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A Management-Orientated Comparative Analysis of Urban and Rural Anglers Living in a Metropolis (Berlin, Germany)

ROBERT ARLINGHAUS*
THOMAS MEHNER
Leibniz-Institute of Freshwater Ecology and Inland Fisheries
Department of Biology and Ecology of Fishes
Müggelseedamm 310
PO Box 850119
12587, Berlin, Germany

ABSTRACT / Increased efforts to analyze the human dimensions of anglers are necessary to improve freshwater fisheries management. This paper is a comparative analysis of urban and rural anglers living in a metropolis, based on n = 1061 anglers responding to a mail survey in the German capital of Berlin. More than two thirds of the anglers (71%) had spent most (>50%) of their effort outside the city borders of Berlin and thus were categorized as rural anglers. Compared to the rural anglers, urban anglers (≥50% of total effort spent inside the city) were younger and less educated. Urban anglers were more avid and committed, less mobile, and more frequently fished from boats and during weekdays. Rural anglers were more experienced, fished for longer times per trip, fished more often at weekends and on holidays, were more often members of angling clubs, and more frequently caught higher valued fish species. The achievement and fish quantity aspects of the angling experience were more important for urban than for rural anglers. Concerning management options, urban anglers more frequently suggested constraining other stakeholders and reducing regulations, whereas rural anglers more often proposed improving physical access to angling sites. Future urban fishing programs should offer ease of access, connection to public transportation, moderate prices, and diverse piscivorous fish stocks. In contrast to rural fisheries, the provision of high ecological and aesthetical quality of the angling waters can be regarded as of minor importance in urban fisheries. Rural fisheries managers need to consider the needs of stakeholders living in Berlin to minimize impacts on the less degraded rural water bodies and potential user conflicts with resident anglers. Ecosystem-based management approaches should guide rural fisheries policy.

Urbanization is a dominant demographic trend and a rapidly growing form of land use change. It is expected that more than 60% of the world's population will live in urban areas by the year 2030 (United Nations 2003). This development has focused attention on management of and research into urban ecosystems (e.g., Paul and Meyer 2001) and improvement of recreation opportunities in urban areas (e.g., Manning 1999). Recreational fishing constitutes one of the most popular forms of outdoor recreation in Western societies (e.g., Cordell and others 1999). Recreational fisheries overall and urban angling in particular can provide many benefits to society (Allen 1984, Pajak 1994, Schramm and Edwards 1994) and may substitute for decreasing commercial fishing activity in industrialised countries (Arlinghaus and Mehner 2003a).

KEY WORDS: Recreational fisheries; Urban fishing; Inland fisheries management; Human dimensions; Rural development

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*Author to whom correspondence should be addressed; *email:* arlinghaus@igb-berlin.de

Despite the fact that angling participation is usually lower in urban as compared to more rural areas (Hendee 1969, Aas 1996a, Arlinghaus 2004), urban populations are often not only regarded as a major new source of recruits to recreational fishing, but also as a source of increased license sales that support public natural resource agency programs (Allen 1984). Furthermore, as the avidity of these new recruits increases, many might move into more rural fisheries outside towns and cities (Ditton and others 2002). Therefore, angling participation of an increasingly urban population may not only affect towns and cities but also benefit comparatively undeveloped rural areas surrounding metropolitan centres, e.g., in the case of the German capital Berlin. In this respect, out-of-the-city angling activity may be regarded as an "ecotourism" activity (Ditton and others 2002). The migration of urban residents to fish in rural waters may help to educate urban anglers, promote respect for less disturbed landscapes, provide funds for habitat management, directly benefit rural economic development (e.g., tourism, commercial fishermen, cf. Bninska and Wolos 2001), and enhance respect for the divergent

cultures of rural anglers. On the other hand, substantial out-of-the-city angling may cause serious conflicts between nonresident and resident anglers in rural areas, especially if the rural-wide fishing opportunities are evaluated as inadequate by resident anglers (Ditton and others 2002). Furthermore, any substantial use of rural aquatic ecosystems by urban residents may have substantial negative impact on these systems, thus challenging the implementation of ecosystem-based sustainable inland fisheries management (Arlinghaus and others 2002) on the regional scale. This particularly applies to the inland fisheries management systems of Germany where each of the 16 states, including the city-states Berlin, Hamburg, and Bremen, has its own responsibility and legislation for inland fisheries.

To better evaluate the seemingly contradictory potentials of angling participation of metropolitan residents, it is imperative to know not only about the biological components of fisheries systems, but also about the characteristics and behavior (coined "human dimensions") of urban resident anglers (Pollock and others 1994, Sutton and Ditton 2001). Sustainable inland fisheries management currently is more about people than fish management (Arlinghaus and others 2002). However, despite the increasing notion of the necessity of research into urban angling, the authors are aware of just two studies specifically dealing with differences between urban and rural anglers (Manfredo and others 1984, Schramm and Dennis 1993), and only Schramm and Dennis (1993) investigated differences between the urban and rural anglers living within the same urban environment.

Because of this lack of knowledge, this exploratory study first reports group differences between urban and rural anglers living in the city of Berlin (Germany). This is done to add to the limited information about the behavioral characteristics of urban and rural anglers. Then, five hypotheses are tested concerning the probability of urban residents fishing either within or outside the urban setting of Berlin. Last, management implications are detailed for improving both recreational fisheries and aquatic ecosystem management at the urban–rural interface of Berlin.

