

Management preferences of urban anglers: Habitat rehabilitation versus other options

ABSTRACT

In sustainable inland fisheries management, the principle of ecosystem-based management encompasses a shift from single-species management driven by stocking towards a systems view characterized mainly by habitat rehabilitation. It is not clear whether anglers are aware of this paradigm shift. Thus, in a mail survey of anglers living in Berlin, Germany, we assumed that the majority of anglers perceive habitat rehabilitation to be the most beneficial action for improving recreational fisheries. Based on the answer pattern to an open-ended question, this hypothesis was rejected. The respondents suggested dimensions such as price, stocking, access, and enforcement considerably more frequently than measures to rehabilitate habitats. One explanation might be that anglers experience a shifting baseline syndrome as suggested earlier for fisheries scientists. If this syndrome applies on a larger scale, this has implications for long-term performance of ecosystem-based recreational fisheries management because of low constituency support for conducting habitat rehabilitation projects.

Introduction



Carp from the Teltow Canal, Berlin, caught by R. Arlinghaus in 1995.

In sustainable fisheries management, the paradigm of ecosystem-based management (EBM) has recently emerged (reviewed by Arlinghaus et al. 2002). This is the result of increasing awareness of (1) the degraded state of many freshwater ecosystems worldwide, (2) the interconnectedness of terrestrial and aquatic ecosystems in space and time, (3) the freshwater fish biodiversity crisis, (4) the ineffectiveness of many traditional inland fisheries management systems, and (5) the consideration of human dimensions in the process of natural resources management (Arlinghaus et al. 2002). In essence, the holistic EBM approach encompasses a shift from a sectoral view of single-species management driven by traditional practices, such as stocking and regulations, towards a systems view of multi-species management characterized mainly by habitat rehabilitation measures (HRM). According to Pitcher (2001), the new goal of fisheries management should be to rebuild ecosystems, and not sustainability per se. This stems, inter alia, from the fact that rebuilt ecosystems are associated with greater economic, social, and ecological benefits (Pitcher 2001).

However, to be successful, EBM needs the strong constituency support of the majority of stakeholders potentially affected by the management programs. It is essential that most stakeholders, including the public, be as informed as possible on the issue under consideration (e.g., Costanza et al. 1998). It remains unclear whether anglers (which in many industrialized countries, and particularly in Germany, are the stakeholders most involved with the practical management of inland fish

stocks, Arlinghaus et al. 2002) are aware of this changing management paradigm and consequently perceive various forms of HRM as more promising than traditional practices such as stocking. Therefore, the aim of an exploratory survey among angling license holders (ALH) living in the metropolitan area of Berlin, Germany, was, (1) to gain insights into potential management measures to increase angler satisfaction, with particular emphasis on the frequency of HRM being mentioned; (2) to assess the link between rehabilitated habitat and improvement of angling opportunities as perceived by the anglers; and (3) to try to explain the answer pattern by investigating the association between mentioning HRM and various human dimension parameters.

We assumed that the majority (>50%) of ALH in Berlin perceive HRM as the most beneficial measure for improving recreational fishing opportunities and angling quality. As degradation of the environment and loss of fishery habitat are the pre-eminent concerns for the sustainability of inland fisheries worldwide (FAO 1999), anglers should perceive measures to rehabilitate and restore habitats as improving (and sustaining) recreational fishing opportunities. This is particularly true for long-term degraded urban water bodies of the German capital and the impoverished fish stocks therein (see below), with anthropogenic impacts dating back to the thirteenth century (Natzschka 1971; Uhlemann 1987). Furthermore, it has been suggested that participation in outdoor recreation (including angling) exposes people to environmental degradation and increases their concern about such degradation on a broader scale (Dunlap and Heffernan 1975).

Description of study area and Berlin inland fisheries

The reunified German capital, Berlin, is a city-state with a population of more than 3.5 million inhabitants, covering an area of 889 km², of which 58 km² (6.4%) consist of rivers and lakes. The landscape is

Robert Arlinghaus Thomas Mehner

Arlinghaus is a Ph.D. candidate in inland fisheries management at the Leibniz—Institute of Freshwater Ecology and Inland Fisheries, Department of Biology and Ecology of Fishes, Müggelseedamm 310, 12587 Berlin, Germany. He can be contacted at arlinghaus@igb-berlin.de, tel. +49-30-64181-653, fax +49-30-64181-750. Mehner is head of the Fisheries Management Group at the Leibniz—Institute of Freshwater Ecology and Inland Fisheries.

