adamowo	-	-	-	13,7	20,1	26,9	35,6	26,9	26,9	2,2	-	-
Drawa: DPN	0,6	-	-	-	-	-	83,0	83,0	65,0	20,0	3,5	0,6
Korytnica: St.Korytnica – Bogdanka	-	-	11,8	24,9	40,1	65,0	65,0	65,0	6,2	1,8	-	-
Drawa: St.Osieczno – Krzyż	5,0	5,0	11,2	20,0	20,0	20,0	22,2	22,2	20,0	20,0	5,0	-
Mierzęcka Struga	-	-	1,2	1,2	5,0	50,0	11,2	11,2	-	-	-	-
Upper Drawa/Górna Drawa												
Drawa: j. Drawsko – j. Wlk. Dębno	-	14,0	28,0	57,0	100,0	100,0	100,0	100,0	100,0	57,0	-	-
Drawa: DPN	-	-	-	-	-	-	71,0	71,0	-	-	-	-
Middle Drawa/Środkowa Drawa												
Drawa: j.Prostynia – j. Adamowo	-	-	-	55,0	67,0	7,0	89,0	77,0	77,0	22,0	-	-
Drawa: DPN	11,0	-	-	-	-	-	100,0	100,0	100,0	44,0	22,0	11,0
Korytnica: St.Korytnica-Bogdanka			11,0	33,0	67,0	77,0	89,0	77,0	77,0	22,0	-	-
Drawa: St.Osieczno – Krzyż	-	-	-	-	-	-	22,0	22,0	-	-	-	-
Lower Drawa/Dolna Drawa												
Drawa: DPN	-	-	-	-	-	-	100,0	100,0	100,0	75,0	25,0	-
Korytnica: St.Korytnica – Bogdanka	-	-	75,0	100,0	100,0	100,0	100,0	100,0	25,0	25,0	-	-
Drawa: St.Osieczno – Krzyż	50,0	50,0	75,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0	33,0	--
Mierzęcka Struga	-	-	25,0	25,0	50,0	50,0	75,0	75,0	-	-	-	-

Source: (Czerniawski et al., 2013).

In the whole Drawa River drainage, nearly 83% of the interviewees believe that the most attractive section in the DPN area for canoeing trips is the Korytnica River (Table 6). In the upper Drawa River area, 71% of the interviewees regarded as most attractive a section of the Drawa River from Rzepowo to Gudowo and the Kokna River, in the middle Drawa River area – The Korytnica River and the Słopica River, and in the lower Drawa River area – the Korytnica River and the Drawa River section Stare Osieczno – Krzyż.

Table 6. Rivers and they stretches the most attractive for tourists [percentage of respondents]

Stretch	Zlewnia Drawy	Górna Drawa	Środkowa Drawa	Dolna Drawa
Drawa: Rzepowo-Gudowo	17,7	71,0	-	-
Rakoń	2,8	28,0	-	-
Kokna	17,7	71,0	-	-
Drawa: Poligon Drawski	5,0	28,0	22,0	-
Stary Potok	0,5	-	1,0	-
Drawica	2,2	-	2,0	-
Sitna	0,5	-	11,0	-
Drawa: DPN	82,7	71,0	100,0	100,0
Słopica	2,2	-	33,0	-
Korytnica	58,4	28,0	89,0	100,0
Drawa: St.Osieczno-Krzyż	5,0	-	-	50,0
Mierzęcka Struga	20,0	-	-	100,0
Człopica	1,2	-	-	25,0

Source: (Czerniawski et al., 2013).

The analysis of the evaluation of canoeing for one year is as follows. The survey indicates that one company on average services 947 canoeists. With 20 PLN for the rental of one canoe per day, the canoeists serviced by one company on average leave here 18,940 PLN annually. Assuming that there are 20 companies offering canoeing trips in the drainage of the Drawa River, the canoeists on average leave 378,800 PLN annually. It has to be underlined here that the analysis excludes costs for tourists spending more than one day on canoeing trips. Therefore, we have adopted the value 20 PLN per one canoe per day even though canoes tend to be double. The analysis also excludes the costs connected with the service of canoeists (DPN fees, accommodation, equipment, transport, etc.). Thus, the value might be bigger.