Methods

Study Area

The reunified German capital, Berlin, is a city-state with a population of more than 3.5 million inhabitants, covering an area of 889 km^2, of which 58 km^2 (6.4%) consist of rivers and lakes (Figure 1). The landscape is characterized by glacial deposits, slow-flowing lowland rivers, and shallow lakes with a maximum depth of 16 m. There are approximately 60 lakes that are >1 ha and more than 500 natural pond-like waters. The primary fishing waters are the rivers Spree and Havel, the latter being large lacustrine-like ecosystems, and their impounded areas comprise two thirds of the total Berlin water area. Thus, Berlin urban waterbodies are considerably different from the urban waters as typically described in the literature (e.g., shallow, small, artificial; Birch and McCaskie 1999). Nevertheless, because of the densely populated area (population density around 4000 people/km^2), waters in Berlin are under intense pressure from a high nutrient load and anthropogenic activities, including shipping, hydraulic engineering, pollution, and recreational uses such as swimming, boating, wildlife viewing, and fishing. As a result, the diversity of fish species is rather poor. Tolerant (eurytopic and phyto-lithophilic) zooplanktivorous species of low fisheries value such as small perch (*Perca fluviatilis*), roach (*Rutilus rutilus*), bream (*Abramis brama*), and white bream (*Abramis bjoerkna*) occur in high numbers, particularly in the urban waterways of the capital (Wolter and Vilcinskas 2000, Wolter and others 2003). In Berlin, highly valued piscivorous fish such as pike (*Esox lucius*), wels (*Silurus glanis*), pikeperch (*Sander lucioperca*), and eel (*Anguilla anguilla*) are now comparatively rare and under heavy fishing pressure from both commercial and recreational fisheries that harvest most of the fish reaching the legal size limits (Arlinghaus and Mehner 2003a).

Angler Survey

Since the last angler survey was conducted several decades ago in Western Berlin (Grosch and others 1977), there has been no detailed information available on the main characteristics of anglers living in the reunified Berlin. To gather actual data on the human dimensions of anglers living in Berlin (Berlin anglers), a simple random sample was drawn from an official list of angling license holders of the Berlin Fishery Board (36,456 total addresses as of December 31, 2000, corrected for duplicates). In the city-state of Berlin, anglers are legally required to pass an angling examination and be issued an official angling license (Fischereischein) to be allowed to fish. Thus, the sample of angling license holders covered all anglers who fish legally in Berlin. A self-administered, six-page mail survey was sent on April 24, 2001 to 3500 anglers. Questionnaires were mailed in Berlin Fishery Board envelopes provided with a postage-paid envelope and a personalized cover letter. The publication of the results was announced.

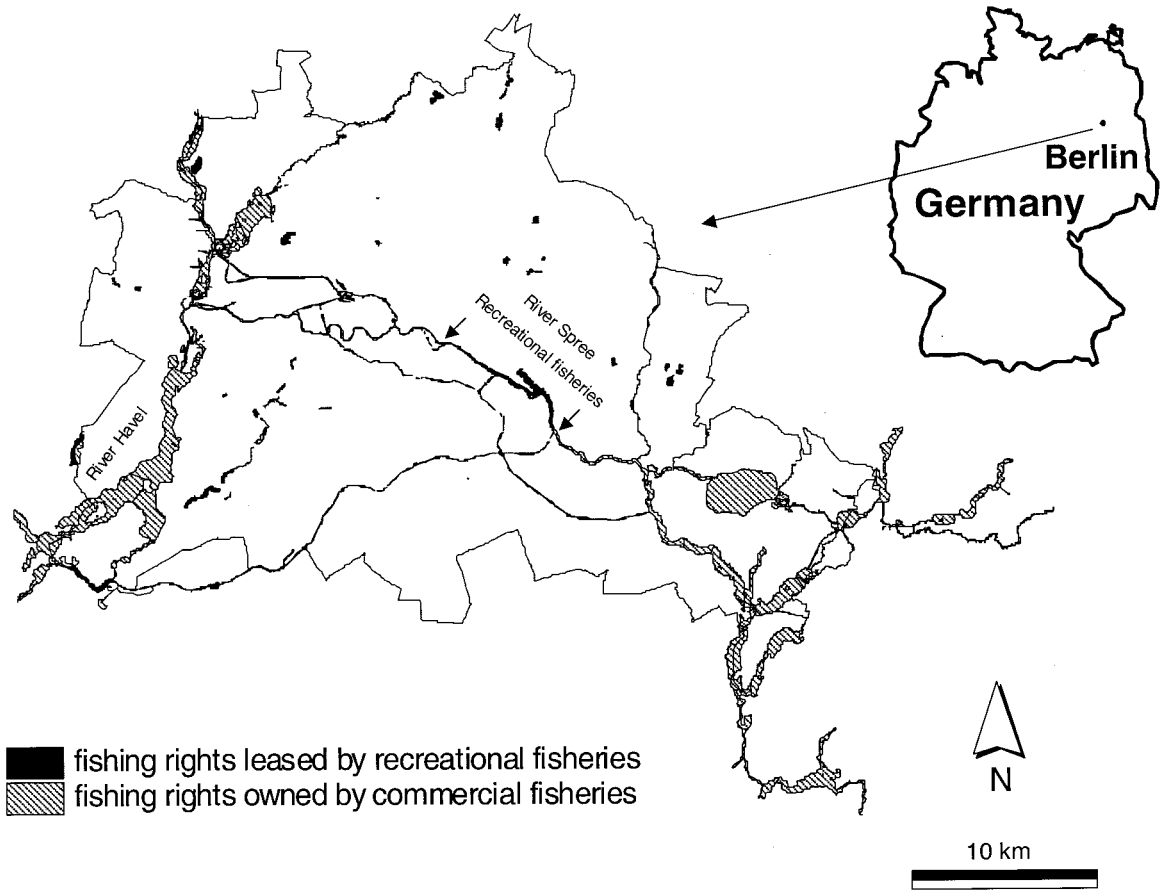

Figure 1. Study area and distribution of fishing rights in the city-state of Berlin (Germany) in 2002. Note that most commercial fishing rights are coexploited by commercial and recreational fisheries. In the River Spree, exclusive rights for recreational fishing are restricted to a small section that is marked in the figure.

The questionnaire was pretested with 70 anglers. It included mostly closed-ended questions with ordered choices. This was done to facilitate completion by the respondents and encourage participation. Six hundred twenty-seven questionnaires (18%) were undeliverable, indicating the high mobility of Berlin anglers and resulting in a moderate adjusted response rate of 37% (n = 1061). A nonresponse check was not possible because this would have demanded distinguishing nonrespondents from responding anglers. Any subsequent contact with the nonresponding anglers was not allowed by the official fisheries authority that granted the permission to draw the sample from among the address list of the anglers (U.A. Grosch, Berlin Fishery Board, personal communication 2000). Instead, to increase participation, the survey was publicized by a press release and special attention was given to avoid asking objectionable questions (e.g., income, willingness-to-pay). To correct for a potential nonresponse bias and under representation of certain age groups in the angler sample, the data were weighted by the known age distribution of the finite angler population in Berlin. Notwithstanding this, potentially nonresponse may have influenced the results, and caution is encouraged when generalizing data to the angler population level. There is, however, no indication to assume that nonrespondents may be underrepresented among either urban or rural anglers. Furthermore, this study is aimed at analyzing group differences between urban and rural anglers living in the same city (see below). Therefore, nonresponse bias is of less concern in this comparative study as compared with studies that target information at the angler population level. However, because of item nonresponse, the following results are partly based on lower sample sizes.