characterized by glacial deposits, slow-flowing lowland rivers, and shallow lakes with a maximum depth of 16 m. There are approximately 60 lakes which are >1 ha and more than 500 natural pond-like waters. The primary fishing waters are the rivers Spree and Havel, the latter being a rather lacustrine body of water, and their impounded areas comprise two-thirds of the total Berlin water area. Because of the densely populated area (population density around 4,000 people/km²), 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 fish species diversity 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 1996, 2000). In Berlin, highly valued piscivorous fish such as pike (*Esox lucius*), European catfish (*Silurus glanis*), pike-perch (*Sander lucioperca*), and eel (*Anguilla anguilla*) are today comparably 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 in press).

There is still intensive commercial fishing activity in the metropolitan center of Berlin (Arlinghaus and Mehner in press). In 2001, commercial fishing in Berlin city was undertaken by 13 full-time and 17 part-time fishery enterprises on 4,517 ha of water area, with 42 people engaged in fishing. Since the reunification of Berlin and the restructuring of the commercial fishing sector, particularly in the former Eastern Berlin, the commercial yield of marketable fish species (mainly eel and pike-perch) has ranged between 50 and 100 metric tons. Additionally, between 200 and 400 metric tons of non-marketable (zooplanktivorous) fish have been harvested as a result of the creation of an artificial market by the water quality management program of the Berlin Fishery Board (Grosch et al. 2000).

In 2001, recreational fishing took place on 5,545 ha of water. Since 1995, people who want to start angling are required to undertake an angling examination to obtain a general angling license, which is issued upon payment of an annual fishing tax. This angling license is a prerequisite for anglers to obtain angling tickets from the fishing rights holder(s) of particular waters, e.g., commercial fishermen or angling clubs. There are more than 250 (mostly commercial) fishing rights in Berlin. Because most fishing rights in Central Europe are private property, in Berlin many water bodies or sections of the river system require different angling tickets. Since 1997, numbers of official Berlin ALH have decreased from 49,000 to around 39,000 in 2001. Reasons may include the requirement to undertake examinations

and the implementation of the fishing tax (Arlinghaus and Mehner in press). In 2001, approximately 60% of the ALH fished at least partly in the urban waters of Berlin and harvested on average 2.3 kg fish/angler/year, mostly piscivorous fish and eel (Arlinghaus and Mehner in press).

Materials and Methods

To gather data on the human dimensions of anglers living in Berlin (Berlin anglers), a simple random sample was drawn from an official list of ALH of the Berlin Fishery Board (36,456 total addresses as of 31 December 2000, corrected for duplicates). A self-administered, 6-page mail survey was sent on 24 April 2001 to 3,500 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. The questionnaire was designed after Dillman (1978) and Pollock et al. (1994) and pre-tested with 70 anglers. It included mostly closed-ended questions with ordered choices. This was done to facilitate completion by the respondents and encourage participation. Due to financial and legal constraints, no follow-up mailings and no non-response check were conducted. Instead, to increase participation, the survey was publicized by a press release and special attention was given to avoid objectionable questions (e.g., income, willingness-to-pay). Six hundred twenty-seven questionnaires (18%) were undeliverable, indicating high mobility of Berlin anglers, and contributing to a moderate adjusted response rate of 37% (n=1,061). Caution is encouraged in generalizing results to the angler population of Berlin because of probable non-response bias. However, this response rate is considered acceptable given the exploratory and hypotheses-testing nature of this study (Bortz and Döring 1995).

The questionnaire was designed to gather data including demographics, angling activity, preferences, motivations, and expenditures. However, the focus of the study was to assess the link between rehabilitated habitat and improvement of angling opportunities as perceived by the anglers, and to explain the answer pattern. To achieve this, one open-ended question was included, asking the anglers to mention up to four measures to improve recreational fisheries and the quality of angling in general. This was done to obtain a spontaneous answer pattern not biased by focusing the respondents' attention on predetermined items (Kuckartz 2000). Content analysis was used to draw inferences from survey responses. This qualitative technique enables objective, systematic, and quantitative descriptions of written communication (Diekmann 1995). The coding system was based on the pre-test of the questionnaire and slightly refined during the coding procedure. Eighty-two code categories with frequencies of response >1% across 22 dimensions were derived from the responses. Inferences were drawn from the frequencies in each dimension. A random subsample of n=500 question-

naires was coded independently by two coders to assess inter-coder reliability. Percent agreement between the two coders was calculated according to Diekmann (1995). Most responses (91%) were placed in the same categories, indicating that categorical statements and meanings of the written messages were interpreted similarly by each coder.