According to the interviewees, altogether from the drainage of the whole Drawa River, the watercourses and sections which are most frequently selected for canoeing trips by tourists and which are most preferred and would be most preferred by tourists, were it not for the bans are as follows: The Drawa River the DPN section and the Korytnica River, that is the most valuable nature in the whole drainage of the Drawa River. Predominantly, tourists select sections for canoeing trips which are located relatively close to the headquarters of the company they rent canoes from. An exception is the DPN section of the Drawa River which is one of the most willingly and frequently selected sections of the whole Drawa River drainage, especially in summer months, regardless of the location of the company offering canoeing services. Entrepreneurs offering canoeing services also support the extension of the tourist season and distribution of tourists to every day of the week, not only during the weekend when crowds of tourists are observed in the area. The DPN is of a similar opinion and encourages tourists to use the area on weekdays, not only at weekend (Cieśla, 2010). This would relieve valuable natural areas of the DPN and, in consequence, facilitate an increase in incomes of entrepreneurs on weekdays because only 700 people may visit the DPN area on one day. However, according to observations, during weekdays the number is significantly smaller, but at weekend the demand for the DPN section is much bigger than 7000 people. It is worth noting that the number of canoeists grew by more than 50% when the DPN was created in 1990. This indicates a boost of the importance of the region and an effect of the etiquette on the number of tourists although the same natural values which are observed here were present here before the creation of the DPN.

Conclusion

The analysis of ecosystem services in the Drawa river drainage with regard to canoeing and angling indicated that anglers found lake areas most attractive whereas canoeists preferred river sections. The use of the Drawa River only by the two branches (only the basic range) of economy and region development generates profit of at least 1.5 million within one year. The initial evaluation indicates that angling can generate higher profit than canoeing in the region. However, in order to be able to precisely determine the value of the two branches of economy of the region, indirect costs associated with that would have to be taken into consideration. The aforementioned analysis excludes indirect costs which may be equal to or exceed the value obtained directly from the sale of angling licenses and canoe rentals. Evaluation of the services may be extremely helpful in spatial planning of communes

if specific environmental features on which their function depends are taken into consideration.

The contribution of the authors

Robert Czerniawski – 40%
Łukasz Sługocki – 30%
Katarzyna Dziewulska – 20%
Józef Domagała – 10%

Literature

Arlinghaus R. (2006), *Overcoming human obstacles to conservation of recreational fishery resources, with emphasis on central Europe*, "Environmental Conservation" No. 33(01), p. 46–59

Cieśla Ł. (2010), *Kup pan bilet i spływaj, czyli Drawieński Park Narodowy*, „Głos Wielkopolski" No. 5

Czerniawski R., Pilecka-Rapacz M., Domagała J. (2013), *Turystyka kajakowa w zlewni Drawy, obszarze Natura 2000 a ochrona przyrody*, in: Kaźmierska-Patrzyczna A., Król M.A. (eds), *Problemy wdrażania systemu Natura 2000 w Polsce*, Poznań, p. 761–771

Czerniawski R., Sługocki Ł., Domagała J. (2015), *Presja wędkarska, połowy ryb i specyficzne cechy wędkowania w wodach zlewni Drawy w 2013 roku*, „Komunikaty Rybackie" No. 6, p. 7–15

Haines-Young R., Potschin M. (2012), *Common International Classification of Ecosystem Services (CICES, Version 4.1)*, European Environment Agency No. 33

Holmlund C.M., Hammer M. (1999), *Ecosystem services generated by fish populations*, „Ecological economics" No. 29(2), p. 253–268

Kapusta A. (2015), *Alternatywne metody zarządzania łowiskami wędkarskimi: potrzeby i konsekwencje biologiczne odpowiedzialnego zarządzania zrównoważonym rybactwem rekreacyjnym*, in: M. Mickiewicz, A. Wołos (eds), *Zrównoważone korzystanie z zasobów rybackich na tle ich stanu w 2014 roku*, Olsztyn, p. 173–182

Mizgajski A., Stępniewska M. (2012), *Ecosystem services assessment for Poland–challenges and possible solutions*, „Ekonomia i Środowisko" No. (2), p. 54–73

Rechulicz J., Płaska W., Tarkowska-Kukuryk A. (2014), *The ichthyofauna of littoral of two shallow lakes on background of fishery management and angling pressure*, „Teka Komisji Ochrony i Kształtowania Środowiska" No. 11, p. 163–172

Wołos A., Czerwiński T., Mickiewicz M. (2001), *Presja i połowy wędkarskie na „warszawskim" odcinku rzeki Wisły*, VI Krajowa Konferencja Rybackich Użytkowników Jezior, Olsztyn, p. 99–110

Wrona J., Guziur J. (2007), *Uwarunkowania wędkarskiego użytkowania zbiornika zaporowego Poraj*. Part II. *Wędkarstwo i jego uwarunkowania socjologiczne*, „Roczniki Naukowe Polskiego Związku Wędkarskiego" No. 20, p. 173–193