The questionnaire was designed to gather basic self-reported data including demographics, angling activity, target species, motivations, and management preferences. It was constructed to gain insights into variables that are of interest for fisheries and ecosystem manag-

ers. Most responses were given on an ordinal scale, i.e. data were grouped into classes, and were based on the previous angling year. Angling motivation was assessed using published items (see Fedler and Ditton 1994 for a review). Factorial analysis with principal component extraction and varimax rotation was used to detect underlying motivational dimensions. Motivation items were grouped based on the detected dimensions, but analyzed individually. This was done because it was assumed that more meaningful insights could be gained by investigating single items instead of item scores (i.e., motivation subdimensions). In fact, some of the items typically used in angler motivation surveys seem to be multifaceted, resembling factors instead of constituting single items of an underlying motivation dimension (e.g., "to experience nature"). Management preferences were assessed by an open-ended question asking the anglers to mention up to four measures to promote recreational fisheries and quality of angling in general. Content analysis was used to draw inferences from survey responses (cf. Arlinghaus and Mehner 2003b).

Comparative Analysis

To test for significant differences between urban and rural anglers living in Berlin, the total sample was segmented. All of the responding anglers who spent more than 50% of their angling effort of the previous 12-month angling season in the urban waters of Berlin were categorized as urban anglers. The remaining subsample was categorized as rural anglers, because most fisheries in the weakly populated, but water-rich states of Brandenburg and West Pomerania surrounding or adjacent to Berlin are rural fisheries outside of towns or cities. Doubtless, this segmentation is somehow artificial. However, it is the most sensible segmentation procedure for two reasons. First, it accounts for the fact that most anglers used (at least temporarily) more rural waters. This avoided the analysis being biased by the low sample sizes of anglers fishing exclusively in urban waters. Second, most anglers (>85% of the sample) spent most (>70%) of their angling time either inside (urban anglers) or outside (rural anglers) Berlin. Thus, in our case the 50%-effort benchmark to segment anglers into urban or rural anglers was less problematic than if many people within the sample had fished, say, 40% in Berlin and 60% outside Berlin. Furthermore, it is more reasonable to group an angler as a rural angler if he or she fishes most of the time outside Berlin as compared to the procedure applied by Schramm and Dennis (1993), in which only anglers fishing exclusively outside the urban area were regarded as rural anglers. Apart from these considerations and to account for a possible segmentation effect on the group comparisons, two additional segmentations modes were tested. First, a segmentation into urban (i.e., fishing at least once in urban waters) and rural anglers (i.e., fishing exclusively outside the urban area) according to the procedure applied by Schramm and Dennis (1993) was tested. Second, a segmentation based on segmenting the sample into thirds and contrasting two segments (fishing most versus fishing least) within Berlin was conducted. The results were compared with the results presented in this paper. Negligible differences were found, which suggests that different segmentation modes produced similar significant results. Therefore, only the segmentation into urban and rural anglers based on the 50% benchmark of total effort spent is reported in this article. Group comparisons were performed either by Mann-Whitney U tests in the case of ordinal data or by χ^2 analysis for frequency distributions or nominal data (cf. Schramm and Dennis 1993). In the latter case, standardized residuals were examined to determine which cells contributed most to a significant χ^2 value. Standardized residuals ≥ 2 were considered as contributing substantially to a significant χ^2 value (Bühl and Zöpfel 2000). Responses to the motivation scale were analyzed by t-tests (Fedler and Ditton 1994).

Analysis of Hypotheses

Theoretical considerations led to the formulation of five hypotheses about likely characteristics of urban and rural anglers and to test internal consistency of the angler response pattern. The restricted time budget of anglers should force those anglers that are (a) more committed (H_1) according to the theory of angling specialization (see Bryan 1977, Scott and Shafer 2001 for details), and (b) less mobile (H_2) to fish in urban waters. On the other hand, a positive association between the (a) importance of anglers placed on nature/escape related motivations (H_3); (b) catch of highly valued fish species (H_4); (c) travel distance and time spent per angling day (H_5), and the likelihood to be an rural angler was expected.

Variable of H_1 (COMITT): The multidimensional concept of angling specialization was operationalized according to a modified, quantitative procedure of Chipman and Helfrich (1988) by creating the sum of the following variables which, except for the dichotomous variables, were standardized to a z-score (mean = 0, SD = 1) before summing: angling experience, angling days per year, yearly issued angling licenses, fish harvest per year, total expenditure per year, replacement value of tackle, replacement value of boats, club membership (no = 0, yes = 1), specific angling holi-

days (no = 0, yes = 1), fishing during nights (no = 0, yes = 1), fishing weekdays (no = 0, yes = 1), and fishing outside holidays (no = 0, yes = 1). Increasing values of the COMITT-index are supposed to indicate an increasing level of enduring involvement of the angler, i.e., emotional involvement with the angling activity increases. However, because a quantitative procedure based on actual fishing behavior was used to create the COMITT-variable, it is assumed that COMITT measures angler commitment (Scott and Shafer 2001) and not angler specialization as defined by Bryan (1977).

Variable of H_2 (REMOBIL): An index of restricted mobility based on the vehicles regularly used to reach the angling sites was created by summing the following binary coded vehicle variables: feet, bicycle, or public transportation. Note that a positive effect of the REMOBIL-index on the odds of being a rural angler would also speak for the internal consistency of the self-reported angling behavior.

Variable of H_3 (NATURE): The importance placed by an angler on nature/escape-related motives was measured by summing the scores of five items (for relaxation, to enjoy pleasant surroundings, to get silence at the waterside, to experience nature, and to get away from everyday life). Each item was rated by the angler on a 5-point scale ranging from 1 (= not at all important) to 5 (= extremely important) as a motive for angling. The nature motivation index was created by summing the individual items to a score. The higher the NATURE-index, the higher the importance placed on a nature/escape-related motive for angling.