Based on theoretical and empirical considerations, 14 likely associations between the probability of mentioning HRM and various independent variables were checked (Table 1). These independent variables were grouped into five classes: (1) demographic variables, (2) variables of recreation specialization, (3) variables of angling motivation, (4) angling preference variables, and (5) variables measuring perceived knowledge of ecosystem state. We presumed that the probability of proposing HRM should significantly correlate with various independent variables within these classes (Table 1). Two-stage logistic regression was used to deter-

mine the effect of the independent variables on the odds of an angler suggesting HRM (yes=1) or suggesting some other management measure (no=0). Forward stepwise selection (LR test) was utilized. First, separate logistic regression equations were fit for each class of independent variables to identify significant effects within each class. All variables found to be significant within each class were then combined into a single logistic regression model in the second stage of the analysis. Two-stage analysis was used because missing data for some independent variables would have reduced the total number of observations available to an unacceptable level if all variables were included simultaneously in a single model (cf. Sutton and Ditton 2001). In addition, chi-square analysis (level of significance $p < 0.05$) was used to verify significant independent variables in the second-stage logistic regression model (level of significance $p < 0.1$). All statistical tests were performed with the

SPSS Version 9.0 software package.

Table 1. Summary of variables (variable class, independent variables, range of variable scale) used to assess the association of mentioning habitat rehabilitation measures (HRM) and various independent variables. Some variables were composed of multiple items (see footnotes for details).

Variable class	Independent variables (items of constructed indexes in parentheses)	Range of variable scale	Predicted relationship ¹
Demographics	Age (years)	1 (<15) – 12 (>65)	-
	Education	1 (low) – 7 (high)	+
Angler specialization ²	Children	0 (no) or 1 (yes)	+
	Experience (years of experience, annual fishing frequency)	-3.81 – 3.26	+
	Resource use (total fish harvest)	-1.43 – 1.97	+
	Investment (total annual expenditure, replacement value)	-2.05 – 11.27	+
Angling motivation ³	Centrality (club membership, number of angling tickets issued, angling vacations, travel distance, self-perceived specialization level)	-2.04 – 7.76	+
	Relax in and enjoy nature	1 (not important) – 5 (very important)	+
Angling preference	Effort spent in rural waters	1 (none) – 12 (all)	+
	Piscivorous fish preferred	0 (no) or 1 (yes)	+
	Rheophilic fish preferred	0 (no) or 1 (yes)	+
	Running water preferred	0 (no) or 1 (yes)	+
Perceived ecosystem state ³	Habitat quality (diversity of shoreline structures, availability of spawning substrates)	1 (poor) – 5 (good)	-
	Water quality (water quality in general, ability to eat the fish)	1 (poor) – 5 (good)	-

¹ The predicted relationships (+ = positive or - = negative) were derived from Bryan (1977), Ditton et al. (1992), Veitch and Arkelin (1995), Theodori and Luloff (2002), Dörner et al. (unpublished data, Institute for Theoretical Psychology, Otto-Friedrich-University Bamberg, Germany) and the fact that urban and running water bodies as well as piscivorous and reophilic fish have particularly suffered from ecosystem degradation (Wolter and Vilcinskis 2000).

² According to Chipman and Helfrich (1988). With the exception of the dummy coded variables, each variable was standardized to a z-score (mean = 0; SD = 1) and the specialization subdimension index was created by summing the variable scores.

³ Derived from factorial analysis by principal component extraction and varimax rotation of a 23 item angling motivation scale (Wolter et al. in press) and a 4-item scale measuring perceived ecosystem state. The combined item means (five items for "relax in and enjoy nature"; two items for each of the perceived quality variables) were calculated and used as variables.

Results

Management preferences of Berlin anglers

The Berlin anglers' response pattern concerning measures to improve recreational fisheries and quality of angling was fairly heterogeneous (Table 2). No statement was of outstanding importance with more than 50% of the responses. Many of the proposed management options referred to traditional inland fisheries management practices such as stocking and regulations (expand stocking, expand enforcement measures, reduce regulations, reduce bureaucracy, expand regulations). Three dimensions (reduce prices of angling, expand stocking, and improve physical access to the water bodies) were named by around one-third of the responding anglers, indicating that these measures might most likely

increase angler satisfaction if properly addressed by fisheries managers.

