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Understanding Recreational Angling Participation in Germany: Preparing for Demographic Change

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This study examined demographic, socioeconomic, and geographic factors facilitating the likelihood of participating in recreational angling. The analysis was based on a nationwide telephone survey in Germany. The probability of being an angler was significantly higher for males with full-time working status, living in Eastern Germany, in rural areas and near to the coast. Educational level and household size were negatively related to angling participation. Increasing net monthly household income increased the odds of participation in fishing. Close access to saltwater was more influential for angling participation than access to freshwater. Given projected trends of demographic change likely affecting the general population structure in Germany, most of the associations found in this study suggest decreased participation in recreational angling in the future. It is a matter of societal values whether targeted marketing and management approaches are implemented to intervene into the likely outcome of demographic change in Germany.

Keywords access, activity, demographic change, human dimensions, participation, outdoor recreation, recreational fisheries

Introduction

Recreational fishing has long been the financial mainstay of public fisheries agencies around the world. In the United States, recreational anglers support fisheries management, conservation efforts, and outdoor recreation opportunities through excise taxes and purchases of licenses, stamps, and equipment registrations (Floyd & Lee, 2002). Knowledge of angling participation rates and intensity is important to fisheries-dependent industries and angler organizations due to the social and economic benefits that are linked to recreational fishing participation (Arlinghaus, Mehner, & Cowx, 2002).

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Recreational fishing participation influences national and regional economies, and public and private fisheries management. In contrast to the United States, in most central European countries fishing rights are private, not public entities (Arlinghaus et al., 2002). Angler expenditure drives fisheries development at both private and public management levels. In Germany, for example, anglers pay taxes ("Fischereiabgabe") for angling licences from public fisheries agencies ("Fischereischein") responsible for fisheries at the state-level ("Bundesland"). This money is used for fish stocking, habitat restoration programs, or fish population monitoring. At the private fisheries management level anglers pay for angling licences supplied by local fishing rights holders (i.e., the owners or leaseholders of local fisheries, e.g., an angling club). Fishing rights holders are legally obliged to manage "their" waters according to the demands set by nature conservation and state-specific fisheries legislation. Modifications of the rate and intensity of angling participation influence the budgetary and managerially capacity of both public agencies and private fishing rights holders to manage fisheries for the benefits of nature and society (e.g., improved health, learning, and self-actualization) (Aas, 1995). Constituency support and the public image of recreational fishing depend on the number of people fishing and having satisfactory experiences.

There are trade-offs between (1) social, economic, and ecological benefits and (2) potential social–ecological costs when debating angling participation rates, pressure, and access. The need to reduce and/or increase participation in fishing is differentially valued by stakeholders and depends on the eye of the beholder. It is for example reasonable to assume a positive correlation between absolute angling participation, angling effort/mortality, and level of crowding such that ultimately fewer anglers mean more fish and space per angler and less stringent regulatory needs as a general rule. Proactive decision making requires some capacity to anticipate events or processes that need to be addressed before undesirable states are created (Thunberg & Milon, 2002). This need has stimulated academic interest in studying recreational fishing participation and the factors prompting it.

Research on projecting future fishing participation has predominantly been conducted in the United States (Walsh, John, McKean, & Hof, 1989; Murdock, Backman, Ditton, Nazrul Hoque, & Ellis, 1992 a, b; Murdock, Loomis, Ditton, & Nazrul Hoque, 1996) and in selected states (Loomis & Ditton, 1988; Edwards, 1989; Thunberg & Milon, 2002). Given that fisheries resources are public goods in the United States, intervention, planning, and management-oriented research focus on public lands. In contrast, only limited information on angling participation trends is currently available in Europe (with Aas, 1996 from Norway as an exception). Predicting continued angler participation or the probability of becoming an angler is consequently poorly understood in the European context. It is unclear whether findings from the United States and Norway generalize to Germany or other European countries. Given the differences in institutional settings characterizing the fisheries system in North America and Europe, generalizing U.S. insights to Europe may be limited.