Variable of H_4 (FISH): An index of highly valued fish species was created by summing individual binary-coded variables related to the indication by anglers of whether they caught (= 1) certain species regularly during the last 12 months or not (= 0). The following fish species were included: burbot (*Lota lota*), common carp (*Cyprinus carpio*), grayling (*Thymallus thymallus*), pike, pike-perch, tench (*Tinca tinca*), and wels and trout species (*Salmo trutta* or *Onchorhynchus mykiss*).

Variable of H_5 (TIME): An travel/angling time index was created by standardizing two variables (travel distance to the preferred angling water and hours spent angling per angling day) to a *z*-score. The TIME-index was calculated by summing the standardized variables and two binary-coded variables (fishing during holidays, fishing at weekends). These variables were taken because they indicate that the angler fishes at times with naturally greater time availability. Note that a positive effect of the TIME-index on the odds of being a rural angler would speak for the internal consistency of the self-reported angling behavior.

Stepwise forward logistic regression models (LR-test) were calculated with the five variables COMITT, REMOBIL, NATURE, FISH, and TIME, and also several demographic variables to detect significant effects of the independent variables on the odds of being grouped as a rural angler (= 1, urban angler = 0). This was done to detect the ranking of the independent variables as the demographic variables were tested exploratively (cf. Backhaus and others 2000).

Results

Geographic Location of Effort

In the previous 12 months, more than two thirds of the responding Berlin anglers (71%, n = 724) had spent most (>50%) of their effort outside the state borders of Berlin and thus were categorized as rural anglers. Sixty-one percent (n = 628) of all responding anglers had fished at least once in the city-state of Berlin. Thirty-nine percent (n = 396) had fished exclusively outside and just over 7% (n = 79) had fished exclusively inside Berlin.

Demographics

Urban and rural anglers living in Berlin differed in demographic characteristics (Table 1). Urban anglers were significantly younger than rural anglers. In particular, the age classes 15–19 and 30–34 years were overrepresented, and the age class of 45–49 years was underrepresented among urban anglers as compared to rural anglers. Both angler segments were predominantly male and married. However, the proportion of singles was significantly greater among urban anglers. Rural anglers showed a tendency to be more highly educated and qualified than urban anglers, e.g. about twice as many rural anglers had completed a university course as compared to the urban segment. The proportion of pupils, students, and homemakers was significantly greater among urban anglers.

Participation

Urban anglers significantly differed from rural anglers on 18 of 20 participation characteristics (Table 2). The urban angler segment fished more often but for less time per angling day, harvested more fish, spent more money, owned more expensive tackle, and fished more during weekdays than did rural anglers. Furthermore, a significantly higher proportion of urban anglers were boat owners and fished more frequently from boats. Rural anglers, on the other hand, were more experienced, traveled longer distances to their preferred angling water, and fished more often during

Table 1. Demographic characteristics (class of group median, group median, or percent of total) of urban and rural anglers living in Berlin

Demographic characteristic	Urban angler (n = 203)	Rural angler (n = 429)	*p* value
Age (yrs)	40–44	45–49	<0.001
Person per household (no.)	2	2	ns
Angler per household (no.)	1	1	ns
Children younger than 18 yrs in household	1	1	ns
Males (%)	95.0	96.9	ns
Singles (%)	35.5	29.5	<0.05
Highest education			
None	0.7	1.1	ns
Secondary school (II-level)	18.1	11.7	<0.01
Secondary school (I-level)	14.6	15.7	ns
University entrance qualification	7.6	5.0	ns
Apprenticeship	37.2	26.2	<0.01
Technician qualification	7.6	13.7	<0.01
University study	13.5	26.5	<0.01
Professional guild			
Without work	7.3	6.5	ns
Pupil/student	6.0	2.6	<0.01
Trainee	1.3	1.0	ns
Homemaker	2.3	0.6	<0.05
Worker	22.0	19.9	ns
Employee	23.0	26.7	ns
Public servant	6.7	9.3	ns
Self-employed	7.0	10.1	ns
Retired person	24.7	23.3	ns

ns = not significant.

Table 2. Participations characteristics (class of group median, group median or percent of total) of urban and rural anglers living in Berlin.

Participation characteristic	Urban angler (n = 296)	Rural angler (n = 719)	*p* value
Angling experience (yrs)	20–24	20–24 (+)	<0.05
Angling days per year (d a^{-1})	40–49	30–39	<0.001
Angling hours per day (h d^{-1})	6–9	9–12	<0.001
Travel distance (km)	10–20	60–70	<0.001
Yearly angling licenses (number)	2	2	ns
Fish harvest per year (kg a^{-1})	9–12 (+)	9–12	<0.01
Replacement value of tackle (DM)	1000–2000 (+)	1000–2000	<0.05
Total expenditure (DM a^{-1})	3937	3413	<0.05
Fishing weekdays (%)	51.5	36.6	<0.001
Fishing during holidays (%)	51.8	68.4	<0.05
Boat owners (%)	43.0	31.3	<0.05
Fishing from boats (%)	47.8	38.1	<0.001
Angling holidays (%)	51.5	60.8	<0.01
Organized in angling club (%)	51.4	60.5	<0.01
Self-perceived species specialization (%)	26.0	31.1	ns
By feet (%)	7.8	2.6	<0.001
By bicycle (%)	12.2	3.2	<0.01
By motorbike (%)	4.1	1.4	<0.05
By public transportation (%)	9.1	2.5	<0.001
By cars (%)	67.0	90.3	<0.001

ns = not significant; + = significant higher calculated median.