Considering only management measures with frequency of responses >10% as relevant, just two statements either directly (stocking) or indirectly (rehabilitate habitat) targeted fish stocks. In this respect, stocking was proposed twice as often as rehabilitation of habitat to improve recreational fisheries. Expanded stocking was also the category which was named most often (8.8%), followed by the categories reduce the angling tax and ticket prices (8.6%), implement more enforcement measures (7.2%), and allow night-fishing and camping (7.2%). HRM were ranked seventh and was not the management action proposed by the majority of anglers as hypothesized. This suggested that Berlin anglers did not immediately consider rehabilitated habitats when evaluating measures to improve angling quality or promote recreational fisheries. However, a small proportion of respondents proposed to improve the cleanliness of the environment (mostly concerning littering of shorelines), which indicates some environmental concern at least with the aesthetical quality of the water body.

The response pattern indicated conflicts between user groups, because some of the stated management options targeted other stakeholders (e.g., constrain commercial fisheries, reduce boat traffic, reduce conflicts with animal welfare and nature conservation activists). Furthermore, public appreciation of the merits of recreational fishing and continuous involvement of anglers seemed to be important points for Berlin anglers because three dimensions (expand public relations, promote angling clubs and associations, and promote angling by children) referred to these issues. Reduction of fish-eating birds, on the other hand, was proposed by a minority of anglers, indicating that these birds did not represent a major source of concern.

Variables influencing the probability of mentioning habitat rehabilitation measures

When the effects of the 5 classes of the 14 independent variables on the odds to propose HRM were analyzed separately, the first stage logistic regression analysis identified 3 significant variables. Two of the significant variables were in the demographic class (age, presence of children in household) and the third variable was the perceived state of physical habitat quality. The second stage logistic regression excluded the age effect on the odds of proposing HRM (Table 3). According to the regression model, the odds of suggesting HRM were negatively related to the perceived state of habitat quality and to the presence of children younger than 18 in the household. Chi-

Dimension (rank in parentheses)	Frequency of response (%) = number of responses per dimension divided by total number of respondents (n = 626) ¹
Reduce prices (1)	Σ = 30.9
Expand stocking (2)	Σ = 30.4
Improve physical access (3)	Σ = 29.6
Expand enforcement measures (4)	Σ = 20.3
Reduce bureaucracy (5)	Σ = 17.9
Promote angling by children (6)	Σ = 16.9
Rehabilitate habitat (7)	Σ = 16.6
Reduce regulations (8)	Σ = 16.1
Improve cleanliness of environment (9)	Σ = 15.2
Constrain commercial fisheries (10)	Σ = 11.8
Expand public relations (11)	Σ = 11.3
Promote angling clubs (12)	Σ = 9.9
Reduce boat traffic (13)	Σ = 7.2
Expand angling possibilities (14)	Σ = 7.0
Expand regulations (15)	Σ = 5.7
Reduce coarse fish (16)	Σ = 3.4
Reduce conflicts with animal welfare or nature conservation activists (17)	Σ = 3.1
Improve access to angling tickets (18)	Σ = 2.7
Reduce fish-eating birds (19)	Σ = 1.9
Increase appreciation for nature (20)	Σ = 1.6
Improve quality of tackle (21)	Σ = 0.8
Others (22)	Σ = 1.4

¹ A single respondent may have had multiple categorical responses (maximum Σ).

Table 2. Frequency of response (%) for each management dimension perceived by anglers living in Berlin (Germany) to improve recreational fishing opportunities and the quality of angling.

Table 3. Results of the stepwise forward logistic regression analysis (LR) to test for significant effects on odds to propose habitat rehabilitation measures (HRM) in which all significant variables from the separate (class) models were analysed simultaneously.

Parameter	Estimate	p-value	Odds ratio ¹	Lower CI ² odds ratio	Upper CI ² odds ratio
Constant	-0.3948	0.1988			
Perceived physical habitat state	-0.4579	0.0057	0.6326	0.4574	0.8750
Children <18 years (1=yes)	-0.6690	0.0128	0.5122	0.3025	0.8674
Age (excluded from the model)		0.1829			

N = 418 (proposing HRM = 82; not proposing HRM, but something else = 336)³
 Model $\chi^2 = 14.578$, df = 2, p=0.0007
 Concordance = 80.38%

¹ 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 proposing HRM is a negative function of the independent variable.
² CI: 95% confidence interval
³ N for this analysis is less than the total sample size due to missing values on some variables.

square analysis of these two remaining variables revealed that the perceived state of physical habitat quality had a significant effect at $p < 0.05$ on the dependent variable but presence of children was not significant ($c = 2.244$, $df = 1$, $p = 0.134$). Thus, according to the variables tested in this study, only awareness of the poor physical habitat state significantly increased the likelihood of mentioning HRM.