To predict future angling participation, information on the factors facilitating recreational fishing is needed (Ditton, 1995). This is particularly critical given the changing demographics in the industrialized world (United Nations, 2004), and the likely effects these changes will have on recreational angling participation. In Germany, for example, an aging population (Statistisches Bundesamt, 2003), reductions in total population size, regional population shifts from Eastern to Western Germany, increases in foreign inhabitants and structural changes in employment and education (Münz, Seifert, & Ulrich, 1997; Bundesinstitut für Bevölkerungsforschung, 2004; Kröhnert, van Ost, & Klingholz, 2004) are all likely to influence angling participation (Murdock et al., 1992 a, b, 1996). To respond effectively, managers need information on which factors influence participation overall.

The present study aims to (1) identify predictive factors promoting participation in German recreational angling and (2) search for generalizable variables explaining the likelihood to fish for recreation. A model is developed to examine the influence of selected demographic, socioeconomic, and geographic (e.g., availability of in-state freshwater) predictors on German recreational angling participation. These variables were included because North American (Edwards, 1989; Walsh et al., 1989; Bissel, Duda, & Young, 1998; Floyd & Lee, 2002) and Norwegian studies (Aas, 1995, 1996) have found them to influence participation. Based on previous research, the probability to be an angler was expected to increase with being a male, having working status, income, education, and residence in an area with greater water availability. The odds of being an angler were expected to be inversely related to age, household size, and level of urbanization (e.g., population size of place of residence). Specific to Germany, different cultural backgrounds and divergent levels of industrialization in Eastern (low) and Western Germany (high) may influence angling participation. People in Eastern Germany generally have a more rural, traditional lifestyle than inhabitants of Western Germany (Bundesinstitut für Bevölkerungsforschung, 2004). Greater angling participation would be expected in Eastern Germany because rural people more likely chose recreational activities that consume, or at least depend on, wild natural resources such as fishing (Hendee, 1969).

The potential predictors of angling probability included in the analysis were exclusively related to demographic, socioeconomic, and geographic constructs. Other potential predictor variables (e.g., travel time, fishing quality) were excluded. The reductionist approach is justified because population projection data that might be useful in the future predictions of angling participation trends typically refer only to demographic and general structural variables. Social structural variables are often better predictors of leisure participation than self-reported constraints such as “lack of time” (Shaw, Bonen, & McCabe, 1991). Nevertheless, it is crucial to realize and accept that beyond mere demographic or socioeconomic variables, many factors including socialization, tradition, and culture are likely responsible for the decision of a person to fish, or more generally, to become an angler. Examining these potential determinants of angling participation is beyond the scope of this article.

Methods

An angler household screening survey was conducted in Germany in 2002. This survey was an add on to ongoing BUS-survey routines administered by a private research institute (USUMA GmbH, Berliner Allee 96, 13088 Berlin, Germany). BUS-surveys are multiple-topic telephone surveys among the German public (aged 14 and older) that adhere to standard survey research designs (e.g., regional stratification, random digit dialing) (ADM-design, Kaase, 1999). Telephone numbers were deleted after ten contact attempts. Within a household the target person was randomly selected according to the last birthday question. Because the chance of being selected in multiple person households is inversely correlated with household size, the final sample was weighted by household size and adjusted to external demographic variables (sex, age, state of the respondent's residence within Germany) to achieve a “representative” person sample. In total 6 survey waves with about 1,000 interviews each were conducted in 2002. The response rate for the BUS-surveys was 55% (Rainer Schwarz, USUMA GmbH, personal communication 2002). No separate non-response survey was conducted because the data were weighted against the demographic structure of the German public.

The angler screening surveys asked two questions: (1) whether anglers were present in the household, and (2) a convenient time to conduct a specific follow-up angler interview. Agreeing households (71% in total) were retained. All potential angler households identified in the BUS-surveys were recalled and personal interviews conducted with all anglers in the household (20–25 minutes each). Additional screening calls were conducted to increase the angler sample size. Data were gathered from October 15 to November 8, 2002, by 38 trained professional interviewers.

Given that most angler households (70%) are single-angler households (Arlinghaus, 2004) and the lack of previous information on the incidence of anglers in the German population that would allow calculation of weightings, the angler sample was not weighted. The sample design for the angler survey was a single-stage cluster sampling, where the primary sampling unit was the household (chosen at random) and the secondary unit was the angler within the household. The response rate in the angler survey was 80%; non-response bias was considered negligible.