Table 3. Frequency (%) of regularly caught fish species by urban and rural anglers living in Berlin; multiple responses were possible

Fish species	Urban angler (n = 275)	Rural angler (n = 670)	*p* value
Highly valued piscivorous species			
Eel (*Anguilla anguilla*)	29.5	25.8	ns
Perch (*Perca fluviatilis*)	54.5	57.6	ns
Pike (*Esox lucius*)	22.2	33.3	<0.05
Pike-perch (*Sander lucioperca*)	19.6	22.7	ns
Wels (*Silurus glanis*)	2.9	4.8	ns
Highly valued benthivorous species			
Burbot (*Lota lota*)	1.1	3.6	<0.05
Common carp (*Cyprinus carpio*)	13.8	25.2	<0.05
Tench (*Tinca tinca*)	8.4	15.7	<0.05
Highly valued salmonid species			
Grayling (*Thymallus thymallus*)	0.0	2.7	<0.05
Trout species	8.0	14.5	<0.05
Low valued, but widespread species			
Bleak (*Alburnus alburnus*)	23.4	13.9	<0.05
Bream (*Abramis brama*)	59.6	48.2	<0.05
Roach (*Rutilus rutilus*)	59.3	57.6	ns
Rudd (*Scardinius erytrophthalmus*)	36.0	41.2	ns
Ruffe (*Gymnocephalus cernuus*)	26.9	14.6	<0.05
White bream (*Abramis bjoerkna*)	42.2	27.9	<0.05
Other less valued and widespread species			
Aland (*Leuciscus idus*)	3.3	2.7	ns
Asp (*Aspius aspius*)	3.3	5.8	ns
Barbel (*Barbus barbus*)	1.1	2.2	ns
Chub (*Leuciscus cephalus*)	3.6	5.1	ns
Crucian carp (*Carassius carassius*)	4.4	5.8	ns
Dace (*Leuciscus leuciscus*)	1.4	1.0	ns
Gras carp (*Ctenopharyngodon idella*)	2.9	4.6	ns

ns = not significant.

holidays than did urban anglers. Higher percentages of the rural angler segment undertook specific angling holidays and were organized in angler clubs as compared to urban anglers. Significantly more rural anglers used cars than did urban anglers did. The latter more often walked or used bicycles, motorbikes, or public transportation to reach the angling sites.

Fish Species Preferences

Significant differences were found between urban anglers and rural anglers in terms of regularly caught fish species (Table 3). Significantly more urban anglers caught low valued, but widespread zooplanktivorous fish species. Significantly higher percentages of rural anglers in Germany, on the other hand, more regularly caught highly valued pike, common carp (*Cyprinus carpio* L.), tench (*Tinca tinca* (L)), and salmonid species.

Despite the detected differences in fishing success, both subgroups in general preferred to catch and consume/harvest the same fish species, i.e., piscivorous fish were preferred over zooplanktivorous species, and benthivorous carp and tench were of intermediate value for both subgroups (Figure 2). Those species that were removed from the waters for consumption were the target species of both urban and rural anglers (Figure 2). This is important information because anglers may fish for species without the intention to harvest the caught fish (e.g., catch-and-release fishing). However, among the angler sample of Berlin, this type of fishing seemed to be of minor importance. Berlin anglers fished in particular for fish species that were considered consumable. Thus, Berlin anglers were characterized as "consumptive or meat fishers."

Motivations

Urban anglers significantly differed from rural anglers in only 3 of the 22 fishing motives (Table 4). However, these items were of subordinate overall importance for angling. That means other items, which were not found to be significantly different between both angler groups, were more important as a reason for fishing than the items where differences were found. Both angler segments attached an overriding importance to nature/escape-related items.

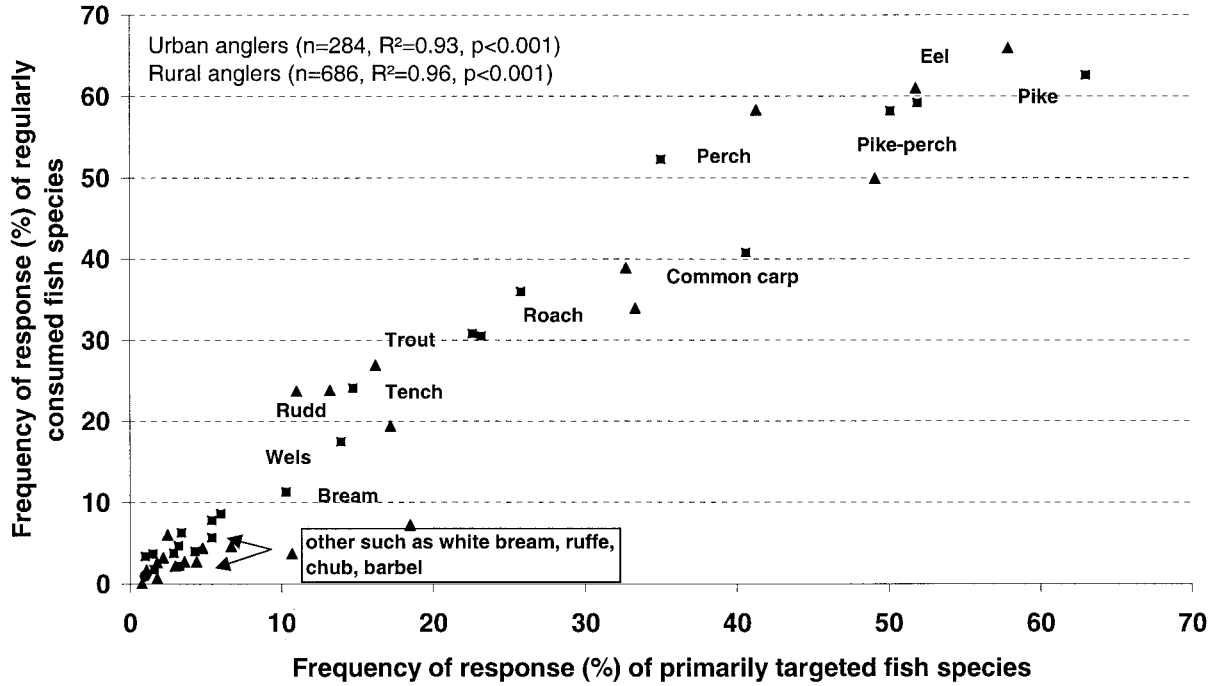

Figure 2. Linear correlation between the frequency (percent of multiple responses) of primarily targeted and regularly consumed fish species of anglers in Berlin. Squares relate to urban and triangles to rural anglers living in Berlin.

For both urban and rural anglers, consumptive motives such as the challenge/thrill aspects of fishing or the motive of catching fish were of lower importance than the nonconsumptive motives, i.e., nature/escape or social-related motivations. Urban anglers were more competition orientated than rural anglers because they placed significantly higher importance on catching several fish, and on achievement-related fishing motives.