Discussion

The well-known diversity in human dimensions of freshwater anglers (Aas and Ditton 1998) is manifested in divergent management tools supported by various subpopulations or segments of anglers (e.g., Wilde and Ditton 1991). As a result of this angler diversity and the open-ended question format in this study, a great variety of dimensional management measures was suggested by the responding anglers to improve recreational fishing and the quality of angling (Table 2). Even though this heterogeneity made it impossible to draw single-dimensional conclusions, the Berlin fishery environment helps to explain the answer pattern to a certain extent. Because of space limitations, only the first ten ranks of the proposed management dimensions will be discussed below.

Reduce prices

Since 1995, (angling license holder) ALH in Berlin have been required to pay an annual fishing tax to the government (Arlinghaus and Mehner in press). Berlin anglers were not accustomed to this additional fee that reduced the net benefit of the angling experience. Price increases are known to cause the attitudes of anglers toward paying fees to become more negative (Kerr and Manfredo 1991). This may explain why a substantial number of the responding anglers proposed to reduce prices for angling. In another German angler study in a state (Saxony-Anhalt) without a recent increase in angling fees, reduction of prices for angling tickets was viewed by the anglers as subordinate to other options, e.g., public relations or stocking, to improve angling (H. Wedekind unpublished data, Institute for Inland Fisheries e.V., Potsdam Sacrow, Germany).

Expand stocking

Expansion of stocking to support highly valued fish stocks was proposed by about one-third of the Berlin anglers. Stocking was found in many other angler studies to be one of the primary management options supported by anglers (Miranda and Frese 1991; Wilde and Ditton 1991; Wolos 1991). This reflects the widespread use of stocking as a management tool in recreational fisheries worldwide (Arlinghaus et al. 2002). The preference of Berlin anglers for stocking over HRM may be due to anglers perceiving that stocking is more successful than HRM in enhancing fish stocks, which ultimately should increase angling success. If, after evaluation of management programs, HRM can be demonstrated to be more effective than stocking practices in achieving this objective, greater angler support for HRM as compared to stocking is probable.

Improve physical access to the water

Physical access to the water bodies inside the city is often difficult because of heavy development of shorelines and the multi-use pattern of the urban waters. In addition, the water bodies outside Berlin in the adjacent German states, which more than 90% of the Berlin anglers use regularly (Arlinghaus and Mehner in press), often have remote shorelines with many driving routes forbidden for angler use. This makes access difficult and time-consuming and may explain why many Berlin anglers listed improvement in physical access as a

way to improve recreational fisheries. Furthermore, because most water bodies or sections of the rivers require a particular angling ticket, the category “expansion of maps and signposting to angling waters” was named fairly often, probably to improve orientation during the travel to the waterside. It has been shown that anglers of different social units place equal importance on convenient access to the angling site (Hunt and Ditton 1997). However, anglers may prefer to have better access to the angling site while also keeping crowding down (Hampton and Lackey 1976).

Expand enforcement measures

This study surveyed only Berlin ALH. There are also unknown numbers of anglers fishing without a license. This might bother those who fish legally and may explain why a noteworthy number of anglers suggested expanding enforcement measures to benefit angling quality. Furthermore, this may indicate the willingness of many ALH to protect fisheries resources by controlling poaching and illegal fishing. This corresponds, for example, with angler opinions in Portugal, where increased enforcement was perceived as most important to the maintenance or re-establishment of the natural equilibrium of the rivers and streams (Marta et al. 2001).