The first questions of the angler interview asked whether the respondent was an active angler (having fished at least once in 2002 in Germany or abroad), inactive angler (having fished in the past, but not during the previous 12 months) or youth angler (aged 13 years or younger). Interviews were only conducted with active anglers 14 years and older.

The two samples (sample of non-anglers generated in the BUS-surveys and active angler sample generated by BUS-surveys and additional screening interviews) were combined into one sample of active anglers and non-anglers. The final sample included 5,274 (92%) non-anglers and 474 (8%) active anglers. Descriptive analysis revealed a high item non-response rate for net monthly household income. Missing values for income were substituted by computing a value based on a multiple linear regression model of demographic variables (age, gender, professional status, education, population size of place of residence, household size) on income. The regression was computed for all respondents providing income information.

To analyze the influence of geographic factors on angler participation, values for the relative area of freshwater in the resident federal state of the respondent were taken from Brämick (2004). Proximity to the coast was estimated if the state of residence was within 100 km (one way travel distance) to the coast. This was done because German anglers reported a mean travel distance of 100 km to their main water body (Arlinghaus, 2004). Age as a potential explanatory variable was also used in a quadratic form because Edwards (1989) found age^2 to significantly explain angling participation in marine angling in the United States.

Logistic regression was used to model the effects of the independent demographic, socioeconomic, and geographic variables (see Table 1 for coding and categorization) on the probability of a person being an active angler (yes = 1; no = 0). Similar to Floyd and Lee (2002), stepwise forward models were run to single out variables that most strongly explained the probability of participating in angling. In total, seven extreme values were excluded from the data set by qualitatively examining a scatterplot of standardized residuals per respondent (Backhaus, Erichson, Plinke, & Weiber, 2000). Based on the bivariate correlations, multicollinearity was considered negligible (Backhaus et al., 2000); no bivariate correlation coefficient exceeded 0.4.

The logistic model can formally be expressed as:

$$\ln[P/(1-P)] = \beta_0 + \bar{\beta} X + \varepsilon,$$

Table 1
Coding of independent variables used in logistic regression models

Level	Variable	Coding procedure
Demographic	Gender	1 = male; 0 = female
	Age	Age of respondent in years
	Residence population size	Proximity to large urbanities is considered (+, otherwise –) 1 = <2,000 2 = 2,000 – <5,000 3 = 5,000 – <20,000 4 = 20,000 – <50,000 5 = 50,000 – <100,000 (–) 6 = 50,000 – <100,000 (+) 7 = 100,000 – <500,000 (–) 8 = 100,000 – <500,000 (+) 9 = 500,000 and more (–) 10 = 500,000 and more (+)
	Region of respondent's state of residence	Region = 1 if respondent resides in Eastern Germany (new German states); 0 otherwise
Socioeconomic	Education	Highest level of scholarly education attained: 1 = still in education without degree 2 = basic school without apprenticeship 3 = basic school with apprenticeship 4 = mid level school 5 = high school (Abitur) 6 = university degree
	Working status	Status = 1 if respondent has full time job; 0 otherwise
	Income	Total 2002 after tax monthly household income 1 = <1,000 € 2 = 1,000 – <1,500 € 3 = 1,500 – <2,000 € 4 = 2,000 – <2,500 € 5 = 2,500 – < 3,000 € 6 = 3,000 € and more
	Household size	Number of people residing in household
Geographic	Freshwater area	Percentage of water area related to total area of respondent's state of residence
	Proximity to coast	Proximity = 1 if respondent's state is within 100 km (one way) of coast; 0 otherwise

where P is the probability of a person being an active angler, β_0 is the intercept, $\bar{\beta}$ is the vector of parameters to be estimated associated with the set independent variables (e.g., gender, education, income) X, and ε is the error term. Interpretation of the strength and direction of the independent variables in the model was based on odds ratios. Odds ratios > 1.0 indicate that being an angler is a positive function of the independent variable. An odds ratio < 1.0 indicates a negative function between the odds of being an angler and the independent variable.