Management Preferences

Concerning inland fisheries management tools, high percentages of both angler segments suggested that reduction of prices, expansion of stocking, and improvement of physical access to the water bodies would improve angling quality (Table 5). However, urban anglers were more likely to propose reducing regulations, constraining commercial fisheries and reducing boat traffic than did rural anglers. In contrast, a significantly higher proportion of rural anglers suggested improving physical access as compared to the urban subgroup.

Test of Hypotheses and Internal Consistency

According to the logistic regression, the variables COMITT, REMOBIL, FISH, and TIME had significant effects on the odds of being grouped as rural anglers (Table 6). These odds were negatively related to COMITT and REMOBIL, and positively related to TIME and FISH. The direction of the significant effects was as predicted. In the case of REMOBIL and TIME, this indicated internal consistency of the answer pattern. Generally, the regression model demonstrated that more committed and less mobile anglers were more likely to have fished in urban waters. On the other hand, rural anglers were more likely characterized by the regular catch of highly valued species. Furthermore, those anglers that traveled greater distances to home at times with naturally higher time availability (weekends, holidays) more likely belonged to the rural angler segment. Rural anglers also fished longer times per angling day than did urban anglers. The demographic variables did not reveal clear tendencies, the age effect aside. The older the angler living in Berlin, the more likely it was that he or she fished rural waters. However, the data also suggested that urban anglers seemed to be less educated than rural anglers (compare also Table 1). There was a not significant effect of the NATURE variable on the odds of being a rural angler, i.e., anglers who placed higher importance on nature/escape-related motivations were not more likely to belong to the rural angler segment. Thus, H_3 was not supported.

Table 4. Means (± SD) for responses to motive items for urban and rural anglers living in Berlin[a]

Motive items	Urban angler (n = 301)	Rural angler (n = 724)	*p* value
Nature/escape (NC, α = 0.73)			
For relaxation	4.47±0.73	4.52±0.68	ns
To enjoy pleasant surroundings	4.27±0.73	4.26±0.72	ns
To get silence at the waterside	4.19±0.69	4.19±0.68	ns
To experience nature	4.21±0.69	4.23±0.67	ns
To get away from everyday life	3.75±1.22	3.76±1.17	ns
Social (NC, α = 0.65)			
To be with friends	2.82±1.29	2.92±1.25	ns
To be alone	3.14±1.20	3.19±1.26	ns
Challenge/thrill (C, α = 0.72)			
To test and experiment	2.55±1.18	2.53±1.16	ns
Because of excitement to outwit a fish	3.07±1.22	3.06±1.18	ns
To enjoy a fighting fish	3.16±1.11	3.20±1.12	ns
To test equipment	2.01±1.02	2.04±1.10	ns
Catch fish (C, α = 0.66)			
To catch several fish	2.24±0.99	2.07±0.92	<0.05
To get trophy fish	2.64±1.03	2.62±1.00	ns
To catch at least one fish	2.62±1.31	2.65±1.28	ns
Novelty (C, α = 0.60)			
To experience new and different things	2.29±1.09	2.33±1.12	ns
To experience biology of fish	2.73±1.09	2.61±1.10	ns
Achievement (C, α = 0.61)			
To win a prize	1.32±0.76	1.20±0.58	<0.05
To compete with other anglers	2.47±1.35	2.21±1.18	<0.05
Without unambiguous factor loadings			
To obtain fish for consumption	2.99±1.18	2.94±1.20	ns
Because angling is cheap	2.10±1.14	2.17±1.18	ns
To publicize the catch	1.27±0.65	1.23±0.59	ns
Because of my children and family	1.18±0.58	1.22±0.66	ns

[a]Items were arranged according to results of factorial analysis (eigenvalue >1) and factorial loadings >0.5. Scale for motives was: 1, not at all important; 2, slightly important; 3, moderately important; 4, very important; and 5, extremely important.
ns = not significant; NC = nonconsumptive motivation; C = consumptive motivation (Cronbach's α in parentheses).

Discussion

This study demonstrated a substantial participation of Berlin residents in rural angling outside the state borders of Berlin, mirroring the statements from the United States of Ditton and others (2002). The comparatively low percentage of people fishing exclusively in urban waters (7%) was in agreement with the angler behavior in Colorado (U.S.A.) in the 1980s (6.8%, Manfredo and others 1984). High rural angling participation may be the result of the desire of city residents to reduce, temporarily, social contacts with others, escape from the artificialities and pressures of modern living and simply "get away from it all" (Hendee 1969). Furthermore, this pattern suggests that certain angling experience components such as less congested and more remote fishing waters are only offered outside of the urban setting, which may be an incentive for many Berlin residents to travel longer distances to the non-urban angling sites.

The significant differences between urban and rural anglers reported in this paper showed that these groups can be regarded as constituting two distinct angler segments living in the same urban environment. It was shown that significantly more young people, school age children, students and homemakers, single people, and less educated people fished in urban than in rural waters (Table 1, Table 6). Manfredo and others (1984) found the same pattern concerning age and education in Colorado. Similarly, Schramm and Dennis (1993) reported that the percentage of households with young people who fished was higher for urban than for rural anglers in Lubbock (Texas, U.S.A.). The restricted mobility of school age children, together with the fact that children typically place less importance on non-catch-related aspects of the angling experience (Aas 1996b), may explain the overrepresentation of school age children and younger people among urban anglers.

Most of the single-item differences in participation and regularly caught species between urban and rural

Table 5. Management preferences (frequency of coded management dimensions in %) of urban and rural anglers living in Berlin; multiple statements were possible in an open question format.

Management dimension	Urban angler (n = 203)	Rural angler (n = 429)	*p* value
Reduce prices	27.6	32.6	ns
Expand stocking	31.5	28.4	ns
Improve physical access	23.8	32.9	<0.05
Expand control measures	19.3	20.5	ns
Reduce bureaucracy	15.3	20.5	ns
Promote angling of children	16.3	18.9	ns
Rehabilitate habitat	18.3	17.5	ns
Reduce regulations	25.6	12.8	<0.001
Improve cleanliness	15.8	16.1	ns
Constrain commercial fisheries	20.3	7.2	<0.001
Expand public relations	15.3	10.3	ns
Promote angling clubs	7.4	10.7	ns
Reduce boat traffic	9.9	6.1	<0.05
Expand angling possibilities	5.9	7.7	ns
Expand regulations	6.9	6.1	ns
Reduce coarse fish	4.5	3.3	ns
Reduce user conflicts	2.0	2.8	ns
Improve access to angling tickets	3.9	2.6	ns
Reduce fish-eating birds	1.5	2.1	ns
Increase sense of nature	2.5	1.4	ns
Improve quality of tackle	1.5	0.2	ns
Other	1.0	1.4	ns

ns = not significant.