Reduce bureaucracy, reduce regulations, and constrain commercial fisheries

In Germany, every federal state (16 in total) has its own fishery legislation and regulations and anglers are required to undertake angling examinations to obtain fishing privileges. This apparently bothered Berlin anglers, such that 17.9% proposed to reduce bureaucracy. In addition, Berlin anglers have to inform themselves about the regulations in place in regions outside Berlin. This information is often not easily accessible and varies from water body to water body because of local rules. This may explain why anglers mentioned “consistent laws and regulations in German states” fairly often. Furthermore, the multi-use nature of Berlin waters and the substantial commercial fishing activity inside Berlin has led to rather strict regulatory schemes. For example, night-fishing is forbidden on major sections of the River Havel because control and enforcement is difficult during night-time, and stationary commercial fishing gear such as fyke nets need protection. These regulations constrain angling opportunities and may explain why dimensions such as “reduce regulations” and “constrain commercial fisheries” were stated fairly often to improve the quality of angling. The latter opinion may also reflect that both fisheries (commercial and recreational) target similar fish species and consequently compete for limited fish resources (Arlinghaus and Mehner in press).

Promote angling by children

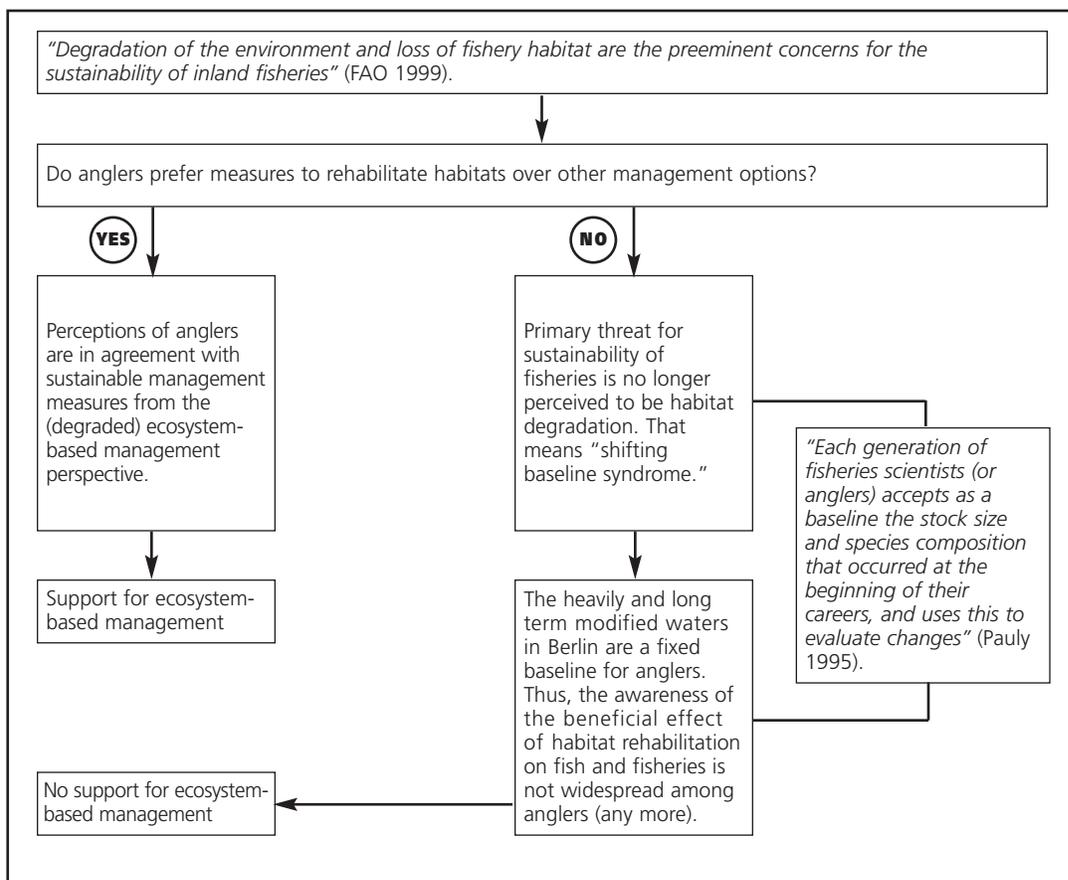
In Berlin angling is restricted for children and adolescent persons younger than 18 years (e.g., angling is allowed only with club membership and for non-piscivorous fish). The angling examination can only be taken by persons older than 14 years. The promotion of angling by children was suggested by many of the responding anglers, which indicates that Berlin anglers may be (a) concerned with the barriers to angling by children in Berlin as described above, (b) aware of the lower probability of persons reared in urban areas participating in fishing (Hendee 1969), and (c) aware of the probable decline in angling participation by younger people given an aging population in Germany (cf. Murdock et al. 1996) and numerous competing leisure activities (Lyons et al. 2002). Furthermore, there is a well-known correlation between recreation activity participation

as a child and as an adult (Sofranko and Nolen 1972), such that promotion of angling by children may serve as insurance for stabilizing or enhancing angling participation in the future. This may be reflected by Berlin anglers as well.