Results

The likelihood of having actively angled in 2002 was significantly associated with 73% of the independent variables tested (8 out of 11, Table 2). About 40% of the total variance was explained by the final model. Angling probability was significantly related to gender, education, working status, income, household size, population size of residence (a measure of level of urbanization), residence region within Germany and geographic proximity to the coast (Table 2). Neither age nor age^2 were significantly associated with the odds of being an angler. The area of freshwater in the respondent's residence state was also not significantly related to the probability of being an angler when proximity to the coast was included in the model. A separate model computed only with the freshwater area as predictor variable and excluding the proximity to coast influence, however, revealed a positive and significant influence of the availability of freshwater on the likelihood to angle (*B* value not shown). Access to saltwater was more influential for active participation in angling than access to freshwater because the latter influence vanished after including the saltwater access variable. The two variables were correlated, which explains the findings.

Table 2
Logistic regression model of demographic, socioeconomic and geographic factors and recreational angling participation in Germany in 2002

	B (Step in which included in the model)	Per Unit Odds ratio (95% CI)	Maximum Odds Ratio in ordinal scales
Intercept	–5.965***		
Gender	2.770*** (1)	15.197 (10.41–24.47)	—
Age	0.204		
Age^2	0.914		
Education	–0.871*** (3)	0.42 (0.37–0.46)	0.005
Working status	0.568*** (6)	1.76 (1.35–2.31)	—
Income	0.836*** (2)	2.30 (2.09–2.55)	150.80
Household size	–0.223*** (7)	0.79 (0.72–0.89)	—
Residence size	–0.055** (8)	0.94 (0.91–0.98)	0.57
Region	0.893*** (4)	2.44 (1.83–3.25)	—
Freshwater area	0.171		
Proximity to coast	0.655*** (5)	1.93 (1.51–2.50)	—
Model evaluation (forward LR-Test)	Model $\chi^2 = 1080.41$	df = 8, $p < .001$	Nagelkerke $R^2 = 0.402$

(** = $p < 0.01$, *** = $p < 0.001$).

The likelihood of being an angler was significantly higher for males with full-time working status, living in Eastern Germany, in rural areas and closer to the coast. Education and household size were negatively related to angling participation. Increasing net monthly household income increased the odds of participation in fishing. Gender was the strongest predictor of angling participation, followed by income, residence in Eastern Germany, and education. These factors had greater influence compared to the supply related geographic variables, particularly proximity to the coast.

The odds ratio (0.42, Table 2) for education suggested only a weak effect on the angling probability. However, the widely spread categories of education (a six-unit change from lowest to highest maximum, Table 1) and the calculation of the maximum odds ratio demonstrated that the effects were in fact much stronger (maximum effect: $e^{[6(-0.871)]} = 0.005$): the highest education category was 0.005 times less likely to angle compared to the lowest. Alternatively, the lowest education category (i.e., still in education) was 200 times (= 1/0.005) more likely to have fished in 2002 compared to the highest.

By coupling results of the logistic model (Table 2) with general predictions of demographic and socioeconomic changes within the German public, a tentative, qualitative prognosis of future German angling participation was developed. Based on expectations (Table 3), an absolute and relative decrease in angling participation rate can be expected in the future. The German population is shrinking over time, even if immigration is accounted for (Statistisches Bundesamt, 2003). The absolute angling participation level will drop, if participation rate remains constant. Structural changes within the population, however, suggest a likely reduction in relative participation rate in angling (Table 3). Only 2 of 8 (25%) expected changes in demographic and socioeconomic structure of the general population will probably facilitate angling participation (i.e., decreasing household size,

Table 3
Hypothesized effects of demographic and socioeconomic change on recreational angling participation in Germany

	Future projection[a]	Expected effect on angling participation[b]
Gender	No change	—
Age	Aging population	Decrease
Education	?, probably decrease[c]	?, probably increase
Working status	More unemployed	Decrease
Income	Decrease	Decrease
Household size	Decrease	Increase
Population size of residence	Increase	Decrease
Region of residence	Shift to West	Decrease

[a]Trends as derived from several sources (Statistisches Bundesamt, 2003; Bundesinstitut für Bevölkerungsforschung, 2004; Kröhnert et al., 2004).

[b]Based on logistic model results in Table 2.

[c]Projected trend is derived from comparative studies on educational levels of school-age-children in principal industrialized countries conducted by the Organization for Economic Cooperation and Development (OECD, Programme for International Student Assessment, PISA, cf. www.pisa.oecd.org).

decreasing educational level). In contrast, six expected changes in demographic and socioeconomic structure are presumably counterproductive to future angling participation. However, it is important to stress that these projected trends are highly uncertain.