Table 6. Results of the stepwise forward logistic regression analysis to test for significant effects on odds to be grouped as rural angler (= 1) or urban angler (= 0) among anglers living in Berlin

Parameter	Estimate	*p* value	Odds ratio[a]
Constant	−1.907	<0.000	
Age	0.1738	<0.000	1.189
Technician qualification (binary)	0.896	0.011	2.449
University study (binary)	1.068	<0.000	2.909
Homemaker (binary)	−2.461	0.046	0.085
COMMITT	−0.158	<0.000	0.853
REMOBIL	−0.916	<0.001	0.400
FISH	0.306	<0.000	1.358
TIME	0.792	<0.000	2.208
N = 708 (rural angler = 503), model χ^2 = 268.463, *df* = 8, *p* < 0.001; concordance = 80.0%			

[a]Odds ratio is the odds of an event occurring defined as the ratio of the probability that it will occur to the probability that it will not. An odds ratio less than 1 indicates that the odds of being a rural angler is a negative function of the independent variable.

anglers living in Berlin (Table 2, Table 3) can be explained by the more general hypotheses introduced and analyzed in this paper (Table 6). Within the Berlin angling protagonists, those more likely to use urban fishing sites were more committed (e.g., made a higher investment of time and money), less mobile, and less frequently caught valuable fish species (compare Figure 2). The explanation seems straightforward. First, because of the limited yearly angling time budget, more committed and emotionally involved anglers "are forced" to use urban waters more frequently to satisfy their higher angling demand, compared to less committed anglers. Second, it was hypothesized and shown that restricted mobility led to the use of fisheries closer to home, i.e., in the urban setting. The close proximity of the urban waters to the residence may also have contributed to the higher angling activity of urban anglers as measured by annual angling days (Table 2).

Similarly, Manfredo and others (1984) found that the most important reason for fishing an urban environment was "close access." Furthermore, we found that people travelling longer distances to the rural fisheries stayed longer times per fishing trip (Table 2), probably to maximize the benefit–cost ratio of the fishing trip. This may explain the difference between urban and rural anglers in that the urban angler segment took more trips per year, but fished significantly less per trip. However, high travel effort is often only possible during holidays or weekends, which explains why (1) urban anglers significantly more often fished on weekdays in Berlin; (2) rural anglers more frequently fished during holidays outside Berlin; and (3) higher percentages of rural anglers undertook specific angling holidays (Table 2). Third, rural waters typically offer healthier habitats, thus increasing the perception of available or the true availability of higher valued fish species (Wolter and Vilcinskas 2000). Because both angler segments target similar species, which was also found by Schramm and Dennis (1993), this availability may be an incentive for urban residents to travel outside Berlin (compare Table 3). Consequently, the index measuring the regularity of catching higher valued species was significantly related to rural angling.

Although this study paralleled other studies (Manfredo and others 1984, Sutton and Ditton 2001) in documenting several reasons for urban residents to fish, there was a dominance of a nature/escape-related angling motive among the Berlin resident anglers (Table 4). Angling typically is associated with escape from daily life and an experience of a more natural environment and wildlife, explaining why the Berlin anglers, similar to many angler populations (Fedler and Ditton 1994), in general placed great importance on nonconsumptive angling motivations. Significant differences between urban anglers and rural anglers were found in the motivational items related to "achievement" and "catching abundant fish," which may be explained by the greater availability of smaller-sized nonpiscivorous fish species such as roach, bream, and silver bream in urban waters (Wolter and Vilcinskas 2000). This opulence probably satisfies the greater demand of more achievement-orientated urban anglers to catch higher numbers of fish more easily in urban than in rural waters and may be an incentive for urban anglers to use urban waters despite their multiuse nature and low aesthetic quality (as judged from the ecological point of view of the authors). Similarly, Schramm and Dennis (1993) found that urban anglers preferred better fish over a better place to fish, whereas rural anglers preferred it the other way around, and Manfredo and others (1984) reported that urban anglers differed from anglers using more primitive waters in that the latter placed higher importance on the remoteness of fisheries. Altogether, this indicates that urban anglers are generally more catch and harvest oriented than rural anglers, which is further substantiated by the significantly higher annual harvest of urban as compared to rural anglers (Table 3). In addition, Sutton and Ditton (2001) reported that for urban anglers in Texas, the most disappointing aspect of their most recent trip was that not enough fish were caught and their given reason to fish "for the fun of catching fish" was rated by >80% (second rank) of the investigated urban anglers as very or extremely important. However, in this study the motivations of both angler groups were generally quite similar (see also Manfredo and others 1984).

Two seemingly contradictory implications can be derived from the homogeneity of angler motivations for both urban and rural anglers. On the one hand, this may indicate a severe conflict potential within the urban environment, because the most important nature/escape-related motive should be better attainable in the less degraded, more natural rural areas surrounding Berlin. It is conceivable that urban fisheries are not and will never be able to offer the possibility to fully satisfy the nature-related expected outcomes (i.e., motivations) of urban residents as compared to rural fisheries. However, on the other hand, the NATURE-variable measuring the importance of the nature/escape-related motivations for anglers failed to significantly discriminate between urban and rural anglers (Table 6). Many anglers living in the city of Berlin can apparently feel comfortable practicing this leisure activity in the middle of a city, and fishing activity can take place in highly modified environments that may be perceived by modern anglers to be "nature" (Arlinghaus and Mehner 2003b). This suggests a shifting relationship between the perception of natural conditions and the necessary prerequisites to satisfy the nature-related expected outcomes by anglers within the artificial urban environment, which would explain urban anglers pursuing angling in highly modified and congested urban environments (compare also Berrens and others 1993, Sutton and Ditton 2001), and at the same time rate nature/escape-related expected outcomes as very important for their angling participation. The latter also raises doubts about the managerial relevance of angling motivation data. The negligible differences in angling motivations between urban and rural anglers suggest that angling motivation data allow only limited inferences with respect to fisheries management. In addition, Schramm and others (2003) recently demonstrated that the explanatory power of angler motivations is rather weak with respect to which angling

sites are selected. However, it is this type of implication that is supposed to be gained from the stated expected outcomes (i.e., motivations) of the angling experience by anglers, for example, an angler indicating that he or she is primarily motivated by the desire to experience natural surroundings should also select more remote angling sites. With regard to the available evidence presented here and elsewhere, this seems not to hold true. One explanation might be that the perception of remote fisheries differs between anglers on the one hand and researchers and managers on the other hand.