Rehabilitate habitat, and improve cleanliness of environment

Given the poor quality of most inland waters in the Berlin area and the dominance of a nature/environment-related motive among Berlin anglers (Wolter et al. in press), the relatively low ranking of measures to rehabilitate habitats (and to enhance cleanliness of the environment) was unexpected. Theoretically, more anglers should have suggested these management actions, because HRM together with measures to improve the cleanliness of water and shorelines may enhance the aesthetic quality of the environment as well as the quality of the fish stocks. As nature/environment-related management measures were suggested relatively infrequently and the nature/environment-related angling motive was not signifi-

Figure 1. Model of the “shifting baseline syndrome” in recreational fisheries as derived from angling in heavily modified waters of the metropolitan area of Berlin.



cantly related to the probability of mentioning HRM (Table 3), satisfaction with the primary “relax in and enjoy nature” motive was supposed to be high. This suggests effects of the shifting baseline syndrome (Pauly 1995, Figure 1) and the shifting reference state of nature as perceived by the anglers. Anglers living in the metropolitan area of Berlin may perceive long-term degraded water bodies of the German capital (and the impoverished fish stocks therein) as a fixed baseline or a fixed reference point against which management measures are judged. This may be the case because most anthropogenic impacts on Berlin water bodies occurred before 1900 (Natzschka 1971; Uhlemann 1987). Therefore, living angler generations never experienced a severe decline in fishing quality after a modification of the ecosystem. As a result, anglers may no longer perceive habitat degradation to be the primary threat for the sustainability of recreational fisheries, thus reducing support for EBM (Figure 1). Today, angling can take place in highly modified environments which may be perceived by modern anglers to be “nature” (Pintér and Sipponen 2001). The shifting angler-nature relationship is also evident in the growing trend towards artificial, highly stocked fisheries in Europe (Arlinghaus et al. 2002) and the observation that many anglers have adapted or grown accustomed to a deterioration in habitat and water quality (Lappalainen and Pönni 2000).

The shifting baseline syndrome among anglers living in a highly modified urban environment as interpreted here also agrees with the empirical results of Tarrant and Green (1999) that participation in consumptive outdoor recreation (i.e., hunting and fishing) does not necessarily mediate or moderate a pro-environmental attitude-



There is still intensive commercial fishing activity in the metropolitan center of Berlin.

behavior relationship. This sharply contrasts with the often stated assumption that angling participation promotes environmental awareness simply by exposing people to environmental issues and concerns (e.g., Dunlap and Heffernan 1975). However, from the EBM perspective, this study demonstrated a “promising” negative correlation between the perceived state of habitat quality and the probability of mentioning HRM (Table 3). This indicates that, if anglers perceive habitat quality to be poor, support for HRM is very likely. In contrast, our data and other publications (Chipman and Helfrich 1988; Vittersø 1997) did not support the original hypothesis introduced by Bryan (1977) that more specialized anglers are more likely to favor habitat management (Table 3). Furthermore, due to the lack of significant associations between variables of four classes (demographics, angling specialization, motivations, and preferences, Table 3) that typically were found to be related to environmental concern in humans (Table 1), our understanding of crucial and managerially manipulable factors fostering support for HRM and EBM among anglers remains limited. Because of this lack of knowledge, the possibility to develop effective angler-orientated aquatic stewardship education programs is constrained.