Discussion

The present article documented for the first time associations between a series of independent variables and the probability to participate in German recreational angling. Many of the significant demographic, socioeconomic, and geographic variables found in this study were consistent with U.S. data suggesting some generalizability of angling participation predictor variables. It is suggested that in the industrialized world recreational angling participation is similarly influenced by relatively general social structural and geographic factors.

The logistic regression model presented explained about 40% of the variance of the probability of being an active angler. The amount of variance explained was considerably greater compared to previous studies (e.g., 11% for total fishing in Walsh et al., 1989; 10% for fishing licenses sales in Floyd & Lee, 2002). Given the low level of multicollinearity characterizing the data set of this study and the relatively large amount of explained variance, the usefulness of explaining angling participation by demographic, socioeconomic, and geographic factors in a logistic regression framework is indicated (Floyd & Lee, 2002). It is paramount, however, to realize that other variables not measured in this study can influence the decision of a person to fish (e.g., Hunt, 2005).

Supporting the relationships found in the present German study, several angling populations have been dominated by males living in rural areas (Hendee, 1969; Walsh et al., 1989; Aas, 1995, 1996; Bissel et al., 1998). The gender effect probably relates to socialization, role expectations and evolutionary impacts. During human evolution men were more likely to be hunters and anglers than women. The existing patterns of recreational participation, however, are not necessarily indicative of female's "natural interests or abilities" (Fedler, 2000). Socialization processes that deter females away from recreational fishing can be overcome, particularly when spouses, relatives, and friends fish (Fedler, 2000).

Urbanization was negatively related to angling participation in the present study. Rural residence facilitates interest in fishing (Hendee, 1969). Rural residence promotes more direct access to fishing opportunities than urban residence and may correspond with a more utilitarian or agrarian orientated value system. An utilitarian value system may be more characteristic of inhabitants in more rural and less industrialized regions of Eastern Germany compared to Western Germany, potentially explaining the significantly higher propensity of Eastern Germans to fish. Comparing the relative frequencies of population sizes and locations of residencies between the active angler and the general German population in 2002, the angler population was found by Arlinghaus (2004) to be overrepresented in rural areas and in Eastern Germany. The significant associations between population size and place of residence found in the present study support Hendee's (1969) observations on urban–rural differences in recreation behavior. Theories of rural–urban differences should be coupled with demographic and economic factors affecting recreation behavior (Hendee, 1969). The effect of population size of residence was not among the most important predictors of angling participation in this study.

The suspected negative influence of age was less pronounced than expected based on North American work (e.g., Walsh et al., 1989). Arlinghaus (2004) compared the age structure of the active male angler population with the male general population in Germany. Age differences were only pronounced within those aged 14–19 (largely overrepresented participation) and those 70 and older (largely underrepresented). The latter

observation agrees with Fedler (2000) who reported drops in angling participation within the U.S. population after initially high levels of participation when age 15 is reached. A second drop was often found at age 45 or older with relatively constant participation rates in between very young and "older" people (i.e., age 45). Aging reflects life-course changes that determine recreation behavior. For example, young people starting a university or a first full-time job will less likely go fishing because of new commitments in life. At older age, physical abilities may limit angling participation (Walsh et al., 1989). The inconsistent trends in relative participation per age class found by Arlinghaus (2004) using the active angler sample may explain the insignificant influence of the metric age variable used in the logistic regression model. Alternatively, the large number of categorical independent variables included in this study might have reduced the explanatory power of age. Much of the variance in the data set was "absorbed" by the categorical variables.

The positive influence of geographic proximity to the coast on the likelihood to fish echoed results of U.S. studies (e.g., Edwards, 1989; Walsh et al., 1989). Relative participation rate in overall angling activity was highest in northern compared to southern German states (Arlinghaus, 2004). Northern states are closer to the coast and to the Scandinavian, water rich countries, which explains the angling stimulating effect of proximity to saltwater. Geographic proximity to recreational opportunities influences participation in most outdoor recreational activities (Hendee, 1969).