A better approach to learn about possible ways to improve fisheries management for the benefits of anglers is to analyze the angler's management preferences. In this study, both angler segments frequently suggested reducing prices and expanding stocking as a means to improve angling quality (Table 5). The proposition to reduce prices probably resulted from the recent implementation of the annual Berlin fishing tax, which every angling license holder has to pay. Price increases are known to cause the attitudes of anglers toward paying fees to become more negative (Kerr and Manfredo 1991). The suggested proposition to expand stocking reflects the dominance of this management tool in recreational fisheries management worldwide (Arlinghaus and others 2002). However, management of fisheries entirely by maintenance stocking reduces the effectiveness of aquatic education programs and the efforts to make anglers part of the management process, if people are led to believe that good fishing simply results from putting fish in the water (Schramm and Edwards 1994). Concerning differences in management preferences between urban anglers and rural anglers (Table 5), the multiuse pattern of the waters inside Berlin has led to diverse user conflicts and regulations that often constrain recreational fishing (Arlinghaus and Mehner 2003b). Furthermore, inside the city, commercial fishing is a direct competitor with the anglers for finite fish resources (Arlinghaus and Mehner 2003a). These unique relationships explain why urban anglers significantly more often proposed to reduce regulations (e.g., allow night fishing), constrain commercial fisheries, and reduce boat traffic as compared to rural anglers. Outside of Berlin, many waters are remote and driving routes directly to the waters are often lacking, which explains why upgrading of access routes was significantly more often proposed by rural as compared to urban anglers.

Management Implications

The divergent characteristics for urban and rural anglers presented in this paper can help managers to design more effective people-orientated management programs in the future. A parallel approach is recommended to maximize the social benefits of angling by Berlin residents inside as well as outside of the city borders.

Because urban fisheries and characteristics of urban anglers are considerably different from rural fisheries and rural anglers (the exception being their most important motivations), angling inside the city should be addressed by specific urban fisheries management strategies. By providing and enhancing urban angling opportunities, recreational fishing can benefit anglers, communities, public agencies, and fisheries resources by (1) increasing the equity goals of sustainable fisheries management; (2) increasing the benefit/cost ratio of individual anglers; (3) minimizing environmental pollution by reduction of travel distances; (4) minimizing potential user conflicts and angling impacts on the less degraded rural water bodies outside Berlin; and (5) increasing revenues to urban economies and agencies. Future urban fisheries programs should not only be directed at the poor, the elderly, the handicapped, and minorities (cf. Allen 1984), but in particular towards the young anglers (cf. Sofranko and Nolen 1972, Aas 1996b), individuals of restricted mobility, and the more committed anglers. There is apparently less conflict potential between the degraded status of Berlin water bodies and urban angling activity. Although reduction of anthropogenic impacts on aquatic ecosystems should always be a management goal, urban fisheries management should therefore particularly be directed at offering ease of access to shorelines, parking places, connections to public transportation, moderate prices, and diverse fish stocks with emphasis on piscivorous species. Currently, it is not clear whether the currently high participation level of urban anglers in boat angling simply reflects a preference for angling from boats or is the result of the weakly developed angling sites at Berlin shorelines. Regardless, improving boat rentals, ramps, and landings can also be recommended for Berlin as well (cf. Sutton and Ditton 2001). Given the ecological constraints of urban waters and the fact that rehabilitation of ecosystem status in "quasi-pristine state" is unrealistic in large cities, some supplemental stocking of piscivorous fish may always be necessary, at least in closed water bodies. To minimize user conflicts, it is recommended to allow and expand night-fishing opportunities for anglers to minimize congestion by different user groups during the daytime. At the moment, this possibility is restricted in Berlin.

However, even the best planned urban fisheries program will never be able to offer satisfying angling opportunities for all Berlin resident anglers (see also Schramm and Dennis 1993). Fisheries and ecosystem

managers in areas surrounding Berlin are therefore encouraged to show consideration for the needs of urban angling stakeholders in their policy planning, by protecting highly valued piscivorous fish, to facilitate enhanced communication with resident and nonresident anglers to reduce potential user conflicts, and to offer improved access to rural fisheries (compare Table 5). However, rural fisheries policies should be acknowledged as being fundamentally different from urban fisheries management, and should be guided by ecosystem-based management approaches, with maintenance and rehabilitation of habitat structure as the primary goal (cf. Arlinghaus and others 2002). For example, facilitation of access to the water for the benefit of anglers should be guided by the objective of minimizing environmental impact because shorelines of freshwater ecosystems are crucial and particularly vulnerable habitats. For ecosystem-based management to be successful in rural fisheries, increased information and education efforts are needed to strengthen the knowledge base of environmentally friendly angling and management practices (aquatic stewardship) of the nonresident anglers living in Berlin to ensure the conservation and rehabilitation of the ecological integrity of rural waters (cf. Arlinghaus and Mehner 2003b, Arlinghaus and others 2002).

Finally, substantial angling activity of Berlin residents directed outside the city-state borders of Berlin means that public fisheries management (which is partly financed by anglers) and angling effort and impact are spatially and temporally decoupled, because the public authorities' responsibility for fisheries systems typically ends at the state's borders in Germany. This reduces the efficiency of public and private recreational fisheries management on the regional scale. To overcome these shortcomings, both (fisheries and ecosystem) managers as well as tourism promotion organizations are encouraged to develop working partnerships and increase interstate cooperation (Ditton and others 2002). In the metropolitan area of Berlin, this is particularly relevant because the governments of Berlin and Brandenburg, the state surrounding Berlin, are planning to probably merge in the future, which also would necessitate harmonizing their currently separate fisheries legislation.

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