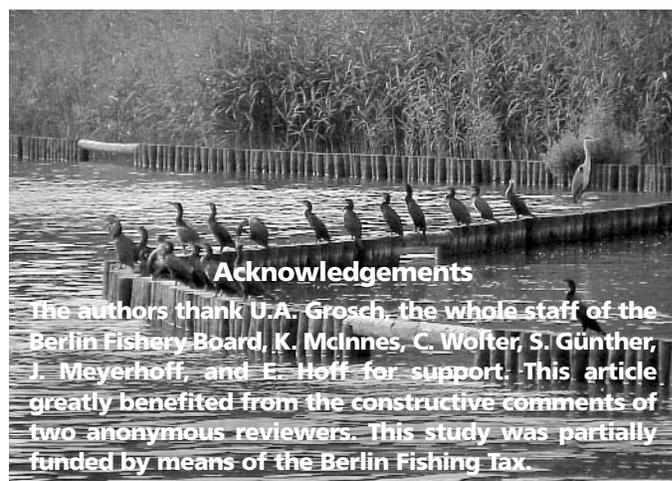
Other explanations for the low awareness of the beneficial effect of habitat rehabilitation on angling quality in Berlin include (1) the angler may “know” that the restoration of aquatic systems into a “pristine” state is unrealistic today; (2) the seemingly irreversible degradation of the environment may have led to public pessimism, a feeling of “helplessness” and low expectations about the possibility to reverse the environmental conditions (Gale 1987; Kaplan 2000); (3) the angler may totally ignore any alternatives to traditional recreational fisheries management based on stocking and regulations; (4) there may be a general opposition to the emerging concept of EBM; (5) the angler may not have faith in the Berlin Fishery Board, which “officially” conducted the survey, to address environmental issues; and (6) the context of the survey probably motivated the respondents to predominantly express measures related to subjective objections with the past fisheries policy of the Berlin Fishery Board. Irrespective, most alternative explanations are counterproductive to the application of EBM (Figure 1).

In contrast to our findings that Berlin anglers prefer stocking over HRM, which was in agreement with other angler investigations (Miranda and Frese 1991; Wolos 1991), several other studies have yielded seemingly contradictory results (Quinn 1992; Aas and Skurdal 1996; Connelly et al. 2000). Contradictory impressions of high versus low environmental awareness of anglers may result from divergent constructs measured in the different studies. Angler survey questions on management options usually use quantitative methods and closed-ended questions with pre-determined items that are typically answered by the respondents on a five-point Likert-type scale. This is a rating task for the respondents and these question formats measure attitudes that are “the feeling or disposition of people toward some entity or object of the attitude” (Pollock et al. 1994). Preferences, on the other hand, are “simply choices or options that people like or desire more highly than one or more alternatives” (Pollock et al. 1994). An open-ended question measures preferences and is a (incomplete) ranking task (Diekmann and Franzen 1999). To answer the open question, one has to choose, from a list of (more or less endless) management options coming to one’s mind, the set of options that rank first. This is a more economic decision as the respondent cannot “vote” for many management options simultaneously, which is possible with the rating question format (Diekmann and Franzen 1999). This methodological influence may direct angler

survey results concerning attitudes and preferences related to nature and environment in the following way (Diekmann and Preisendörfer 2001): environmental concern and awareness of environmental problems appear high in closed-ended question formats with pre-determined items and Likert-scales (Aas and Skurdal 1996; Connelly et al. 2000). In closed-ended questions with unordered choices where respondents have to rank items (Quinn 1992), environmental concern appears moderate, whereas in open-ended questions environmental concern and awareness usually appear less pronounced (Wolos 1991, this study). Reasons for these response differences stem first from the fact that pre-determined items turn the attention of the responding angler to management measures which they otherwise had never thought about, reducing validity of the answer pattern (Kuckartz 2000). Second, people in industrialized countries today have a high sensitization towards environmental issues (Diekmann and Preisendörfer 2001) and pro-environmental behavior is often a societal norm (D. Dörner et al. unpublished data, Institute for Theoretical Psychology, Otto-Friedrich-University, Bamberg, Germany). Thus, pro-environmental answer patterns in studies using rating question formats measuring “feelings” (attitudes) might be more biased by social desirability effects than answer patterns to open-ended questions measuring preferences, because it is socially desirable to (directly or indirectly) behave in an environmentally friendly way.

Conclusions

Because anglers are the stakeholders most involved with the practical management of inland fish stocks, constituency pressure may lead to management actions which are deleterious for ecosystem health. Ultimately, the likely shifting baseline syndrome in recreational fisheries means that with an increasing degree of industrialization of societies and associated anthropogenic impacts, anglers lose the ability to link aquatic ecosystem status, fish stock health, and angling quality, healthy ecosystems are no longer considered a prerequisite for healthy fish stocks. However, because of the significant association between the perceived knowledge of habitat quality on the odds of mentioning HRM, the prerequisites for anglers to exhibit indirect pro-environmental behavior based on support for EBM are favorable. With respect to this, anglers need to be thoroughly informed and educated about the state of freshwater ecosystems, negative effects of habitat degradation, and positive effects of habitat rehabilitation. This requires that rehabilitation projects be properly evaluated and communicated to the public, which is rarely done in Germany. 



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