In contrast to the influences of demographic and geographic variables on angling participation, the effects of socioeconomic variables were less pronounced and in part equivocal. Income, for example, was among the strongest predictors of angling participation. In the United States and Norway biggest per capita fishing rates were in higher income classes (Aas, 1995, 1996; Fedler, 2000), and income significantly explained total national fishing participation in the United States (Walsh et al., 1989; Floyd & Lee, 2002). Income may have an influence because it provides the means to undertake an activity, particularly if significant travel is involved (Floyd & Lee, 2002). The same should apply to working status because unemployed persons should experience resource-related constraints (e.g., money) counterproductive to angling participation. In this study the angling probability increased if the person had full-time employment and with net monthly income as a measure of total monetary resources available to members of a household. In contrast, employment did not significantly explain fishing participation in the United States (Walsh et al., 1989). The effect of employment on angling probability remains equivocal.

In contrast to North American work, education was negatively related to the odds of recreational angling in Germany. This may be related to the way education was measured in the present study by treating school age children as "low educated." In addition, income was purposely measured as net monthly income, not personal income. This resulted in a weak relationship between education and "income" and satisfactory discrimination between education and income in the logistic regression.

The influence of education on angling probability is equivocal in the literature. Fedler (2000) revealed slightly higher educational levels among anglers compared with non-anglers. Walsh et al. (1989) found education to be positively related to the fishing participation probability in the United States. Floyd and Lee (2002), however, found education was not a significant predictor of fishing license purchase in Texas, and a negative correlation between education and license purchase probability. In Germany, anecdotal speculations suggest that consumptive recreationists anglers are less educated than hunters. Somehow supportive of this speculation, the angling probability decreased with increasing educational level in the present study.

Less information is available with respect to the angling stimulating/inhibiting effects of other socioeconomic factors such as household size and presence (absence) of children younger than 18 years in a household. Murdock et al. (1992a) suggested that changes in household composition will affect angling participation without providing data on direction and magnitude of change. Household size was not significantly related to total fishing participation in the United States (Walsh et al., 1989). Increasing household size and correlated family commitments limit the time availability. Lack of time can be a primary constraint to participation in recreational fishing (Aas, 1995; Fedler, 2000). Increasing household size should constrain angling participation as suggested in this study. Households with children younger than 18 years, however, were not included in the final model, because a strong covariance between presence of children and household size was identified.

Although not examined here, North American work has suggested that minority ethnic population growth may account for the net growth in angler numbers and associated effects such as economic impact (Murdock et al., 1992a, b, 1996). Changes in the composition and numbers of ethnic groups can influence angling participation. Changing proportions of ethnic groups and minorities may also influence how anglers view and approach recreational fishing in general (Hunt & Ditton, 2001). Increasing numbers and percentages of ethnic minorities, foreigners, and immigrants from other countries in Germany may change the composition and motives of the fishing population in the long term, especially given the recent extension of the European Union toward Eastern Europe.

The findings presented here lend weight to an expectation of absolute and relative reductions in future angling participation rates in Germany if the predicted demographic changes for the general population occur. Only potentially shrinking educational levels and household sizes may positively influence future angling participation. The likely reduction in participation level in recreational angling can exert negative and positive impacts on society. Negative impacts can occur because (1) the social and economic benefits generated by angling might be reduced and (2) the formation of large quantities of responsible aquatic stewards who serve as watchdogs against negative environmental influences can be impaired (Arlinghaus et al., 2002). Alternatively, "internally motivated" reductions of angling participation may reduce pressure exerted by anglers on aquatic ecosystems. This may reduce crowding, overfishing, and social conflicts with stakeholders traditionally opposing recreational fishing (e.g., animal welfare groupings) (Arlinghaus, 2005).

To conclude, major factors affecting recreational angling participation appear to include demographic and social changes such as urbanization, an aging population, changes in income and educational levels, and the changing role of women in society. Fisheries managers should recognize how demographic change can impact the angling population and the environment in which management occurs. Monitoring demographic effects on angling participation must become an increasingly important part of fisheries planning, development, and management.

There are no simple issues or single factors that adequately explain angling participation, desertion, retention, and initiation (Bissel et al., 1998). Accurately predicting future angling participation rates remains inherently difficult. People in the industrialized world are increasingly facing time constraints (Prahl, 2002). Recreational fishing might be increasingly difficult to fit with the daily routines. This poses considerable challenges for those interested in keeping interest in fishing high, while serving others who strive to reduce or even ban recreational fishing. Time will reveal whether recreational fishing will remain an activity pursued by a substantial number of people in a time-constrained society.

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